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Department:
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Directorate: Water Resource Development Planning
Department of Water & Sanitation
Private Bag X313
Pretoria
0001
South Africa

Greater Mangaung Water Augmentation Project

Geological and Materials Investigation Report

Xhariep Pipeline Feasibility Study

ZUTARI
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Geological and Materials Investigation Report

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CONSULTANT: ZUTARI (PTY) LTD
Approved for the Consultant:

Stephan Kleynhans
Signed by: Stephan Kleynhans, stephan.kleynhans@zutari.com

S KLEYNHANS
Design Director | Study Leader

DEPARTMENT OF WATER & SANITATION
Directorate: Water Resource Development Planning
Approved for Department of Water & Sanitation:

M MUGUMO
Chief Engineer: Water Resource Development Planning

C FOURIE
Director: Water Resource Development Planning

Document control record

Document prepared by:

Zutari (Pty) Ltd

Reg No 1977/003711/07
1 Century City Drive
Waterford Precinct
Century City
Cape Town

South Africa

PO Box 494
Cape Town
8000
Docex: DX 204

T +27 21 526 9400

E capetown@zutari.com

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Approval			
Author signature	Peter Vermeulen 19/03/2025 10:33:00(UTC+02:00)	Approver signature	09:40:22(UTC+02:00)
Name	Peter Vermeulen Cand.Sci.Nat	Name	Siya Nyathi Pri.Sci.Nat
Title	Engineering Geologist	Title	Associate Specialist: Engineering Geologist

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Report Structure

This report forms part of the following suite for the study:

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18	Integrated Water and Waste Management Plan	P WMA 06/D00/00/3423/18
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DWS Report Number: P WMA 06/D00/00/3423/7

Prepared by Zutari (Pty) Ltd

Executive Summary

Zutari (Pty) Ltd was appointed by the Department of Water and Sanitation (DWS) for the Xhariep Pipeline Feasibility Study. This appointment includes the geotechnical investigation along the proposed bulk pipeline route, and associated structures that includes pump stations, reservoirs and a water treatment plant (WTP). This report presents the findings of the fieldwork investigation and laboratory testing.

The geotechnical fieldwork included the excavation and profiling of 410 No. test pits, 44 No. boreholes, 106 No. Dynamic Cone Penetrometer (DCP) tests and 120 No. Dynamic Probe Super Heavy (DPSH) tests undertaken along the pipeline alignment and at the locations of the proposed major structures (i.e. the pump stations, reservoirs and water treatment plant). Soil electrical resistivity testing was also conducted along the pipeline at 200 m intervals.

At the time of the field investigation, access to certain privately owned farmland was not granted and wayleaves from Mangaung Metropolitan Municipality were not received. Thus, there are sections along the proposed pipeline route and at Command Reservoir No 2 that were excluded from the investigation. The field investigation for these areas needs to be undertaken as part of the detailed design phase of the project.

The general area is characterized by a gentle topography with local hills. Most of the proposed route alignment is adjacent to road reserves, with the northern section spanning over farmland. With the exception of cultivated land, the surface is mainly covered by grass and bushes, with occasional trees. The bush and tree cover are mainly found over the local hills and along drainage courses. Additionally, within the developed portion towards the Rustfontein WTP, heaps of building rubble were noted.

The 1: 250 000 scale geological maps of the area indicates that the pipeline is largely underlain by interbedded sandstone, shale and mudstone belonging to the Beaufort Group of the Karoo Supergroup, with dolerite intrusions throughout the site.

The geotechnical investigation found general ground conditions as:

Pipeline

With the investigation spanning over approximately 250 km, the ground profile naturally varied along the pipeline. However, most of the route is underlain by relatively shallow bedrock (0.3 m – 3.5 m below surface) that is covered by a combination of silty clay to silty sand (colluvium and alluvium), silty to sandy clay with occasional gravel, cobbles and boulders (residual dolerite and mudstone), silty sand (residual sandstone) and clayey silt (residual siltstone) that is partly covered by angular gravel with occasional dolerite cobbles and boulders in a silty sand matrix (fill within the road reserve).

Calcrete typically formed towards the base of the transported materials (colluvium and alluvium) at depths ranging between 0.6 m to 2.8 m, with local hardpan calcrete lenses along the pipe route. The DPSH test results indicated occasionally deep bedrock levels that ranged from 5.7 m to 12.6 m, typically at river crossings.

Ground water seepage and water rest levels were noted between 0.2 m to 7.9 m, with the shallow occurrences likely related to local peached groundwater tables.

The electrical resistivity analysis indicates that approximately 83% of the surveyed sections along the pipeline route traverse soils which range from mildly corrosive to extremely corrosive to buried steel. The pH and conductivity results also indicated that the material encountered on site are generally extremely corrosive. It is recommended that protection of the steel pipelines will be required in the form of protective coatings and/or cathodic protection.

Soil samples taken were from test pits to determine the material quality to be considered for use during construction. The results showed that the excavated material over the area is generally not suitable for use as bedding or engineered fill. However, there are very few occasions where the colluvium, residual dolerite and residual sandstone tested as G7 - G6, that could be suitable as engineered fill. The residual soil also generally classifies as SM, with a PI less than 15 that could be suitable as selected fill blanket. However, it should be noted that the test results are variable, and not all the samples passed the required specifications. Good quality control would thus be required should this material be considered.

Based on the geological maps of the study area and the findings of the geotechnical investigation, no feasible locations for borrow pits, which could yield suitable material for use as pipe bedding, could be identified. Enquiries have also been made with consultants and contractors that were involved on construction projects in the study area over the past decade to determine whether they used material from commercial sources or from borrow pits. All of them indicated that they used material imported from commercial sources.

With the pipe invert level between 3.0 – 4.5 m below surface, most of the pipeline will be situated within bedrock (hard excavation). A combination of mudstone and sandstone underly the majority of the pipeline, with dolerite encountered in only 11% of the test pits. Blasting may be required for the dolerite intrusions. Additionally, there are local zones, along approximately 7% of the proposed alignment, with a thick soil cover that is generally related to the wetlands, rivers and streams.

No sidewall collapse was encountered within the test pits and based on this assessment excavations are considered stable. Should deep excavations be required (beyond 3.0 m), shoring or battering of excavation faces must be considered to ensure safety, which will need to be assessed by a geo-professional. It is recommended that the excavated face be inspected by a competent engineering geologist or geotechnical engineer to confirm the stability of excavations during construction.

It is also important to note that the mudstone from the Beaufort Group undergoes rapid disintegration after exposure to air if it is not protected or backfilled immediately after excavation.

Raw Water Pump Station

The raw water pump station area is underlain by shallow bedrock from surface to a depth of 1.1 m. Most of the area is underlain by mudstone that is covered by a hard rock dolerite sill towards the north-west. Groundwater was encountered from 2.3 m.

“Soft to intermediate” excavation to 0.8 m over most of the site, becoming “hard” thereafter, with “hard excavation” from surface over the dolerite sill is anticipated. An evaluation of seismicity found that the site classifies as ground type 1 (after SANS 10160-4:2017).

Foundations should be placed at a depth of 1 m on bedrock, with an allowable bearing pressure (ABP) of 400 kPa. Allowance for local blasting should be made for the dolerite sill.

Xhariep WTP and High-Lift Pump Station

The Xhariep water treatment plant (WTP) and high-lift pump station zone is underlain by shallow bedrock from 0.1 to 2.0 m below surface. Bedrock depth is generally within 0.5 m from surface but is locally deeper along the southeastern boundary. Most of the area is underlain by mudstone, with a thin dolerite dyke intrusion that traverses the site in a northwest to southeast direction. The water rest level is variable (between 1.6 - 5.7 m).

“Soft to intermediate” excavation to 0.5 m, with “hard” excavation below, over most of the site is anticipated. However, “hard” excavation is anticipated from 0.2 m over the dolerite sill. An evaluation of seismicity found that the site classifies as ground type 1 (after SANS 10160-4:2017).

Foundations should be placed at a depth of 1.1 m on bedrock, with an allowable bearing pressure (ABP) of 400 kPa. Should the foundation footprint extend over the weathered zone (where bedrock is typically

deeper), the foundation should be undercut to 1 m below foundation level or bedrock (whichever is the shallowest) and replaced with a G6 material, or better, that is compacted to 95% MOD AASHTO at ± 2% optimum moisture content in 300mm thick layers. The ABP should be limited to 200 kPa. Allowance should also be made for dewatering of excavations, especially after periods of heavy and / or continuous rain. Local blasting may be required at the dolerite dyke.

Command Reservoir No 1

The Command Reservoir No 1 site is underlain by interbedded sandstone and mudstone with the competent bedrock between 1.3 m becoming deeper towards the south (to 2.5 m). A local hard rock dolerite sill was intersected in one of the test pits within the central eastern portion of the site, with bedrock from 1.2 m. Groundwater is generally encountered from 3.8 m.

The foundation should extend through the colluvium and be placed on a combination of bedrock and dense residual sandstone. Allowance for hard rock excavation should be made where an excavation deeper than 1.2 m is required. An evaluation of seismicity found that the site classifies as ground type 1 (after SANS 10160-4:2017).

The foundation should extend through the colluvium and placed at a depth of 1.3 m on a combination of bedrock and dense residual sandstone, with an allowable bearing pressure of 200 kPa. Allowance for local hard rock excavation should be made for the dolerite intrusion.

Booster Pump Station and Suction Reservoir

The booster pump station and suction reservoir area are underlain by shallow interbedded mudstone and sandstone bedrock from 0.2 m to 0.5 m below surface. Measured groundwater rest levels varied between 1.2 – 5.9 m.

“Soft to intermediate” excavation to 0.5 m, with intermediate to hard excavation beyond 0.5 m depth, is anticipated. An evaluation of seismicity found that the site classifies as ground type 1 (after SANS 10160-4:2017).

Foundations should be placed at a depth of 0.5 m on bedrock, with an allowable bearing pressure (ABP) of 400 kPa.

It should be noted the recommended allowable bearing pressures at each of the structure positions are included to guide the conceptional and detailed designs. Geotechnical design, with verification of these estimates, and associated settlement calculations will need to be included at detailed design phase.

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Abbreviations

Acronyms

Acronym	Description
AADD	Average Annual Daily Demand
BW	Bloem Water
CBD	Central business district
DEM	Digital Elevation Model
DWS	Department of Water & Sanitation
EFR	Environmental flow requirements
EIA	Environmental Impact Assessment
GIS	Geographical information systems
IAP	Interested and Affected Parties
IDP	Integrated Development Plan
ISP	Internal Strategic Perspective
IWULA	Integrated Water Use License Application
MMM	Mangaung Metropolitan Municipality
NWRP	DWA Directorate: National Water Resource Planning
P/s	Pump station
PPP	Private Public Partnerships
PPPr	Public Participation Process
PRV	Pressure reducing valve
RDP	Reconstruction and Development Programme
RO	Reverse osmosis
RPST	Reconciliation Planning Support Tool
SDF	Spatial Development Plan
SMC	Study Management Committee
ToR	Terms of Reference
UAW	Unaccounted for Water
URV	Unit Reference Values
VCWB	Vaal Central Water Board
WARMS	Water Authorisation and Registration Management System
WC/WDM	Water Conservation and Water Demand Management
WMA	Water Management Area
WSDP	Water Service Development Plan
WTP/WTW	Water Treatment Plant or Water Treatment Works

Measurement Units

Symbol	Description
Ha	Hectares
km	Kilometres
m	Meters
m^3/a	Cubic meters per annum
m^3/d	Cubic meters per day
m^3/s	Cubic meters per second
million m^3	Million cubic meters
mm/a	Millimetres per annum
million m^3/a	Million cubic meters per annum

1 Introduction

1.1 Terms of Reference

The Department of Water and Sanitation (DWS) has appointed Zutari under Contract WP11405-142213 to render multi-disciplinary professional services for the development of the Xhariep Pipeline which is to be designed to convey water from the Gariep Dam (Southern Free State) to both the existing Longridge Reservoir in Bloemfontein and the clearwell reservoir at the Rustfontein water treatment plant (WTP), approximately 50 km east of Bloemfontein.

As part of the appointed services, a geotechnical investigation was conducted along the length of the proposed pipeline and at the locations of major infrastructure components, i.e., pump stations, reservoirs and the water treatment plant. This geotechnical report presents the findings of the fieldwork investigation and laboratory testing.

1.2 Proposed Development

The proposed bulk transfer pipeline will include a tie-in to an existing DN2100 outlet pipe downstream of the Gariep Dam wall and extend approximately 1.6 km to a new raw water pump station (also referred to as 'low-lift pump station') near the existing Gariep WTP, from where the raw water will be pumped along an 11 km long rising main to the proposed new Xhariep WTP. From the WTP, a high-lift pump station delivers potable water to Command Reservoir No 1 (also referred to as 'high-point reservoir'), a booster pump station with suction reservoir, as well as Command Reservoir No 2 via a 177 km northeast - southwest pipeline alignment. Command Reservoir No 2 is situated on a local hill within the northern portion of Farm Lieuwkop 105, from where potable water will be supplied under gravity to the existing Brandkop Reservoir in Bloemfontein and the clearwell at the Rustfontein WTP (*Note – the pipeline has been designed to terminate at Longridge Reservoir in Bloemfontein, but provision has been made for Mangaung Metropolitan Municipality to extend the pipeline in future to the Brandkop Reservoir should this be required for operational flexibility. As such, where possible, the geotechnical investigation was extended to include the future pipeline extension to Brandkop Reservoir*). Figure 1-1 shows the location of the abovementioned major infrastructure components and the associated pipeline routes.

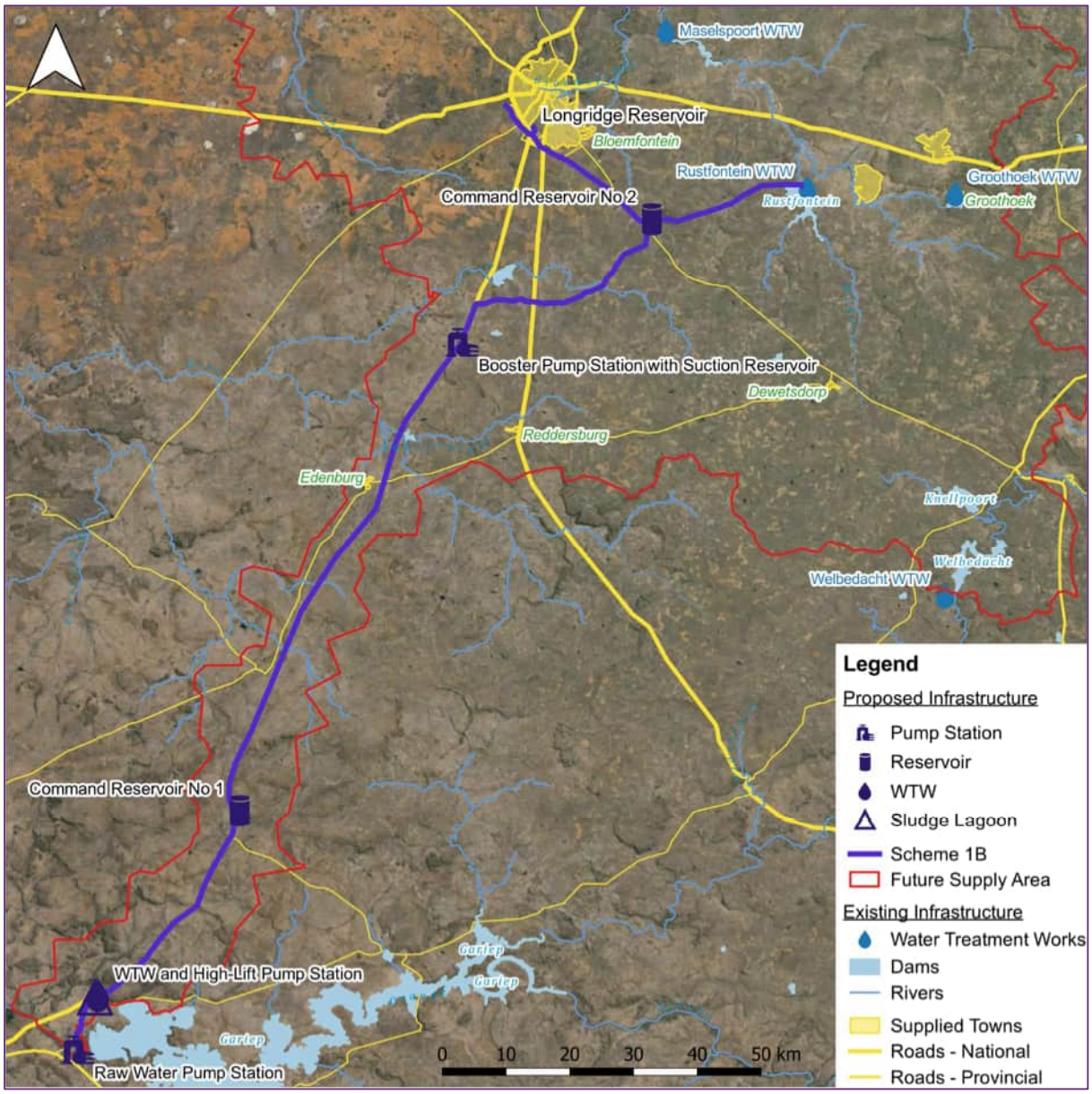


Figure 1-1: Major infrastructure components of proposed scheme

1.3 Objectives and Methodology

The objectives of this geotechnical investigation were to:

- Identify the composition of soil and rock horizons encountered along the pipeline route and group areas with similar profiles into zones.
- Determine engineering and mechanical properties of the encountered materials along the pipeline route and at the sites of the major infrastructure components.
- Assess groundwater conditions along the pipeline route and at the major infrastructure components, and identify how these may impact the development.
- Assess excavatability of materials along the pipeline route and at the various sites.
- Assess suitability of in-situ material as fill or bedding material.
- Assess the stability of open excavations and trenches.
- Consider geotechnical factors that may influence the proposed development.
- Provide founding recommendations for the water treatment plant and associated infrastructure.

The investigation methodology can be summarized as follows:

- Test pitting to a depth of 3 m (maximum reach of the TLB machine), or up to refusal on hard material (whichever occurs first) or a depth where the excavation sidewalls became unsafe or where groundwater seepage was encountered. These test pits were excavated at 400 m intervals along the pipeline route. All test pits were safely excavated following the SAICE Code (SAICE, 2007) Safe Practice.
- Dynamic Cone Penetrometer (DCP) testing from surface or from 1.5 m below ground level within the test pit.
- Rotary core drilling at major road and river / stream crossings along the pipeline route where pipe jacking may be required, in order to determine rockhead levels and ground water depths.
- Dynamic Probe Super Heavy (DPSH) tests were conducted at selected locations, initially to cover the pipeline route at 1 km intervals and at stream / river crossings, but was revised to target areas were the TLB did not refuce on bedrock within 2.8 m.
- Electrical resistivity testing was conducted at 200 m intervals along the proposed pipeline alignment.
- Geological mapping was undertaken to aid in the geological zoning across the pipeline route.

1.4 Limitations of Assessment

Following from Section 1.3, the following had bearing on the investigation and presented findings:

1.4.1 Test Pits and Dynamic Cone Penetrometer (DCP)

At the time of the field investigation, access to certain privately owned farmland was not resolved and wayleaves from Mangaung Metropolitan Municipality were not received. These areas, as well as areas with space restrictions between fences and local steep road embankments along the road reserve, were excluded from the planned test pits. Test pits that were excluded includes Figure 5-1TP 236, TP 324-325, TP 355, TP 427-431, TP 440-446, TP 462-485, TP 553, TP 555, TP 580-TP 629, TP 634-TP 654, TP 671, TP 673 and TP 682-TP 685.

1.4.2 Rotary Core Drilling

Due to similar access constraints as discussed in Section 1.4.1 above, certain rotary core test positions (BH 27, BH33-BH34, BH 41, BH 43-BH 46, BH 51-BH 53 and BH 55-BH 57) could not be drilled.

1.4.3 Data Assumptions

The zoning of the pipeline was determined based on ‘point data’ gathered from test pits, boreholes, and exposures observed during the investigation. Given the spacing (approximately 400 m) between each test point, the zoning exercise offers a generalized view of the expected ground conditions along the pipeline route. Consequently, some conditions may differ from those presented in this report.

1.5 Information Sources

The following sources of information were consulted prior to the commencement of the geotechnical investigations:

- 1:250 000 scale geological maps
    - Sheet 2924 Koffiefontein, Council for Geoscience, 1994.
    - Sheet 2926 Bloemfontein, Council for Geoscience, 1966.
    - Sheet 3024 Colesburg, Council for Geoscience, 1997.
    - Sheet 3026 Alival North, Council for Geoscience, 1983.

- Google Earth imagery (2025).
- Geotech Investigation Part 1.kmz file that Zutari provided to the geotechnical contractor
- Geotech Investigation Part 2.kmz file that Zutari provided to the geotechnical contractor
- CapeFarmMapper (2025).

2 Site Characterisation

2.1 Site Location and Description

The development may be subdivided into six key components, namely:

- The low lift pump station 1.6 km from the Gariep Dam,
- The Xhariep WTP with a high lift pump station,
- Command Reservoir No 1,
- A booster pump station with a suction reservoir,
- Command Reservoir No 2, and,
- The connection point at the existing Longridge/Brandkop Reservoirs in Bloemfontein and the clearwell at the Rustfontein WTP.

The central co-ordinates of the following sites are provided below:

- Low Lift Pump Station 30°37'29.29"S and 25°29'6.65"E
- Xhariep WTW and high lift pumpstation 30°32'39.25"S and 25°30'24.34”E
- Command Reservoir No 1 30°14'58.71"S and 25°44'15.91"E
- Proposed booster pumpstation with suction reservoir 29°30'55.01"S and 26° 5'14.59"E
- Command Reservoir No 2 29°19'16.80"S and 26°23'8.35"E

The co-ordinates of the approximate pipeline tie-in point at the Longridge Reservoir is 29°10'37.66"S and 26°11'58.48"E. The co-ordinates of the approximate pipeline tie-in point at the Rustfontein WTP is 9°16'8.81"S and 26°37'9.83"E.

Most of the proposed route alignment is immediately adjacent to road reserves, with the northern section spanning over farmland. Except for cultivated land, the surface is mainly covered by grass and bushes, with occasional trees. The bush and tree cover are mainly found over the local hills and along drainage courses. Additionally, within the developed portion towards the Rustfontein WTP, heaps of building rubble were noted.

General views of the area are included as Figure 2-1.

Natural vegetation over the area, with predominantly grass over the flat plains, with additional bushes and trees, mainly at the local hills and along drainage courses.

Heaps of building rubble towards the Rustfontein WTP.

Culvert on shallow bedrock along the N1 road reserve

Steep embankment and fences where there are not enough space for the TLB to excavate a test pit.

Figure 2-1: General views of the area

The proposed structure locations and pipeline route is shown in Figure 2-2.

2.2 Topography

The proposed alignment of Xhariep pipeline is characterised by mainly a gentle topography, ranging from about 1250 metres above sea level (masl) in the south (Gariep Dam) to between approximately 1360 masl and 1400 masl towards the north (Brandkop / Longridge reservoir).

Local exceptions are encountered where the proposed pipeline traverse hills (refer to Figure 2-3), including:

- A local increase in the ground elevation up to approximately 1520 masl at Springfontein; and
- At the proposed Command Reservoir No 2, where the elevation increase to 1530 masl.

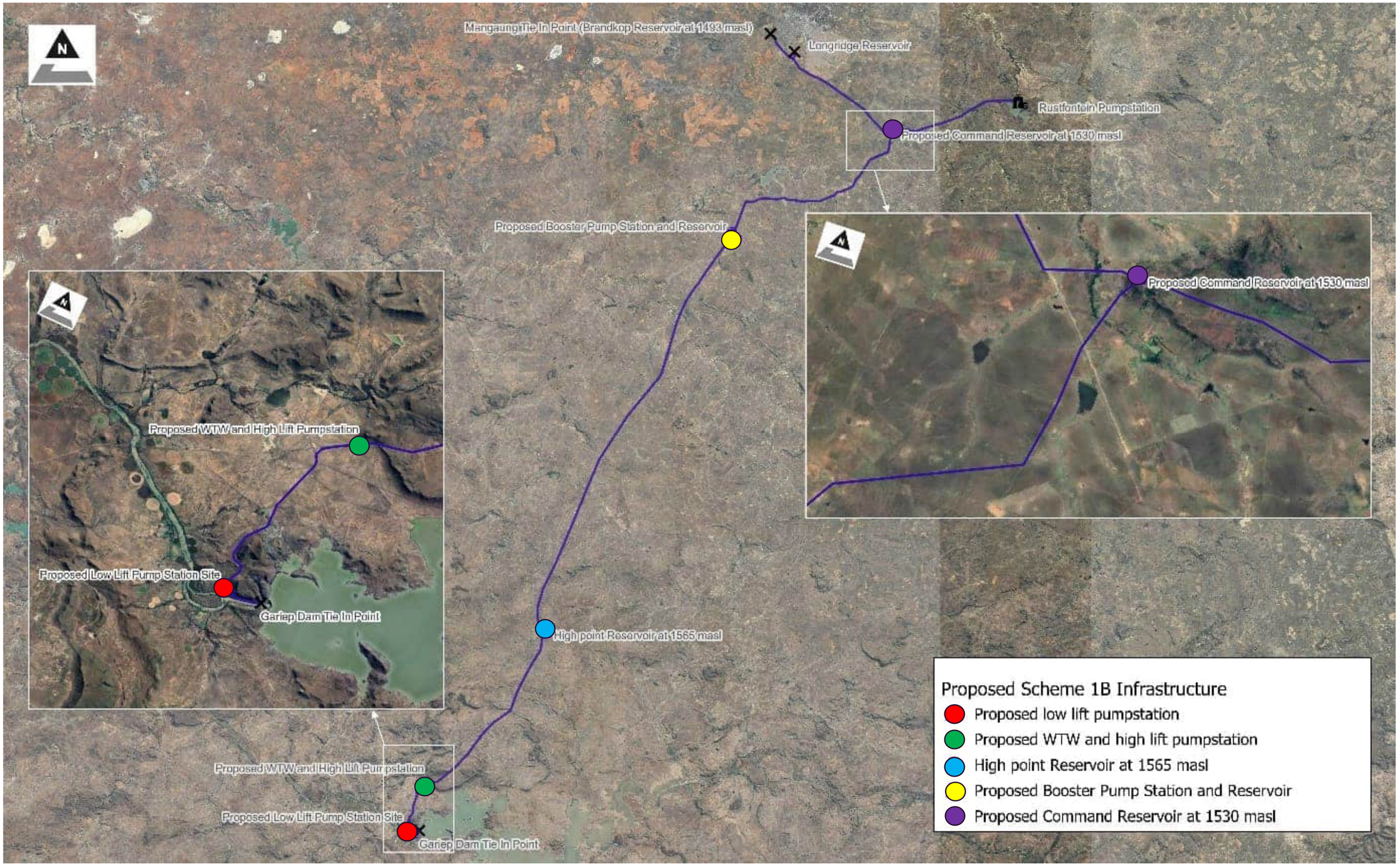


Figure 2-2: Proposed pipeline route and infrastructure

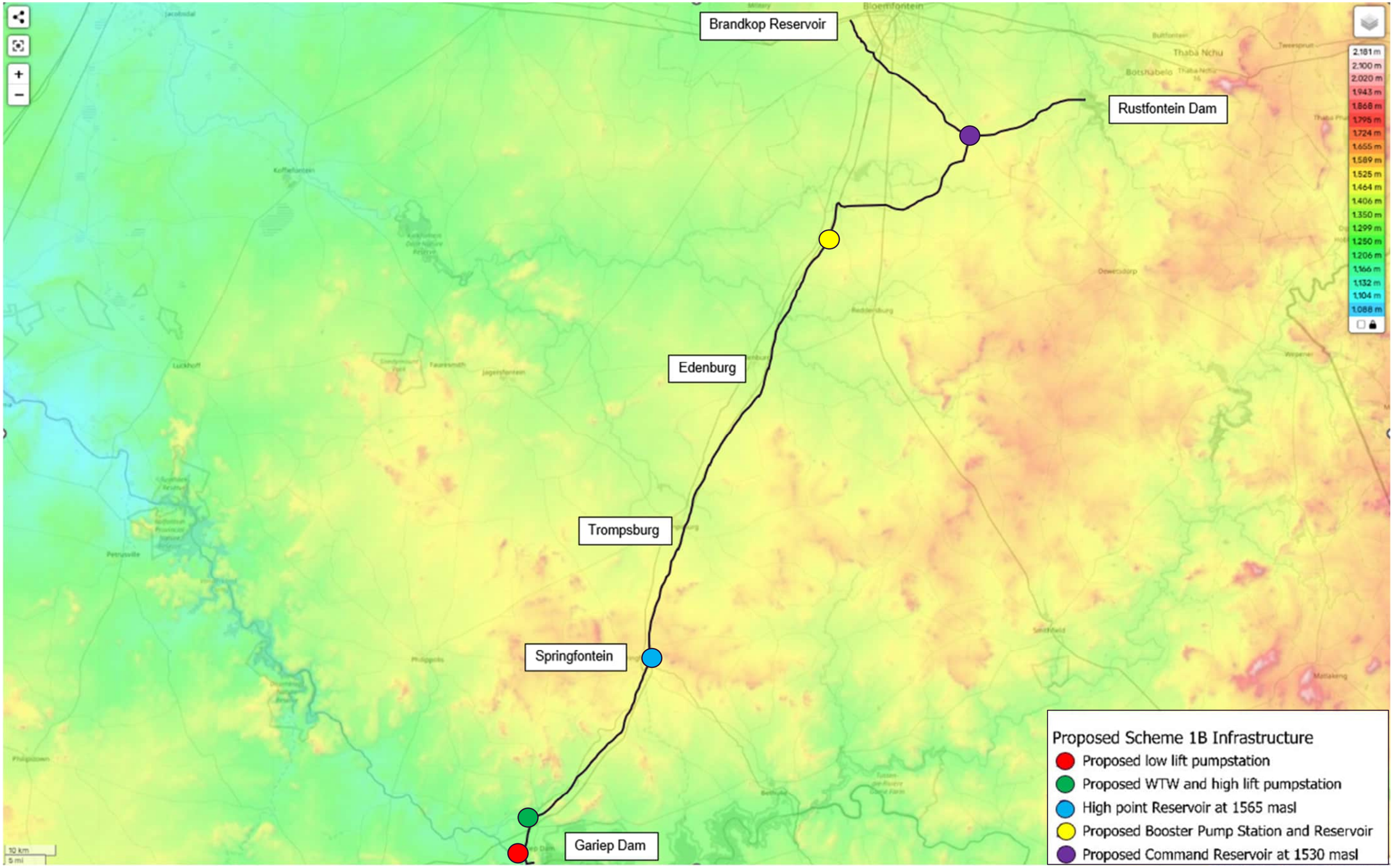


Figure 2-3: Topographic map extending from Gariep Dam to Rustfontein Dam and Brandkop Reservoir (topographic-map.com – Bloemfontein, 2025)

2.3 Climate

The climatic conditions largely determine the rate and mechanism of weathering of natural rock and its products. The Weinert N-value groups climatic regions according to areas of similar moisture patterns, and the likely weathering mechanisms that can be expected. According to Weinert, physical weathering will prevail in areas where the N-value is larger than 5 and chemical weathering will prevail in areas where the N-values are less than 5 (Figure 2-4).

Physical weathering is therefore the prevailing rock weathering mode for the study area. This weathering mode is generally associated with shallow residual soils. It should be noted that this applies only to the residual soil profile and does not include or describe possible local accumulations of transported soil.

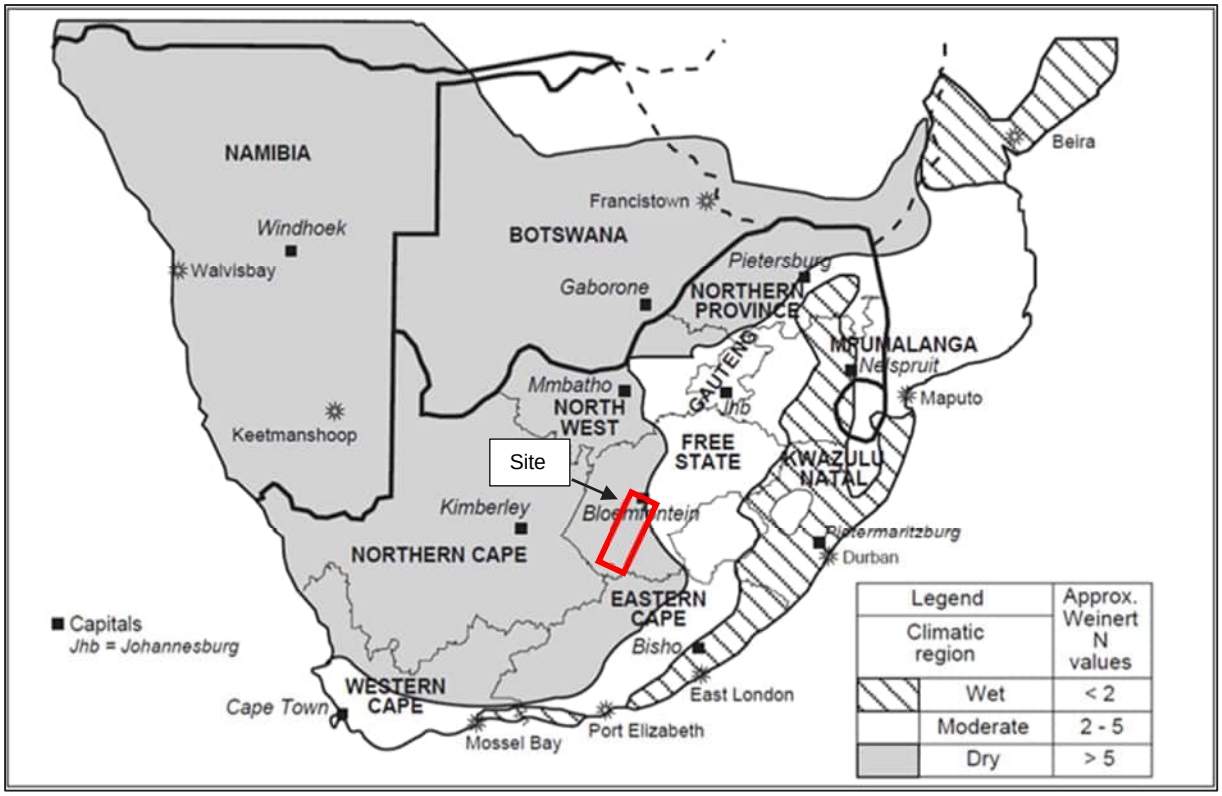


Figure 2-4: Project location with respect to macro-climatic regions of Southern Africa (Weinert, 1980)

2.4 Regional Geology

A review of the 1:250 000 scale, 2924 geological map of Koffiefontein (1992) (referred to as map ‘A’ in Figure 2-5), 2926 geological map of Bloemfontein (1966) (map ‘B’ in Figure 2-5) and 3024 geological maps of Colesberg (1997) (map ‘C’ in Figure 2-5) indicates that the pipeline is largely underlain by sandstone interbedded with shale and mudstone belonging to the Beaufort Group of the Karoo Supergroup, with dolerite intrusions abundantly present throughout the site. Quaternary deposits, described as alluvium, locally covers the residual profile, especially along the southern proposed pipeline route alignment that traverse geological map ‘A’ and ‘C’.

The geological maps (refer to Figure 2-5) do not indicate any major faults near any of the proposed structures or the proposed pipe alignment. The geological legends associated with the respective geology maps have been reproduced as Figure 2-6 to Figure 2-8. It is important to note that the geological map only shows the hard rock geologies (bedrock) beneath the site, which would be encountered at depth. The drift geology and the nature of the overlying soils are not shown in Figure 2-5.

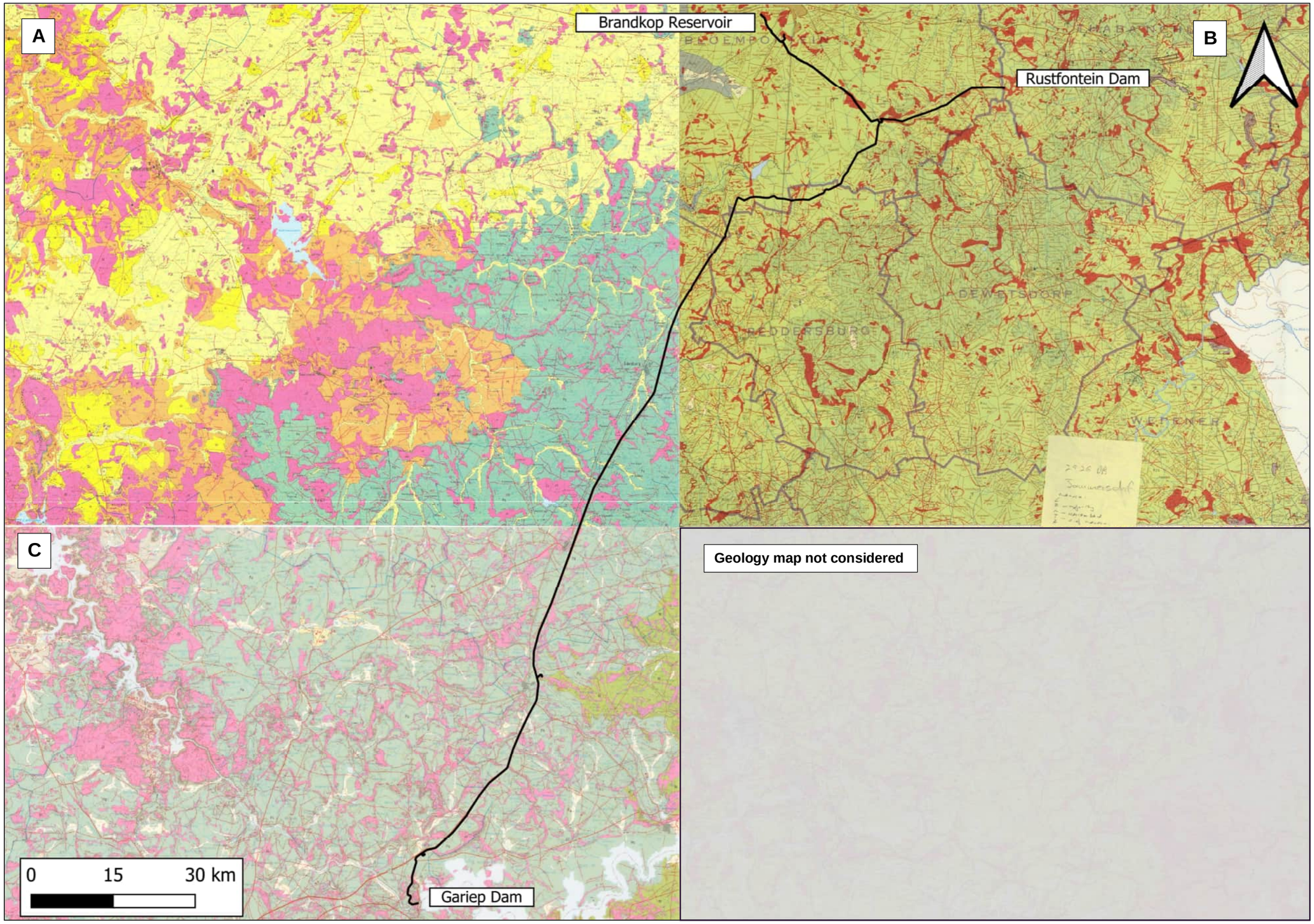


Figure 2-5: **Regional geology for the proposed Xhariep pipeline (1:250 000 geological map, Sheet 2924 (1986), Sheet 2426 (1963) and Sheet 3024 (1997), Geological Survey of South Africa)**

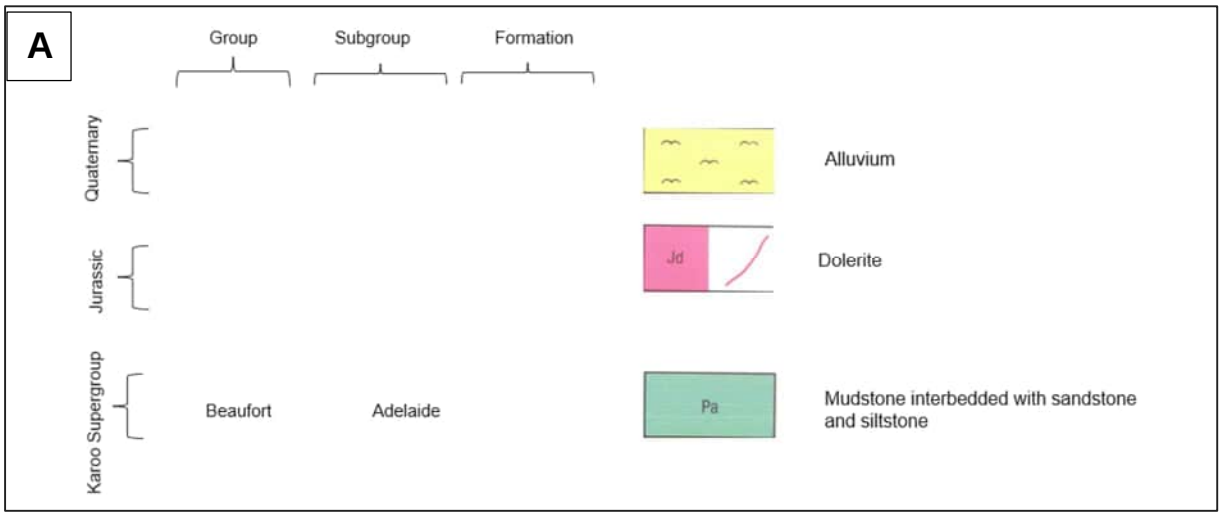


Figure 2-6: **Regional geology (sheet 2924, Koffiefontein, 1: 250 000 scale – Geological Survey of South Africa, 1986)**

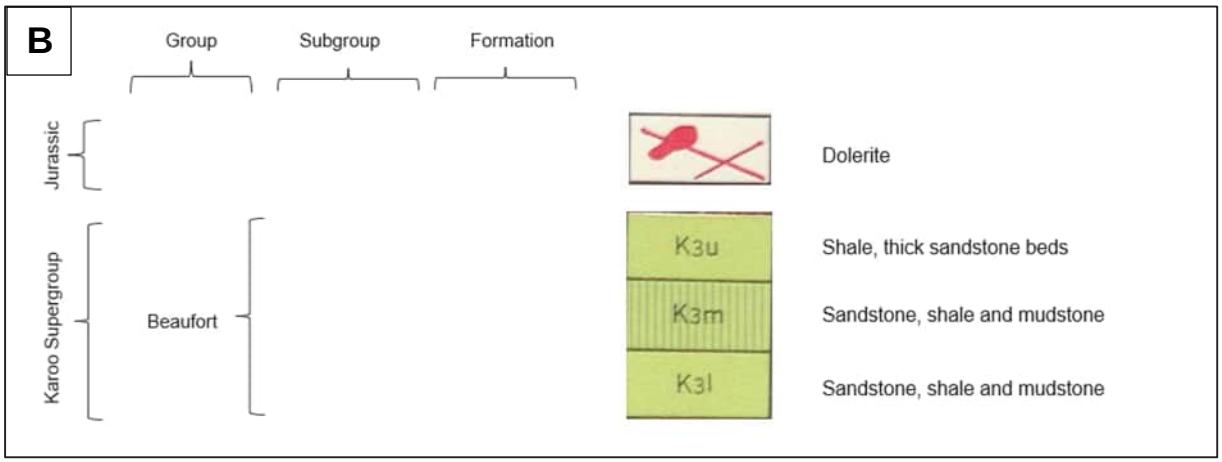


Figure 2-7: **Regional geology (sheet 2926 Bloemfontein, 1: 250 000 scale – Geological Survey of South Africa, 1963)**

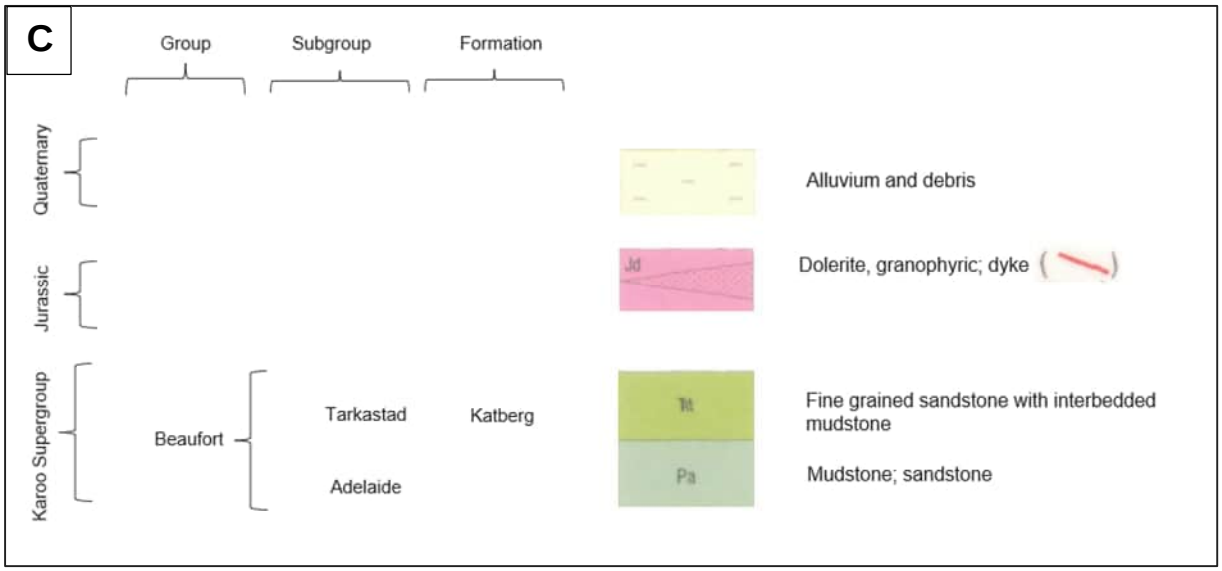


Figure 2-8: **Regional geology (sheet 3024 Colesberg, 1: 250 000 scale – Geological Survey of South Africa, 1997)**

2.5 Seismicity

According to SANS 10160-4:2017, the site area, indicated in red in Figure 2-9, falls within an area with a Peak Ground Acceleration (PGA) of 0.1 to 0.2 g due to a combination of both mining-induced and natural seismic activity. The probability of exceeding this PGA is 10% in a 50-year period. As a result, site-specific seismic design requirements should be adhered to as prescribed by SANS, other than normal structural design requirements. This assessment is based on published SANS data and no site-specific studies have been performed.

It is important to highlight that, although the site experiences mining-induced tremors, the boundary of the mining operations is located to the north of the site.

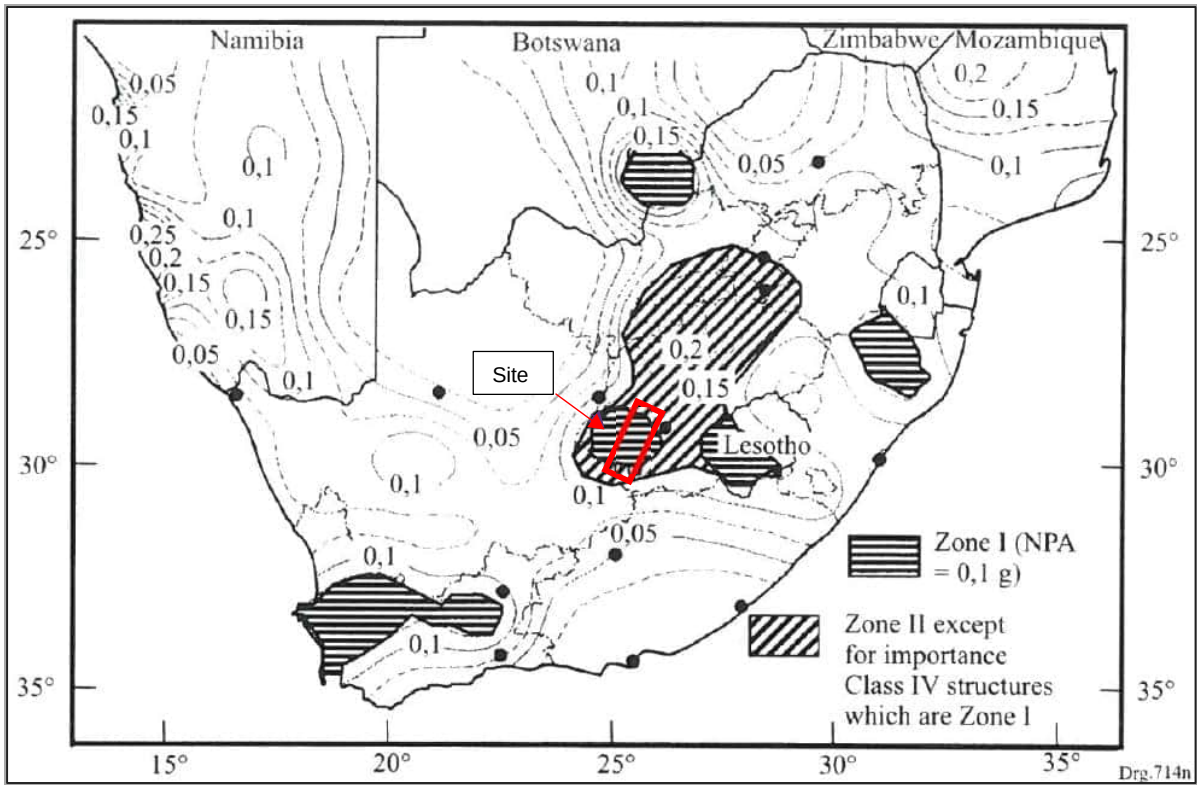


Figure 2-9: Seismic hazard map of South Africa showing seismic hazard zones and peak ground acceleration with 10% probability of being exceeded in a 50-year period (SABS, 2017).

2.6 Geohydrology

Information provided by the Department of Water and Sanitation, presented on the GIS database CapeFarmMapper3 (Western Cape Department of Agriculture, 2024) was reproduced as Figure 2-10 and Figure 2-11. From these figures, the following hydrological conditions may be expected across the development area:

Groundwater may be expected at a depth of between approximately 4 m and 21 m below ground level that generally becomes deeper towards Bloemfontein. This refers to the depth to groundwater within deep aquifers for agricultural water-use (i.e., boreholes). Therefore, it is quite possible to encountered water seepage from a perched water table or from stormwater infiltration at depths shallower than these along the pipeline, particularly where impermeable pedogenic horizons are present. Groundwater recharge is expected to be between approximately 5 mm/annum and 18 mm/annum.

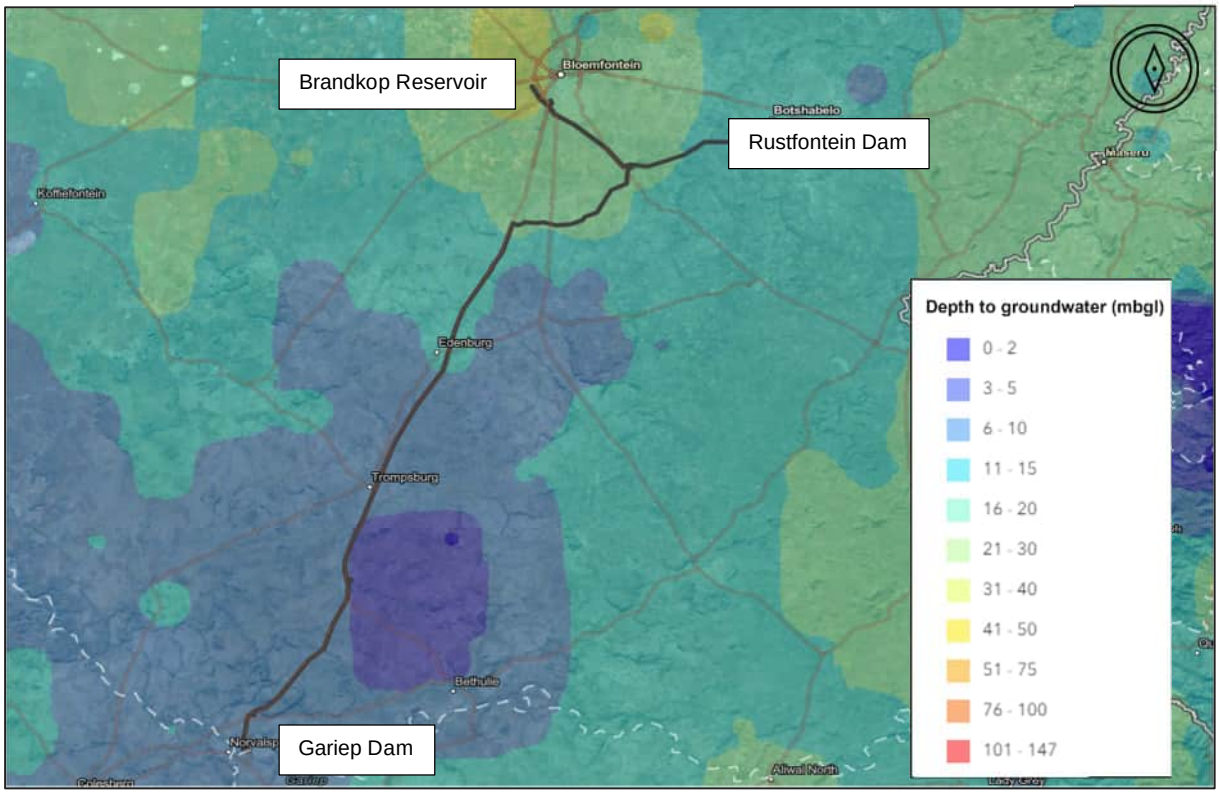


Figure 2-10: Geohydrology, depth to groundwater of the proposed development area (Western Cape Department of Agriculture, 2024)

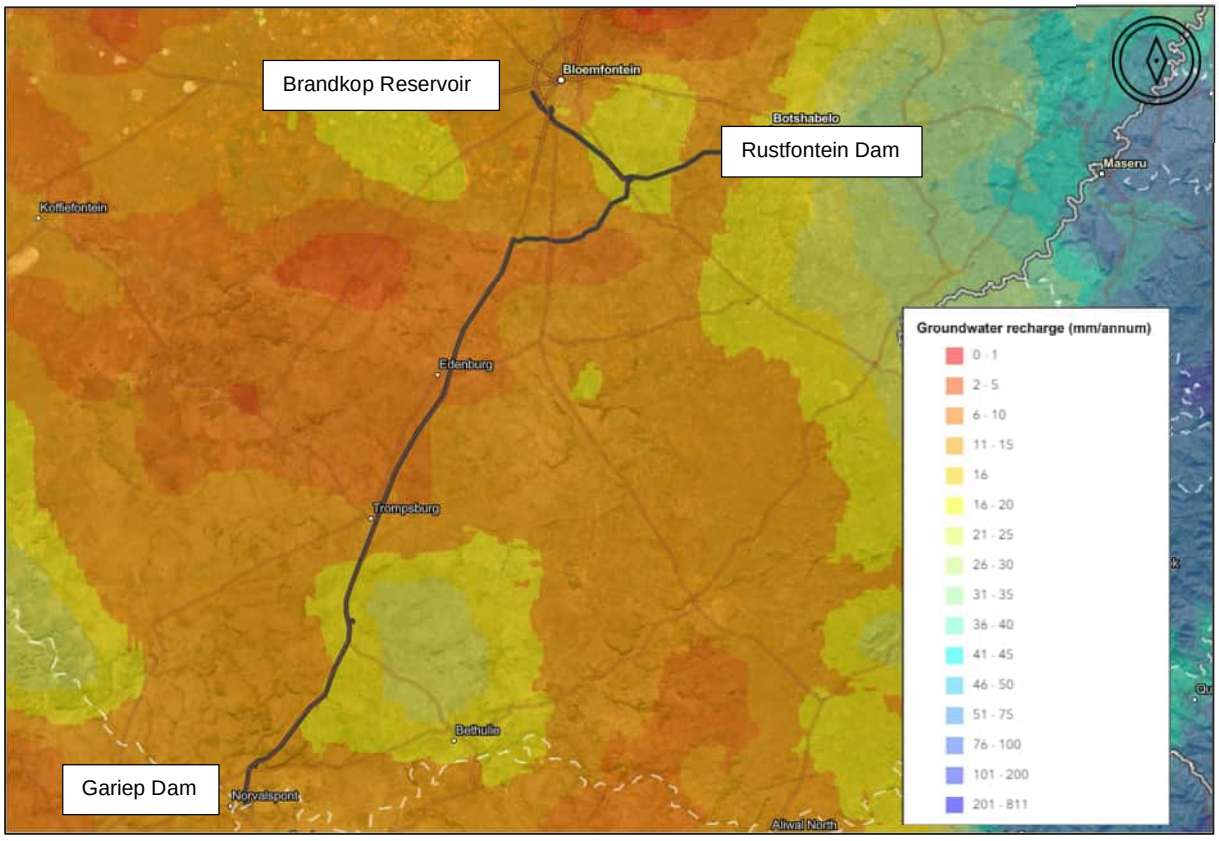


Figure 2-11: Geohydrology, groundwater recharge of the proposed development area (Western Cape Department of Agriculture, 2024)

3 Investigation Methodology

The preliminary geotechnical investigation was conducted by Mukona Geotechnics (Pty) Ltd from the 3rd of September 2024 to the 10th of December 2024 and was reviewed by Zutari's engineering geologists. The following key components were conducted:

- 410 No. test pits excavated with a TLB to final depths in the range of 0.1 m to 3.8 m.
- 106 No. Dynamic Cone Penetrometer (DCP) tests to final depths in the range of 0.1 m to 1.0 m.
- 44 No. boreholes drllied to final depths in the range of 5.0 m to 15.22 m.
- 120 No. Dynamic Penetration Super Heavy (DPSH) tests to a final depth in the range of 0.3 m to 12.6 m.

Laboratory testing, including:

- 94 No. Foundation Indicators, comprising grading analyses (both sieve and hydrometer), Atterberg limits and linear shrinkage.
- 46 No. Mod AASHTO Compaction and California Bearing Ratio (CBR).
- 60 No. pH and conductivity.

The test position coordinates are summarised in Table 3-1 and

Table 3-2 for the pipeline and structures, respectively. The coordinates and termination depths for the boreholes are represented in Table 3-3. All test points were marked out using a handheld GPS with a horizontal accuracy of 3 – 5 m.

3.1 Test Pitting

410 No. test pits were excavated and profiled across the site. Figure 3-1 illustrates the locations of these test pits. Due to the high density of test pits, spaced at intervals of 400 meters, only every 50th test pit is labelled on the site map. The test pits were excavated using a Tractor Loader Backhoe (TLB) to a depth of 3.8 m (maximum reach of the machine), or up to refusal on hard material (whichever occurs first) or a depth where the excavation sidewalls became unsafe or where groundwater seepage was encountered. All test pits were safely excavated following the SAICE Code (SAICE, 2007) Safe Practice.

Mukona Geotechnics (Pty) Ltd was contracted by Zutari to excavate and profile the test pits, which were reviewed by a Zutari engineering geologist in accordance with the South African best practice for soil and rock description (Dippenaar M.A., Van Rooy J.L., Davis G. (eds.), 2024). The test pit positions along the pipelines and structures are summarized in Table 3-1 and

Table 3-2, respectively.

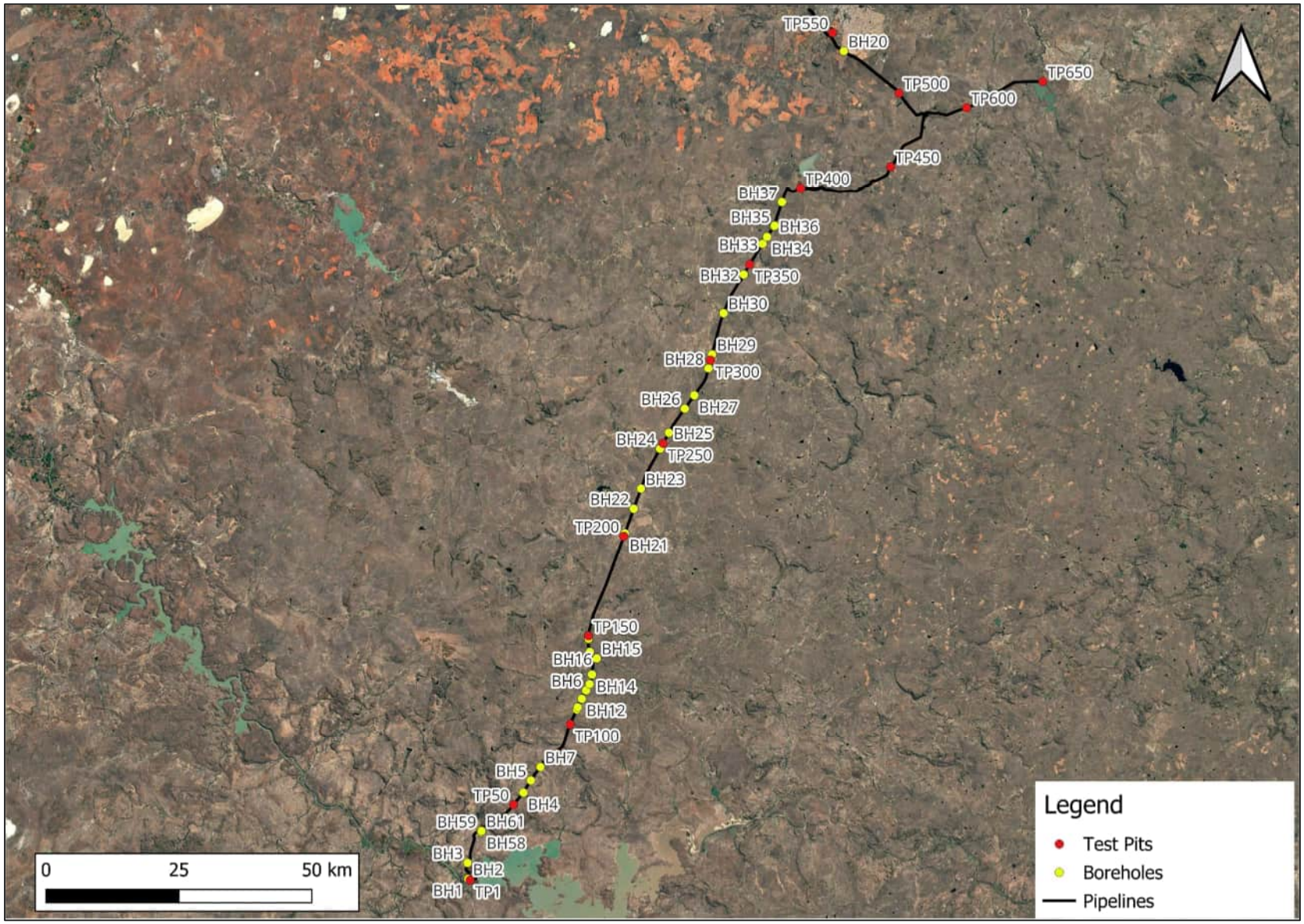


Figure 3-1: Site plan showing test pits (TP) and boreholes (BH) across the pipeline route

Table 3-1: Test pit coordinates for pipeline

Test point	Latitude	Longitude	Test point	Latitude	Longitude	Test point	Latitude	Longitude
TP1	-30.62712	25.48920	TP27	-30.54759	25.49995	TP53	-30.49156	25.58253
TP2	-30.62550	25.48701	TP28	-30.54535	25.50357	TP54	-30.48601	25.58773
TP3	-30.62346	25.48425	TP29	-30.54328	25.50699	TP55	-30.48321	25.59037
TP4	-30.61993	25.48447	TP30	-30.54127	25.51045	TP56	-30.47990	25.59383
TP5	-30.61627	25.48654	TP31	-30.53745	25.51755	TP57	-30.47658	25.59545
TP6	-30.61363	25.48652	TP32	-30.53665	25.52093	TP58	-30.47351	25.59768
TP7	-30.61200	25.48293	TP33	-30.53582	25.52507	TP59	-30.47052	25.59993
TP8	-30.60909	25.48087	TP34	-30.53499	25.52911	TP60	-30.46748	25.60220
TP9	-30.60548	25.48149	TP35	-30.53459	25.53101	TP61	-30.46445	25.60450
TP10	-30.60191	25.48210	TP36	-30.53346	25.53496	TP62	-30.46140	25.60681
TP11	-30.59836	25.48394	TP37	-30.53120	25.53821	TP63	-30.45943	25.60832
TP12	-30.59641	25.48562	TP38	-30.52874	25.54128	TP64	-30.45913	25.60854
TP13	-30.59343	25.48821	TP39	-30.52629	25.54432	TP65	-30.45850	25.60901
TP14	-30.59011	25.48955	TP40 / DCP40	-30.52387	25.54739	TP66	-30.45550	25.61129
TP15	-30.58662	25.48944	TP41	-30.52142	25.55048	TP67	-30.45248	25.61359
TP16	-30.58304	25.48935	TP42	-30.51893	25.55352	TP68	-30.44972	25.61569
TP17	-30.57949	25.48982	TP43	-30.51647	25.55657	TP69	-30.44644	25.61828
TP18	-30.57598	25.49105	TP44	-30.51417	25.55940	TP70	-30.44366	25.62083
TP19	-30.57259	25.49225	TP45	-30.51158	25.56266	TP71	-30.44076	25.62340
TP20	-30.56914	25.49342	TP46	-30.50913	25.56574	TP72	-30.43794	25.62594
TP21	-30.56571	25.49461	TP47	-30.50658	25.56857	TP73	-30.43630	25.62739
TP22	-30.56144	25.49612	TP48	-30.50382	25.57116	TP74	-30.43562	25.62807
TP23	-30.55837	25.49714	TP49	-30.50282	25.57207	TP75	-30.43274	25.63059
TP24	-30.55488	25.49679	TP50	-30.49999	25.57465	TP76	-30.42994	25.63313
TP25	-30.55365	25.49601	TP51	-30.49721	25.57728	TP77	-30.42710	25.63570
TP26	-30.55022	25.49685	TP52	-30.49442	25.57991	TP78	-30.42436	25.63894
TP79	-30.42207	25.64216	TP106	-30.34385	25.69501	TP133	-30.25695	25.72947
TP80	-30.41976	25.64539	TP107	-30.34055	25.69679	TP134	-30.25342	25.72842
TP81	-30.41746	25.64861	TP108	-30.33718	25.69862	TP135	-30.25173	25.72791

Test point	Latitude	Longitude	Test point	Latitude	Longitude	Test point	Latitude	Longitude
TP82	-30.41517	25.65183	TP109	-30.33379	25.70049	TP136	-30.24808	25.73252
TP83	-30.41287	25.65503	TP110	-30.33051	25.70228	TP137	-30.24629	25.73590
TP84	-30.41062	25.65823	TP111	-30.32726	25.70408	TP138 / DCP 138	-30.24801	25.72679
TP85	-30.40834	25.66145	TP112	-30.32389	25.70592	TP139	-30.24458	25.72572
TP86	-30.40601	25.66472	TP113	-30.32061	25.70772	TP140	-30.24106	25.72468
TP87	-30.40376	25.66791	TP114	-30.31921	25.70850	TP141	-30.23970	25.72431
TP88	-30.40121	25.67085	TP115	-30.31591	25.71029	TP142	-30.23622	25.72320
TP89	-30.39785	25.67248	TP116	-30.31293	25.71200	TP143	-30.23277	25.72212
TP90	-30.39437	25.67366	TP117	-30.30981	25.71397	TP144	-30.22922	25.72144
TP91	-30.39090	25.67487	TP118	-30.30664	25.71597	TP145	-30.22557	25.72152
TP92	-30.38733	25.67612	TP119	-30.30182	25.71901	TP146	-30.22201	25.72161
TP93	-30.38390	25.67732	TP120	-30.29874	25.72100	TP147	-30.21867	25.72171
TP94	-30.38042	25.67853	TP121	-30.29556	25.72303	TP148	-30.21733	25.72174
TP95	-30.37694	25.67976	TP122	-30.29408	25.72399	TP149	-30.21625	25.72178
TP96	-30.37350	25.68097	TP123	-30.29092	25.72593	TP150	-30.21269	25.72191
TP97	-30.37002	25.68220	TP124	-30.28750	25.72720	TP151	-30.20908	25.72203
TP98	-30.36668	25.68376	TP125	-30.28523	25.72752	TP152	-30.20551	25.72269
TP99	-30.36336	25.68537	TP126	-30.28164	25.72806	TP153	-30.20200	25.72374
TP100	-30.36239	25.68593				TP154	-30.19850	25.72481
TP101	-30.35915	25.68740	TP128	-30.27477	25.72904	TP155 / DCP 155	-30.19498	25.72590
TP102	-30.35831	25.68779	TP129	-30.27116	25.72956	TP156	-30.19148	25.72695
TP103	-30.35494	25.68943	TP130 / DCP130	-30.26762	25.73007	TP157	-30.18798	25.72799
TP104	-30.35165	25.69108	TP131	-30.26404	25.73062	TP158	-30.18445	25.72905
TP105	-30.34835	25.69272	TP132	-30.26047	25.73051	TP159	-30.18095	25.73012
TP160 / DCP160	-30.17747	25.73117	TP187	-30.08655	25.77282	TP214	-29.99649	25.81052
TP161	-30.17406	25.73243	TP188	-30.08315	25.77425	TP215 / DCP215	-29.99311	25.81193
TP162	-30.17064	25.73409	TP189	-30.07978	25.77566	TP216	-29.98972	25.81334
TP163	-30.16732	25.73575	TP190	-30.07638	25.77705	TP217 / DCP217	-29.98631	25.81474
TP164	-30.16401	25.73736	TP191	-30.07353	25.77832	TP218 / DCP218	-29.98293	25.81617
TP165	-30.16112	25.73883	TP192	-30.07013	25.77977	TP219 / DCP 219	-29.97954	25.81757

Test point	Latitude	Longitude	Test point	Latitude	Longitude	Test point	Latitude	Longitude
TP166	-30.15447	25.74212	TP193	-30.06675	25.78119	TP220 / DCP220	-29.97616	25.81899
TP167	-30.15115	25.74374	TP194	-30.06333	25.78256	TP221	-29.97275	25.82039
TP168	-30.14782	25.74542	TP195	-30.05995	25.78402	TP222	-29.96934	25.82184
TP169	-30.14451	25.74705	TP196	-30.05657	25.78545	TP223	-29.96590	25.82328
TP170	-30.14116	25.74871	TP197	-30.05317	25.78689	TP224	-29.96373	25.82418
TP171	-30.13784	25.75035	TP198	-30.04976	25.78829	TP225	-29.96182	25.82502
TP172	-30.13452	25.75201	TP199	-30.04641	25.78976	TP226	-29.95963	25.82590
TP173	-30.13120	25.75365	TP200	-30.04301	25.79117	TP227	-29.95620	25.82736
TP174	-30.12789	25.75529	TP201	-30.03964	25.79266	TP228	-29.95280	25.82875
TP175	-30.12452	25.75679	TP202	-30.03787	25.79336	TP229	-29.94941	25.83013
TP176	-30.12113	25.75822	TP203	-30.03496	25.79453	TP230	-29.94598	25.83153
TP177	-30.11775	25.75965	TP204	-30.03156	25.79590	TP231	-29.94258	25.83293
TP178	-30.11435	25.76108	TP205	-30.02816	25.79730	TP232	-29.93920	25.83434
TP179	-30.11357	25.76138	TP206	-30.02477	25.79873	TP233	-29.93580	25.83589
TP180 / DCP180	-30.11024	25.76281	TP207	-30.02100	25.80028	TP234	-29.93262	25.83787
TP181	-30.10687	25.76423	TP208	-30.01761	25.80171	TP235	-29.92946	25.83989
TP182	-30.10348	25.76568	TP209	-30.01421	25.80313	TP236	-29.92824	25.84067
TP183	-30.10007	25.76714	TP210	-30.01082	25.80456	TP237	-29.92629	25.84190
TP184	-30.09669	25.76853	TP211	-30.00743	25.80597	TP238	-29.92313	25.84392
TP185	-30.09331	25.76994	TP212	-30.00403	25.80738	TP239	-29.91995	25.84598
TP186	-30.08994	25.77139	TP213	-30.00065	25.80878	TP240	-29.91678	25.84808
TP241	-29.91360	25.85008	TP268	-29.83099	25.90715	TP295	-29.75897	25.95702
TP242	-29.91048	25.85212	TP269	-29.82805	25.90959	TP296 / DCP296	-29.75762	25.95748
TP243	-29.90732	25.85412	TP270	-29.82638	25.91094	TP297	-29.75410	25.95844
TP244	-29.90416	25.85613	TP271 / DCP 271	-29.82344	25.91338	TP298	-29.75058	25.95948
TP245	-29.90103	25.85813	TP272	-29.82051	25.91581	TP299	-29.74710	25.96049
TP246 / DCP246	-29.89787	25.86013	TP273	-29.81759	25.91823	TP300 / DCP300	-29.74362	25.96154
TP247	-29.89465	25.86219	TP274	-29.81463	25.92067	TP301	-29.74012	25.96257
TP248	-29.89153	25.86425	TP275	-29.81171	25.92312	TP302 / DCP302	-29.73641	25.96378
TP249	-29.88840	25.86629	TP276	-29.81062	25.92406	TP303	-29.73345	25.96469

Test point	Latitude	Longitude	Test point	Latitude	Longitude	Test point	Latitude	Longitude
TP250	-29.88524	25.86830	TP277	-29.80770	25.92646	TP304	-29.73107	25.96552
TP251	-29.88209	25.87036	TP278 / DCP 278	-29.80512	25.92867	TP305	-29.72753	25.96635
TP252	-29.87891	25.87237	TP279	-29.80366	25.92992	TP306 / DCP306	-29.72401	25.96739
TP253	-29.87576	25.87435	TP280	-29.80179	25.93149	TP307 / DCP307	-29.72050	25.96843
TP254	-29.87262	25.87636	TP281	-29.79878	25.93376	TP308	-29.71702	25.96947
TP255	-29.86950	25.87839	TP282	-29.79585	25.93620	TP309	-29.71354	25.97050
TP256 / DCP 256	-29.86715	25.87990	TP283	-29.79289	25.93862	TP310	-29.71001	25.97149
TP257	-29.86397	25.88190	TP284 / DCP 284	-29.79083	25.94031	TP311 / DCP311	-29.70651	25.97260
TP258	-29.86082	25.88390	TP285	-29.79050	25.94060	TP312	-29.70302	25.97363
TP259	-29.85769	25.88591	TP286	-29.78755	25.94303	TP313	-29.69955	25.97467
TP260	-29.85453	25.88794	TP287	-29.78461	25.94547	TP314	-29.69607	25.97571
TP261	-29.85149	25.89017	TP288 / DCP288	-29.78168	25.94789	TP315 / DCP315	-29.69259	25.97673
TP262	-29.84857	25.89262	TP289	-29.77865	25.95012	TP316 / DCP316	-29.68910	25.97778
TP263	-29.84565	25.89503	TP290	-29.77538	25.95189	TP317	-29.68562	25.97883
TP264	-29.84271	25.89744	TP291	-29.77195	25.95314	TP318	-29.68214	25.97986
TP265	-29.83979	25.89987	TP292 / DCP292	-29.76845	25.95416	TP319	-29.67861	25.98092
TP266	-29.83687	25.90229	TP293	-29.76495	25.95521	TP320	-29.67521	25.98215
TP267	-29.83392	25.90473	TP294 / DCP294	-29.76246	25.95597	TP321	-29.67179	25.98352
TP322	-29.66844	25.98502	TP349	-29.58397	26.03632	TP376	-29.50235	26.09104
TP323	-29.66507	25.98645	TP350	-29.58089	26.03848	TP377	-29.49895	26.09235
TP324	-29.66170	25.98796	TP351	-29.57780	26.04062	TP378	-29.49555	26.09362
TP325	-29.65966	25.98889	TP352	-29.57472	26.04279	TP379	-29.49204	26.09501
TP326	-29.65631	25.99041	TP353	-29.57164	26.04495	TP380	-29.48856	26.09631
TP327	-29.65302	25.99191	TP354	-29.56855	26.04709	TP381	-29.48513	26.09764
TP328	-29.64969	25.99341	TP355	-29.56546	26.04923	TP382	-29.48162	26.09896
TP329 / DCP329	-29.64636	25.99486	TP356	-29.56239	26.05139	TP383	-29.47816	26.10029
TP330	-29.64305	25.99633	TP357	-29.55931	26.05357	TP384	-29.47462	26.10160
TP331	-29.63967	25.99802	TP358	-29.55630	26.05582	TP385	-29.47121	26.10294
TP332	-29.63639	25.99979	TP359	-29.55328	26.05806	TP386	-29.46778	26.10426
TP333	-29.63326	26.00186	TP360	-29.55024	26.06032	TP387 / DCP387	-29.46550	26.10511

Test point	Latitude	Longitude	Test point	Latitude	Longitude	Test point	Latitude	Longitude
TP334	-29.63011	26.00406	TP361	-29.54722	26.06257	TP388	-29.46208	26.10642
TP335	-29.62710	26.00622	TP362	-29.54559	26.06378	TP389	-29.45867	26.10774
TP336	-29.62396	26.00836	TP363	-29.54256	26.06604	TP390	-29.45527	26.10910
TP337	-29.62087	26.01052	TP364	-29.53952	26.06828	TP391	-29.45191	26.11065
TP338	-29.61780	26.01265	TP365 / DCP365	-29.53648	26.07056	TP392	-29.45039	26.11230
TP339	-29.61473	26.01482	TP366 / DCP366	-29.53374	26.07258	TP393	-29.45199	26.11609
TP340	-29.61166	26.01700	TP367 / DCP367	-29.53070	26.07485	TP394	-29.45362	26.11981
TP341	-29.60876	26.01922	TP368	-29.52769	26.07715	TP395	-29.45569	26.12301
TP342	-29.60597	26.02243	TP369	-29.52466	26.07939	TP396	-29.45544	26.12376
TP343	-29.60256	26.02363	TP370 / DCP370	-29.52160	26.08164	TP397	-29.45373	26.12734
TP344	-29.59942	26.02561	TP371	-29.51858	26.08390	TP398	-29.45211	26.13102
TP345	-29.59630	26.02774	TP372	-29.51710	26.08502	TP399	-29.45055	26.13470
TP346	-29.59320	26.02988	TP373	-29.51276	26.08707	TP400	-29.44990	26.13874
TP347	-29.59013	26.03201	TP374	-29.50936	26.08839	TP401	-29.44940	26.14284
TP348	-29.58707	26.03416	TP375	-29.50579	26.08970	TP402	-29.44954	26.14697
TP403	-29.44970	26.15110	TP430	-29.45298	26.25024	TP457	-29.39297	26.33027
TP404	-29.45016	26.15520	TP431	-29.45142	26.25395	TP458	-29.38982	26.33211
TP405	-29.45071	26.15932	TP432 / DCP432	-29.44924	26.25918	TP459 / DCP459	-29.38643	26.33361
TP406	-29.45105	26.16341	TP433	-29.44763	26.26290	TP460	-29.38339	26.33589
TP407	-29.45115	26.16757	TP434 / DCP434	-29.44603	26.26665	TP461 / DCP461	-29.38042	26.33818
TP408	-29.45057	26.17155	TP435	-29.44479	26.27050	TP462	-29.37766	26.34013
TP409	-29.44927	26.17540	TP436	-29.44342	26.27426	TP463	-29.37603	26.34382
TP410	-29.44880	26.17707	TP437	-29.44049	26.27658	TP464	-29.37441	26.34750
TP411	-29.44852	26.17807	TP438 / DCP438	-29.43753	26.27889	TP465	-29.37278	26.35121
TP412	-29.44887	26.18188	TP439	-29.43740	26.28278	TP466	-29.37116	26.35489
TP413	-29.45109	26.18519	TP440	-29.43696	26.28683	TP467	-29.36954	26.35859
TP414	-29.45205	26.18901	TP441	-29.43529	26.29049	TP468	-29.36793	26.36228
TP415	-29.45226	26.19314	TP442	-29.43368	26.29421	TP469	-29.36632	26.36596
TP416	-29.45248	26.19725	TP443	-29.43206	26.29790	TP470	-29.36470	26.36965
TP417	-29.45263	26.19948	TP444	-29.43041	26.30168	TP471	-29.36266	26.37430

Test point	Latitude	Longitude	Test point	Latitude	Longitude	Test point	Latitude	Longitude
TP418	-29.45336	26.20351	TP445	-29.42875	26.30522	TP472	-29.36125	26.37457
TP419	-29.45405	26.20754	TP446	-29.42749	26.30754	TP473	-29.35800	26.37541
TP420 / DCP420	-29.45499	26.21149	TP447	-29.42289	26.31002	TP474	-29.35445	26.37630
TP421 / DCP421	-29.45559	26.21537	TP448 / DCP448	-29.41942	26.31139	TP475	-29.35095	26.37690
TP422	-29.45504	26.21852	TP449	-29.41599	26.31286	TP476	-29.34722	26.37684
TP423	-29.45460	26.22199	TP450	-29.41317	26.31530	TP477	-29.34360	26.37716
TP424	-29.45438	26.22611	TP451	-29.41041	26.31799	TP478	-29.33997	26.37762
TP425	-29.45416	26.23023	TP452	-29.40763	26.32076	TP479	-29.33466	26.37891
TP426	-29.45394	26.23435	TP453 / DCP453	-29.40487	26.32268	TP480	-29.33129	26.37999
TP427	-29.45376	26.23775	TP454 / DCP454	-29.40178	26.32478	TP481	-29.32731	26.38132
TP428	-29.45414	26.24193	TP455 / DCP455	-29.39859	26.32678	TP482	-29.32588	26.38176
TP429	-29.45455	26.24653	TP456 / DCP456	-29.39611	26.32826	TP483	-29.32105	26.38114
TP484	-29.32242	26.37644	TP511 / DCP511	-29.28469	26.29038	TP538 / DCP538	-29.21063	26.21027
TP485	-29.32433	26.36985	TP512 / DCP512	-29.26129	26.29681	TP539 / DCP539	-29.20882	26.20904
TP486 / DCP486	-29.32536	26.36642	TP513 / DCP513	-29.25681	26.28715	TP540	-29.20818	26.20835
TP487	-29.32258	26.36370	TP514 / DCP514	-29.25461	26.28401	TP541 / DCP541	-29.20707	26.20639
TP488 / DCP488	-29.31981	26.36099	TP515	-29.25233	26.28085	TP542	-29.20390	26.20440
TP489	-29.31706	26.35832	TP516	-29.25002	26.27768	TP543 / DCP543	-29.20073	26.20300
TP490 / DCP490	-29.31431	26.35561	TP517 / DCP517	-29.24773	26.27447	TP544	-29.19843	26.20101
TP491 / DCP491	-29.31157	26.35292	TP518	-29.24546	26.27132	TP545	-29.19526	26.19906
TP492 / DCP492	-29.30885	26.35022	TP519	-29.24321	26.26810	TP546	-29.19211	26.19785
TP493	-29.30608	26.34758	TP520 / DCP520	-29.24099	26.26489	TP547 / DCP547	-29.19014	26.19589
TP494 / DCP494	-29.30323	26.34507	TP521 / DCP521	-29.23874	26.26169	TP548 / DCP548	-29.18905	26.19871
TP495	-29.30032	26.34261	TP522	-29.23647	26.25845	TP549	-29.18668	26.20149
TP496 / DCP496	-29.29745	26.34013	TP523 / DCP523	-29.23426	26.25521	TP550	-29.18433	26.20004
TP497	-29.29458	26.33768	TP524	-29.23204	26.25173	TP551	-29.18245	26.19857
TP498 / DCP498	-29.29343	26.33674	TP525 / DCP525	-29.23015	26.24822	TP552	-29.18045	26.19946
TP499 / DCP499	-29.29059	26.33422	TP526	-29.22833	26.24468	TP553	-29.17899	26.19875
TP500	-29.28771	26.33172	TP527 / DCP527	-29.22648	26.24115	TP554	-29.17757	26.25648
TP501 / DCP501	-29.28469	26.32940	TP528 / DCP528	-29.22464	26.23802	TP555	-29.45037	26.38479

Test point	Latitude	Longitude	Test point	Latitude	Longitude	Test point	Latitude	Longitude
TP502	-29.28184	26.32683	TP529	-29.22385	26.23440	TP580	-29.32056	26.38881
TP503	-29.27963	26.32358	TP530	-29.22217	26.23075	TP581	-29.32097	26.39163
TP504	-29.27677	26.31958	TP531 / DCP531	-29.22050	26.22722	TP582	-29.32135	26.39579
TP505 / DCP505	-29.27450	26.31636	TP532	-29.21868	26.22370	TP583	-29.32167	26.39989
TP506 / DCP506	-29.27230	26.31308	TP533 / DCP533	-29.21682	26.22323	TP584	-29.32190	26.40402
TP507	-29.27010	26.30978	TP534	-29.21598	26.22349	TP585	-29.32202	26.40814
TP508 / DCP508	-29.26575	26.30324	TP535	-29.21547	26.21992	TP586	-29.32197	26.41219
TP509 / DCP509	-29.26354	26.30001	TP536 / DCP536	-29.21370	26.21637	TP587	-29.32245	26.41620
TP510 / DCP510	-29.25905	26.29358	TP537	-29.21191	26.21385	TP588	-29.32333	26.42025
TP589	-29.32422	26.42470	TP616	-29.29504	26.51275	TP647	-29.26790	26.60503
TP590	-29.32522	26.42894	TP617	-29.29278	26.51597	TP648	-29.26797	26.60914
TP591	-29.32378	26.43257	TP618	-29.29034	26.51950	TP649	-29.26807	26.61089
TP592	-29.32254	26.43645	TP619	-29.28899	26.52154	TP650	-29.26784	26.61427
TP593	-29.32112	26.44034	TP620	-29.28672	26.52478	TP651	-29.26807	26.61550
TP594	-29.31972	26.44495	TP621	-29.28481	26.52761	TP652	-29.26824	26.61885
TP595	-29.31820	26.44824	TP622	-29.28288	26.53110	TP653	-29.26858	26.61963
TP596	-29.31706	26.45254	TP623	-29.28099	26.53462	TP654	-29.26899	26.61944
TP597	-29.31589	26.45651	TP624	-29.27916	26.53806	TP655 / DCP655	-30.24958	25.73749
TP598	-29.31483	26.46035	TP625	-29.27725	26.54161	TP656	-29.51692	26.08653
TP599	-29.31362	26.46433	TP626	-29.27542	26.54514	TP658	-29.51375	26.08780
TP600	-29.31233	26.12734	TP627	-29.27359	26.54863	TP659	-29.51522	26.08721
TP601	-29.31139	26.46833	TP628	-29.27175	26.55219	TP660	-30.51345	25.56040
TP602	-29.31108	26.46934	TP629	-29.27117	26.55310	TP661	-30.48884	25.58512
TP603	-29.31064	26.47067	TP634	-29.26947	26.55638	TP662	-30.30486	25.71712
TP604	-29.30936	26.47453	TP635	-29.26895	26.55727	TP663	-30.01461	25.80296
TP605	-29.30809	26.47838	TP636	-29.26882	26.56139	TP664	-29.92834	25.84060
TP606	-29.30682	26.48223	TP637	-29.26868	26.56551	TP665	-29.81088	25.92377
TP607	-29.30493	26.48580	TP638	-29.26857	26.56875	TP666	-29.76275	25.95589
TP608	-29.30440	26.49002	TP639	-29.26848	26.57191	TP667	-29.66340	25.98720
TP609	-29.30275	26.49381	TP640	-29.26831	26.57609	TP668	-29.65956	25.98892

Test point	Latitude	Longitude	Test point	Latitude	Longitude	Test point	Latitude	Longitude
TP610	-29.30102	26.49744	TP641	-29.26815	26.58028	TP669 / DCP669	-29.61977	26.01127
TP611	-29.30008	26.49948	TP642	-29.26799	26.58438	TP670 / DCP670	-29.59808	26.02651
TP612	-29.29970	26.50091	TP643	-29.26783	26.58851	TP671	-29.42495	26.30915
TP613	-29.29864	26.50486	TP644	-29.26768	26.59263	TP673	-29.33753	26.37797
TP614	-29.29758	26.50878	TP645	-29.26755	26.59676	TP674	-30.16131	25.73876
TP615	-29.29738	26.50958	TP646	-29.26779	26.60090	TP675	-29.60583	26.02248
TP678	-30.43578	25.62793	TP683	-29.32424	26.42767	TP685	-29.31273	26.46284
TP682	-29.32494	26.42353	TP684	-29.32190	26.43422			

Table 3-2: Test pit coordinates for structures

Test point	Latitude	Longitude	Test point	Latitude	Longitude	Test point	Latitude	Longitude
TPS1	-30.62496	25.48618	TPS11	-30.54472	25.51079	TPS21	-29.51681	26.08734
TPS2	-30.62431	25.48491	TPS12	-30.54657	25.50567	TPS22	-29.51645	26.08593
TPS3	-30.62488	25.48435	TPS13	-30.54549	25.50741	TPS23	-29.51383	26.08697
TPS4	-30.62564	25.48564	TPS14	-30.54793	25.50690	TPS24	-29.51422	26.08839
TPS5	-30.62487	25.48535	TPS15	-30.54691	25.50855	TPS25	-29.51522	26.08645
TPS6	-30.54422	25.51336	TPS16	-30.25017	25.73724	TPS26	-29.32148	26.38467
TPS7	-30.54398	25.51188	TPS17	-30.24970	25.73872	TPS27	-29.32070	26.38425
TPS8	-30.54541	25.51146	TPS18	-30.25132	25.73776	TPS28	-29.32104	26.38559
TPS9	-30.54353	25.51251	TPS19	-30.25088	25.73920	TPS29	-29.32228	26.38513
TPS10	-30.54507	25.51205	TPS20	-30.25052	25.73830	TPS30	-29.32191	26.38375

3.2 Rotary Core Drilling

Mukona Geotechnics (Pty) Ltd was appointed to conduct rotary core drilling on site. Where possible, Standard Penetration Testing (SPT's) were carried out at 1.5 m intervals to assess the consistency of the soils. The borehole core and/or soil was logged by Zutari engineering geologists in accordance with the South African best practice for soil and rock description (Dippenaar M.A., Van Rooy J.L., Davis G. (eds.), 2024).

The boreholes were strategically placed to target areas where pipe jacking need to be considered at stream / river and road crossings along the pipeline route and at the proposed structure locations. The boreholes were drilled to depths ranging from 5.0 m at road crossings, with up to 10 m at stream / river crossings and up to 15.22 m at the proposed structure positions. All boreholes were set out on site using a hand-held Global Positioning System (GPS).

Table 3-3 provides a summary of the borehole details with geographical location, the depth to rock head and the termination depth.

Table 3-3: Borehole coordinates for the Xhariep pipeline and structures.

Pipeline and Structure Borehole	Latitude	Longitude	Rockhead Depth (m)	Termination Depth (m)
Road Crossings				
BH3	-30.5982	25.48408	1.05	5.00
BH4	-30.4797	25.59391	1.05	5.18
BH11	-30.3336	25.70059	1.5	5.21
BH13	-30.2944	25.72382	1	5.07
BH14	-30.2781	25.72858	0.75	5.10
BH17	-30.2399	25.72438	0.5	5.11
BH18	-30.2185	25.72172	1.76	5.11
BH20	-29.2158	26.22333	1.95	5.17
BH21	-30.0381	25.79325	0.8	5.13
BH23	-29.962	25.82488	0.35	5.09
BH25	-29.8674	25.87972	1.9	5.21
BH28	-29.7578	25.95733	0.88	5.05
BH29	-29.7338	25.96462	1	5.07
BH31	-29.1986	26.20309	Not encountered	5.10
BH38	-29.4525	26.19908	0.68	5.12
BH40	-29.4376	26.27896	0.7	5.08
BH47	-29.3253	26.36662	1.6	5.09
BH48	-29.2108	26.21416	2.5	5.05
BH5	-30.4592	25.60852	0.7	5.15
BH6	-30.305	25.71705	2.3	5.21
BH9	-30.3626	25.68583	2.16	5.25
Stream / River Crossings				
BH7	-30.4365	25.62731	1.6	9.98
BH10	-30.3371	25.69869	2.63	10.15
BH12	-30.3192	25.70853	3.3	10.09
BH19	-30.2172	25.72176	2.9	10.16

Pipeline and Structure Borehole	Latitude	Longitude	Rockhead Depth (m)	Termination Depth (m)
BH22	-29.9963	25.8106	1.95	10.08
BH24	-29.8945	25.86234	3	10.02
BH26	-29.8265	25.91085	0.86	10.04
BH32	-29.598	26.02658	1.64	10.08
BH35	-29.5159	26.08655	0.3	10.00
BH37	-29.4745	26.1017	4.2	10.29
BH39	-29.4551	26.21837	1.53	10.11
BH42	-29.4047	26.3228	2.17	10.08
BH54	-29.2681	26.61595	3.45	10.05
Structures				
BH1	-30.6246	25.48483	0.55	14.97
BH2	-30.6253	25.48557	0.3	15.15
BH15	-30.2503	25.73864	1.2	15.00
BH16	-30.2509	25.73785	1.62	15.10
BH30	-29.6637	25.98706	Not encountered	10.00
BH36	-29.5147	26.08775	0.3	15.22
BH58	-30.5458	25.50984	0.5	15.17
BH59	-30.5448	25.51236	0.3	15.00
BH60	-30.5451	25.51021	2	15.1
BH61	-30.5458	25.51086	0.2	15.01

3.3 Dynamic Cone Penetrometer (DCP) Testing

106 No. DCP tests were conducted along the proposed pipeline alongside the test pit from surface or within the test pit from a depth of 1.5 m.

The Dynamic Cone Penetrometer is an economical tool suitable for shallow foundation investigation work and evaluation of sub-surface soil consistencies. The DCP test comprises a 20 mm diameter, 60º cone driven into the soil by an 8 kg weight dropped through 575 mm and the results are plotted as blows per 100 mm penetration (N10L) in accordance with the EN1997-2 specifications.

3.4 Dynamic Probe Super Heavy (DPSH) Testing

A total of 120 No. DPSH tests were conducted by Mukona Geotechnics (Pty) Ltd at various positions along the alignment of the pipeline, adjacent to the test pitting and elsewhere to provide supplementary ground information along the alignment. The positions at which the DPSH tests were undertaken during the investigation are illustrated in Figure 3-2 and Figure 3-3.

DPSH tests were conducted in accordance with BS EN ISO 22476-2:2005 guidelines. They were conducted to various depths or to refusal along the alignment. DPSH equipment consists of a weight of 63.5 kg dropping a height of 750 mm onto a length of rods which are 50 mm in diameter (20 cm^2 projected area). Disposable cones, which have a 90° apex angle, are attached to the ends of the rod, and remain in the ground when the rods are retracted.

The result of the test is presented as a graph of the number of blows required for each 300 mm of penetration recorded as a so-called DPSH N-value, which may be associated by empirical evaluation to the Standard Penetration Test (SPT) N-value, typically recorded during rotary core borehole drilling. The test is continued to refusal, when penetration of 300 mm is not achieved within 80 to 100 blows.

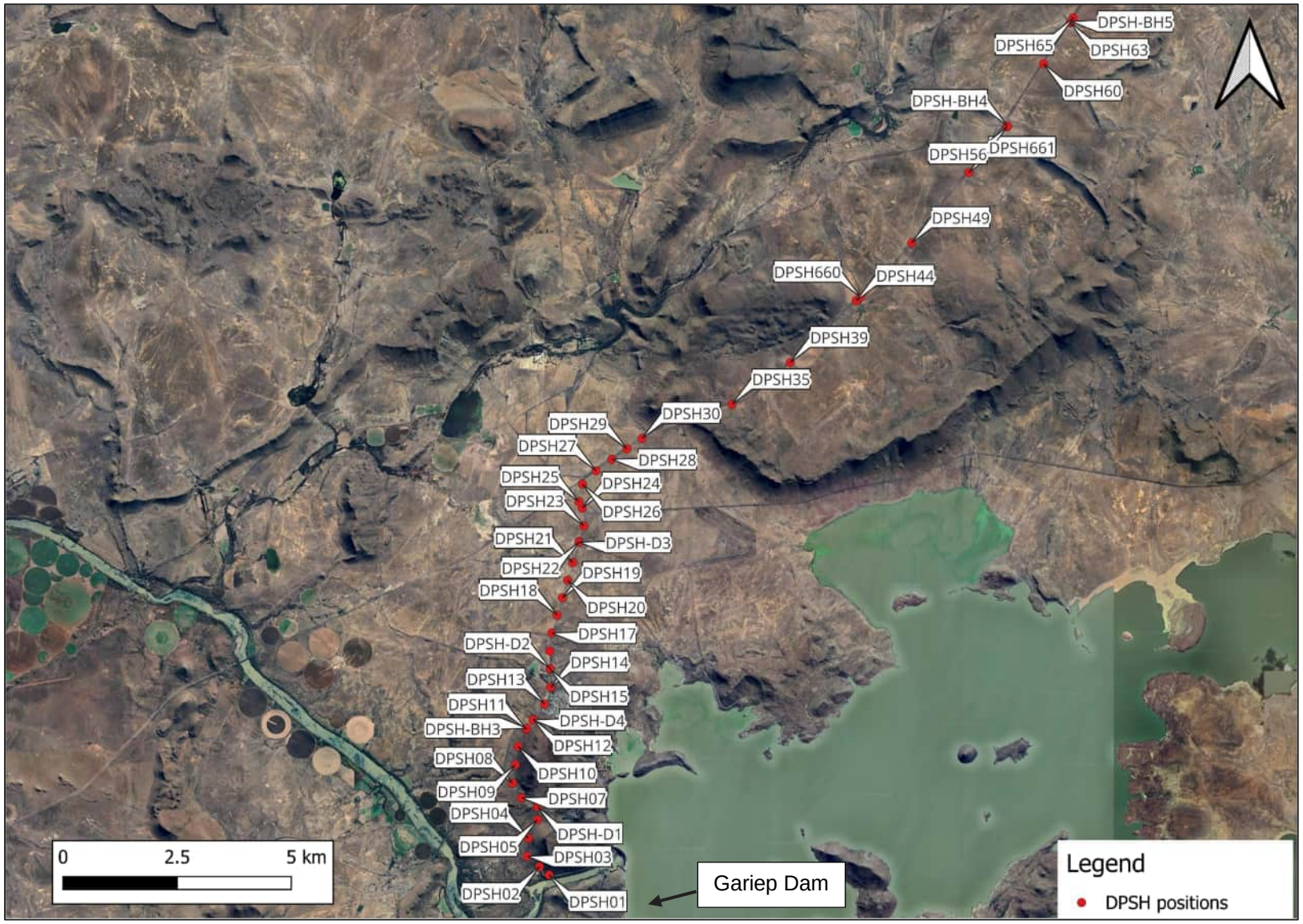


Figure 3-2: Site plan showing DPSH positions from the southern portion of the pipeline (Gariep Dam) from DPSH01 to DPSH65

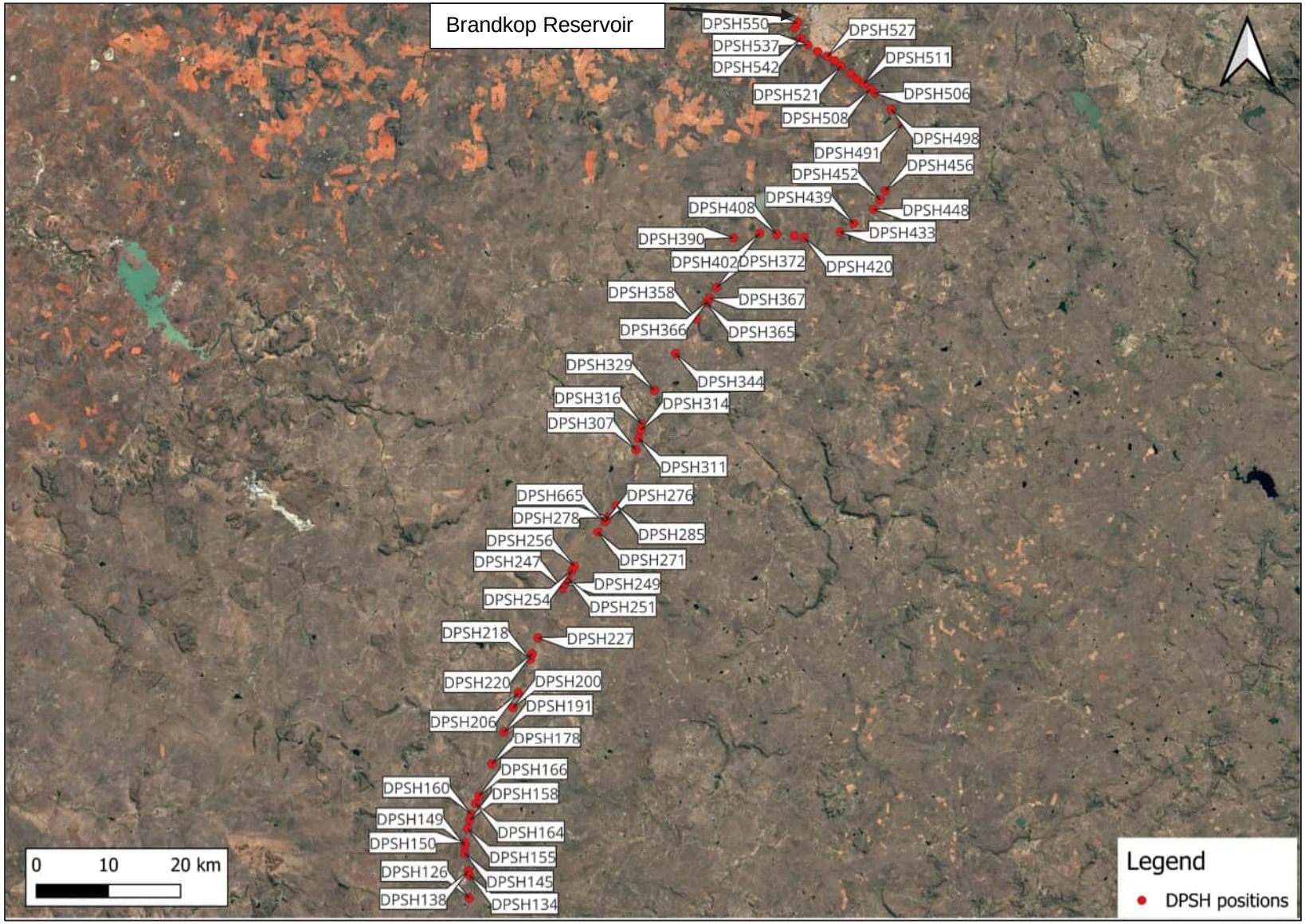


Figure 3-3: Site plan showing DPSH positions from the northern portion of the pipeline (Brandkop Reservoir) from DPSH138 to DPSH550

The DPSH locations and depths at which refusal was encountered are summarised in Table 3-4. The DPSH test positions were recorded on site using a hand-held GPS (horizontal accuracy of 3 - 5 m).

Table 3-4: Summary of DPSH test positions along pipeline

DPSH no.	Longitude	Latitude	Refusal Depth (m)
DPSH01	25.48904122	-30.62692485	0.3
DPSH02	25.48862015	-30.62494486	0.6
DPSH03	25.48679521	-30.62324740	1.2
DPSH04	25.48545213	-30.62021732	1.8
DPSH05	25.48713670	-30.61589905	1.5
DPSH06	25.48681594	-30.61354747	2.4
DPSH07	25.48430009	-30.61154757	1.5
DPSH08	25.48350340	-30.61057187	2.1
DPSH09	25.48184825	-30.60573068	2.1
DPSH10	25.48359171	-30.60384206	0.6
DPSH11	25.48431556	-30.59804794	2.4
DPSH12	25.48597293	-30.59653641	0.6
DPSH13	25.48900377	-30.59347128	0.6
DPSH14	25.49011140	-30.58988906	2.1
DPSH15	25.48940832	-30.58641719	0.6
DPSH16	25.48855396	-30.58360532	0.6
DPSH17	25.49230938	-30.57969452	0.9
DPSH18	25.49284505	-30.57568055	0.6
DPSH19	25.49488777	-30.57242937	0.3
DPSH20	25.49560003	-30.57122191	0.9
DPSH21	25.49543397	-30.56592860	0.3
DPSH22	25.49596164	-30.56137645	0.6
DPSH23	25.49728180	-30.55753925	0.9
DPSH24	25.49654000	-30.55443834	0.6
DPSH25	25.49629402	-30.55294667	0.3
DPSH26	25.49731559	-30.54982870	0.6
DPSH27	25.50004900	-30.54663741	1.5
DPSH28	25.50405242	-30.54379455	0.6
DPSH29	25.50699627	-30.54280306	1.2
DPSH30	25.51081995	-30.54153137	0.6
DPSH35	25.53040715	-30.53469659	0.9
DPSH39	25.54742715	-30.52453575	0.6
DPSH44	25.55883488	-30.51384167	1.5
DPSH660	25.56024153	-30.51359120	2.1
DPSH49	25.57202701	-30.50247860	1.2
DPSH661	25.58456133	-30.48850358	2.1
DPSH56	25.59529150	-30.47815846	0.9
DPSH60	25.60668171	-30.46434309	0.6

DPSH no.	Longitude	Latitude	Refusal Depth (m)
DPSH63	25.60835567	-30.45921745	1.2
DPSH65	25.60917990	-30.45833534	0.6
DPSH-74	25.62806700	-30.43561900	0.6
DPSH-76	25.63312500	-30.42993600	0.9
DPSH-D1	25.48675580	-30.61372114	0.6
DPSH-D2	25.48940832	-30.58641719	0.6
DPSH-D3	25.49583176	-30.56079052	0.6
DPSH-D4	25.48550025	-30.59658016	0.6
DPSH-BH4	25.59326106	-30.47912788	0.3
DPSH-BH5	25.60831435	-30.45900563	0.6
DPSH-BH3	25.48489059	-30.59815255	0.6
DPSH-108	25.69862500	-30.33718100	2.7
DPSH-112	25.70591900	-30.32388900	3.3
DPSH-114	25.70849700	-30.31921100	3.6
DPSH-115	25.71029400	-30.31591100	1.2
DPSH-118	25.71597200	-30.30663900	4.5
DPSH-126	25.72934793	-30.27952956	1.8
DPSH-134	25.72875265	-30.25293953	1.2
DPSH-138	25.72665161	-30.24536387	4.2
DPSH-145	25.72277588	-30.22394189	1.8
DPSH-149	25.72246307	-30.21594438	2.4
DPSH-150	25.72209970	-30.21208701	1.5
DPSH-155	25.72714157	-30.19381889	3.3
DPSH-158	25.72935782	-30.18401051	3.0
DPSH-160	25.73173680	-30.17855561	2.1
DPSH-164	25.73804575	-30.16443485	1.2
DPSH-166	25.74181617	-30.15545480	0.9
DPSH-178	25.76134417	-30.11386191	3.3
DPSH-191	25.77846227	-30.07348350	1.5
DPSH-200	25.79188770	-30.04280260	2.1
DPSH-206	25.79924453	-30.02506686	2.4
DPSH-218	25.81612474	-29.98446739	1.2
DPSH-220	25.81917189	-29.97750629	0.9
DPSH-227	25.82820790	-29.95686957	2.4
DPSH-244	25.85613600	-29.90415600	1.5
DPSH-247	25.86260145	-29.89435612	2.4
DPSH-249	25.86557112	-29.88956122	0.9
DPSH-251	25.87070559	-29.88303113	2.4
DPSH-254	25.87614673	-29.87301903	2.7
DPSH-256	25.88054047	-29.86684326	2.1
DPSH-271	25.91253170	-29.82558782	3.9

DPSH no.	Longitude	Latitude	Refusal Depth (m)
DPSH-276	25.92440563	-29.80970464	1.8
DPSH-278	25.92780924	-29.80552981	2.1
DPSH-285	25.94074714	-29.79063734	1.2
DPSH-307	25.97072782	-29.72070552	2.1
DPSH-311	25.97460013	-29.70783948	1.5
DPSH-314	25.97839008	-29.69680109	2.1
DPSH-316	25.98037442	-29.68981435	2.4
DPSH-329	25.99596327	-29.64607586	1.8
DPSH-344	26.02554754	-29.60037288	1.8
DPSH-358	26.05566791	-29.55746159	1.2
DPSH-365	26.06978741	-29.53779260	3.9
DPSH-366	26.07241711	-29.53387079	2.4
DPSH-367	26.07611011	-29.52961794	3.0
DPSH-372	26.08639419	-29.51640248	1.2
DPSH-390	26.10942241	-29.45707557	0.9
DPSH-402	26.14717189	-29.44911115	3.3
DPSH-408	26.17183491	-29.44986205	3.0
DPSH-416	26.19925023	-29.45128006	1.2
DPSH-420	26.21285265	-29.45425133	6.3
DPSH-433	26.26494995	-29.44643806	1.5
DPSH-439	26.28375405	-29.43631494	8.7
DPSH-448	26.31094971	-29.41994523	2.1
DPSH-452	26.32117578	-29.40696953	2.7
DPSH-456	26.32819175	-29.39668109	1.5
DPSH-491	26.35247591	-29.31061633	1.5
DPSH-498	26.33703924	-29.29305880	2.4
DPSH-506	26.31830662	-29.26980820	2.1
DPSH-508	26.30678205	-29.26786228	3.0
DPSH-511	26.29849557	-29.26184268	2.4
DPSH-514	26.28792200	-29.25435429	1.2
DPSH-517	26.27880360	-29.24648173	3.0
DPSH-521	26.26948144	-29.23708065	2.1
DPSH-524	26.25675262	-29.23170300	1.5
DPSH-527	26.24498419	-29.22607711	3.3
DPSH-531	26.23686004	-29.21502546	1.2
DPSH-537	26.22164853	-29.21139121	2.4
DPSH-542	26.20700206	-29.20449271	5.7
DPSH-547	26.19893947	-29.19102718	1.8
DPSH-550	26.20113000	-29.18390000	1.8
DPSH-665	25.92381000	-29.81070000	1.8
DPSH-668	25.98892200	-29.65955600	12.6

3.5 Laboratory Testing

Representative samples were taken of all material origins encountered in the test pits. The samples were transported to Roadlab in the Free State Province (Bloemfontein) for testing.

The tests conducted on the samples included:

- 94 No. Foundation Indicator, comprising grading analyses (both sieve and hydrometer) and Atterberg limits and linera shrinkage.
- 46 No. Mod AASHTO Compaction and California Bearing Ratio (CBR).
- 60 No. pH and conductivity.

3.6 Soil Electrical Resistivity Survey

Soil electrical resistivity is a measure of the in-situ soil's ability to resist the flow of electrical current, with the soil composition, moisture content and temperature all impacting the soil's electrical resistivity. Soils with high resistivity are typically not corrosive, whilst low resistivity soils are generally more corrosive and often associated with high moisture contents and dissolved salts, which may be corrosive themselves. With steel pipes being considered, the soil resistivity provides a reliable indicator for the requirement of cathodic protection.

The soil resistivity tests were conducted by Isinyithi Cathodic Protection from October 2024 to November 2024, in order to determine the corrosivity of the proposed pipeline route at nominal 200 m intervals starting in the south at Gariep Dam and moving towards the north (Brandkop Reservoir).

4 Investigation Results

4.1 Ground Profile Along Pipeline

With the investigation spanning over 250 km, the encountered ground profile naturally varied along the pipeline. However, some similarities were apparent and where possible, ground profiles were grouped together with the use of laboratory results (engineering properties). Table 4-1 outlines the encountered ground profiles through test pitting whist Table 4-2 represents the ground profiles encountered through rotary core drilling. The main constituents of the encountered profiles have been identified as:

4.1.1 Made Ground / Fill

Fill, used in either the neighbouring road embankments or layer works, was encountered from surface to depths ranging from up to 0.1 m to 2.1 m. The fill occurred as loosely to moderately packed, angular gravel with occasional dolerite cobbles and boulders in a silty sand matrix, with an overall consistency of loose to medium dense.

4.1.2 Transported Material (colluvium and alluvium)

Colluvium was generally underlying the fill material at a depth ranging between 0.1 m and 3.2 m, whilst occasionally the colluvium was present at surface. The material was described as slightly moist, dark brown speckled orange to grey, loose to medium dense, intact, silty sand with occasional mudstone cobbles. Occasional colluvium encounters were described as moist, orange brown, firm, intact, silty clay.

The alluvium was described as slightly moist, light grey speckled dark grey, medium dense, intact, silty sand. The material was encountered at depths ranging between 0.0 m and 3.6 m.

4.1.3 Pedogenic Material

The pedogenic material typically underlies the transported materials and consisted of a slightly moist, red brown and olive speckled off-white, very stiff, sandy clayey silt with gravels of calcrete. This is underlain by highly cemented calcrete, pale brown blotched off-white hardpan calcrete. The material is encountered at depths ranging between 0.6 m to 2.8 m.

4.1.4 Residual Soil

The residual material was typically underlaying the pedogenic material. The following residual material was encountered during the investigation:

Residual dolerite was noted as slightly moist, reddish to dark brown speckled grey, stiff, sandy clay with occasional dolerite gravel, cobbles and boulders. The material was typically encountered at a depth ranging between 0.1 m to 3.0 m.

Residual mudstone was typically encountered as slightly moist, reddish brown speckled grey to dark purple to blotched orange, soft to stiff, silty to sandy clay with occasional gravel. The material ranged in depth from 0.1 m to more than 3.8 m.

Residual sandstone was generally noted as slightly moist, olive greenish grey speckled orange, medium dense, intact, silty sand with occasional cobbles. The material was typically encountered at a depth ranging between 0.2 m to 2.8 m.

Residual siltstone was noted as slightly moist, olive brown speckled off-white, stiff, clayey silt with occasional calcrete gravels. The material ranged in depth from 2.7 m to 3.1 m.

Table 4-1: Summary of test pit profiles across the pipeline route

Test point Pipeline	Fill	Colluvium	Alluvium	Pedogenic	Residual mudstone	Mudstone	Residual sandstone	Sandstone	Interbedded residual sandstone/ mudstone	Interbedded sandstone/ mudstone	Residual dolerite	Dolerite	Residual siltstone	Pavement layers	Termination depth	Seepage
1	0.0-0.7					0.7-0.9									0.9	None
2	0.0-0.6				0.6-0.7	0.7-0.8									0.8	None
3	0.0-1.1					1.1-1.2									1.2	None
4	0.0-2.1														2.1	None
5	0.0-1.2														1.2	None
6	0.0-0.9					0.9-1.5									1.5	None
7	0.0-0.8											0.8-1.5			1.5	None
8	0.0-0.5											0.5-0.6			0.6	None
9	0.0-1.2					1.2-1.3									1.3	None
10	0.0-1.2				1.2-1.4	1.4-1.6									1.6	None
11	0.0-1.2				1.2-1.3	1.3-1.4									1.4	None
12	0.0-1.3														1.3	None
13		0.0-0.6			0.6-0.7	0.7-0.8									0.8	None
14		0.0-0.6									0.6-1.3	1.3-1.4			1.4	None
15		0.0-0.1			0.1-0.2	0.2-0.6									0.6	None
16	0.0-0.4				0.4-0.8	0.8-0.9									0.9	None
17		0.0-0.4			0.4-0.8	0.8-0.9									0.9	None
18		0.0-0.3				0.3-0.4									0.4	None
19		0.0-0.2				0.2-0.5									0.5	None
20		0.0-0.2			0.2-0.3	0.3-0.7									0.7	None
21		0.0-0.3			0.3-0.4	0.4-0.5									0.5	None
22		0.0-0.6			0.6-0.9	0.9-1.1									1.1	None
23		0.0-0.5			0.5-0.9	0.9-1.0									1.0	None
24		0.0-0.3			0.3-0.4	0.4-0.5									0.5	None
25		0.0-0.3				0.3-0.4									0.4	None
26		0.0-0.3			0.3-0.5	0.5-0.7									0.7	None
27		0.0-0.5			0.5-0.7	0.7-1.1									1.1	None
28		0.0-0.3			0.3-0.5	0.5-0.6									0.6	None
29		0.0-0.4			0.4-0.7	0.7-0.8									0.8	None
30		0.0-0.3				0.3-0.4									0.4	None
31		0.0-0.4									0.4-1.3	1.3-1.4			1.4	None
32												0.0-0.1			0.1	None
33		0.0-0.1			0.1-0.2	0.2-0.3*									0.3	None
34		0.0-0.7										0.7-0.8			0.8	None
35		0.0-0.6			0.6-1.1	1.1-1.2									1.2	None
36		0.0-0.4			0.4-1.1	1.1-1.2									1.2	None
37		0.0-0.9			0.9-1.2	1.2-1.3									1.3	None
38		0.0-0.3				0.3-0.4									0.4	None

Test point Pipeline	Fill	Colluvium	Alluvium	Pedogenic	Residual mudstone	Mudstone	Residual sandstone	Sandstone	Interbedded residual sandstone/ mudstone	Interbedded sandstone/ mudstone	Residual dolerite	Dolerite	Residual siltstone	Pavement layers	Termination depth	Seepage
39		0.0-0.4			0.4-1.0	1.0-1.1									1.1	None
40		0.0-0.6			0.6-1.8	1.8-1.9									1.9	None
41		0.0-0.4			0.4-1.2	1.2-1.4									1.4	None
42		0.0-0.5			0.5-1.3	1.3-1.4									1.4	None
43		0.0-0.4			0.4-1.3	1.3-1.5									1.5	None
44		0.0-0.3			0.3-1.0										1.0	None
45		0.0-0.5			0.5-1.2	1.2-1.3									1.3	None
46												0.0-0.2			0.2	None
47		0.0-0.4			0.4-0.8	0.8-0.9									0.9	None
48		0.0-0.3				0.3-0.6									0.6	None
49		0.0-0.4				0.4-0.5									0.5	None
50		0.0-0.3			0.3-1.0	1.0-1.1									1.1	None
51		0.0-0.6						0.6-0.7							0.7	None
52	0.0-0.2	0.2-0.6			0.6-0.7	0.7-0.8									0.8	None
53		0.0-0.3			0.3-0.5	0.5-0.6									0.6	None
54		0.0-0.5			0.5-0.6										0.6	None
55															0.0	None
56		0.0-0.2				0.2-0.3									0.3	None
57	0.0-0.6				0.6-0.9	0.9-1.0									1.0	None
58		0.0-0.1				0.1-0.2									0.2	None
59		0.0-0.2			0.2-0.5	0.5-0.6									0.6	None
60		0.0-0.2				0.2-0.7									0.7	None
61		0.0-0.1				0.1-0.2									0.2	None
62		0.0-0.1				0.1-0.2									0.2	None
63	0.0-1.0					1.0-1.2									1.2	None
64	0.0-0.6											0.6-0.8			0.8	None
65	0.0-0.6				0.6-1.0	1.0-1.1									1.1	None
66		0.0-0.7									0.7-1.2				1.2	None
67		0.0-0.5									0.5-0.9				0.9	None
68	0.0-1.1										1.1-1.6	1.6-1.7			1.7	None
69		0.0-0.2			0.2-0.4*	0.4-0.5*									0.5	None
70	0.0-0.4				0.4-0.5	0.5-0.6									0.6	None
71		0.0-0.3			0.3-1.0										1.0	None
72		0.0-0.6			0.6-0.9	0.9-1.0									1.0	None
73	0.0-0.6				0.6-1.4	1.4-1.5									1.5	None
74	0.0-1.7				1.7-1.9	1.9-2.0									2.0	None
75	0.0-0.3					0.3-0.5									0.5	None
76	0.0-0.3	0.3-0.6			0.6-0.8	0.8-2.0									2.0	None
77	0.0-0.3	0.3-0.8			0.8-0.9	0.9-1.0									1.0	None

Test point Pipeline	Fill	Colluvium	Alluvium	Pedogenic	Residual mudstone	Mudstone	Residual sandstone	Sandstone	Interbedded residual sandstone/ mudstone	Interbedded sandstone/ mudstone	Residual dolerite	Dolerite	Residual siltstone	Pavement layers	Termination depth	Seepage
78						0.0-0.1									0.1	None
79		0.0-0.3						0.3-0.4							0.4	None
80								0.0-0.1							0.1	None
81		0.0-0.7			0.7-0.9	0.9-1.0									1.0	None
82		0.0-0.8									0.8-1.3	1.3-1.5			1.5	None
83		0.0-0.2									0.2-0.4	0.4-0.5			0.5	None
84	0.0-0.7					0.7-0.8*									0.8	None
85	0.0-0.6					0.6-0.8*									0.8	None
86	0.0-0.4				0.4-0.6*	0.6-0.8*									0.8	None
87	0.0-0.3							0.3-0.4							0.4	None
88	0.0-0.1							0.1-0.2							0.2	None
89					0.0-0.6	0.6-0.8									0.8	None
90	0.0-0.2				0.2-0.5	0.5-0.8									0.8	None
91	0.0-0.3				0.3-0.5	0.5-0.7									0.7	None
92	0.0-0.1	0.1-0.7			0.7-0.9	0.9-1.0									1.0	None
93	0.0-0.2							0.2-0.3							0.3	None
94	0.0-0.3	0.3-0.6						0.6-0.7							0.7	None
95	0.0-0.2	0.2-0.8			0.8-0.9	0.9-1.2									1.2	None
96												0.0-0.1			0.1	None
97	0.0-0.1	0.1-0.8				0.8-1.0									1.0	None
98	0.0-0.2	0.2-0.5				0.5-0.7									0.7	None
99	0.0-0.1	0.1-0.6				0.6-0.7									0.7	None
100	0.0-0.2	0.2-1.0			1.0-1.3	1.3-1.5									1.5	None
101	0.0-0.4	0.4-0.8			0.8-0.9	0.9-1.0									1.0	None
102	0.0-0.4				0.4-0.8	0.8-1.0									1.0	None
103	0.0-0.4	0.4-1.1			1.1-1.4	1.4-1.6									1.6	None
104	0.0-0.3	0.3-1.0			1.0-1.2	1.2-1.3									1.3	None
105	0.0-0.3	0.3-1.2			1.2-1.4	1.4-1.5									1.5	None
106	0.0-0.2	0.2-0.6				0.6-0.7									0.7	None
107	0.0-0.3	0.3-0.6				0.6-0.7									0.7	None
108	0.0-2.6						2.6-2.7	2.7-2.8							2.8	None
109	0.0-1.3							1.3-1.4							1.4	None
110	0.0-0.3	0.3-0.6				0.6-0.8									0.8	None
111	0.0-0.5					0.5-0.8									0.8	None
112	0.0-0.4	0.4-1.4			1.4-2.9	2.9-3.1									3.1	None
113	0.0-0.6	0.6-1.4			1.4-3.8										3.8	3.8
114	0.0-0.8	0.8-1.6			1.6-3.4										3.4	3.4
115	0.0-0.3	0.3-1.0					1.0-2.8	2.8-2.9							2.9	None
116	0.0-0.4										0.4-0.8	0.8-0.9			0.9	None

Test point Pipeline	Fill	Colluvium	Alluvium	Pedogenic	Residual mudstone	Mudstone	Residual sandstone	Sandstone	Interbedded residual sandstone/ mudstone	Interbedded sandstone/ mudstone	Residual dolerite	Dolerite	Residual siltstone	Pavement layers	Termination depth	Seepage
117	0.0-0.3				0.3-0.5	0.5-0.8									0.8	None
118	0.0-0.4	0.4-1.2			1.2-3.2										3.2	3.2
119	0.0-0.5	0.5-0.6				0.6-0.8									0.8	None
120	0.0-0.1							0.1-0.2							0.2	None
121	0.0-0.4	0.4-0.6			0.6-1.0	1.0-1.3									1.3	None
122	0.0-0.5					0.5-0.8									0.8	None
123	0.0-0.3	0.3-0.5			0.5-0.6	0.6-0.7									0.7	None
124	0.0-0.3	0.3-0.7				0.7-0.8									0.8	None
125								0.0-0.1							0.1	None
126	0.0-0.2	0.2-2.5				2.5-2.6									2.6	None
128	0.0-0.3	0.3-0.5			0.5-0.6	0.6-0.7									0.7	None
129	0.0-0.3	0.3-0.6				0.6-0.8									0.8	None
130	0.0-0.2	0.2-0.9					0.9-1.0	1.0-1.1							1.1	None
131	0.0-0.5											0.5-0.6			0.6	None
132	0.0-0.5	0.5-0.9				0.9-1.2									1.2	None
133		0.0-1.3			1.3-1.4	1.4-1.6									1.6	None
134	0.0-1.2	1.2-2.2				2.2-2.3									2.3	None
135	0.0-0.6					0.6-1.0									1.0	None
136		0.0-0.2				0.2-0.4									0.4	None
137		0.0-0.4				0.4-0.5									0.5	None
138	0.0-0.1		0.1-3.0												3.0	None
139	0.0-0.4					0.4-0.6									0.6	None
140	0.0-0.4				0.4-0.5	0.5-0.6									0.6	None
141	0.0-0.4				0.4-0.6	0.6-0.7									0.7	None
142	0.0-0.2	0.2-1.0			1.0-1.2	1.2-1.3									1.3	None
143	0.0-0.3	0.3-0.9			0.9-1.2	1.2-1.3									1.3	None
144	0.0-0.5					0.5-0.7									0.7	None
145		0.0-1.1			1.1-2.3	2.3-2.4									2.4	None
146	0.0-0.1	0.1-0.7			0.7-1.1	1.1-1.2									1.2	None
147	0.0-0.7	0.7-1.0			1.0-1.4	1.4-1.5									1.5	None
148	0.0-1.4				1.4-1.6	1.6-1.8									1.8	1.6
149	0.0-0.8	0.8-1.9			1.9-2.3	2.3-2.5									2.5	None
150	0.0-0.6	0.6-1.8			1.8-2.3	2.3-2.4									2.4	None
151	0.0-0.4					0.4-0.5									0.5	None
152	0.0-0.7	0.7-1.3									1.3-1.7	1.7-1.8			1.8	None
153		0.0-0.6									0.6-1.1	1.1-1.2			1.2	None
154	0.0-0.6	0.6-1.7			1.7-2.1										2.1	None
155	0.0-0.6	0.6-2.6			2.6-3.0										3.0	None

Test point Pipeline	Fill	Colluvium	Alluvium	Pedogenic	Residual mudstone	Mudstone	Residual sandstone	Sandstone	Interbedded residual sandstone/ mudstone	Interbedded sandstone/ mudstone	Residual dolerite	Dolerite	Residual siltstone	Pavement layers	Termination depth	Seepage
156	0.0-0.3	0.3-1.5			1.5-1.8	1.8-2.0									2.0	None
157	0.0-0.4	0.4-1.8			1.8-2.1										2.1	None
158			0.0-3.0			3.0-3.2									3.2	None
159	0.0-0.2	0.2-0.9									0.9-2.4	2.4-2.5			2.5	None
160	0.0-0.1	0.1-0.7			0.7-1.7	1.7-2.0									2.0	None
161		0.0-0.4				0.4-0.6*									0.6	None
162	0.0-0.2	0.2-0.6				0.6-1.0									1.0	None
163	0.0-0.2	0.2-0.8				0.8-1.0*									1.0	None
164	0.0-0.1	0.1-0.9					0.9-1.7	1.7-2.0							2.0	None
165	0.0-0.3					0.3-0.5									0.5	None
166	0.0-0.1	0.1-0.9													2.8	None
167	0.0-0.2	0.2-0.9				0.9-1.4									1.4	None
168	0.0-0.2	0.2-0.4			0.4-0.6	0.6-0.9									0.9	None
169	0.0-0.2										0.2-0.6	0.6-0.9			0.9	None
170	0.0-0.2		0.2-0.8			0.8-1.0*									1.0	None
171	0.0-0.1		0.1-0.7		0.7-1.0	1.0-1.2									1.2	None
172	0.0-0.3	0.3-0.8				0.8-0.9									0.9	None
173	0.0-0.2	0.2-0.7			0.7-1.1	1.1-1.4									1.4	None
174	0.0-0.5	0.5-1.0			1.0-1.3	1.3-1.5									1.5	None
175	0.0-0.3	0.3-0.7				0.7-0.8									0.8	None
176	0.0-0.3	0.3-0.9				0.9-1.4									1.4	None
177	0.0-0.1	0.1-0.5					0.5-1.4	1.4-1.6							1.6	0.5
178	0.0-0.3		0.3-1.1		1.1-2.0	2.0-2.5									2.5	None
179	0.0-0.1		0.1-0.9		0.9-1.7	1.7-2.2									2.2	None
180	0.0-0.2	0.2-0.7					0.7-1.5	1.5-1.7							1.7	None
181	0.0-0.2	0.2-0.5				0.5-0.8									0.8	None
182	0.0-0.1	0.1-0.4			0.4-0.9	0.9-1.0									1.0	None
183	0.0-0.4	0.4-0.8						0.8-1.0							1.0	None
184	0.0-0.3	0.3-1.2									1.2-2.5	2.5-2.6			2.6	None
185	0.0-0.4	0.4-0.7						0.7-1.-0							1.0	None
186	0.0-0.2	0.2-0.7					0.7-1.4	1.4-1.5							1.5	None
187	0.0-0.2	0.2-0.7			0.7-1.3	1.3-1.4									1.4	None
188	0.0-0.3	0.3-0.9			0.9-1.6	1.6-1.7									1.7	None
189	0.0-0.3	0.3-0.6				0.6-1.6									1.6	None
190	0.0-0.1	0.1-0.4			0.4-0.6	0.6-0.8									0.8	None
191	0.0-0.2		0.2-0.6		0.6-1.4	1.4-2.0									2.0	None
193	0.0-0.3	0.3-0.6				0.6-0.9									0.9	None
194	0.0-0.2	0.2-0.5			0.5-0.7	0.7-0.9									0.9	None
195	0.0-0.1	0.1-0.7				0.7-1.2									1.2	None

Test point Pipeline	Fill	Colluvium	Alluvium	Pedogenic	Residual mudstone	Mudstone	Residual sandstone	Sandstone	Interbedded residual sandstone/ mudstone	Interbedded sandstone/ mudstone	Residual dolerite	Dolerite	Residual siltstone	Pavement layers	Termination depth	Seepage
196	0.0-0.2	0.2-0.9				0.9-1.2									1.2	None
197	0.0-0.1	0.1-0.6				0.6-0.7									0.7	None
198	0.0-0.1	0.1-0.5				0.5-0.6									0.6	None
199	0.0-0.4	0.4-1.0			1.0-1.3	1.3-1.6									1.6	None
200	0.0-0.2	0.2-1.4			1.4-3.0										3.0	None
201	0.0-0.2	0.2-0.5				0.5-0.6									0.6	None
202	0.0-0.6							0.6-0.7							0.7	None
203	0.0-1.2							1.2-1.3							1.3	None
204		0.0-0.8				0.8-1.4									1.4	None
205		0.0-0.6				0.6-0.8									0.8	None
206		0.0-1.2			1.2-2.3	2.3-2.5									2.5	None
207		0.0-1.2				1.2-1.5									1.5	None
208		0.0-0.4			0.4-0.6	0.6-0.7									0.7	None
209		0.0-0.3				0.3-0.4									0.4	None
210	0.0-0.4	0.4-1.0			1.0-1.4	1.4-1.5									1.5	None
211		0.0-0.3										0.3-0.5			0.5	None
212	0.0-1.3					1.3-1.6									1.6	None
213								0.0-0.2							0.2	None
214		0.0-2.7			2.7-3.5										3.5	None
215		0.0-2.5			2.5-3.3										3.3	None
216		0.0-3.1				3.1-3.2									3.2	None
217		0.0-0.4	0.4-3.6												3.6	None
218	0.0-0.2	0.2-0.5			0.5-0.9	0.9-1.9					1.9-3.0	3.0-3.1			3.1	None
219	0.0-0.3	0.3-0.6			0.6-0.9	0.9-1.7						1.7-2.7	2.7-3.1		3.1	None
220	0.0-0.3	0.3-0.6			0.6-0.9	0.9-1.7						1.7-2.7	2.7-3.1		3.1	None
221		0.0-0.2						0.2-0.3							0.3	None
222		0.0-0.2			0.2-0.3	0.3-0.4									0.4	None
223		0.0-0.7			0.7-1.1	1.1-1.3									1.3	None
224		0.0-0.6			0.6-1.1	1.1-1.3									1.3	None
225		0.0-0.8 1.2-1.5			0.8-1.2										1.5	None
226	0.0-0.6	0.6-0.9			0.9-1.2	1.2-1.3									1.3	None
227	0.0-0.7	0.7-2.0			2.0-2.5	2.5-2.7									2.7	None
228	0.0-0.5	0.5-1.0			1.0-1.2	1.2-1.3									1.3	None
229		0.0-0.6			0.6-0.7	0.7-0.9									0.9	None
230		0.0-0.4										0.4-0.5			0.5	None
231		0.0-0.6			0.6-1.2	1.2-1.4									1.4	None
232	0.0-0.3	0.3-0.6			0.6-0.8	0.8-0.9									0.9	None
233	0.0-0.4	0.4-0.8			0.8-1.2	1.2-1.4									1.4	None

Test point Pipeline	Fill	Colluvium	Alluvium	Pedogenic	Residual mudstone	Mudstone	Residual sandstone	Sandstone	Interbedded residual sandstone/ mudstone	Interbedded sandstone/ mudstone	Residual dolerite	Dolerite	Residual siltstone	Pavement layers	Termination depth	Seepage
234	0.0-0.2	0.2-0.5			0.5-1.6	1.6-1.7									1.7	None
235	0.0-0.4					0.4-0.5									0.5	None
237		0.0-0.5					0.5-0.7	0.7-0.8							0.8	None
238		0.0-0.5						0.5-0.9							0.9	None
239		0.0-1.3			1.3-1.4	1.4-1.6									1.6	None
240		0.0-0.4			0.4-0.5	0.5-1.2									1.2	None
241		0.0-0.6						0.6-0.9							0.9	None
242		0.0-0.4			0.4-0.7	0.7-1.1									1.1	None
243		0.0-0.7						0.7-0.8							0.8	None
244	0.0-0.8				0.8-3.2										3.2	None
245		0.0-0.4						0.4-0.7							0.7	None
246	0.0-0.6	0.6-2.4				2.4-2.6									2.6	None
247	0.0-0.6	0.6-1.5	1.5-2.3					2.3-2.8							2.8	2.8
248	0.0-0.7							0.7-0.9							0.9	None
249	0.0-0.5	0.5-1.4			1.4-3.1										3.1	None
250	0.0-0.5				0.5-0.8	0.8-2.7									2.7	None
251	0.0-0.8	0.8-2.4			2.4-3.1										3.1	None
252	0.0-0.5	0.5-1.0				1.0-1.1									1.1	None
253	0.0-0.5				0.5-0.7	0.7-0.8									0.8	None
254	0.0-0.6	0.6-0.8			0.8-3.0										3.0	None
255	0.0-0.6	0.6-1.0			1.0-3.1										3.1	None
256	0.0-0.5	0.5-1.1			1.1-2.6	2.6-2.8									2.8	None
257	0.0-0.6	0.6-1.1			1.1-2.2	2.2-2.4									2.4	None
258	0.0-0.4				0.4-1.2	1.2-1.6									1.6	None
259	0.0-0.3	0.3-0.5						0.5-0.6							0.6	None
260	0.0-0.3	0.3-0.8			0.8-1.6	1.6-1.7									1.7	None
261	0.0-0.3	0.3-0.6									0.6-1.2	1.2-1.4			1.4	None
262	0.0-0.4	0.4-1.3				1.3-1.4									1.4	None
263	0.0-0.3					0.3-0.4									0.4	None
264	0.0-0.4	0.4-0.8				1.3-1.5	0.8-1.3								1.5	None
265	0.0-0.4	0.4-0.8			0.8-1.3	1.3-1.4									1.4	None
266	0.0-0.3				0.3-0.8*	0.8-0.9*									0.9	None
267	0.0-0.4	0.4-0.8			0.8-1.2	1.2-1.5									1.5	None
268	0.0-0.3	0.3-0.7			0.7-1.3	1.3-1.4									1.4	None
269	0.0-0.4				0.4-0.8	0.8-1.2									1.2	None
270	0.0-0.5	0.5-1.2				1.2-1.3									1.3	None
271	0.0-0.6	0.6-3.2													3.2	None
272	0.0-0.9	0.9-2.5						2.5-3.2							3.2	None
273	0.0-0.5	0.5-1.2				1.2-1.3									1.3	None

Test point Pipeline	Fill	Colluvium	Alluvium	Pedogenic	Residual mudstone	Mudstone	Residual sandstone	Sandstone	Interbedded residual sandstone/ mudstone	Interbedded sandstone/ mudstone	Residual dolerite	Dolerite	Residual siltstone	Pavement layers	Termination depth	Seepage
274	0.0-0.1					0.1-0.2									0.2	None
275	0.0-1.0	1.0-1.5				1.5-1.7									1.7	None
276	0.0-0.7	0.7-1.6				1.6-2.3									2.3	None
277		0.0-3.2													3.2	None
278		0.0-1.3			1.3-2.7	2.7-2.9									2.9	None
279	0.0-0.8				0.8-0.9	0.9-1.1									1.1	None
280	0.0-0.5					0.5-1.0									1.0	None
281	0.0-0.6					0.6-1.7									1.7	None
282	0.0-0.8					0.8-1.6									1.6	None
283	0.0-0.6	0.6-0.9			0.9-1.5	1.5-1.8									1.8	None
284	0.0-2.4				2.4-2.5	2.5-2.7									2.7	1.8
285	0.0-0.6	0.6-1.7			1.7-1.9	1.9-2.1									2.1	None
286	0.0-0.5							0.5-0.7							0.7	None
287	0.0-0.3				0.3-0.7	0.7-0.8									0.8	None
288	0.0-0.5					0.5-0.6									0.6	None
289	0.0-0.7					0.7-0.8									0.8	None
290	0.0-0.7	0.7-1.1									1.1-1.2	1.2-1.4			1.4	None
291	0.0-0.6				0.6-1.2	1.2-1.4									1.4	None
292	0.0-0.4											0.4-0.7			0.7	None
293	0.0-0.2	0.2-0.7			0.7-0.8	0.8-1.4									1.4	None
294	0.0-0.4	0.4-1.3			1.3-1.4	1.4-1.6									1.6	None
295	0.0-0.2	0.2-0.5									0.5-0.7	0.7-0.8			0.8	None
296	0.0-1.2										1.2-1.5	1.5-2.5			1.6	None
297	0.0-0.4	0.4-0.7			0.7-0.9	0.9-1.2									1.2	None
298	0.0-0.2	0.2-0.6			0.6-1.0	1.0-1.4									1.4	None
299	0.0-0.8					0.8-1.7									1.7	None
300	0.0-0.7				0.7-1.1	1.1-1.3									1.3	None
301	0.0-0.2	0.2-0.8			0.8-2.2	2.2-2.3									2.3	None
302	0.0-1.2				1.2-1.6	1.6-1.7									1.7	None
303	0.0-0.3	0.3-0.7			0.7-0.8	0.8-1.0									1.0	None
304	0.0-1.1	1.1-1.4			1.4-1.5	1.5-1.7									1.7	None
305	0.0-0.7	0.7-1.4			1.4-1.6	1.6-1.9									1.9	None
306	0.0-0.6	0.6-1.6			1.6-2.1	2.1-2.3									2.3	None
307	0.0-0.4	0.4-1.4			1.4-2.5	2.5-2.7*									2.7	None
308	0.0-0.3				0.3-0.5	0.5-0.7*									0.7	None
309	0.0-0.3	0.3-0.7			0.7-1.8	1.8-2.1*									2.1	None
310								0.0-0.1							0.1	None
311	0.0-0.6	0.6-1.0			1.0-2.5	2.5-2.7									2.7	None
312	0.0-0.9				0.9-2.3	2.3-2.5									2.5	None

Test point Pipeline	Fill	Colluvium	Alluvium	Pedogenic	Residual mudstone	Mudstone	Residual sandstone	Sandstone	Interbedded residual sandstone/ mudstone	Interbedded sandstone/ mudstone	Residual dolerite	Dolerite	Residual siltstone	Pavement layers	Termination depth	Seepage
313	0.0-0.8	0.8-1.6			1.6-2.2	2.2-2.5									2.5	None
314	0.0-0.8	0.8-2.3			2.3-3.1	3.1-3.2									3.2	None
315	0.0-0.5	0.5-1.4			1.4-2.3	2.3-2.8									2.8	None
316	0.0-0.5	0.5-2.6			2.6-3.0										3.0	None
317	0.0-0.6				0.6-1.6	1.6-1.9									1.9	None
318	0.0-0.9	0.9-1.4			1.4-2.8	2.8-2.9									2.9	None
319	0.0-0.3	0.3-0.6						0.6-0.8							0.8	None
320	0.0-0.5											0.5-0.7			0.7	None
321	0.0-1.3					1.3-1.4									1.4	None
322	0.0-1.1					1.1-1.3									1.3	None
323	0.0-0.4														0.4	None
326	0.0-0.3														0.3	None
327	0.0-1.3														1.3	None
328		0.0-0.3						0.3-0.4							0.4	None
329	0.0-0.5	0.5-1.7			1.7-2.1	2.1-2.3									2.3	None
330	0.0-0.6	0.6-1.2				1.2-1.4									1.4	None
331	0.0-0.9					0.9-1.1									1.1	None
332											0.0-0.1	0.1-0.2			0.2	None
333	0.0-1.1	1.1-1.5						1.5-1.6							1.6	None
334	0.0-0.1				0.1-0.3	0.3-0.4									0.4	None
335	0.0-0.2				0.2-0.7	0.7-1.2									1.2	None
336	0.0-0.2				0.2-0.5	0.5-0.8									0.8	None
337	0.0-0.4				0.4-1.0	1.0-1.4									1.4	None
338	0.0-0.4				0.4-0.8	0.8-1.7									1.7	None
339	0.0-0.4							0.4-0.5							0.5	None
340	0.0-0.1				0.1-0.7	0.7-1.0									1.0	None
341	0.0-0.1				0.1-0.7	0.7-1.0									1.0	None
342	0.0-0.6					0.6-1.5									1.5	None
343	0.0-0.6				0.6-0.8	1.4-1.5					0.8-1.4				1.5	None
344	0.0-0.1		0.1-1.4			2.2-2.4*					1.4-2.2				2.4	None
345	0.0-0.4				0.4-0.7	0.7-0.8									0.8	None
346		0.0-0.2			0.2-1.2	1.2-1.3*									1.3	None
347	0.0-0.3		0.3-0.6									0.6-1.0			1.0	None
348			0.0-0.7	0.7-0.8											0.8	None
349	0.0-0.2						0.2-0.7	0.7-1.3							1.3	None
350	0.0-0.3						0.3-0.6	0.6-1.0							1.0	None
351	0.0-0.1							0.1-0.2							0.2	None
352		0.0-0.4			0.4-0.6	0.6-0.8*									0.8	None
353	0.0-0.3				0.3-0.5	0.5-0.7*									0.7	None

Test point Pipeline	Fill	Colluvium	Alluvium	Pedogenic	Residual mudstone	Mudstone	Residual sandstone	Sandstone	Interbedded residual sandstone/ mudstone	Interbedded sandstone/ mudstone	Residual dolerite	Dolerite	Residual siltstone	Pavement layers	Termination depth	Seepage
354	0.0-0.1							0.1-0.4							0.4	None
356	0.0-0.3	0.3-0.4					0.4-0.5	0.5-0.6							0.6	None
357															0.0	None
358	0.0-0.5	0.5-1.0			1.0-1.4	1.4-2.0*									2.0	None
359	0.0-0.3	0.3-0.6			0.6-0.8	0.8-0.9*									0.9	None
360	0.0-0.4	0.4-0.5			0.5-1.3	1.3-1.6*									1.6	None
361	0.0-0.3	0.3-0.6			0.6-0.7	0.7-0.8									0.8	None
362															0.0	None
363	0.0-0.2				0.2-0.4	0.4-0.5									0.5	None
364	0.0-0.2				0.2-0.6	0.6-0.8									0.8	None
365	0.0-0.5	0.5-1.4			1.4-3.0										3.0	None
366	0.0-1.0		1.0-3.0												3.0	None
367	0.0-0.2	0.2-1.2			1.2-2.4	2.4-2.9									2.9	None
368	0.0-0.2	0.2-0.5			0.5-0.9	0.9-1.3*									1.3	None
369	0.0-0.2	0.2-0.6			0.6-1.1	1.1-1.3									1.3	None
370	0.0-0.2	0.2-0.6			0.6-0.8	0.8-1.0									1.0	None
371	0.0-1.1														1.1	None
372	0.0-0.3	0.3-1.3			1.3-2.4	2.4-2.5									2.5	None
373	0.0-0.2							0.2-0.3							0.3	None
374	0.0-0.3	0.3-0.9			0.9-1.0	1.0-1.1									1.1	None
375	0.0-0.3	0.3-0.7										0.7-0.8			0.8	None
376	0.0-0.3	0.3-0.7										0.7-0.9			0.9	None
377	0.0-0.2	0.2-0.5					0.5-0.9	0.9-1.3							1.3	None
378	0.0-0.2	0.2-0.7			0.7-0.9	0.9-1.7									1.7	None
379	0.0-0.1	0.1-0.5			0.5-1.4	1.4-1.9									1.9	None
380	0.0-0.2	0.2-0.8			0.8-2.5	2.5-2.7									2.7	None
381	0.0-0.1	0.1-0.5			0.5-0.8	0.8-1.4									1.4	None
382		0.0-1.1				1.1-2.4									2.4	None
383		0.0-0.5						0.5-0.7							0.7	None
384	0.0-1.5														1.5	None
385					0.0-0.3	0.3-0.4*									0.4	None
386	0.0-0.2	0.2-0.6			0.6-0.9	0.9-1.0									1.0	None
387	0.0-1.1		1.1-2.0		2.0-3.1										3.1	None
388	0.0-0.2				0.2-0.7	0.7-1.4									1.4	None
389		0.0-0.5					0.5-0.6	0.6-0.7							0.7	None
390		0.0-0.6					0.6-0.7	0.7-0.8							0.8	None
391		0.0-0.7			0.7-0.8	0.8-0.9*									0.9	None
392		0.0-0.2					0.2-1.3	1.3-1.5							1.5	None
393		0.0-0.3						0.3-0.5							0.5	None

Test point Pipeline	Fill	Colluvium	Alluvium	Pedogenic	Residual mudstone	Mudstone	Residual sandstone	Sandstone	Interbedded residual sandstone/ mudstone	Interbedded sandstone/ mudstone	Residual dolerite	Dolerite	Residual siltstone	Pavement layers	Termination depth	Seepage
394	0.0-0.2	0.2-0.7			0.7-1.5	1.5-1.8									1.8	None
395		0.0-0.4			0.4-0.6	0.6-0.8									0.8	None
396	0.0-0.4						0.4-0.8	0.8-0.9							0.9	None
397	0.0-0.2				0.2-0.5	0.5-1.0									1.0	None
398	0.0-0.2					0.2-0.3*									0.3	None
399	0.0-0.1											0.1-0.3			0.3	None
400	0.0-0.1					0.1-0.2									0.2	None
401			0.0-0.6		0.6-1.1	1.1-1.3									1.3	None
402		0.0-0.9			0.9-3.0										3.0	None
403	0.0-0.1	0.1-0.4			0.4-0.6	0.6-0.8*									0.8	None
404		0.0-0.2			0.2-0.4	0.4-0.7*									0.7	None
405		0.0-0.4			0.4-0.8	0.8-2.9									2.9	None
406		0.0-0.4			0.4-0.8	0.8-2.0									2.0	None
407		0.0-0.4			0.4-0.6	0.6-2.4*									2.4	None
408		0.0-0.6			0.6-3.1										3.1	None
409	0.0-0.2		0.2-2.8					2.8-3.1							3.1	None
410	0.0-0.9		0.9-2.8		2.8-3.0										3.0	None
411	0.0-1.5		1.5-2.9												3.1	None
412		0.0-0.5			0.5-0.7	0.7-2.5									2.5	None
413		0.0-0.9			0.9-1.7	1.7-2.8									2.8	None
414		0.0-0.6			0.6-1.4	1.4-3.0									3.0	None
415	0.0-0.2	0.2-0.8					0.8-0.9	0.9-1.0							1.0	None
416		0.0-0.6			0.6-1.5	1.5-3.0									3.0	None
417	0.0-0.8	0.8-1.2			1.2-1.6										2.6	None
418		0.0-0.3						0.3-0.35							0.35	None
419		0.0-0.6			1.1-2.5	2.5-3.0	0.6-1.1								3.0	None
420	0.0-0.5	1.5-3.0	0.5-1.5												3.0	None
421	0.0-0.3		0.3-0.8	0.8-2.8											2.8	None
422	0.0-2.7														2.7	None
423		0.0-0.5										0.5-0.6			0.6	None
424															1.0	None
425															1.7	None
426		0.0-0.4			0.4-0.7	0.7-1.0									2.6	None
432		0.0-0.7				0.7-1.7*									1.7	None
433		0.0-1.9				1.9-2.6*									2.6	None
434		0.0-0.7			0.7-0.8			0.8-0.9							0.9	None
435		0.0-0.3						0.3-0.6							0.6	None
436								0.0-0.1							0.1	None
437		0.0-0.6						0.6-0.7							0.7	None

Test point Pipeline	Fill	Colluvium	Alluvium	Pedogenic	Residual mudstone	Mudstone	Residual sandstone	Sandstone	Interbedded residual sandstone/ mudstone	Interbedded sandstone/ mudstone	Residual dolerite	Dolerite	Residual siltstone	Pavement layers	Termination depth	Seepage
438			0.0-1.5			1.5-2.7									2.7	None
439	0.0-0.3	0.3-0.6		0.6-2.8	2.8-3.0										3.0	None
447	0.0-0.2					0.2-0.3									1.7	None
448			0.0-0.9		0.9-3.0	3.0-3.1*									2.6	None
449	0.0-0.2					0.2-1.0*									0.9	None
450	0.0-0.2	0.2-0.7													0.6	None
451	0.0-0.3	0.3-0.7			0.7-0.9	0.9-1.3									0.1	None
452	0.0-0.1	0.1-1.0			1.0-3.0										0.7	None
453		0.0-1.0	1.0-2.5												2.7	None
454	0.0-0.2	0.2-0.6									0.6-0.7	0.7-1.7			3.0	None
455	0.0-0.2				0.2-0.5	0.5-0.7									1.7	None
456	0.0-0.3	0.3-0.8			0.8-1.5	1.5-2.0									2.6	None
457	0.0-0.2				0.2-0.4	0.4-0.6									0.9	None
458	0.0-0.2					0.2-0.4									0.6	None
459		0.0-0.4					0.4-1.2	1.2-1.4							0.1	None
460		0.0-0.7		0.7-0.8						0.8-1.2					0.7	None
461		0.0-0.4				0.6-1.2		0.4-0.6							2.7	None
486		0.0-1.0		1.0-1.2		1.2-2.8									2.8	None
487		0.0-1.0			1.0-1.2	1.2-2.5									2.5	None
488		0.0-1.0			1.0-2.3 2.5-3.1	2.3-2.5									3.1	None
489	0.0-0.2	0.2-0.6						0.6-1.1							1.1	None
490		0.0-0.6							0.6-1.8	1.8-2.5					2.5	None
491	0.0-0.2	0.2-1.5			1.5-2.5	2.5-3.1									3.1	None
492		0.0-0.7						0.7-1.5							1.5	None
493	0.0-0.2											0.2-1.2			1.2	None
494		0.0-0.3										0.3-0.7			0.7	None
495	0.0-0.1										0.1-0.2				0.2	None
496		0.0-0.4										0.4-0.5			0.5	None
497		0.0-0.4										0.4-0.7			0.7	None
498			0.0-2.6												2.6	None
499		0.0-0.8									0.8-1.1	1.1-1.6			1.6	None
500	0.0-0.2	0.2-0.4										0.4-0.5			0.5	None
501		0.0-0.5									0.5-0.7	0.7-0.8			0.8	None
502		0.0-0.5									0.5-0.7	0.7-0.9			0.9	None
503		0.0-0.3										0.3-0.6			0.6	None
504		0.0-0.8				0.8-1.0*									1.0	None
505		0.0-0.5				0.5-0.6*									0.6	None
506		0.0-1.0		1.0-1.9	1.9-2.8	2.8-3.0									3.0	None

Test point Pipeline	Fill	Colluvium	Alluvium	Pedogenic	Residual mudstone	Mudstone	Residual sandstone	Sandstone	Interbedded residual sandstone/ mudstone	Interbedded sandstone/ mudstone	Residual dolerite	Dolerite	Residual siltstone	Pavement layers	Termination depth	Seepage
507		0.0-0.3			0.3-1.2	1.2-1.7									1.7	None
508		0.0-1.5			1.5-3.0										3.0	None
509	0.0-0.2	0.2-0.9		0.9-2.0	2.0-3.0										3.0	None
510	0.0-0.2	0.2-0.6				3.0-3.2		2.3-3.0							3.2	None
511		0.0-1.4			1.4-2.5	2.5-3.1									3.1	None
512		0.0-0.9			0.9-1.5	1.5-2.0									2.0	None
513	0.0-0.2	0.2-1.2		1.2-1.7	1.7-2.0	2.0-2.3									2.3	None
514	0.0-0.2	0.2-1.5		1.5-2.3	2.3-2.8	2.8-3.0									3.0	None
515	0.0-0.2	0.2-1.4		1.4-1.8							1.8-2.2	2.2-2.4			2.4	None
516		0.0-0.6				0.6-0.7*									0.7	None
517	0.0-0.9			0.9-1.9	1.9-3.0										3.0	None
518	0.0-0.3	0.3-1.3		1.3-1.5											1.5	None
519	0.0-0.1	0.1-0.9					0.9-1.4	1.4-1.7							1.7	None
520		0.0-1.2													3.0	None
521	0.0-0.2	0.2-1.3			1.3-2.6	2.6-3.1									3.1	None
522	0.0-0.2		0.2-0.9		0.9-1.2	1.2-2.8									2.8	None
523	0.0-0.3	0.3-0.8							0.8-1.0	1.0-2.4					2.4	None
524	0.0-0.4	0.4-0.7							0.7-0.9	0.9-3.0					3.0	None
525	0.0-0.4	0.4-1.6				1.6-2.6									2.6	None
526	0.0-0.3	0.3-1.2			1.2-2.2	2.2-3.0									3.0	None
527	0.0-0.3	0.3-1.1			1.1-2.5	2.5-3.0									3.0	None
528	0.0-1.0														1.0	None
529		0.0-0.8			0.8-1.4	1.4-1.6									1.6	None
530		0.0-0.7					0.7-1.8	1.8-2.0							2.0	None
531		0.0-0.8			0.8-3.0										3.0	None
532		0.0-0.7			0.7-3.1										3.1	None
533	0.0-0.5	0.5-0.7			0.7-1.1	1.1-1.4									1.4	None
534		0.0-2.2				2.2-3.0									3.0	None
535		0.0-0.7				0.7-1.0*									1.0	None
536	0.0-0.4	0.4-1.4			1.4-2.8	2.8-3.0									3.0	None
537	0.0-0.3	0.3-1.4			1.4-3.0										3.0	None
538	0.0-0.3	0.3-2.6													2.6	None
539	0.0-0.4	0.4-1.3			1.3-1.5	1.5-2.4*									2.4	1.5
540		0.0-0.4									0.4-1.3				1.3	None
541			0.0-1.7		1.7-2.1	2.1-3.1									3.1	None
542		0.0-1.4		1.4-2.3	2.3-3.1										3.1	None
543	0.0-0.3	0.3-1.5			1.5-3.1										3.1	None
544	0.0-0.7										0.7-1.8				1.8	None
545		0.0-0.9			0.9-1.9	1.9-2.7									2.7	None

Test point Pipeline	Fill	Colluvium	Alluvium	Pedogenic	Residual mudstone	Mudstone	Residual sandstone	Sandstone	Interbedded residual sandstone/ mudstone	Interbedded sandstone/ mudstone	Residual dolerite	Dolerite	Residual siltstone	Pavement layers	Termination depth	Seepage
546	0.0-1.0				1.4-2.7		1.0-1.4								2.7	None
547		0.0-0.9	0.9-2.1	2.1-3.0											3.0	None
548		1.0-1.3	0.0-1.0	1.3-3.0											3.0	None
549		0.0-1.2		1.2-2.0											2.0	None
550	0.0-2.0				2.0-2.7	2.7-3.0*									3.0	None
551		0.0-1.5			1.5-1.7										1.7	None
552	0.0-0.6										0.6-0.8				0.8	None
554															0.0	None
655		0.0-0.5					0.5-1.7								2.8	None
656								0.0-0.1							2.5	None
658								0.0-0.1							3.1	None
659								0.0-0.1							1.1	None
660		0.0-0.3			0.3-1.4										2.5	None
661		0.0-0.5			0.5-0.7	0.7-0.8									3.1	None
662	0.0-2.3														1.5	None
663	0.0-0.3	0.3-0.6										0.6-0.9			1.2	None
664		0.0-0.6									0.6-0.7	0.7-0.8			0.7	None
665	0.0-1.5		1.5-2.1		2.1-2.4	2.4-2.5										
666	0.0-0.2		0.2-1.5		1.5-1.7	1.7-2.3									0.5	None
667														0.0-0.3	0.7	None
668	0.0-0.7		0.7-3.0												2.6	None
669		0.0-0.7				0.7-1.4									1.6	None
670	0.0-1.5														0.5	None
674	0.0-0.3					0.3-0.4									0.4	None
675	0.0-1.0														1.0	None
678	0.0-1.7				1.7-1.8	1.8-1.9									1.9	None

Table 4-2: Summary of boreholes across the proposed pipeline

Borehole position	Topsoil	Fill	Transported material	Colluvium	Alluvium	Residual mudstone	Mudstone	Residual sandstone	Sandstone	Interbedded mudstone/ sandstone	Residual dolerite	Dolerite	Termination depth (m)	Water level (m)
BH3		0.0-0.3					1.05-2.29		2.29-5.0		0.3-1.05		5.00	0.65
BH4	0.0-0.3					0.3-1.05	1.05-5.18						5.18	0.85
BH6	0.0-0.3		0.3-1.3			1.3-2.3	2.3-5.21						5.21	1.85
BH7			0.0-0.3			0.3-1.6	3.72-5.57 8.05-9.98			1.6-3.72 5.57-8.05			9.98	0.85
BH9			0.0-0.3			0.3-2.16	2.16-4.56		4.56-5.25				5.25	-
BH10		0.0-0.5	0.5-2.63				6.07-10.15			2.63-6.07			10.15	3.65
BH11		0.0-0.5					3.73-5.21	0.5-1.5	1.5-3.73				5.21	2.25
BH12		0.0-0.4			0.4-2.84		4.09-10.09	2.84-3.3	3.3-4.09				10.09	2.35
BH13		0.0-1.0					1.0-5.07						5.07	2.83
BH14		0.0-0.3		0.3-0.75			0.75-1.47 3.52-5.1		1.47-3.52				5.10	2.28
BH17		0.0-0.5					1.74-5.11			0.5-1.74			5.11	2.50
BH18		0.0-0.7					1.76-5.11				0.7-1.76		5.11	1.87
BH19					0.0-2.9				2.9-10.16				10.16	1.65
BH20	0.0-0.3					0.3-1.95	1.95-5.17						5.17	0.58
BH21		0.0-0.8							0.8-5.13				5.13	0.30
BH22					0.0-1.95		1.95-2.38 3.00-3.54		2.38-3.00 3.54-4.23	4.23-10.08			10.08	1.35
BH23		0.0-0.35					0.35-5.09						5.09	0.25
BH24					0.0-3.0		3.63-7.55		7.55-10.02			3.0-3.63	10.02	3.45
BH25		0.0-0.45			0.45-1.90		1.90-5.21						5.21	1.65
BH26		0.0-0.3			0.3-0.86		0.86-3.71 4.21-6.59 7.83-10.04		3.71-4.21 6.59-7.83				10.04	6.95
BH28		0.0-0.3									0.3-0.88	0.88-5.05	5.05	0.20
BH29		0.0-1.0					1.0-5.07						5.07	1.08
BH30		0.0-0.3			0.3-10.0								10.00	2.15
BH31		0.0-1.72				1.72-5.1							5.1	1.28
BH32		0.0-0.87				0.87-1.64	1.64-6.44		6.44-10.06				10.08	1.38
BH40								0.0-0.7	0.7-4.6	4.6-5.08			5.08	0.85
BH42					0.0-2.17				10.08				10.08	7.90
BH47	0.0-1.0					1.0-1.6	1.6-5.09						5.09	1.25
BH48		0.0-0.9		0.9-2.5			2.5-5.05						5.05	3.20
BH54	0.0-0.3										0.3-3.45	3.45-10.05	10.05	2.35

4.1.5 Bedrock

Bedrock was typically encountered underlying the residual material along the pipeline route. The following rock types were noted during the investigation:

Dolerite – dark grey stained reddish brown, moderately to highly weathered, very closely jointed, soft rock from between 0.1 and 3.5 m below surface.

Mudstone – greenish grey to purplish brown, blotched orange, moderately to highly weathered, fine grained, thinly bedded, very closely jointed, very soft to soft rock from 0. 3 – 3.0 m below surface.

Sandstone – light grey stained brown, moderately weathered, medium grained, thinly bedded, closely jointed, soft rock from surface to 3.3 m below surface.

Interbedded sandstone/mudstone – yellow brown blotched off-white and olive brown, highly weathered, medium grained, thinly bedded, very soft to soft rock from 0.5 – 2.6 m below surface.

A combination of mudstone and sandstone underly the majority of the pipeline, with dolerite encountered in only 11% of the test pits.

It should be noted that bedrock was not encountered in some of the test pit and borehole profiles. Here the DPSH tests were used to estimate the local bedrock level and to determine the consistency of the deeper soil profiles. However, the DPSH sometimes refused on cobbles, boulders or hardpan calcrete. The bedrock is not described at these points.

None of the bedrock samples were tested, however, based on the rock hardness descriptions, the Uniaxial Compressive Strength (UCS) of the bedrock can be estimated (after ISRM 1981).

Deere and Miller's research established that the modulus ratio, which is the ratio of Young's Modulus to UCS, typically falls within the range of 200 to 500 for many rock types. This empirical correlation helps estimate the stiffness of rock materials based on their compressive strength (Deere and Miller, 1966).

Additionally a case study at Beatrix Mine include rock material properties of the Beaufort Group (Brink, 1983), within which the propose pipeline route is situated.

It is important to note that the mudstone from the Beaufort Group undergoes rapid disintegration after exposure to air if it is not protected immediately after excavation.

A summary of the anticipated rock properties along the pipeline route is presented in Table 4-3.

Table 4-3: Estimated rock properties along the pipeline route based on the test pit and borehole descriptions

Rock type	Hardness description	UCS (MPa) after ISRM, 1981	UCS (MPa), measured at Beatrix Mine	Young's Modulus (GPa) measured at Beatrix Mine	Modulus ratio estimate (after Deere)	Estimated Young's Modulus (GPa)
Interbedded Mudstone and Sandstone	Medium hard	25 - 50	25 - 65 (avg 45)	4.17 - 6.96 (avg 5.8)	200 - 500 (consider 200*)	5 - 10
Dolerite	Medium hard to hard	50 - 100			200 - 500 (Consider 300*)	15 - 30

*Conform with estimates published on www.rockmass.net for the respective rock types

4.2 Ground Profile at Raw Water Pump Station

The encountered ground profile for the proposed raw water pump station is represented in Figure 4-1 and Figure 4-2.

4.2.1 Topsoil

The topsoil was encountered at surface up to 0.3 m in one of the boreholes. The material was described as clayey sand with minor gravel and grass roots.

4.2.2 Made Ground / Fill

General fill material was occasionally encountered from surface to depths of up to 0.6 m. The fill occurred as loose to medium dense, intact, gravelly sand with occasional sub-angular cobbles of dolerite.

4.2.3 Residual Soil

Residual mudstone was encountered from depths ranging from surface to 1.1 m. The material was described as soft to firm, sandy clay with occasional weathered mudstone gravels and cobbles.

Residual dolerite was up to 0.2 m thick, and the material is described as sandy gravelly clay.

4.2.4 Bedrock

Mudstone - bedrock is encountered from 0.3 to 1.2 m below surface and is described as pale olive green, moderately to highly weathered, thinly bedded, soft to medium hard rock.

Dolerite - Bedrock is encountered from surface to 0.6 m below surface and described as dark grey, moderately weathered, medium grained, very closely jointed, hard rock

Sandstone - Sandstone bedrock was encountered in BH02 from 7 m below surface and is described as light grey, moderately weathered, very fine grained, medium hard rock.

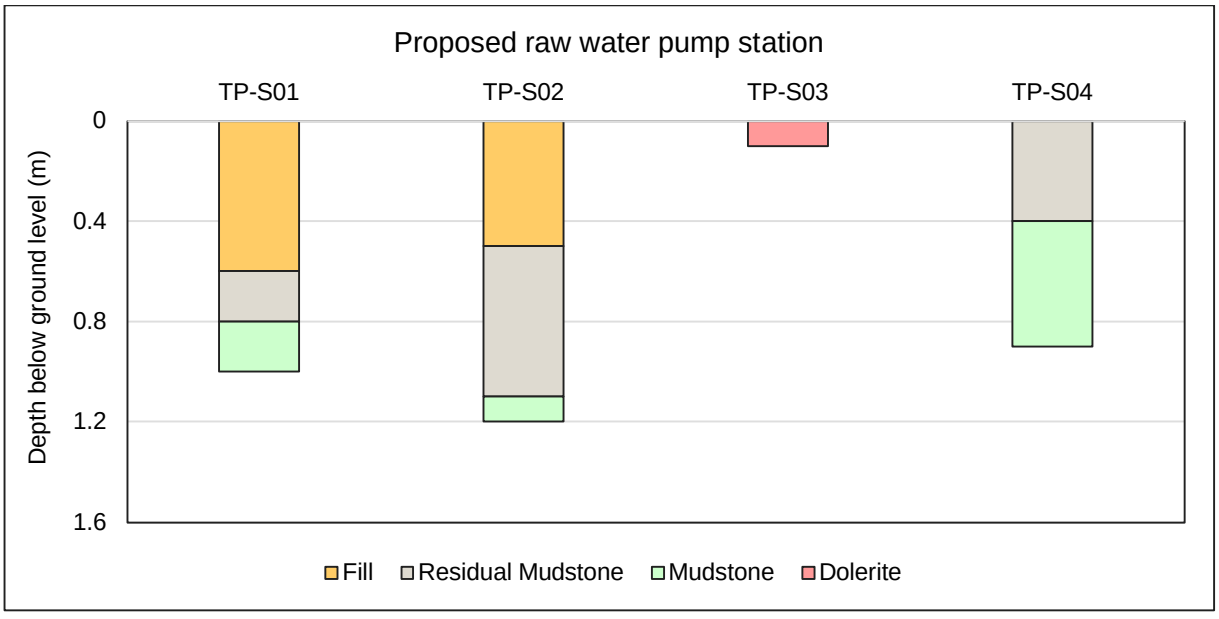


Figure 4-1: Summary of test pit profiles for the proposed raw water pump station

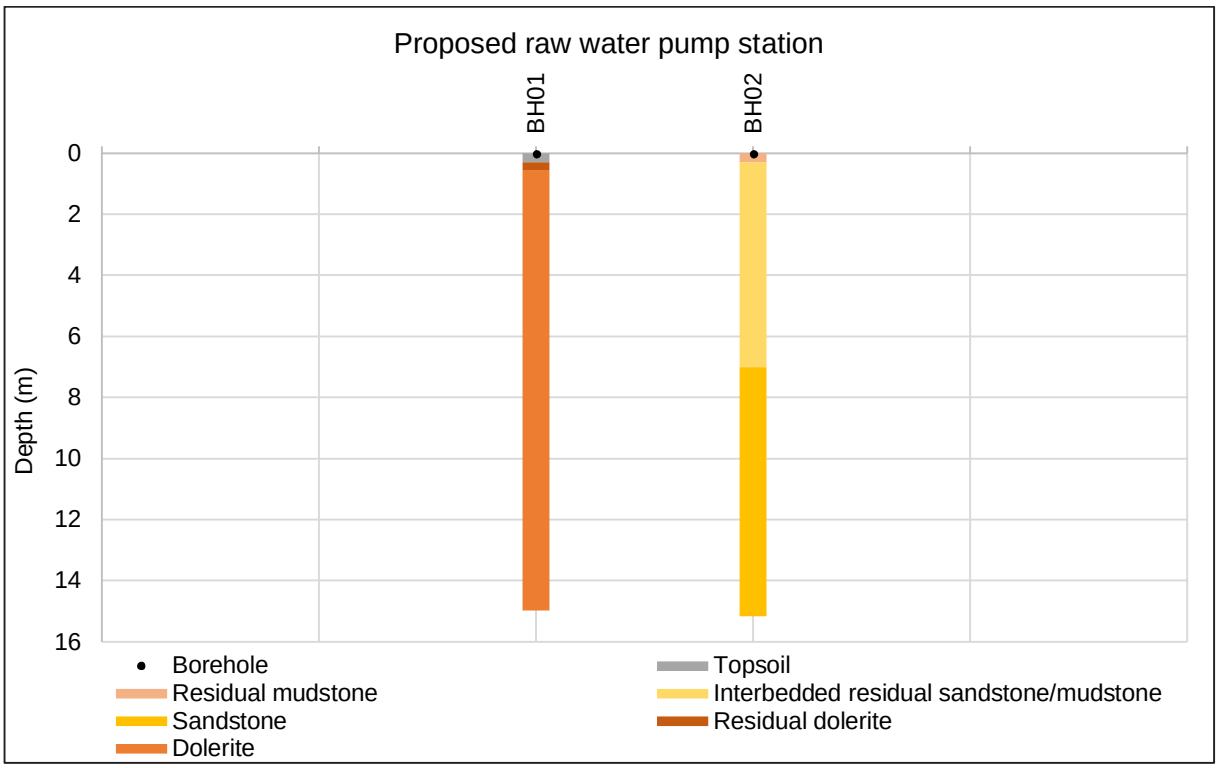


Figure 4-2: Summary of borehole profiles for the proposed raw water pump station

4.3 Ground Profile at WTP and High-Lift Pump Station

The ground profile for the proposed WTP and high-lift pump station is represented in Figure 4-3 and Figure 4-4.

4.3.1 Topsoil

The topsoil was encountered in one of the boreholes from surface up to 0.3 m and is described as silty clayey sand.

4.3.2 Colluvium

Colluvium material was occasionally encountered from surface to depths of up to 0.8 m. The colluvium was encountered as loose to medium dense, intact, silty sand.

4.3.3 Residual mudstone

Residual mudstone material was encountered from depths ranging from 0.1 m to 2.0 m. The material was described as well packed angular, highly weathered mudstone gravels and cobbles, with an overall consistency of medium dense to dense.

4.3.4 Bedrock

Mudstone - Bedrock is encountered from 0.2 m to 2 m below surface and is described as pale olive green, moderately to highly weathered, thinly bedded, soft to medium hard rock. Zones with thin interbedded sandstone beds were also noted.

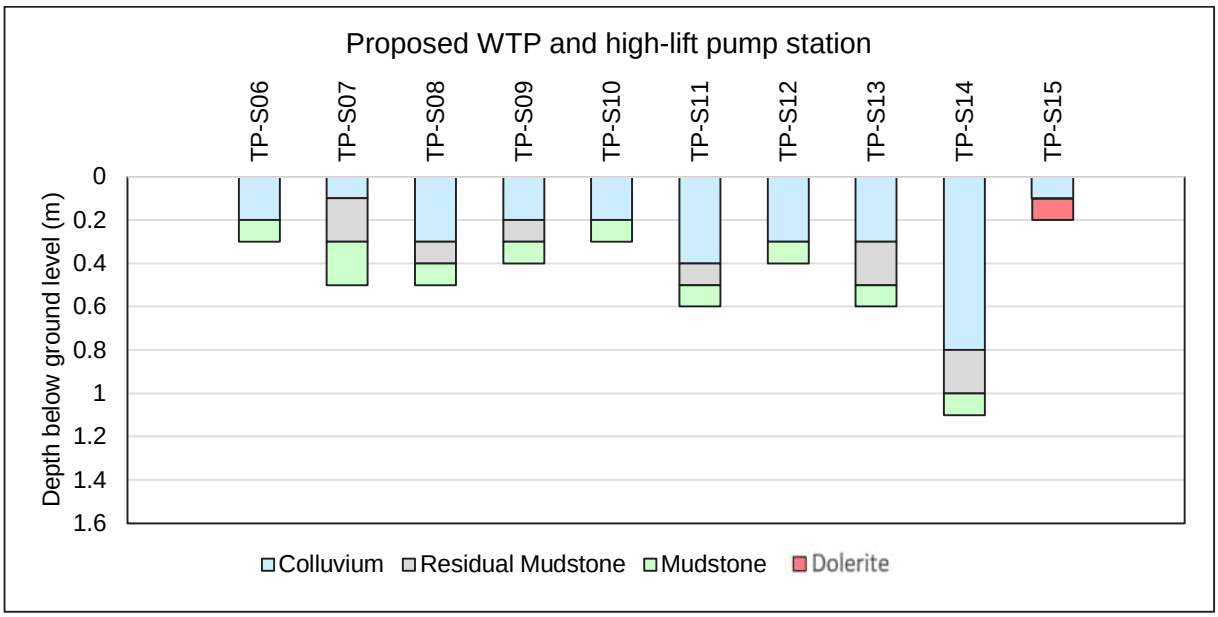


Figure 4-3: Summary of test pit profiles for the proposed WTP and high-lift pump station

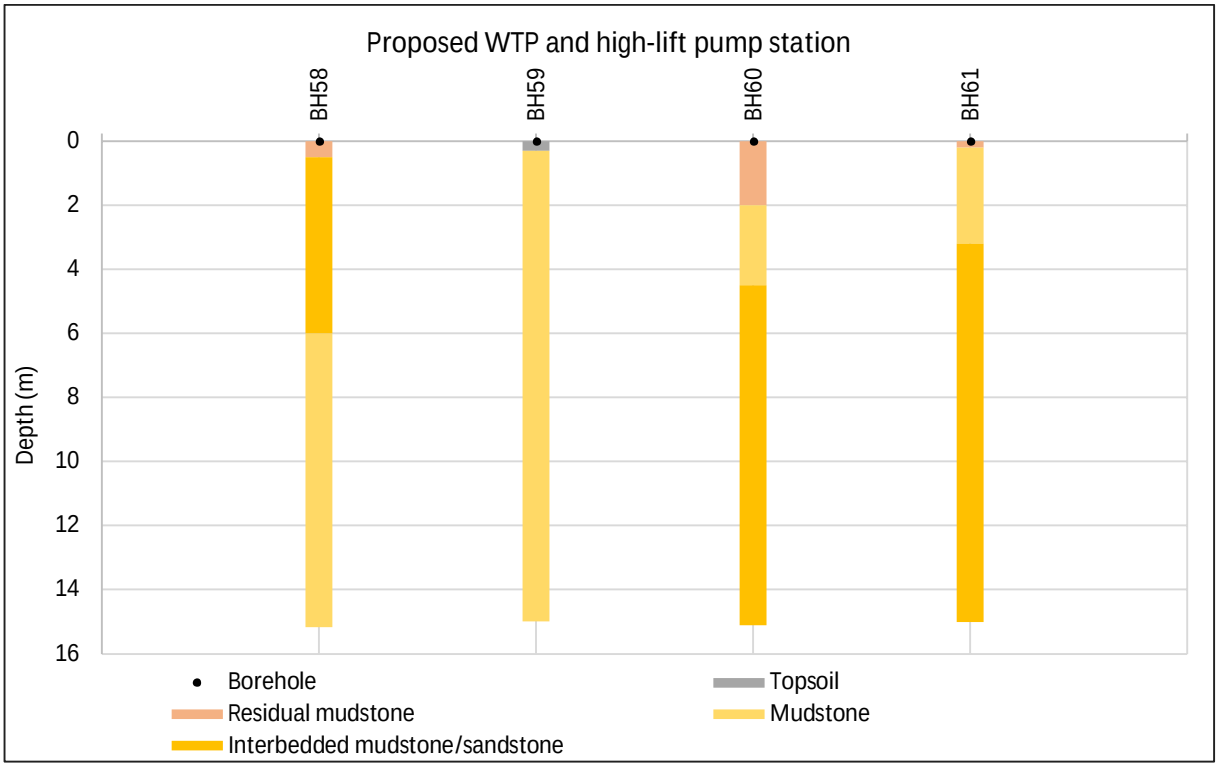


Figure 4-4: Summary of borehole profiles for the proposed WTP and high-lift pump station

4.4 Ground Profile at Command Reservoir No 1

The ground profile for the proposed Command Reservoir No 1 is represented in Figure 4-5 and Figure 4-6.

4.4.1 Topsoil

The topsoil material was occasionally found at surface to depth of 0.4 m and described as silty sand with grass roots.

4.4.2 Colluvium

Colluvium material was occasionally encountered from surface to depths of up to 0.8 m. The colluvium was encountered as loose to very dense, intact, slightly gravelly sand with occasional dolerite cobbles.

4.4.3 Residual materials

Residual sandstone was encountered from depths ranging from 0.6 m to 2.4 m. The material was described orange brown, dense to very dense, intact, silty sand with occasional cobbles.

Residual dolerite was encountered from 0.0 m to 1.2 m and described as reddish brown, clayey silt.

Interbedded residual sandstone/mudstone was encountered from 0.5 m to 1.2 m and described as orange brown, dense to very dense, intact, silty clayey sand.

4.4.4 Bedrock

Mudstone - bedrock is encountered from 0.5 - 5.9 m and is described as pale olive green, moderately to highly weathered, thinly bedded, soft to medium hard rock.

Sandstone - bedrock is encountered in two of the test pits from 1.3 m below surface and is described as light grey, slightly to moderately weathered, medium grained, thinly bedded, medium to hard rock.

Dolerite - A sill was observed in only one of the boreholes between 1.2 - 5.9 m and is described as olive green to dark grey, highly weathered, fine grained, highly fractured, very soft to soft rock.

Interbedded mudstone/sandstone - Bedrock is encountered from 0.5 - 1.6 m below surface and is described as light grey stained black, moderately weathered, very closely to medium jointed, very fine grained, soft rock

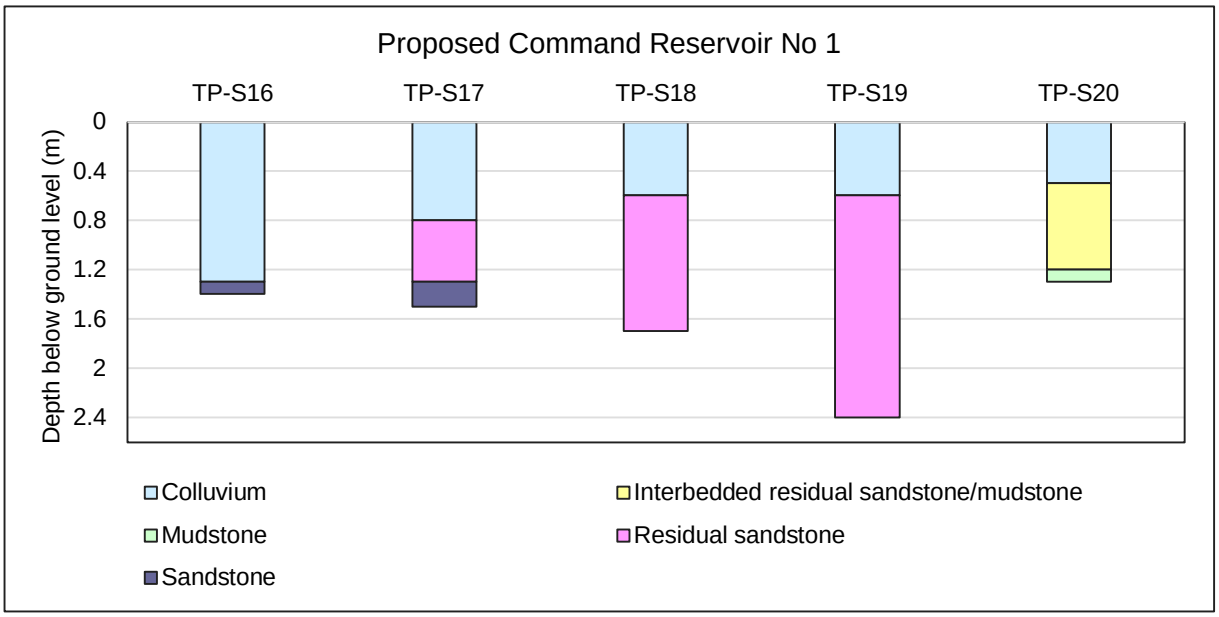


Figure 4-5: Summary of test pit profiles for the proposed Command Reservoir No 1

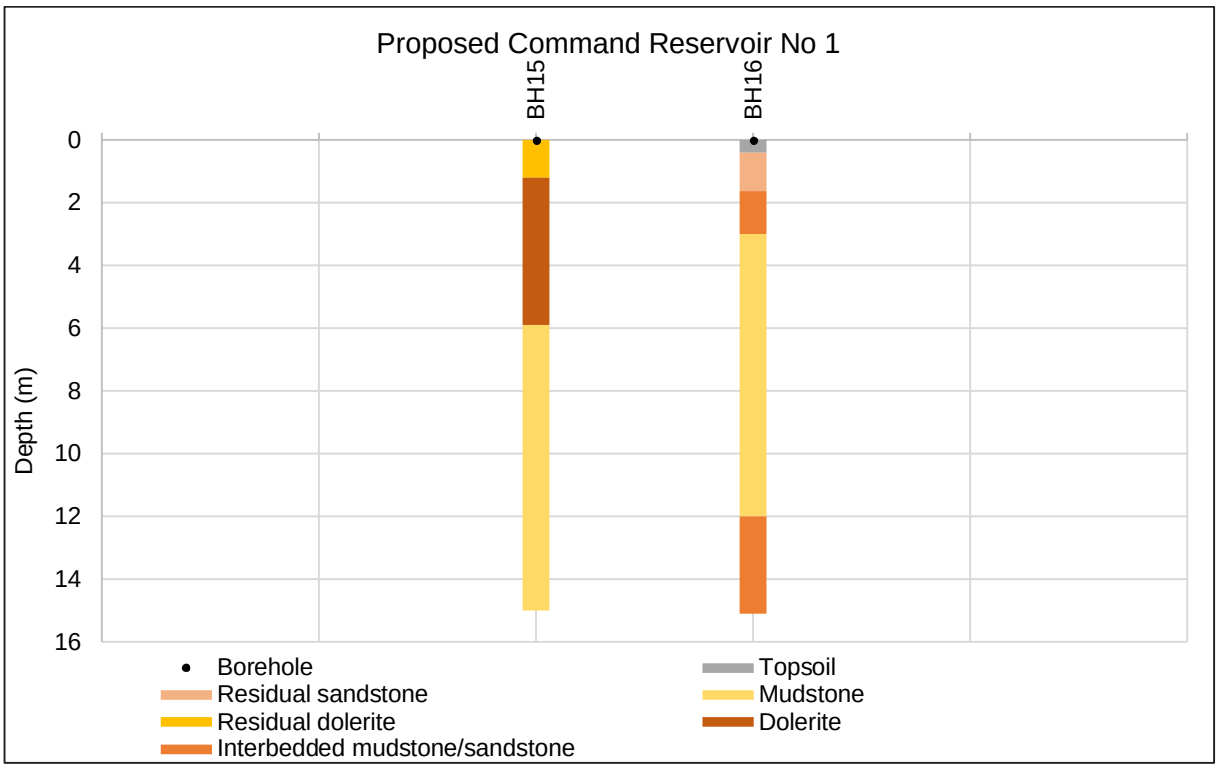


Figure 4-6: Summary of borehole profiles for the proposed Command Reservoir No 1

4.5 Ground Profile at the Booster Pump Station and Suction Reservoir

The encountered ground profile for the booster pump station and suction reservoir is represented in Figure 4-7 and Figure 4-8.

4.5.1 Colluvium

Colluvium material was encountered from surface to depths of up to 0.3 m. The colluvium was encountered as medium dense, intact, silty sand with occasional gravels.

4.5.2 Residual mudstone

Residual mudstone material was encountered from depths ranging from 0.2 m to 0.5 m. The material was described as moderately packed, angular highly weathered mudstone gravel in a clayey sand matrix, with an overall consistency of medium dense.

4.5.3 Bedrock

Mudstone - Bedrock is encountered from 0.3 m below surface and is described as pale olive green, moderately to highly weathered, thinly bedded, soft to medium hard rock.

Sandstone - Bedrock is encountered from 0.1 - 0.3 m below surface and is described as pale brown, moderately weathered, medium grained, very thinly bedded, medium hard rock.

These two rock types are thinly interbedded in places.

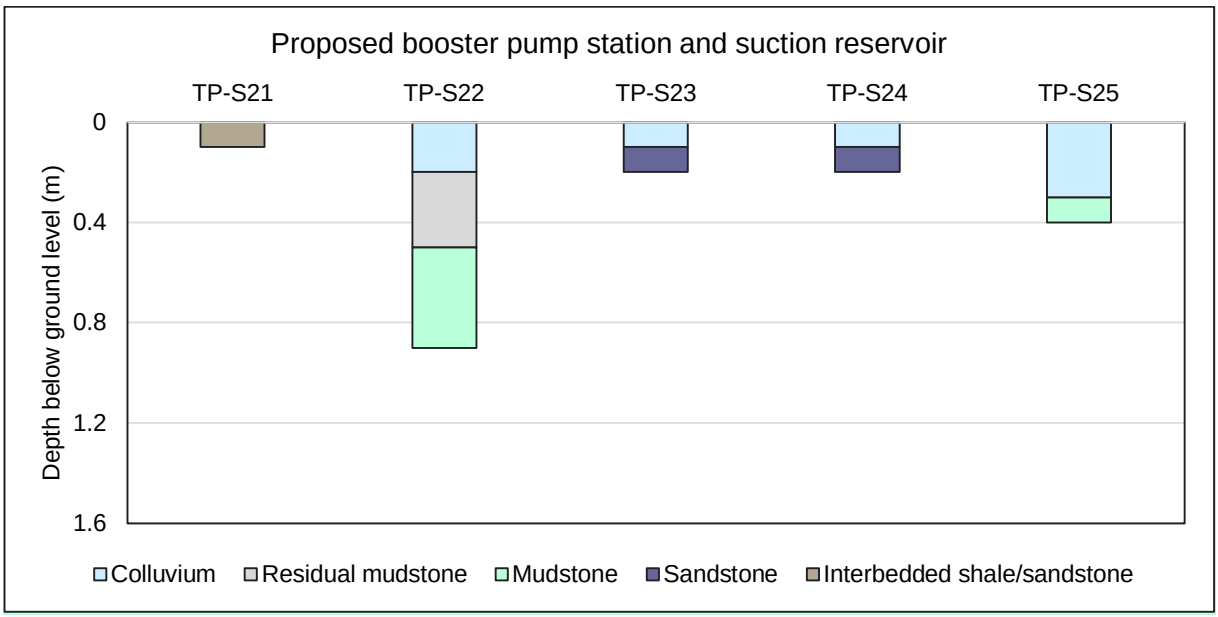


Figure 4-7: Summary of test pit profiles for the proposed booster pump station and suction reservoir

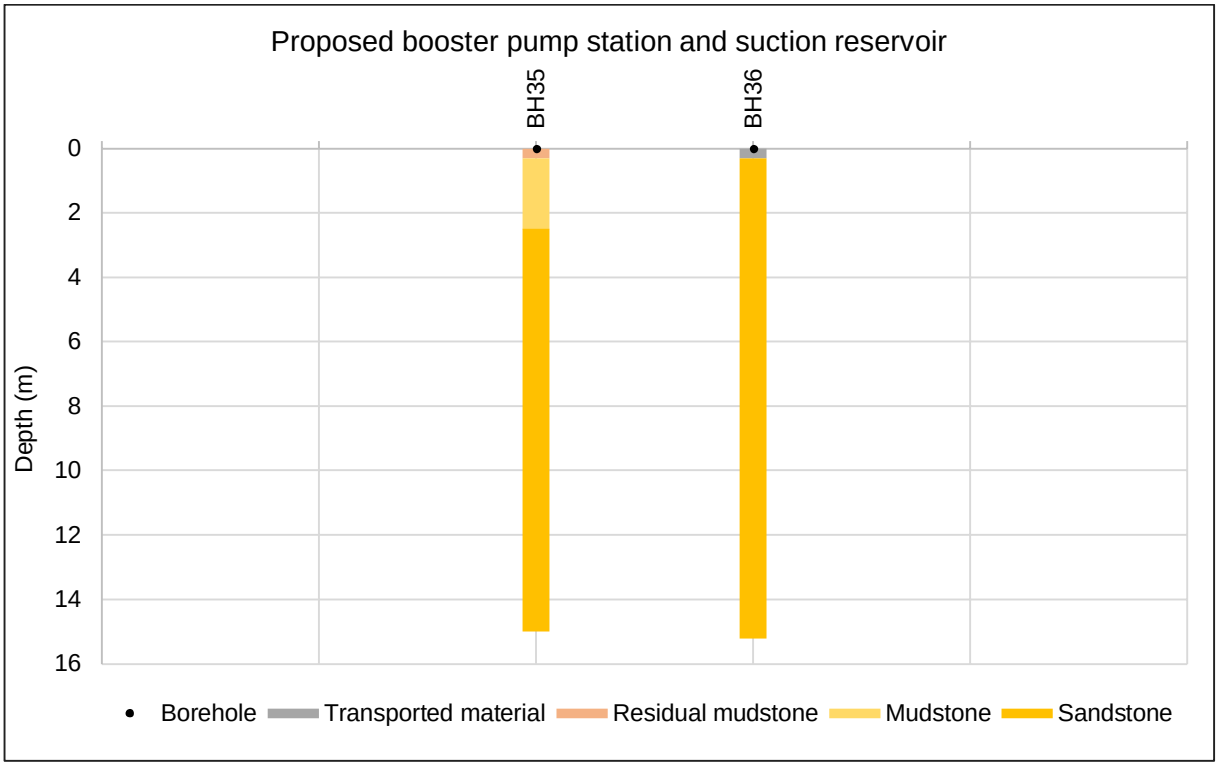


Figure 4-8: Summary of borehole profiles for the proposed booster pump station and suction reservoir

Table 4-4: Summary of test pit profiles across the proposed structures

Test point Structure	Fill	Colluvium	Residual mudstone	Mudstone	Residual sandstone	Sandstone	Interbedded residual sandstone/ mudstone	Dolerite	Shale	Interbedded shale/sandstone	Termination depth (m)	Seepage
Proposed raw water pump station												
TP-S01	0.0-0.6		0.6-0.8	0.8-1.0							1.0	None
TP-S02	0.0-0.5		0.5-1.1	1.1-1.2							1.2	None
TP-S03								0.0-0.1			0.1	None
TP-S04			0.0-0.4	0.4-0.9							0.9	None
TP-S05	No access											
Proposed WTP and high-lift pump station												
TP-S06		0.0-0.2		0.2-0.3							0.3	None
TP-S07		0.0-0.1	0.1-0.3	0.3-0.5							0.5	None
TP-S08		0.0-0.3	0.3-0.4	0.4-0.5							0.5	None
TP-S09		0.0-0.2	0.2-0.3	0.3-0.4							0.4	None
TP-S10		0.0-0.2		0.2-0.3							0.3	None
TP-S11		0.0-0.4	0.4-0.5	0.5-0.6							0.6	None
TP-S12		0.0-0.3		0.3-0.4							0.4	None
TP-S13		0.0-0.3	0.3-0.5	0.5-0.6							0.6	None
TP-S14		0.0-0.8	0.8-1.0	1.0-1.1							1.1	None
TP-S15		0.0-0.1				0.1-0.2					0.2	None
Command Reservoir No 1												
TP-S16		0.0-1.3				1.3-1.4					1.4	None
TP-S17		0.0-0.8			0.8-1.3	1.3-1.5					1.5	None
TP-S18		0.0-0.6			0.6-1.7						1.7	None
TP-S19		0.0-0.6			0.6-2.4						2.4	None
TP-S20		0.0-0.5		1.2-1.3			0.5-1.2				1.3	None
Proposed booster pump station and suction reservoir												
TP-S21										0.0-0.1	0.1	None
TP-S22		0.0-0.2	0.2-0.5	0.5-0.9							0.9	None
TP-S23		0.0-0.1				0.1-0.2					0.2	None
TP-S24		0.0-0.1				0.1-0.2					0.2	None
TP-S25		0.0-0.3							0.3-0.4		0.4	None
Proposed Command Reservoir No 2												
TP-S26	Access not permitted											
TP-S27	Access not permitted											
TP-S28	Access not permitted											
TP-S29	Access not permitted											
TP-S29	Access not permitted											

Table 4-5: Summary of borehole profiles encountered across the structures

Borehole position	Topsoil	Fill		Transported material	Colluvium	Alluvium	Residual mudstone	Mudstone	Residual sandstone	Sandstone	Interbedded residual sandstone/ mudstone	Interbedded mudstone/ sandstone	Residual dolerite	Dolerite	Termination depth (m)	Water level (m)
Proposed raw water pump station																
BH1	0.0-0.3												0.3-0.55	0.55-14.97	14.97	2.65
BH2							0.0-0.3			7.0-15.15	0.3-7.0				15.15	2.25
Proposed Command Reservoir No 1																
BH15								5.9-15.0					0.0-1.2	1.2-5.9	15.0	3.89
BH16	0.0-0.4							3.0-12.0	0.4-1.62			1.62-3.0 12.0-15.1			15.1	1.66
Proposed booster pump station and suction reservoir																
BH35							0.0-0.3	0.3-2.5		2.5-15.0					15.00	5.90
BH36				0.0-0.3						0.3-15.22					15.22	1.20
Proposed WTP and lift-pump station																
BH58							0.0-0.5	6.0-15.17				0.5-6.0			15.17	5.70
BH59	0.0-0.3							0.3-15.0							15.0	1.55
BH60							0.0-2.0	2.0-4.5				4.5-15.1			15.1	1.95
BH61							0.0-0.2	0.2-3.2				3.2-15.01			15.01	2.60

4.6 Groundwater

Groundwater levels typically vary across the pipeline route, with seepage noted within 2 % of the test pits, ranging between 0.5 m to 3.8 m below surface. The groundwater seepage is generally found within bedrock at intersecting stream and river crossings. Water rest levels recorded in the rotary core boreholes varies between 0.20 m and 7.90 m. Additionally, the occasional presence of pedogenic material encountered within 3 % of the test pits across pipeline route indicates the seasonal fluctuating groundwater table. Pedogenic occurrences are generally confined to the northern portion of the route, with no seepage noted in any of these pits.

4.7 Dynamic Cone Penetrometer (DCP) Test Results

To determine the consistency of the in-situ materials within the upper horizon along the proposed pipeline, DCP testing was conducted either from surface or within the test pit at a depth of 1.5 m. DCP results have been tabulated as conventional penetration rate (mm/blow) and are indicated in Table 4-6. Individual DCP data are attached in Appendix D.

Consistencies according to Brink et al. (1982) with respective DCP values are detailed in Table 4-7 for cohesionless soils. It should be noted that a degree of caution is prudent when gravels, cobbles and/or boulders are present within the soil profile as this may result in non-representative results and refusal may occur prematurely and not necessarily on bedrock.

Due to the extent of the pipeline together with the limited DCP tests conducted and the degree of variability for the fill material (loose to very dense), colluvium (loose to very dense) and alluvium (loose to very dense) this information would only be appropriate to determine the consistency at the point at which the test was conducted.

The DCP data was converted into a N_{10} value as displayed as blows per 100 mm. This N_{10} value was applied to estimate a representative value for the Young's Modulus, with a conversion of 0.9 and 1.5 for cohesive and non-cohesive soil respectively based on CIRIA 143 (Clayton, 1995).

Table 4-6: Summary of Dynamic Cone Penetrometer test results along the pipeline

Test Pit	Tested from (m)	mm/blow	N10 (blows/100mm)	Young's Modulus E (MPa)	Consistency	Material
TP40	0.0	2	5	7.5	Very dense	Colluvium
TP130	0.0	2	5	7.5	Very dense	Fill
TP138	1.5	2	5	7.5	Very dense	Alluvium
TP155	1.5	2	5	7.5	Very dense	Colluvium
TP160	1.5	1-10	1-10	0.9-9	Very stiff	Residual mudstone
TP180	1.5	1-5	2-10	1.8-9	Very stiff	Residual sandstone
TP200	1.5	1-24	0-10	0.36-9	Stiff to very stiff	Residual shale
TP215	1.5	2	5	7.5	Very dense	Colluvium
TP217	1.5	2	5	7.5	Very dense	Alluvium
TP218	0	1-18	1-10	0.9-15	Medium dense to very dense	Fill to colluvium
TP219	0	1-8	1-10	1.95-15	Dense to very dense	Fill to colluvium
TP220	0	1-16	1-10	0.9-15	Medium dense to very dense	Fill
TP246	1.5	2	5	7.5	Very dense	Colluvium
TP256	1.5	1-2	5-10	4.5-9	Very stiff	Residual mudstone

Test Pit	Tested from (m)	mm/blow	N10 (blows/100mm)	Young's Modulus E (MPa)	Consistency	Material
TP271	1.5	2	5	7.5	Very dense	Colluvium
TP278	1.5	15-44	0-1	0.18-0.63	Firm to stiff	Residual mudstone
TP280	0	14-44	0-1	0.3-1.05	Medium dense to loose	Fill
TP284	1.5	1-30	0-10	0.45-15	Medium dense to very dense	Fill
TP288	0	1-17	1-10	0.9-15	Medium dense to very dense	Fill
TP292A	0	2-8	1-5	1.95-7.5	Dense to very dense	Fill
TP292B	0	1-4	3-10	3.75-15	Very dense	Fill
TP294	0	8-57	0-1	0.3-1.95	Dense to loose	Fill to colluvium
TP296A	0	2-9	1-5	1.65-7.5	Dense to very dense	Fill
TP296B	0	7-40	0-1	0.45-2.1	Loose to medium dense	Fill
TP300A	0	3-15	1-3	1.05-4.95	Medium dense to very dense	Fill
TP300B	0	5-46	0-2	0.3-3	Loose to very dense	Fill
TP302	0	4-20	1-3	0.75-3.75	Medium dense to very dense	Fill to residual mudstone
TP306	1.5	1-24	0-10	0.36-9	Firm to very stiff	Residual mudstone
TP307	1.5	2	5	4.5	Very stiff	Residual mudstone
TP311	1.5	2	5	4.5	Very stiff	Residual mudstone
TP315	1.5	2	5	4.5	Very stiff	Residual mudstone
TP316	1.5	1-120	0-10	0.15-15	Very loose to very dense	Colluvium
TP329	1.5	2	5	7.5	Very dense	Colluvium
TP344	1.5	2-15	1-5	0.63-4.5	Very stiff	Residual dolerite
TP365	1.5	2-36	0-5	0.27-4.5	Firm to very stiff	Residual mudstone
TP366	1.5	1-24	0-10	0.6-15	Medium dense to very dense	Alluvium
TP367	1.5	1-16	1-10	0.54-9	Stiff to very stiff	Residual mudstone
TP370	0	1-15	1-10	1.05-15	Medium dense to very dense	Fill to colluvium
TP372	1.5	3-11	1-3	0.81-2.97	Very stiff	Residual mudstone
TP380	1.5	1-24	0-10	0.36-9	Very stiff to stiff	Residual mudstone
TP387	1.5	1-18	1-10	0.9-15	Medium dense to very dense	Alluvium
TP402	1.5	4-24	0-3	0.36-2.25	Very stiff to stiff	Residual mudstone
TP408	1.5	1-15	1-10	0.63-9	Very stiff	Residual mudstone
TP409	1.5	1-37	0-10	0.45-15	Loose to very dense	Alluvium

Test Pit	Tested from (m)	mm/blow	N10 (blows/100mm)	Young's Modulus E (MPa)	Consistency	Material
TP410	1.5	1-25	0-10	0.6-15	Medium dense to very dense	Alluvium
TP413	1.4	1-8	1-10	1.17-9	Very stiff	Residual mudstone
TP419	1.5	6-49	0-2	0.18-1.53	Very stiff to firm	Residual mudstone
TP420	0	1-11	1-10	1.35-15	Dense to very dense	Fill
TP421A	1.5	1-18	1-10	0.9-15	Medium dense to very dense	Pedogenic
TP421B	1.5	1-19	1-10	0.75-15	Medium dense to very dense	Pedogenic
TP422	1.5	1-19	1-10	0.75-15	Medium dense to very dense	Fill
TP432	0	4-34	0-3	0.45-3.75	Loose to very dense	Colluvium
TP433	0	1-19	1-10	0.75-15	Medium dense to very dense	Colluvium
TP434	1.5	4-28	0-3	0.6-3.75	Medium dense to very dense	Colluvium to residual mudstone
TP438	0	1-9	1-10	1.65-15	Dense to very dense	Alluvium
TP439	1.5	9-44	0-1	0.3-1.65	Dense to loose	Pedogenic
TP448	1.5	5-28	0-2	0.36-1.8	Stiff to very stiff	Residual shale
TP451	0	1-9	1-10	1.65-15	Dense to very dense	Fill
TP453	1.5	3-29	0-3	0.45-4.95	Medium dense to very dense	Alluvium
TP454	0	1-9	1-10	1.65-15	Dense to very dense	Fill to colluvium
TP455	0	4-13	1-3	1.2-3.75	Medium dense to very dense	Fill to colluvium
TP456	1.5	1-28	0-10	0.36-9	Stiff to very stiff	Residual mudstone
TP459	0	4-24	0-3	0.6-3.75	Medium dense to very dense	Colluvium to residual sandstone
TP461	0	1-37	0-10	0.45-15	Loose to very dense	Colluvium
TP486	0	13-36	0-1	0.45-1.2	Loose to medium dense	Colluvium to pedogenic
TP488	1.5	12-66	0-1	0.18-0.72	Soft to very stiff	Residual mudstone
TP490	1.5	4-20	1-3	0.75-3.75	Medium dense to very dense	Residual interbedded sandstone/mudstone
TP491	1.5	3-11	1-3	1.35-4.95	Dense to very dense	Residual mudstone
TP492	0	3-54	0-3	0.3-4.95	Loose to very dense	Colluvium
TP494	0	1-20	1-10	0.75-15	Medium dense to very dense	Colluvium

Test Pit	Tested from (m)	mm/blow	N10 (blows/100mm)	Young's Modulus E (MPa)	Consistency	Material
TP496	0	1-12	1-10	1.2-15	Dense to very dense	Colluvium
TP498	1.5	6-22	0-2	0.75-2.55	Medium dense to dense	Alluvium
TP499	0	4-40	0-3	0.45-3.75	Loose to very dense	Colluvium
TP501	0.0	1-8	1-10	1.95-15	Dense to very dense	Colluvium
TP505	0	1-6	2-10	2.55-15	Dense to very dense	Colluvium
TP506	1.5	6-24	0-2	0.6-2.55	Medium dense to very dense	Pedogenic
TP507	0	1-6	2-10	2.55-15	Very dense	Colluvium
TP508	1.5	4-39	0-3	0.27-2.25	Firm to very stiff	Residual shale
TP509	1.5	1-8	1-10	1.95-15	Dense to very dense	Pedogenic
TP510	1.5	4-10	1-3	0.9-2.25	Very stiff	Residual shale
TP511	1.5	5-36	0-2	0.27-1.8	Firm to very stiff	Residual mudstone
TP512	0.0	2-44	0-5	0.3-7.5	Loose to very dense	Colluvium
TP513	1.5	3-19	1-3	0.75-4.95	Medium dense to very dense	Pedogenic to residual mudstone
TP514	1.5	4-24	0-3	0.6-3.75	Medium dense to very dense	Pedogenic
TP517	1.5	1-9	1-10	1.65-15	Dense to very dense	Pedogenic
TP520	0	2-42	0-5	0.3-7.5	Loose to very dense	Colluvium
TP521	1.5	2-18	1-5	0.54-4.5	Stiff to very stiff	Residual mudstone
TP523	0.0	4-40	0-3	0.45-3.75	Loose to very dense	Fill to colluvium
TP525	0.0	4-22	0-3	0.75-3.75	Medium dense to very dense	Fill to colluvium
TP527	1.5	1-10	1-10	0.9-9	Very stiff	Residual mudstone
TP528	0	3-42	0-3	0.3-4.95	Loose to very dense	Fill
TP531	1.5	1-10	1-10	0.9-9	Very stiff	Residual mudstone
TP533	0.0	2-36	0-5	0.45-7.5	Loose to very dense	Fill to colluvium
TP536	1.5	6-52	0-2	0.18-1.53	Firm to very stiff	Residual mudstone
TP538	1.5	1-15	1-10	1.05-15	Very dense to medium dense	Colluvium
TP539	0.0	1-98	0-10	0.15-15	Very loose to very dense	Fill to colluvium

Test Pit	Tested from (m)	mm/blow	N10 (blows/100mm)	Young's Modulus E (MPa)	Consistency	Material
TP541	1.5	2-15	1-5	1.05-7.5	Medium dense to very dense	Alluvium to residual shale
TP543	1.5	2-40	0-5	0.27-4.5	Firm to very stiff	Residual mudstone
TP547	1.5	2-50	0-5	0.3-7.5	Loose to very dense	Alluvium
TP548	1.5	8-72	0-1	0.15-1.95	Loose to dense	Pedogenic
TP551	1.5	1-3	3-10	2.97-9	Very stiff	Residual mudstone
TP665	1.5	2-78	0-5	0.15-7.5	Very loose to very dense	Alluvium
TP666	1.5	1-68	0-10	0.09-9	Very stiff to soft	Residual mudstone
TP669	0	2-16	1-5	0.9-7.5	Medium dense to very dense	Colluvium
TP670	0	4-74	0-3	0.15-3.75	Loose to very dense	Fill

Table 4-7: Indications of consistency (Brink et al., 1982)

Soil consistency	mm/blow
Cohesive material	
Very soft	>110
Soft	55 – 110
Firm	30 – 55
Stiff	15 – 30
Very stiff	7 – 15
Non-cohesive material	
Very loose	>75
Loose	30 – 75
Medium dense	12.5 – 30
Dense	5 – 12.5
Very dense	2 – 5

4.8 Standard Penetration Tests

Standard Penetration Tests (SPT's) were conducted in selected boreholes at 1.5 m intervals where soil material was encountered drilled at the site. The SPT is conducted by driving a split spoon sampler into the ground using a 63.5 kg hammer. The hammer is mechanically lifted and dropped 762 mm. The SPT spoon is driven 450 mm into the ground and the number of blows required for the final 300 mm of penetration (referred to as the N-value) is recorded on the borehole profile descriptions. A guideline for the relationship between the SPT N-values and consistency of the soil is given in Table 4-8.

Table 4-8: Indications of consistency for both cohesive and non-cohesive soils (Brink et al., 1986)

Cohesive soils	
N-Value	Material Consistency
<2	Very soft
2-4	Soft
4-8	Firm
8-15	Stiff
15-30	Very stiff
Non-cohesive soils	
<5	Very loose
5-10	Loose
10-30	Medium dense
30-50	Dense
>50	Very dense

From the SPT testing conducted on the 15 No. boreholes, the correlated consistencies for the encountered horizons are presented in Table 4-9. Note should be taken that higher SPT N-values may have been recorded due to the presence of gravels and cobbles within the soil horizons, and the consistencies indicated should be viewed with caution.

The SPT-N value may be used to derive representative values for the Young's Modulus, with a 1.5 conversion factor for non-cohesive soil and 0.9 conversion for cohesive soil respectively based on CIRIA 143 (Clayton, 1995).

Table 4-9: Summary of Standard Penetration Test results

Borehole	Depth (m)		SPT N-value	Youns Modulus E (MPa)	Description of material encountered
	From	To			
BH06	1.50	1.95	14	13	Stiff, sandy clay (residual mudstone)
BH10	1.50	1.57	Refusal		Very stiff, silty clay (transported material)
BH12	1.50	1.95	20	13	Medium dense, clayey silt (alluvium)
	3.00	3.30	Refusal		Very dense, clayey sand (residual sandstone)
BH16	1.50	1.62	Refusal		Very stiff, (silty clay) residual sandstone
BH18	1.50	1.76	Refusal		Very dense, clayey sand (residual dolerite)
BH19	1.50	1.95	24	36	Medium dense, (fine grained gravel) alluvium
BH20	1.50	1.95	35*	32	Very stiff, (sandy clay) residual mudstone
BH22	1.50	1.95	30	27	Very stiff, (sandy clay) alluvium
BH24	1.55	2.00	17	15	Very stiff, (sandy clay) alluvium
BH25	1.50	1.95	20	18	Very stiff, (sandy clay) alluvium
BH30	1.50	1.95	42	38	Very stiff, (sandy clay) alluvium
	3.00	3.45	38	34	Very stiff, (sandy clay) alluvium
	4.50	4.95	24	22	Very stiff, (sandy clay) alluvium
	8.05	8.45	10	9	Stiff, (silty clay) alluvium
	9.00	9.45	14	13	Stiff, (silty clay) alluvium
BH32	1.50	1.65	Refusal		Very stiff, (sandy clay) residual mudstone
BH37	1.50	1.95	17	26	Medium dense, (clayey sand) alluvium

Borehole	Depth (m)		SPT N-value	Youns Modulus E (MPa)	Description of material encountered
	From	To			
	3.00	3.45	9	14	Loose, (clayey sand) alluvium
BH42	1.50	1.95	30	13	Very stiff, (sandy clay) alluvium
BH60	1.50	1.85	Refusal		Very stiff, (silty clay) residual mudstone
*** = Unreliable or questionable results due to presence of coarser fraction**					

4.9 Dynamic Probe Super Heavy (DPSH) Results

The DPSH tests were conducted at various locations along the pipeline alignment, at the positions illustrated in Figure 3-2 and Figure 3-3. The in-situ tests were performed until refusal with a total of 120 No. tests being undertaken to a maximum depth of 12.6 m. The full individual DPSH test results at each location are attached in Appendix G.

Additionally, the results recorded from the in-situ DPSH tests were converted to an equivalent SPT N-value using an empirical conversion proposed by MacRobert et al. (2011), using the following equation:

$$Equivalent\ SPT\ N = \frac{N_{30SB}}{0.02\ \times N_{30SB} + 0.8}$$

The equivalent SPT N-values have been plotted versus depth for each of the DPSH tests conducted. Figure 4-9 to Figure 4-13 represents the summary of the equivalent SPT N values determined form the DPSH tests along the proposed pipeline.

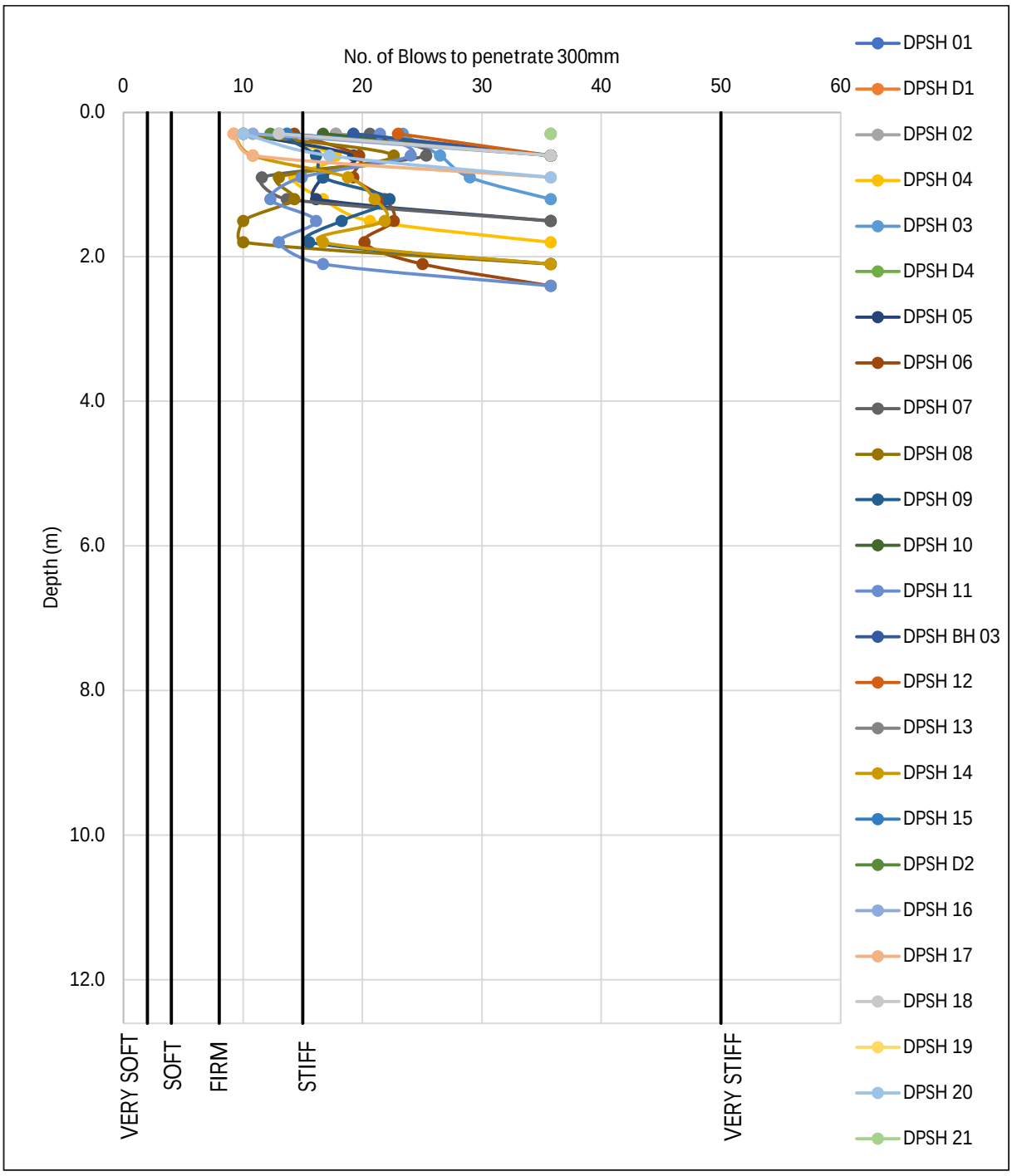


Figure 4-9: Summary of the DPSH test results converted to SPT N values from DPSH 01 to DPSH 21

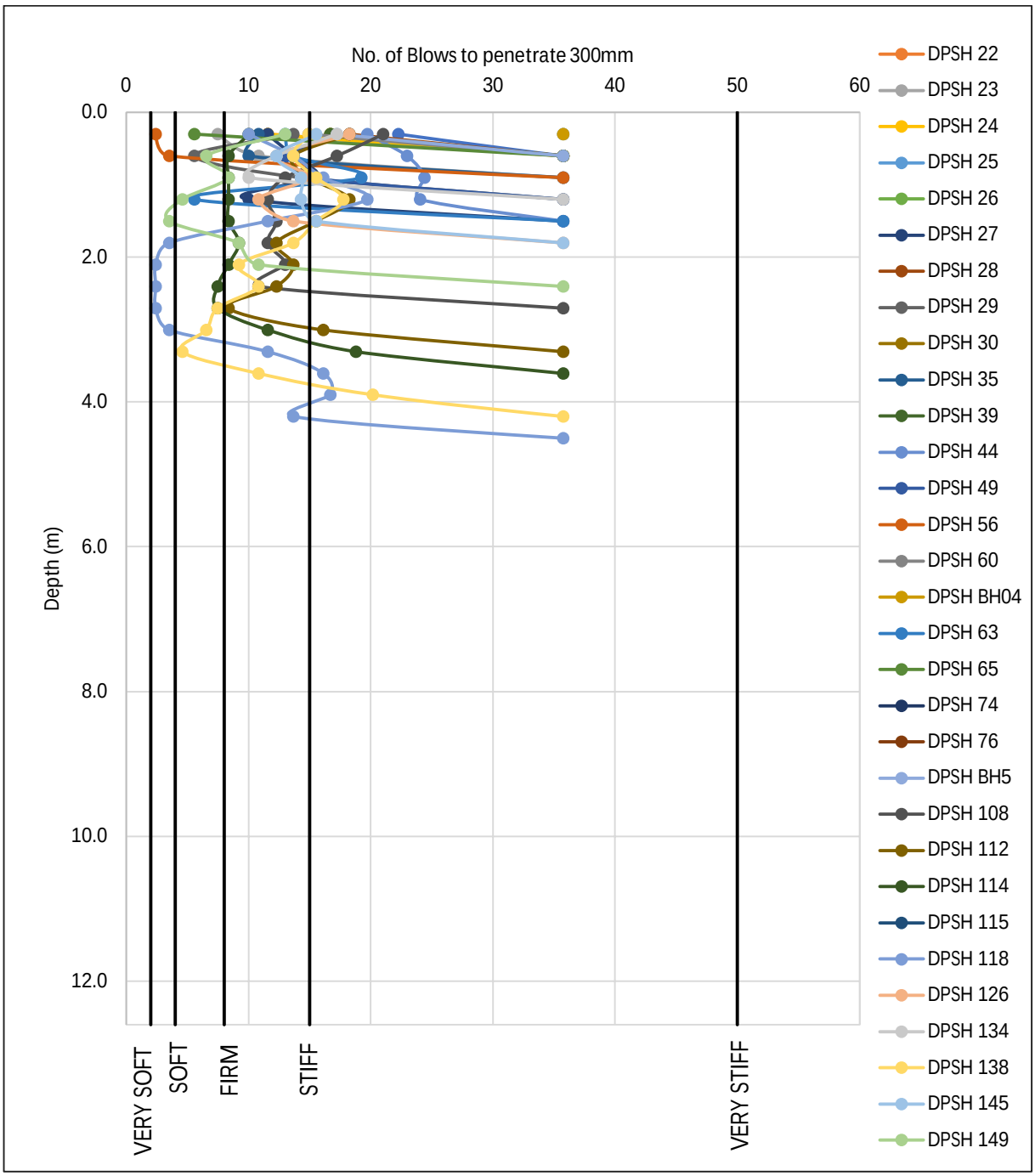


Figure 4-10: Summary of the DPSH test results converted to SPT N values from DPSH 22 to DPSH 149

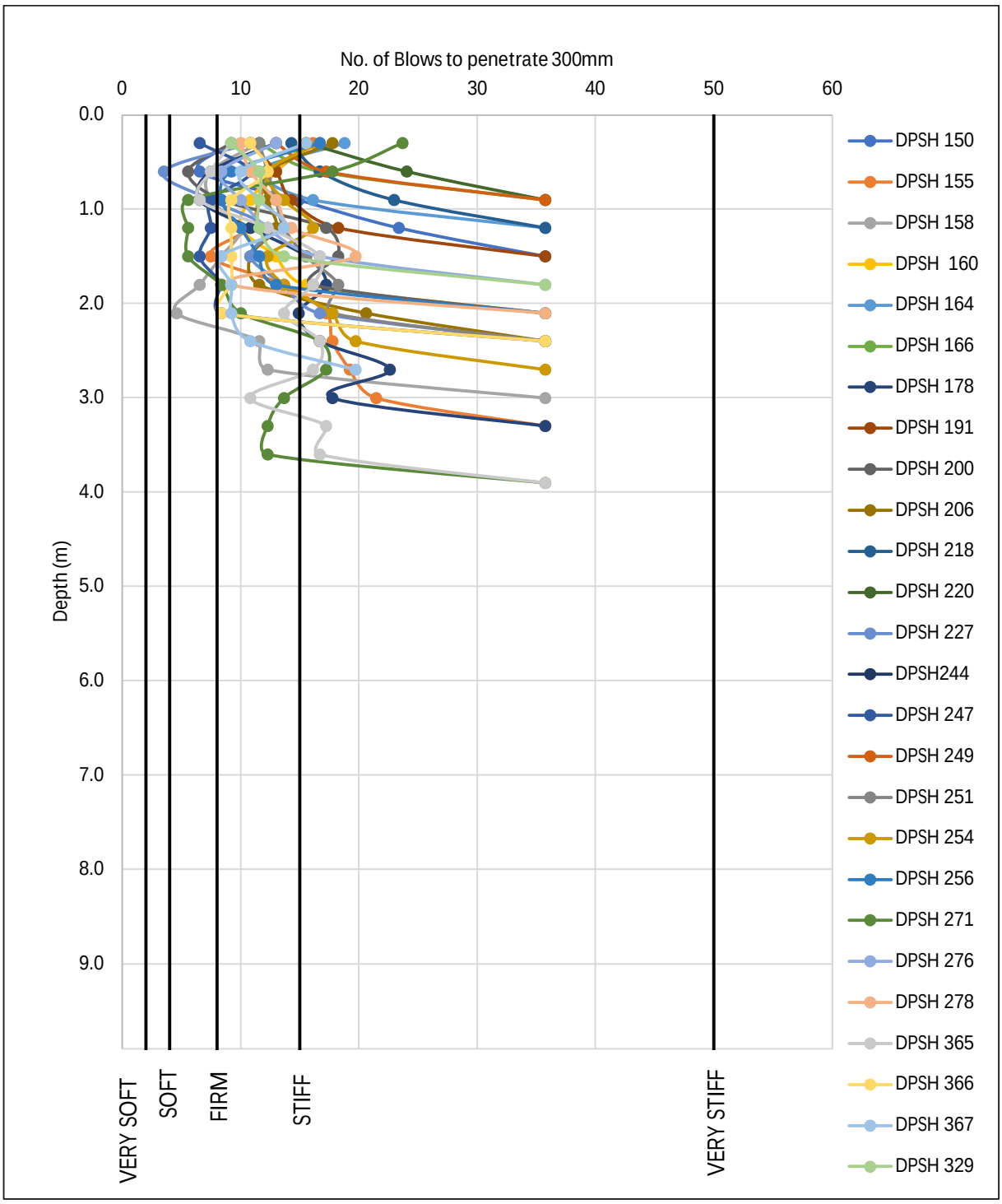


Figure 4-11: Summary of the DPSH test results converted to SPT N values from DPSH 150 to DPSH 329

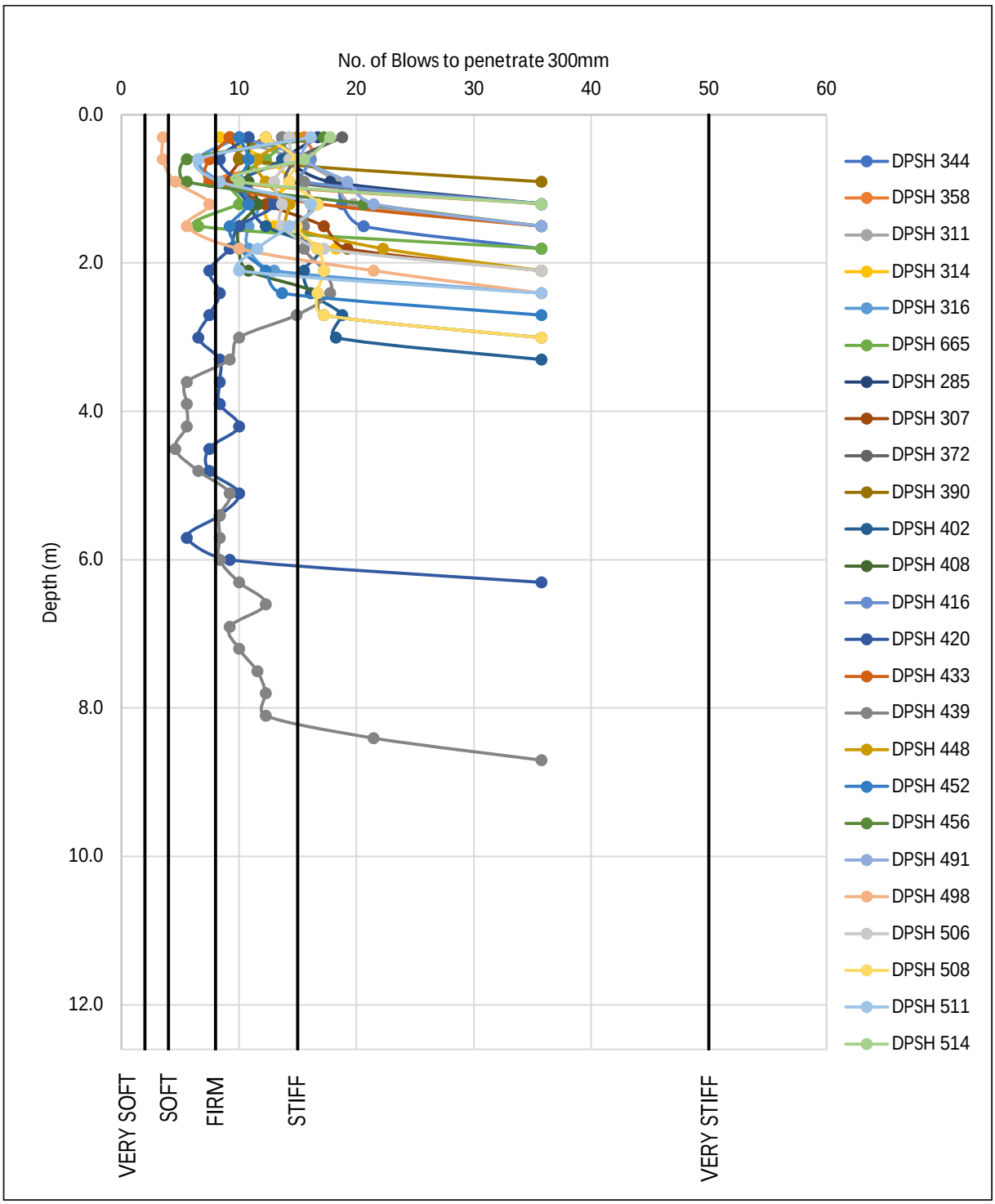


Figure 4-12: Summary of the DPSH test results from converted to SPT N values DPSH 344 to DPSH 514

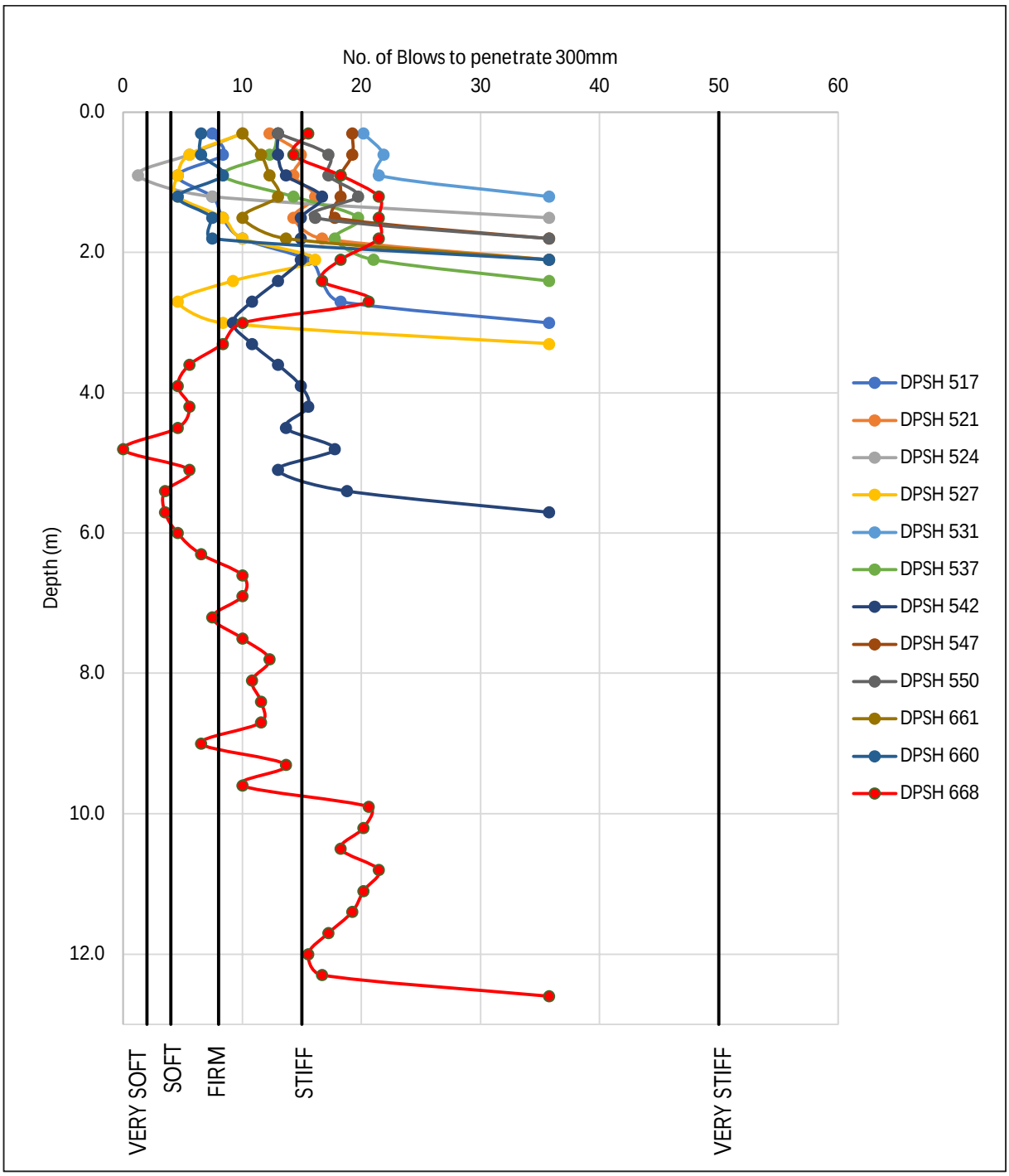


Figure 4-13: Summary of the DPSH test results from converted to SPT N values DPSH 517 to DP 668

4.10 Laboratory Test Results

Representative soil samples from the site were sampled from the test pits and sent to Roadlab in Bloemfontein for engineering material classification testing, determination of material compaction properties and chemical testing. The laboratory test results are summarised and discussed below, and are included in Appendix H.

4.10.1 Foundation Indicator

4.10.1.1 Pipeline Foundation Indicator Results

The foundation indicator tests which include grading hydrometer analysis, Atterberg Limits and Linear Shrinkage were undertaken on disturbed samples (including bedrock) and are summarised in Table 4-10.

Table 4-10: Summary of foundation indicator test results along pipeline

Test Pit No.	Depth (m)	Material type	Gravel %	Sand %	Silt %	Clay %	Atterberg Limits			GM*	USCS / Activity
							LL (%)	PI (%)	LS (%)		
Fill											
TP 5	0.0-1.2	Fill	6.2	78.7	14.2	0.9	28	7	4.1	0.65	SC-SM/Low
TP 7	0.0-0.8	Fill	23.3	68.9	6.4	1.3	15	19	21.6	1.32	SP-SC/Low
TP 9	0.2-0.5	Fill	2.9	74.9	18.7	3.5	36	12	6.7	0.36	SC/Low
TP 12	0.0-0.3	Fill	2.6	70.7	21.6	5.1	53	30	14.6	0.42	SC/Low
Colluvium											
TP 9	0.0-0.2	Colluvium	2.8	86.8	9.6	0.8	20	3	1.9	0.79	SP-SM/Low
TP 81	0.0-0.7	Colluvium	3.3	74.7	18.0	3.9	36	18	8.7	0.47	SC/Low
TP 81	0.7-0.9	Colluvium	6.2	80.9	11.9	0.9	21	6	2.8	0.7	SC-SM/Low
TP 92	0.1-0.7	Colluvium	3.3	75.6	18.3	2.9	36	14	8.0	0.43	SC/Low
TP98	0.2-0.5	Colluvium	2.9	74.9	18.7	3.5	36	12	6.7	0.36	SC/ Low
TP 114	0.8-1.6	Colluvium	5.9	78	15.3	0.8	32	11	5.9	0.66	SC/Low
TP126	0.2-2.5	Colluvium	1.9	76.8	19.3	2.0	34	13	6.0	0.40	SC / Low
TP128	0.3-0.6	Colluvium	1.3	75.9	19.2	3.6	39	16	8.0	0.32	SC/ Low
TP 154	0.6-1.7	Colluvium	0.4	83.6	13.8	2.1	22	3	1.8	0.41	SM/Low
TP 172	0.5	Colluvium	2.0	77.9	16.9	3.2	42	14	7.1	0.54	SM/Low
TP 196	0.7	Colluvium	4.4	77.5	9.0	9.1	52	26	13.8	0.77	SC/Low
TP 197	0.2-0.6	Colluvium	1.5	71.8	17.3	9.4	44	21	9.6	0.45	SC/Low
TP 210	0.4-1.0	Colluvium	4.4	76.3	13.9	5.4	40	17	9.2	0.62	SC/Low
TP214	0.5-2.7	Colluvium	4.3	70.6	18.7	6.4	40	22	10.1	0.43	SC/ Low
TP 214	2.7-3.5	Colluvium	1.4	76.4	18.9	3.3	36	18	4.6	0.41	SC/Low
TP 216	0.7-3.1	Colluvium	5.9	80.0	13.2	0.9	26	9	4.7	0.71	SC/Low
TP233	0.4-0.8	Colluvium	3.9	78.1	10.1	7.9	55	24	12.9	0.71	SM/ Low
TP 260	0.3-0.8	Colluvium	3.6	68.0	17.9	10.4	58	32	16.7	0.41	SC/Low
TP 271	0.6-1.4	Colluvium	4.5	79.8	14.8	0.9	30	8	5.4	0.60	SC/Low
TP 277	1.4-3.2	Colluvium	1.4	72.9	19.1	6.5	45	18	10.2	0.36	SM/Low
TP 293	0.2-0.7	Colluvium	2.4	72.1	20.0	5.4	52	28	13.5	0.41	SC/Low

Test Pit No.	Depth (m)	Material type	Gravel %	Sand %	Silt %	Clay %	Atterberg Limits			GM*	USCS / Activity
							LL (%)	PI (%)	LS (%)		
TP 315	0.5-1.4	Colluvium	0.2	71.0	23.9	4.8	53	28	13.3	0.23	SC/Low
TP 329	0.5-1.7	Colluvium	1.2	68.4	25.7	4.7	53	24	12.9	0.21	SM/Low
Alluvium											
TP138	1.6-3.0	Alluvium	10.0	73.4	15.3	1.3	37	13	6.9	0.78	SC/ Low
TP 158	1.1-3.0	Alluvium	5.2	69.2	19.2	6.4	41	24	11.5	0.48	SC/Low
TP411	1.5-2.7	Alluvium	5.6	70.1	17.9	6.4	42	24	11.5	0.48	SC/Low
TP 541	0.5	Alluvium	1.5	73.7	20.1	4.7	45	17	9.4	0.31	SM/Low
TP 548	1.0-1.2	Alluvium	1.2	82.1	11.3	5.4	44	18	9.8	0.64	SC/Low
Pedogenic											
TP421	1.4-2.5	Pedogenic	14.2	65.7	18.8	1.3	34	13	6.6	0.75	SC/ Low
Residual dolerite											
TP14	0.6-3.0	Residual dolerite	7.9	78.3	12.4	1.4	29	10	4.9	0.90	SC/ Low
TP 66	0.7-1.2	Residual Dolerite	2.9	83.4	10.8	2.9	38	11	6.4	0.72	SM/Low
TP184	1.3-1.7	Residual dolerite	16.6	73.1	9.6	0.7	38	16	8.1	1.30	SP-SC/Low
TP 218	2.2	Residual dolerite	1.7	71.9	17.6	8.8	53	27	13.6	0.35	SC/Low
TP343	0.8-1.4	Residual dolerite	5.0	84.5	9.3	1.2	28	6	3.3	1.04	SP-SC / Low
TP 344	1.4-2.2	Residual dolerite	9.2	72.9	14.9	3.0	33	14	6.8	0.73	SC/Low
TP 454	1.5	Residual dolerite	18.2	71.7	9.1	1.0	31	11	5.9	1.27	SP-SC/Low
TP 499	0.8-1.1	Residual dolerite	2.4	82.6	13.5	1.5	37	10	5.4	0.64	SM/Low
Residual mudstone											
TP 16	0.4-0.8	Residual mudstone	1.1	76.8	16.5	5.6	41	17	9.2	0.35	SC/Low
TP 35	0.6-1.1	Residual mudstone	1.0	72.3	21.1	6.6	43	18	10.3	0.33	SC/Low
TP 37	0.9-1.2	Residual mudstone	44.9	43.0	9.4	2.7	39	14	7.8	1.57	GC/Low
TP41	0.4-1.2	Residual mudstone	5.1	81.9	9.5	3.5	33	9	5.0	0.81	SM / Low
TP 43	0.4-1.3	Residual mudstone	11.8	79.1	7.8	1.3	32	6	3.2	1.22	SP-SM/Low
TP45	0.5-1.3	Residual mudstone	10.0	82.4	6.8	0.8	25	5	2.6	1.04	SP-SC / Low
TP71	0.3-1.0	Residual mudstone	11	78.3	9.4	1.3	32	12	6.4	1.12	SP-SC/ Low
TP103	1.1-1.4	Residual mudstone	10.9	74.5	12.3	2.3	34	14	8.0	0.94	SC / Low
TP105	1.2-1.4	Residual mudstone	3.4	70.5	19.4	6.7	45	21	11.0	0.41	SC / Low
TP 112	1.4-2.9	Residual mudstone	1.1	73.1	20.2	5.6	40	17	9.2	0.3	SC/Low
TP118	2.6-3.2	Residual mudstone	5.6	73.4	15.4	5.6	51	19	10.1	0.59	SM/ Low
TP 160	0.7-1.3	Residual mudstone	3.3	79.2	16.9	0.6	26	9	5.0	0.5	SC/Low

Test Pit No.	Depth (m)	Material type	Gravel %	Sand %	Silt %	Clay %	Atterberg Limits			GM*	USCS / Activity
							LL (%)	PI (%)	LS (%)		
TP 191	1.0	Residual mudstone	2.9	72.7	18.9	5.5	40	18	9.2	0.39	SC/Low
TP 199	1.2	Residual mudstone	4.6	77.7	15.9	1.9	30	11	5.5	0.55	SC/Low
TP214	2.7-3.5	Residual mudstone	1.4	76.4	18.9	3.3	36	18	4.6	0.41	SC/ Low
TP 234	0.5-1.6	Residual mudstone	56.5	38.9	3.8	0.8	33	5	2.6	2.15	GP/Low
TP 244	0.8-3.2	Residual mudstone	42.4	55.0	2.2	0.4	37	13	7.1	2.16	SP/Low
TP 254	0.8-3.0	Residual mudstone	6.9	64.7	14.1	14.3	56	31	16.5	0.59	SC/Low
TP 256	1.1-2.6	Residual mudstone	6.5	71.9	16.9	4.7	46	14	8.3	0.59	SM/Low
TP 311	1.0-2.5	Residual mudstone	86.6	12.2	1.2	0.1	35	12	6.0	2.75	GP/Low
TP 318	1.4-2.8	Residual mudstone	22.0	58.2	18.5	1.3	28	11	5.2	0.77	SC/Low
TP 337	1.0	Residual mudstone	4.7	73.0	16.1	6.2	49	27	13.1	0.59	SC/Low
TP 346	0.9-1.2	Residual mudstone	2.0	72.4	19.9	5.7	40	20	9.6	0.35	SC/Low
TP 358	1.0	Residual mudstone	6.9	76.9	14.3	2.0	35	16	8.1	0.72	SC/Low
TP 364	0.5	Residual mudstone	2.0	69.6	20.8	7.6	57	28	16.0	0.33	SC/Low
TP365	1.4-3.0	Residual mudstone	3.0	76.2	16.7	4.0	35	13	6.9	0.40	SC / Low
TP 367	1.5	Residual mudstone	4.6	79.2	12.6	3.6	33	9	5.0	0.66	SM/Low
TP 380	1.4-3.0	Residual mudstone	1.9	70.4	21.7	6.0	51	27	14.0	0.31	SC/Low
TP394	0.7-1.3	Residual mudstone	2.5	70.8	21.6	5.1	50	25	12.4	0.38	SC/ Low
TP 402	1.2-3.0	Residual mudstone	6.6	72.7	18.1	2.6	37	12	6.9	0.56	SM/Low
TP408	0.6-3.1	Residual mudstone	6.4	75.3	16.6	1.7	38	18	10	0.67	SC / Low
TP 413	1.4	Residual mudstone	3.6	78.1	14.8	3.5	41	13	6.5	0.56	SM/Low
TP 511	1.5	Residual mudstone	3.3	69.0	19	8.8	50	26	11.7	0.39	SC/Low
TP 545	1.2	Residual mudstone	2.3	67.6	23.0	7.1	50	26	10.7	0.32	SC/Low
Residual sandstone											
TP 115	1.0-2.8	Residual sandstone	10.3	78.2	10.7	0.8	30	6	3.5	0.87	SP-SM/Low
TP 177	1.0	Residual sandstone	12.9	70.4	13.8	2.9	34	15	7.6	0.85	SC/Low
TP180	0.7-1.5	Residual sandstone	2.1	74.8	20.0	3.1	45	14	7.3	0.32	SM/ Low
TP 186	0.7-1.4	Residual sandstone	30.8	57.9	10.5	0.8	29	6	3.0	1.44	SP-SM/Low
TP 264	0.8-1.3	Residual sandstone	2.6	70.6	20.3	6.6	46	24	11.7	0.33	SC/Low
TP 396	0.5	Residual sandstone	37.9	57.1	4.2	0.8	27	5	3.0	1.79	SP-SM/Low
TP 419	0.6-1.1	Residual sandstone	2.3	76.0	15.0	6.7	63	35	17.2	0.54	SC/Low
TP 655	0.5-1.7	Residual sandstone	3.4	81.1	14.7	0.9	26	6	3.3	0.56	SC-SM/Low
Residual shale											
TP 507	0.7	Residual shale	3.8	76.6	11.4	8.2	47	17	9.2	0.68	SM/Low
TP 510	1.0-2.0	Residual shale	11.4	69.0	14.5	5.1	55	20	10.1	0.73	SM/Low

Test Pit No.	Depth (m)	Material type	Gravel %	Sand %	Silt %	Clay %	Atterberg Limits			GM*	USCS / Activity
							LL (%)	PI (%)	LS (%)		
Mudstone											
TP 52	0.6-0.8	Mudstone	60.5	32.6	5.2	1.7	50	20	9.7	2.16	GP-GM / Low
TP 179	2.0	Mudstone	3.9	73.0	17.1	5.9	50	25	14.0	0.53	SC/Low
TP 195	0.9-1.2	Mudstone	8.2	77.0	13.9	0.9	28	7	4.5	0.69	SC-SM/Low
TP 224	1.1-1.3	Mudstone	19.2	72.9	7.0	0.9	24	3	2.2	1.1	SP-SM/Low
TP 299	0.8-1.7	Mudstone	53.4	41.6	4.6	0.3	32	10	5.4	2.07	GP/Low
TP 372	2.4-2.5	Mudstone	1.9	71.1	20.3	6.7	53	30	14.5	0.35	SC/Low
Sandstone											
TP272	2.5-3.1	Sandstone	1.1	76.2	16.4	6.2	54	26	13	0.46	SC / Low
Interbedded sandstone/mudstone											
TP524	1.6-2.0	Interbedded sandstone/mudstone	2.9	72.5	23.2	1.5	46	13	6.2	0.33	SM / Low

Where:

LL = Liquid Limit
LS = Linear Shrinkage
PI = Plastic Index
GM = Grading Modulus
Activity = expansion potential according to Van der Merwe (1964)
SC = Clayey sand
SM = Silty sand
SP = Poorly graded sand
GP = Poorly graded gravel

The **fill material** generally comprised 0.9 - 5.1% clay, silt in the range of 6.4 - 21.6%, sand in the range of 68.9 - 78.7% and gravels ranged from 2.6 - 23.3%. The Atterberg limits indicate that the material has a low to high liquid limit of 15 - 53% and a low to high plastic index of 7 - 30%. The linear shrinkage ranges from 4.1 - 21.6% (low to very high). The material has a low activity in accordance with Van der Merwe (1964).

The **colluvium** shows to have a grade comprising of 0.8 - 10.4% clay and 10.1 - 25.7% silt. Sand accounts for between 68.4 - 83.6% and gravel 0.2 - 6.2%. The Atterberg limits indicate that the material has a liquid limit which classifies as low to high of 21 - 58% and very low to very high plastic index of 3 - 32%. The linear shrinkage ranges form 1.8 - 16.7% (very low to very high). The material has a low activity in accordance with Van der Merwe (1964).

The **alluvium** comprised 1.3 - 6.4% clay, silt ranged from 15.3 - 19.2%, sand ranged from 69.2 - 73.4%, whilst gravel comprised of 5.2 - 10.0%. The Atterberg limits indicate that the alluvium has a moderate liquid limit in the range of 37 - 42% and a moderate to high plastic index ranging between 13 - 24%. The linear shrinkage ranges from 6.9 - 11.5% (moderate to high). The material has a low activity in accordance with Van der Merwe (1964).

The **pedogenic material** shows to have a grade comprising 1.3% clay, 18.8% silt, 65.7% sand and 14.2% gravel. The Atterberg limits indicate that the material has a moderate liquid limit of 34% whilst the plastic index is at 13% classifying as moderate. The linear shrinkage of the material is 6.6% (moderate). The material has a low activity in accordance with Van der Merwe (1964).

The **residual dolerite** comprised 0.7 - 3.0% clay and 9.3 - 14.9% silt. Sand comprised 72.9 - 84.5% whilst gravel comprised 2.4 - 16.6%. The Atterberg limits indicate that the residual dolerite has a moderate liquid limit in the range of 29 - 38% and a low to moderate plastic index of 6 - 16%. The linear shrinkage ranges from 3.3 - 13.6% (low to high). The material has a low activity in accordance with Van der Merwe (1964).

The **residual mudstone** generally comprised 0.1 - 14.3% clay, silt in the range of 1.2 - 21.7%, sand in the range of 12.2 - 82.4% and gravel at 1.0 - 86.6%. The Atterberg limits indicate that the material has a low to high liquid limit ranging between 25 - 56% and a low to very high plastic index of 5 - 31%. The linear shrinkage ranges from 2.6 - 16.5% (low to very high). The material has a low activity in accordance with Van der Merwe (1964).

The **residual sandstone** shows to have a grade comprising of 0.8 - 6.7% clay, 10.5 - 20.3% silt, 57.9 - 81.1% sand and 2.1 - 30.8% gravel. The Atterberg limits indicate that the residual sandstone has a moderate to high liquid limit of 26 - 63% and a low to very high plastic index of 6 - 35%. The linear shrinkage ranges from 3.0 - 17.2% (low to very high). The material has a low activity in accordance with Van der Merwe (1964).

The **residual shale** comprised 5.1% clay, 14.5% silt, 69.0% sand and 11.4% gravel. The Atterberg limits indicate that the material has a high liquid limit of 55% and a moderate plastic index of 20%. The linear shrinkage ranges from 9.2 - 10.1% (moderate to high). The material has a low activity in accordance with Van der Merwe (1964).

The **mudstone** comprises 0.3 - 6.7% clay, 4.6 - 20.3% silt, 32.6 - 77.0% sand and 1.9 - 60.5% gravel. The Atterberg limits indicate that the material has a low to high liquid limit of 24 - 53% and a very low to high plastic index of 3 - 30%. The linear shrinkage ranges from 2.2 – 14.5 % (low to high). The material has a low activity in accordance with Van der Merwe (1964).

The **sandstone** comprises 6.2% clay, 16.4% silt, 76.2% sand and 1.1% gravel. The Atterberg limits indicate that the material has a high liquid limit of 54% and high plastic index of 26%. The linear shrinkage of the material is 13.0% (high). The material has a low activity in accordance with Van der Merwe (1964).

The interbedded **sandstone/mudstone** comprises 1.5% clay, 23.25 silt, 72.5% sand and 2.9% gravel. The Atterberg limits indicate that the material has ahigh liquid limit of 46% and moderate plastic index of 13%. The linear shrinkage of the material is 6.2% (moderate). The material has a low activity in accordance with Van der Merwe (1964).

The material composition and engineering properties of all tested bedrock (mudstone, sandstone and interbedded sandstone/mudstone) is directly depended on the manner in which the material is excavated and the degree of crushing of the rock fragments. Thus, the presented values are an indication of the potential classification for the ripped material.

4.10.1.2 Proposed Structures Foundation Indicator Results

Table 4-11: Summary of foundation indicator test results at the proposed structures

Test Pit No.	Depth (m)	Material type	Gravel %	Sand %	Silt %	Clay %	Atterberg Limits			GM*	USCS / Activity
							LL (%)	PI (%)	LS (%)		
Colluvium at Xhariep WTW and high lift pumpstation											
TP S9	0.0-0.2	Colluvium	2.8	86.8	9.6	0.8	20	3	1.9	0.79	SP-SM/Low
TP S12	0.0-0.3	Colluvium	4.9	82.7	11.5	0.9	39	11	5.9	0.76	SM/Low
TP S13	0.0-0.3	Colluvium	2.1	71.2	22.4	4.2	50	27	12.5	0.39	SC/Low
Residual mudstone at Low Lift Pump Station											
TP S2	0.5-1.1	Residual mudstone	6.3	68.0	20.2	5.5	45	26	10.8	0.51	SC/Low

Where:

LL = Liquid Limit

LS = Linear Shrinkage

PI = Plastic Index

GM = Grading Modulus

Activity = expansion potential according to Van der Merwe (1964)

SC = Clayey sand

SM = Silty sand

SP = Poorly graded sand

SC = Clayey sand

The **colluvium** material shows to have a grade comprising of 0.8 - 4.2% clay and 9.6-22.4% silt. Sand accounts for between 71.2 - 86.8% and gravel 2.1 - 4.9%. The Atterberg limits indicate that the material has a liquid limit which classifies as low to high of 20 - 50% and very low to high plastic index of 3 - 27%. The linear shrinkage ranges from 1.9 - 12.5% (very low to high). The material has a low activity in accordance with Van der Merwe (1964).

The **residual mudstone** generally comprised 5.5% clay, silt accounts for 20.2%, sand 68.0% and gravel at 6.3%. The Atterberg limits indicate that the material has a moderate liquid limit at 45% and a high plastic index of 26%. The linear shrinkage of the material is 10.8% (high). The material has a low activity in accordance with Van der Merwe (1964).

4.10.2 California Bearing ratio and Compaction Test Results

To determine the suitability of the in-situ soils and excavated rock material for re-use as construction materials, samples of the representative materials were taken and subjected to compaction tests, including moisture-density relationships and California Bearing ratio (CBR) tests. The results are summarised in Table 4-12.

Table 4-12: Summary of CBR and compaction test results

Test point	Depth (m)	Material type	PI	GM	Mod AASHTO		CBR (%)				Swell (%)	COLTO class.
					OMC (%)	MDD (kg/m3)	100 %	98 %	95 %	93 %		
Colluvium												
TP114	0.8-1.6	Colluvium	11	0.66	14.4	1658	20	18	15	13	2.00	<G9
TP126	0.2-2.5	Colluvium	13 *	0.40 *	14.4	1725	38	27	24	21	0.24	<G9
TP197	0.2-0.6	Colluvium	18	0.60	14.5	1658	16	12	7	6	0.95	<G9
TP210	0.4-1.0	Colluvium	8	0.77	11.1	1793	29	26	22	20	0.22	G7
TP277	1.4-3.2	Colluvium	34	0.34	12.3	1681	17	15	13	11	0.45	<G9
Alluvium												

Test point	Depth (m)	Material type	PI	GM	Mod AASHTO		CBR (%)				Swell (%)	COLTO class.
					OMC (%)	MDD (kg/m3)	100 %	98 %	95 %	93 %		
TP411	1.5-2.9	Alluvium	24	0.51	11.7	1810	34	30	24	21	0.20	<G9
Pedogenic												
TP421	1.4-2.5	Pedogenic	13	0.75	12.2	1935	37	33	29	26	0.12	<G9
Residual dolerite												
TP66	0.7-1.2	Residual dolerite	11	0.72	12.6	1785	50	47	32	25	-	<G9
TP184	1.3-1.7	Residual dolerite	13	1.05	12.6	1785	50	47	32	25	0.28	G7
TP343	0.8-1.4	Residual dolerite	6	1.04	10.4	1947	30	27	24	22	0.25	G7
TP344	1.4-2.2	Residual dolerite	14	0.73	13.7	1888	26	24	21	19	0.20	<G9
TP346	0.9-1.2	Residual dolerite	20	0.34	14.4	1765	26	23	21	19	1.60	<G9
TP499	0.8-1.1	Residual dolerite	10	1.30	11.2	1949	38	34	29	27	0.12	G7
Residual mudstone												
TP35	0.6-1.1	Residual mudstone	18	0.33	13.4	1658	12	9	3	6	1.50	<G9
TP37	0.9-1.2	Residual mudstone	14	0.80	10.6	1829	50	47	32	25	0.60	<G9
TP43	0.4-1.3	Residual mudstone	6	1.21	9.3	1957	38	34	29	27	0.50	G6
TP52	0.6-0.8	Residual mudstone	20	2.16	7.1	1919	33	29	24	22	0.30	<G9
TP103	1.1-1.4	Residual mudstone	14 *	0.94	12.0	1771	16	14	11	9	0.44	<G9
TP105	1.2-1.4	Residual mudstone	21 *	0.41 *	12.2	1685	17	14	11	9	0.50	<G9
TP121	0.6-1.1	Residual mudstone	22 *	0.45 *	13.8	1624	20	18	15	14	0.35	<G9
TP160	0.7-1.3	Residual mudstone	11	0.56	9.8	1738	15	11	7	6	1.20	<G9
TP234	0.5-1.6	Residual mudstone	5	2.33	9.7	1924	36	32	27	24	0.24	G6
TP244	0.8-3.2	Residual mudstone	13	2.16	7.4	1882	32	28	23	20	0.24	
TP256	1.1-2.6	Residual mudstone	5	0.59	9.1	2035	48	41	28	21	0.40	<G9
TP311	1.0-2.5	Residual mudstone	12	1.24	16.3	1913	30	27	23	21	0.20	G7
TP346	0.9-1.2	Residual mudstone	20	0.34	14.4	1765	26	23	21	19	1.60	<G9
TP365	1.4-3.0	Residual mudstone	13	0.41	12.6	1804	31	27	21	18	0.31	<G9
TP380	1.4-3.0	Residual mudstone	27	0.30	12.7	1593	12	10	7	6	0.57	<G9

Test point	Depth (m)	Material type	PI	GM	Mod AASHTO		CBR (%)				Swell (%)	COLTO class.
					OMC (%)	MDD (kg/m3)	100 %	98 %	95 %	93 %		
TP394	0.7-1.3	Residual mudstone	13	2.16	7.4	1882	32	28	23	20	1.60	<G9
TP394	1.3-1.5	Residual mudstone	25	0.38	16.4	1705	12	11	6	4	1.50	<G9
TP402	1.2-3.0	Residual mudstone	12	0.56	13.6	1822	13	11	7	5	1.30	<G9
TP408	0.6-2.1	Residual mudstone	18	0.67	14.6	1762	25	22	18	15	0.24	<G9
Residual sandstone												
TP164	0.9-1.7	Residual sandstone	10	1.17	11.6	1855	17	14	9	7	0.95	<G9
TP180	0.7-1.5	Residual sandstone	14	0.33	11.3	1897	27	24	21	19	0.21	<G9
TP186	0.7-1.4	Residual sandstone	NP	1.80	11.3	1904	46	38	28	23	0.22	G6
TP419	0.6-1.1	Residual sandstone	35	0.53	14.9	1644	26	22	17	14	0.39	<G9
Residual shale												
TP510	1.0-2.0	Residual shale	20	0.72	15.1	1756	36	30	23	19	2.20	<G9
Interbedded residual sandstone/mudstone												
TP490	0.6-1.8	Interbedded residual sandstone/mudstone	23	0.28	13.2	1816	16	13	7	5	1.20	<G9
Dolerite												
TP220	1.8-2.8	Dolerite	8	0.77	12.5	1866	22	17	13	11	0.24	G8
Mudstone												
TP195	0.9-1.2	Mudstone	9	1.05	12.5	1896	22	17	13	11	0.80	G8
TP224	1.1-1.3	Mudstone	3	1.10	7.7	1992	34	31	26	24	0.60	<G7
TP299	0.8-1.7	Mudstone	9	2.5	9.7	1942	37	33	28	24	0.20	-
TP372	2.4-2.5	Mudstone	30	0.34	11.3	1904	46	38	28	23	-	<G9
Sandstone												
TP272	2.5-3.1	Sandstone	26	0.46	10.2	1724	23	20	16	14	0.24	<G9
Shale												
TP220	0.8-1.8	Shale	8	0.77	17.6	1693	22	19	15	13	0.38	G8
Interbedded sandstone/mudstone												
TP524	1.6-2.0	Interbedded sandstone/mudstone	13	0.35	16.5	1662	19	16	13	11	0.39	<G9

*Material classifications are limited by their grading modulus. If these horizons were to undergo further crushing, a lower grading modulus may be achieved, resulting in a more competent (COTO) classification

GM = Grading modulus PI = Plastic index

OMC = Optimum moisture content MDD = Maximum dry density

CBR = California Bearing Ration at different degrees of compaction relative to MDD

COLTO = Committee of Land Transport Officials (2009)

The **colluvium** material, according to the COLTO specification, generally classifies as worse than G9 (<G9) material, with exception to one sample which classified as G7. The maximum Dry Density (MDD) ranges between 1658 kg/m^3 and 1793 kg/m^3 (low) and has a moderate to high Optimum Moisture Content (OMC) ranging between 11.1% to 14.5%.The swell of the material ranged from very low to high at 0.22 - 2.0%.

The **alluvium** material classifies as <G9, where the MDD is 1810 kg/m^3 is classified as being moderate with a moderate OMC of 11.7%. The swell of the material was 0.20% (very low).

The **pedogenic** material classifies as <G9, where the MDD is classified as being moderate at 1935 kg/m^3 and the OMC is 12.2% classifying as high. The swell of the pedogenic material was 0.12% (very low).

The **residual dolerite** tested across the site was noted to classify as either G7 or <G9 (in equal proportions). The MDD of the material ranged from 1765 kg/m^3 to 1949 kg/m^3 (low to moderate) with a moderate to high OMC of 10.4% to 14.4%. The swell of the material ranged from very low to high at 0.12 – 1.6%.

The **residual mudstone** tested across the site was noted to classify as <G9 with a few samples classifying as G6 to G7. The MDD of the material ranged from 1593 kg/m^3 to 2035 kg/m^3 (very low to high) with a low to very high OMC of 7.1% to 16.4%. The swell of the material ranged from very low to high at 0.24 – 1.60%.

The **residual sandstone** material tested across the site was noted as <G9 with a one sample classifying as G6. The MDD of the material ranged from 1644 kg/m^3 to 1904 kg/m^3 (very low to moderate) with a moderate to high OMC of 11.3% to 14.9%. The swell of the material ranged from very low to moderate at 0.21 – 0.95%.

The **residual shale** classifies as <G9, where the MDD is 1756 kg/m^3 classifying as low and the OMC is 15.1% classifying as high. The swell of the material was 2.20% (very high).

The **interbedded residual sandstone/mudstone** material classifies as <G9, where the MDD is 1816 kg/m^3 classifying as moderate and the OMC is 13.2% classifying as high. The swell of the material was 1.20% (high).

The **dolerite** material classifies as G8, where the MDD is 1866 kg/m^3 classifying as moderate and the OMC is 12.5% classifying as high. The swell of the material was 0.24% (very low).

The **mudstone** material tested across the site was noted to classifying as either <G7, G8 or <G9, where the MDD ranged from 1896 kg/m^3 to 1992 kg/m^3 (moderate to high) with a low to high OMC of 7.7% to 12.5%. The swell of the material ranged from very low to moderate at 0.2 – 0.8%.

The **sandstone** material classifies as <G9, where the MDD is 1724 kg/m^3 classifying as low, and the OMC is 10.2% classifying as moderate. The swell of the material was 0.24% (very low).

The **shale** material classifies as G8, where the MDD is 1693 kg/m^3 classifying as low, and the OMC is 17.6% classifying as very high. The swell of the material was 0.38% (low).

The **interbedded sandstone/mudstone** material classifies as <G9, where the MDD is 1662 kg/m^3 (low), and the OMC is 16.5% classifying as very high. The swell of the material was 0.39% (low).

As discussed above, the bedrock material (dolerite, mudstone, sandstone, shale and interbedded sandstone/mudstone) were ripped from the ground and thus the grading modulus and material proportions are impacted by the ripping mechanism implemented and degree of crushing. Therefore, the classifications according to COLTO will vary based on these aspects.

4.10.3 pH and Conductivity Test Results

The pH and conductivity of the soil has a profound influence on the rate of corrosion of buried metallic objects and is typically considered as an indicator of potential corrosivity. The rate of corrosion is dependent on the pH of the soil. A soil with a pH above 7 is considered to be alkaline whereas a soil

with a pH below 7 is considered to be acidic. According to Powell et. al (1995), the corrosion rate increases with decreasing pH value. The acidic environment with pH lower than 6 is more corrosive compared to a pH from 6–8 or alkaline pH higher than 8 (Bradford, 1993). Based on significance of soil resistivity on corrosiveness, Duligal (1996) provides Table 4-13 to evaluate conductivity of soils.

Table 4-13: Guideline values for interpretation of soil conductivity

Soil conductivity (mS/m)	Soil resistivity (Ohm.cm)	Corrosivity Classification
More than 50	0-2000	Extremely corrosive
25-50	2000-4000	Very corrosive
20-25	4000-5000	Corrosive
10-20	5000-10000	Mildly corrosive
Less than 10	>10000	Not generally corrosive

Table 4-14: pH and conductivity results

Test Pit	Material	Depth(m)	pH	Soil Conductivity (mS/m)	Corrosivity classification
Fill					
TP05	Fill	0.0-1.2	6.9	220	Extremely corrosive
TP68	Fill	0.7-1.2	6.9	204	Extremely corrosive
TP210	Fill	0.4-1.0	6.9	210	Extremely corrosive
TP271	Fill	0.6-1.4	6.6	168	Extremely corrosive
Colluvium					
TP9	Colluvium	0.0-0.2	6.8	132	Extremely corrosive
TP12	Colluvium	0.0-0.3	6.6	145	Extremely corrosive
TP13	Colluvium	0.0-0.3	6.3	168	Extremely corrosive
TP114	Colluvium	0.8-1.6	7.2	168	Extremely corrosive
TP154	Colluvium	0.6-1.7	7.3	208	Extremely corrosive
TP196	Colluvium	0.7	6.9	220	Extremely corrosive
TP197	Colluvium	0.2-0.6	7.3	188	Extremely corrosive
TP204	Colluvium	0.0-0.8	6.8	124	Extremely corrosive
TP277	Colluvium	1.4-3.2	6.7	204	Extremely corrosive
TP246	Colluvium	0.6-2.4	6.8	128	Extremely corrosive
TP254	Colluvium	0.8-3.0	6.9	144	Extremely corrosive
TP293	Colluvium	0.2-0.7	6.3	138	Extremely corrosive
TP419	Colluvium	0.6-1.1	6.9	175	Extremely corrosive
TP548	Colluvium	1.2	7.3	196	Extremely corrosive
Alluvium					

Test Pit	Material	Depth(m)	pH	Soil Conductivity (mS/m)	Corrosivity classification
TP158	Alluvium	1.1-3.0	7.6	196	Extremely corrosive
TP411	Alluvium	1.5-2.9	6.8	208	Extremely corrosive
TP541	Alluvium	1.0	7.6	186	Extremely corrosive
TP548	Alluvium	1.0	7.1	128	Extremely corrosive
Residual dolerite					
TP14	Residual dolerite	0.6-1.3	6.9	138	Extremely corrosive
TP66	Residual dolerite	0.7-1.2	6.4	191	Extremely corrosive
TP166	Residual dolerite	0.9-2.6	6.9	230	Extremely corrosive
TP184	Residual dolerite	1.3-1.7	6.8	190	Extremely corrosive
TP218	Residual dolerite	2.2	7.1	155	Extremely corrosive
TP344	Residual dolerite	1.4-2.2	6.9	176	Extremely corrosive
TP499	Residual dolerite	0.8-1.1	7.2	168	Extremely corrosive
Residual mudstone					
TP16	Residual mudstone	0.4-0.8	7.2	130	Extremely corrosive
TP21	Residual mudstone	0.5-1.1	6.6	206	Extremely corrosive
TP35	Residual mudstone	0.6-1.1	6.8	166	Extremely corrosive
TP112	Residual mudstone	1.4-2.9	7.3	185	Extremely corrosive
TP118	Residual mudstone	1.2-2.6	6.8	148	Extremely corrosive
TP147	Residual mudstone	1.0-1.4	7.1	164	Extremely corrosive
TP179	Residual mudstone	2.00	6.8	185	Extremely corrosive
TP188	Residual mudstone	1.10	6.9	155	Extremely corrosive
TP191	Residual mudstone	1.00	6.4	163	Extremely corrosive
TP199	Residual mudstone	1.2	7.2	128	Extremely corrosive
TP256	Residual mudstone	1.1-2.6	7.6	136	Extremely corrosive
TP264	Residual mudstone	0.8-1.3	7.1	148	Extremely corrosive
TP364	Residual mudstone	0.5	6.6	158	Extremely corrosive
TP380	Residual mudstone	0.8-2.2	7.1	202	Extremely corrosive
TP390	Residual mudstone	1.5	7.3	196	Extremely corrosive
TP413	Residual mudstone	1.6	6.4	168	Extremely corrosive
TP452	Residual mudstone	1.5-2.5	6.9	186	Extremely corrosive
TP511	Residual mudstone	1.5	6.8	194	Extremely corrosive
TP545	Residual mudstone	1.2	6.9	133	Extremely corrosive
Residual sandstone					

Test Pit	Material	Depth(m)	pH	Soil Conductivity (mS/m)	Corrosivity classification
TP130	Residual sandstone	0.9-1.1	7.6	168	Extremely corrosive
TP164	Residual sandstone	0.9-1.7	6.9	176	Extremely corrosive
TP177	Residual sandstone	1.00	7.1	138	Extremely corrosive
TP186	Residual sandstone	0.7-1.4	6.4	162	Extremely corrosive
TP655	Residual sandstone	0.0-0.5	6.4	196	Extremely corrosive
Weathered dolerite					
TP220	Weathered dolerite	1.8-2.8	7.1	230	Extremely corrosive
TP296	Weathered dolerite	1.7-2.5	7.2	208	Extremely corrosive
Weathered mudstone					
TP21	Weathered mudstone	0.4-0.5	7.6	196	Extremely corrosive
TP224	Weathered mudstone	1.1-1.3	7.2	111	Extremely corrosive
TP234	Weathered mudstone	0.5-1.6	7.2	138	Extremely corrosive
TP244	Weathered mudstone	0.8-3.2	7.3	196	Extremely corrosive
TP311	Weathered mudstone	1.0-2.5	7.6	190	Extremely corrosive
Weathered sandstone					
TP195	Weathered sandstone	0.9-1.2	6.6	128	Extremely corrosive
TP396	Weathered Sandstone	0.5	6.3	168	Extremely corrosive
Weathered shale					
TP220	Weathered shale	0.8-1.8	6.8	204	Extremely corrosive
Interbedded sandstone/mudstone					
TP490	Interbedded sandstone/mudstone	0.6-1.8	7.3	220	Extremely corrosive

The chemical test results were analysed and interpreted based on the pH and soil conductivity results.

The results from the material sampled at various depths along the proposed pipeline alignment indicate a pH range of 6.3 and 7.6, with the soil conductivity for all tested material being extremely corrosive. Based on the chemical results, it is recommended that protective measures be put in place to protect buried metal along the entire proposed pipeline route.

Given the corrosivity of the soil, it is highly recommended that BRE/DIN chemical testing be done during the detailed design phase to be more accurate in determining the corrosivity of the soil towards steel and aggressiveness towards buried concrete. These tests are very time-consuming and should therefore be undertaken as soon as the detailed design commences.

4.11 Soil Electrical Resistivity Results

The tests conducted to determine the soil resistivity along the pipeline at nominal 200 m intervals are represented in Figure 4-13 to Figure 4-25, Gariep Dam to Brandkop Reservoir. The tabulated data with GPS co-ordinates may be found in Appendix I.

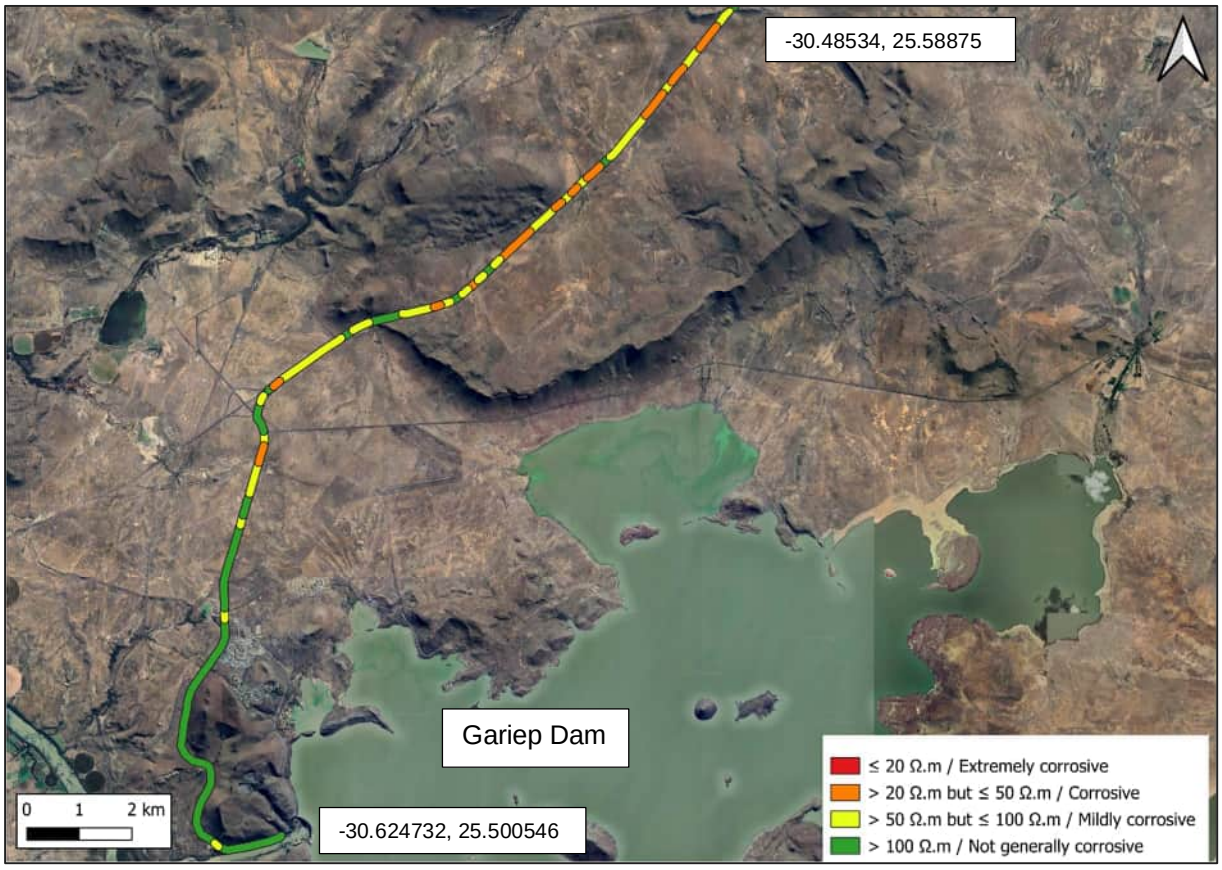


Figure 4-14: Map showing soil electrical resistivity results along pipeline route from -30.624732, 25.500546 to -30.48534, 25.58875.

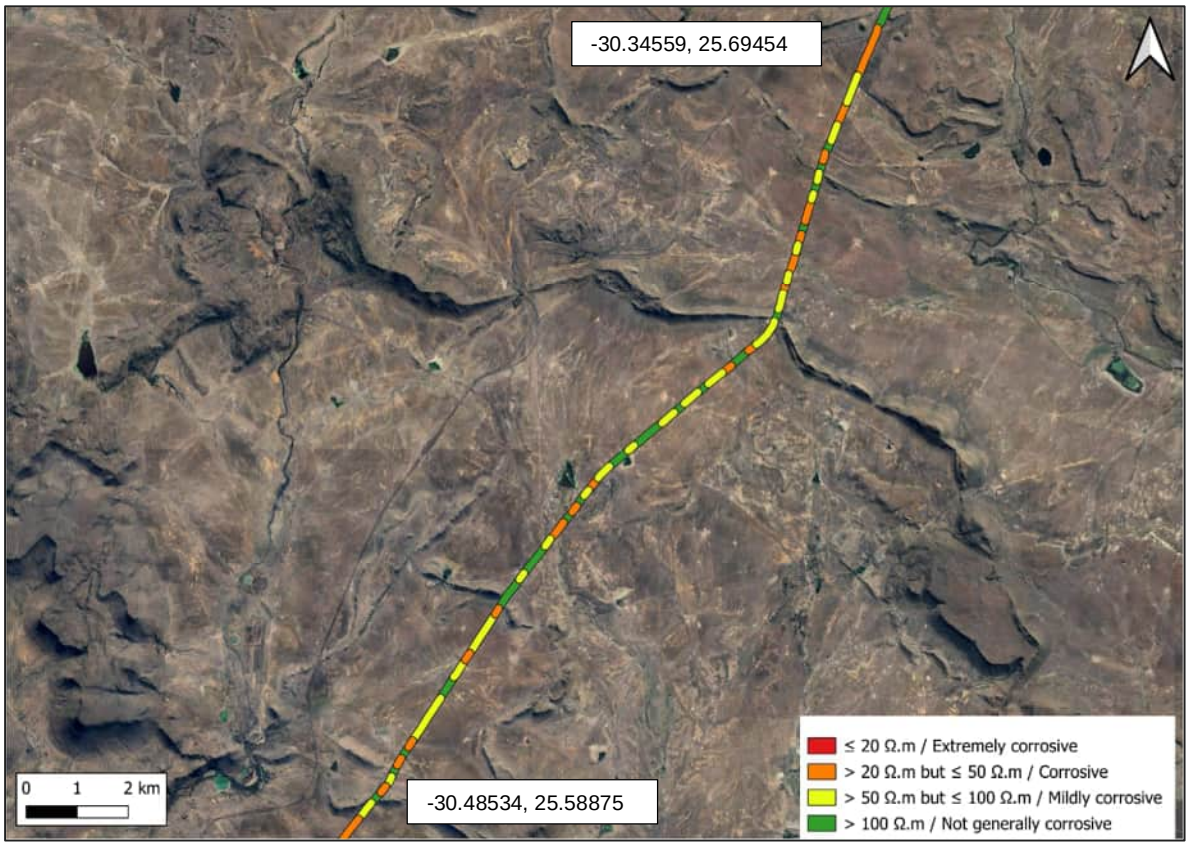


Figure 4-15: Map showing soil electrical resistivity results along pipeline route from -30.48534, 25.58875 to -30.34559, 25.69454

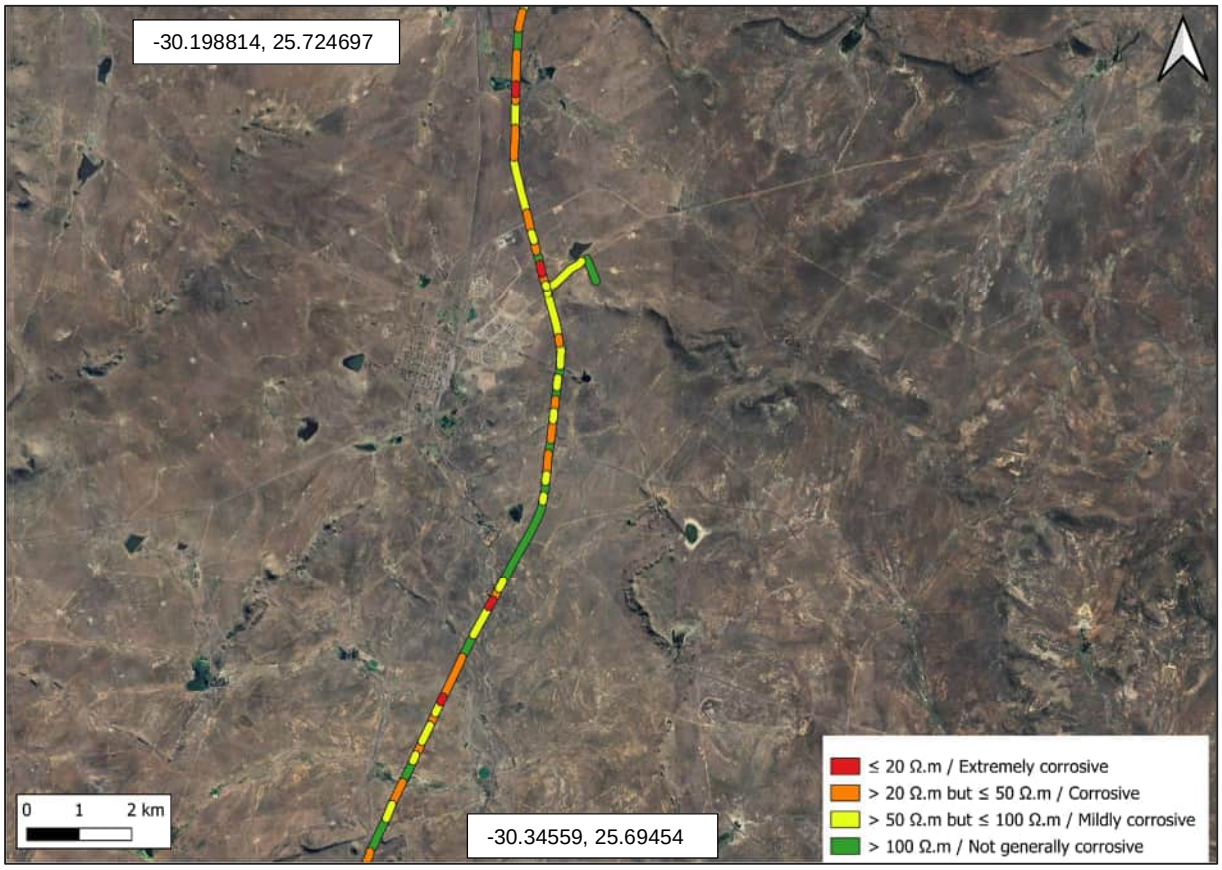


Figure 4-16: Map showing soil electrical resistivity results along pipeline route from -30.34559, 25.69454 to -30.198814, 25.724697.

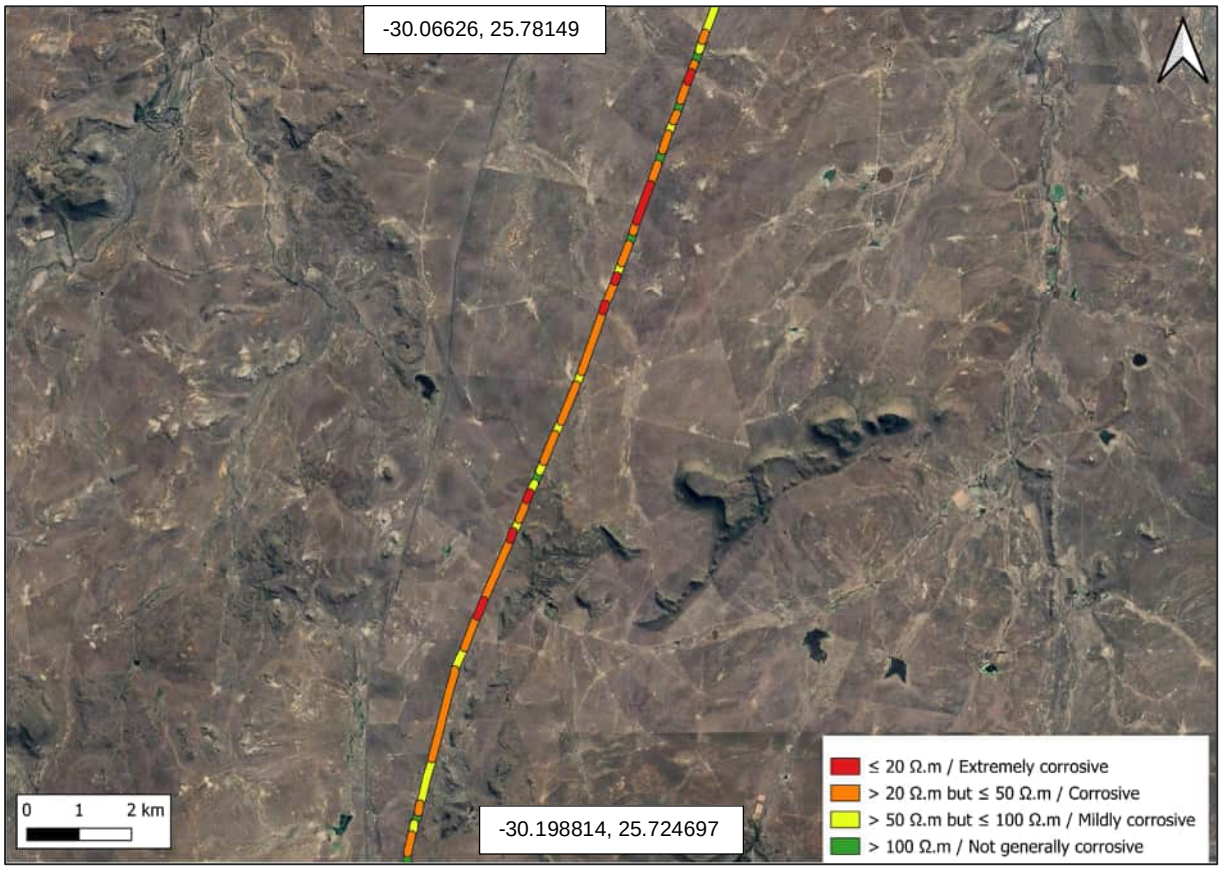


Figure 4-17: Map showing soil electrical resistivity results along pipeline route from -30.198814, 25.724697 to -30.06626, 25.78149

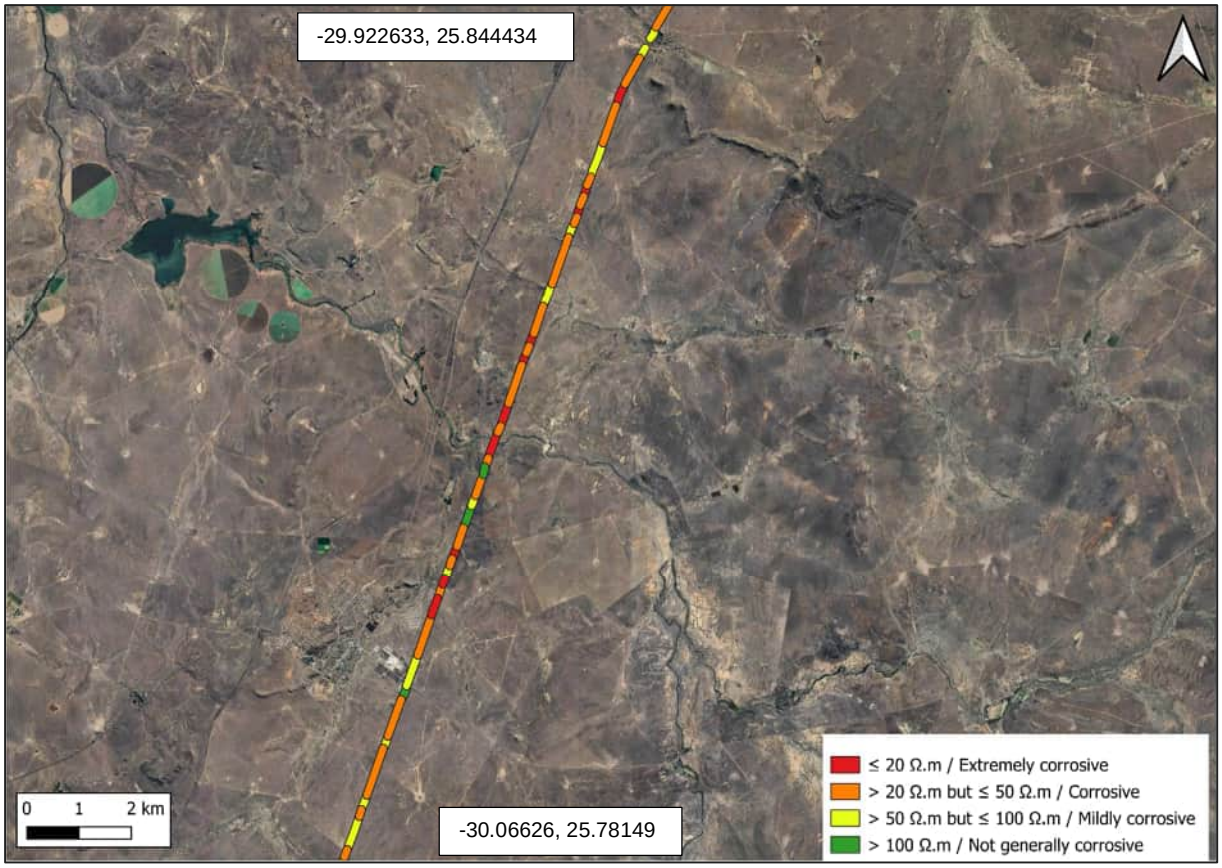


Figure 4-18: Map showing soil electrical resistivity results along pipeline route from -30.06626, 25.78149 to -29.922633, 25.844434

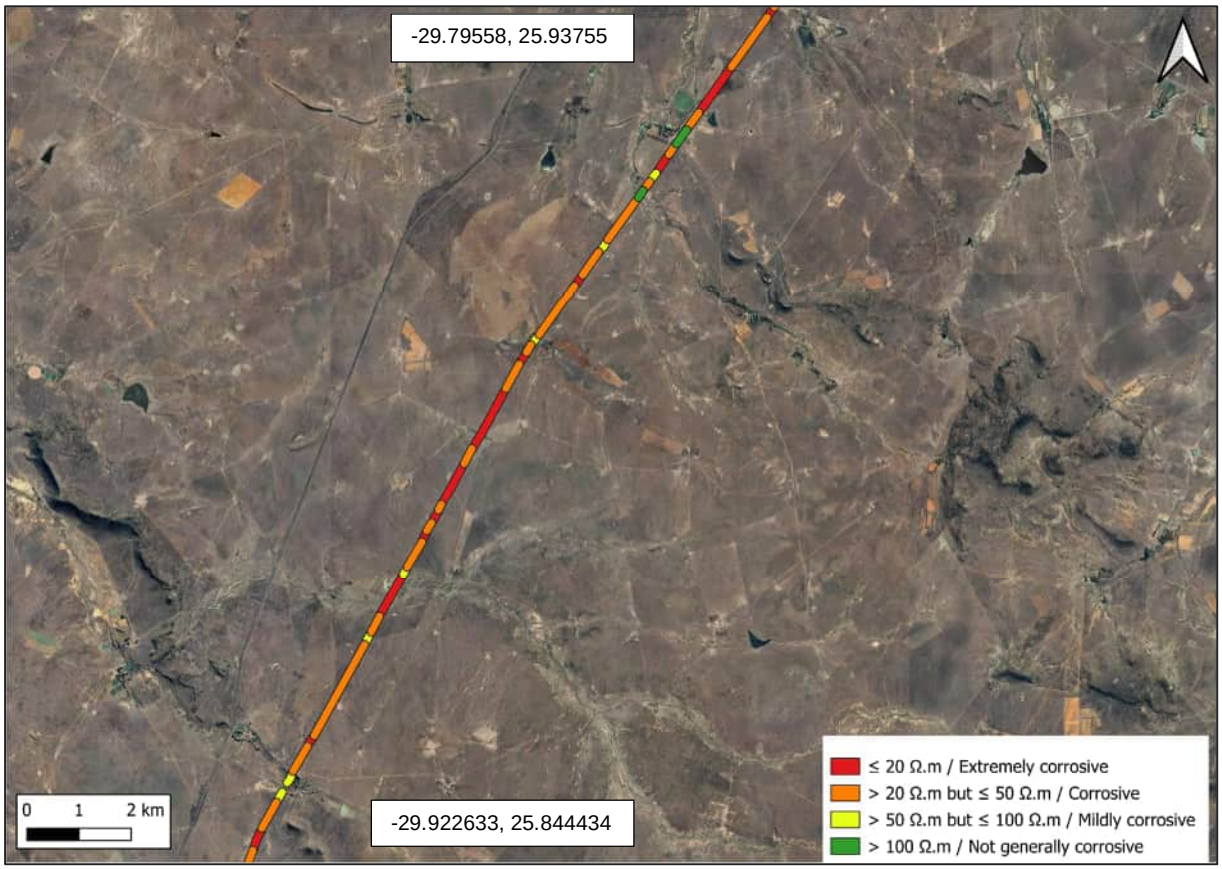


Figure 4-19: Map showing soil electrical resistivity results along pipeline route from -29.922633, 25.844434 to -29.79558, 25.93755

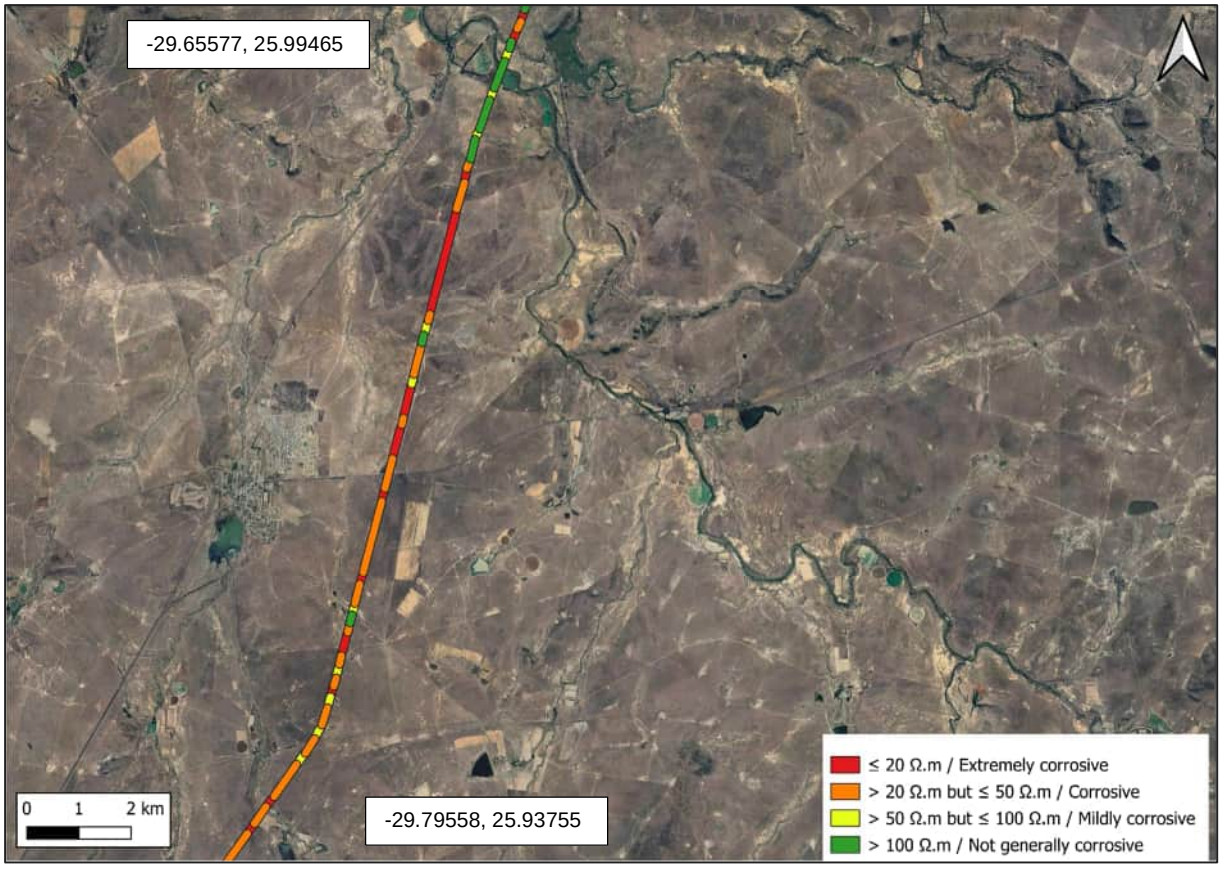


Figure 4-20: Map showing soil electrical resistivity results along pipeline route from -29.79558, 25.93755 to -29.65577, 25.99465

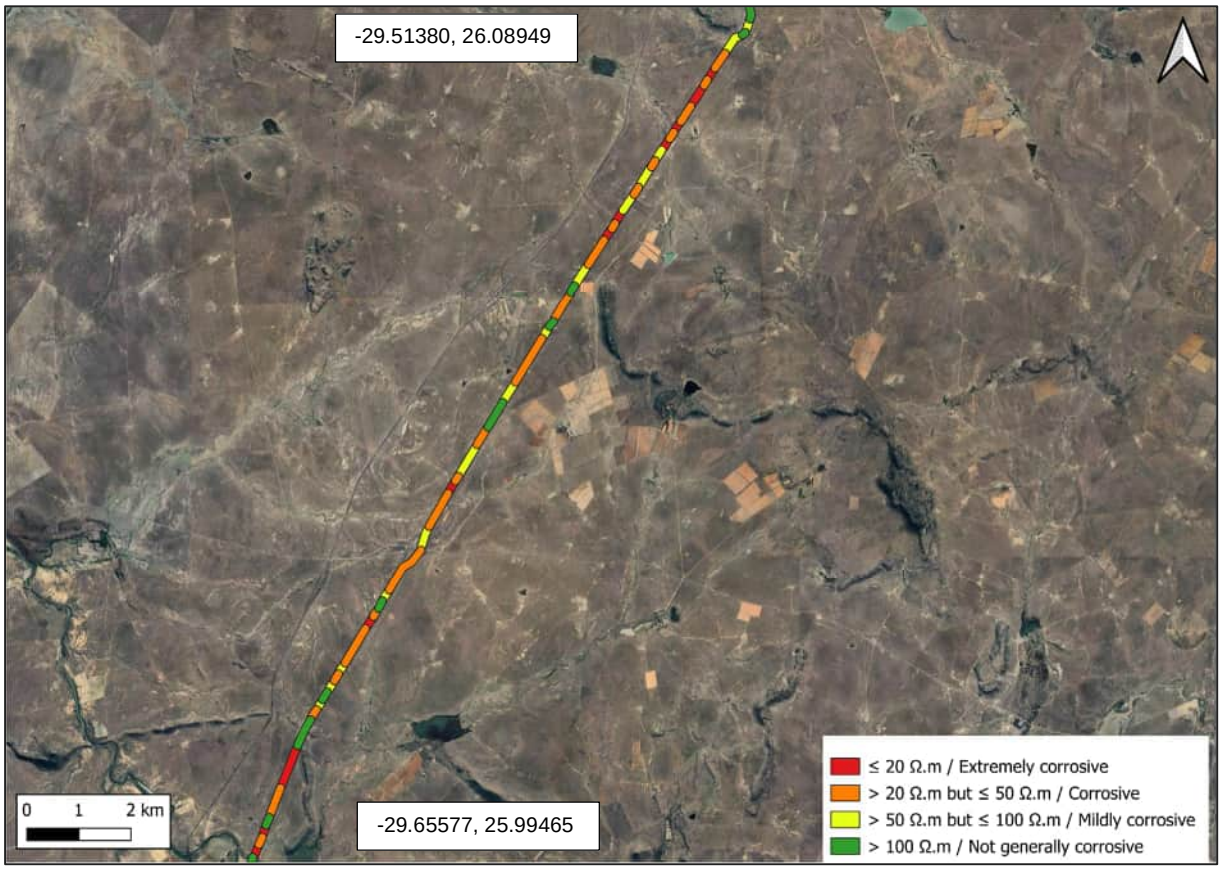


Figure 4-21: Map showing soil electrical resistivity results along pipeline route from -29.65577, 25.99465 to -29.51380, 26.08949

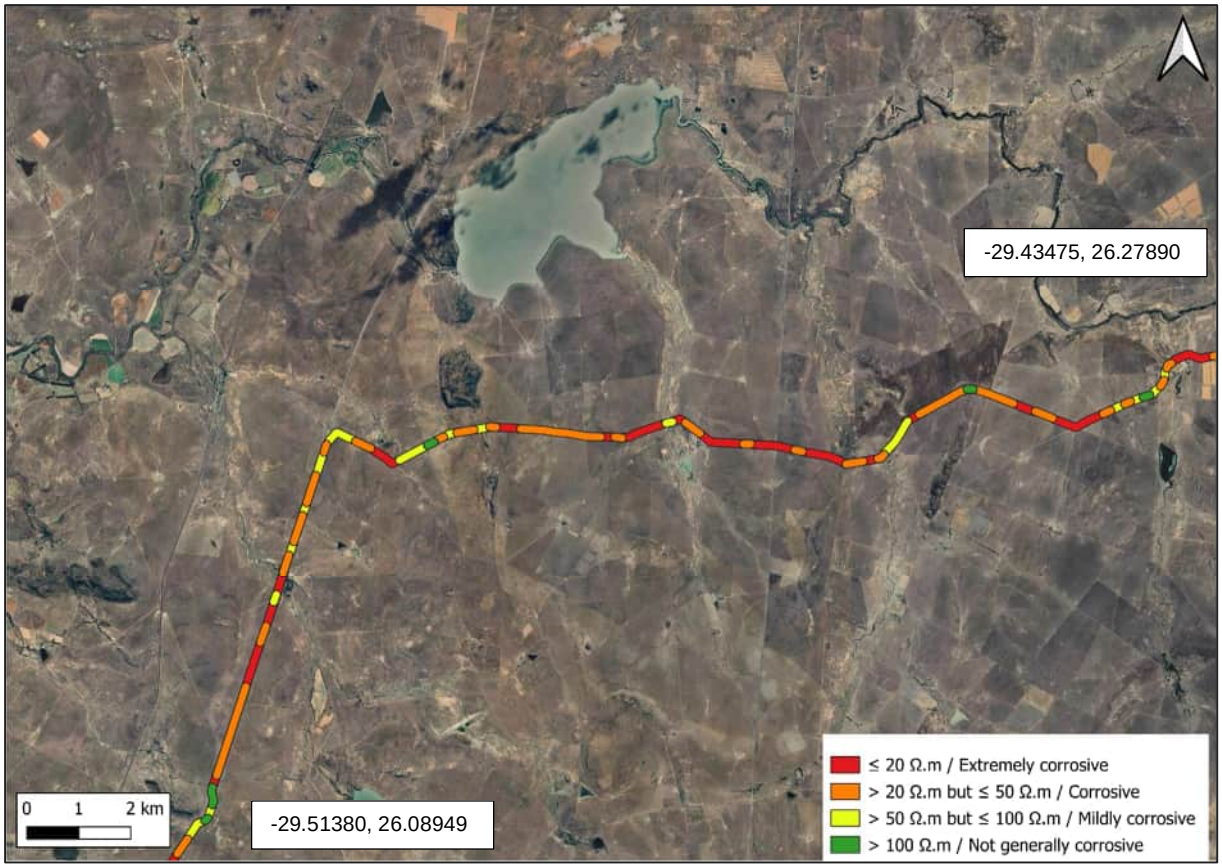


Figure 4-22: Map showing soil electrical resistivity results along pipeline route from -29.51380, 26.08949 to -29.43475, 26.27890

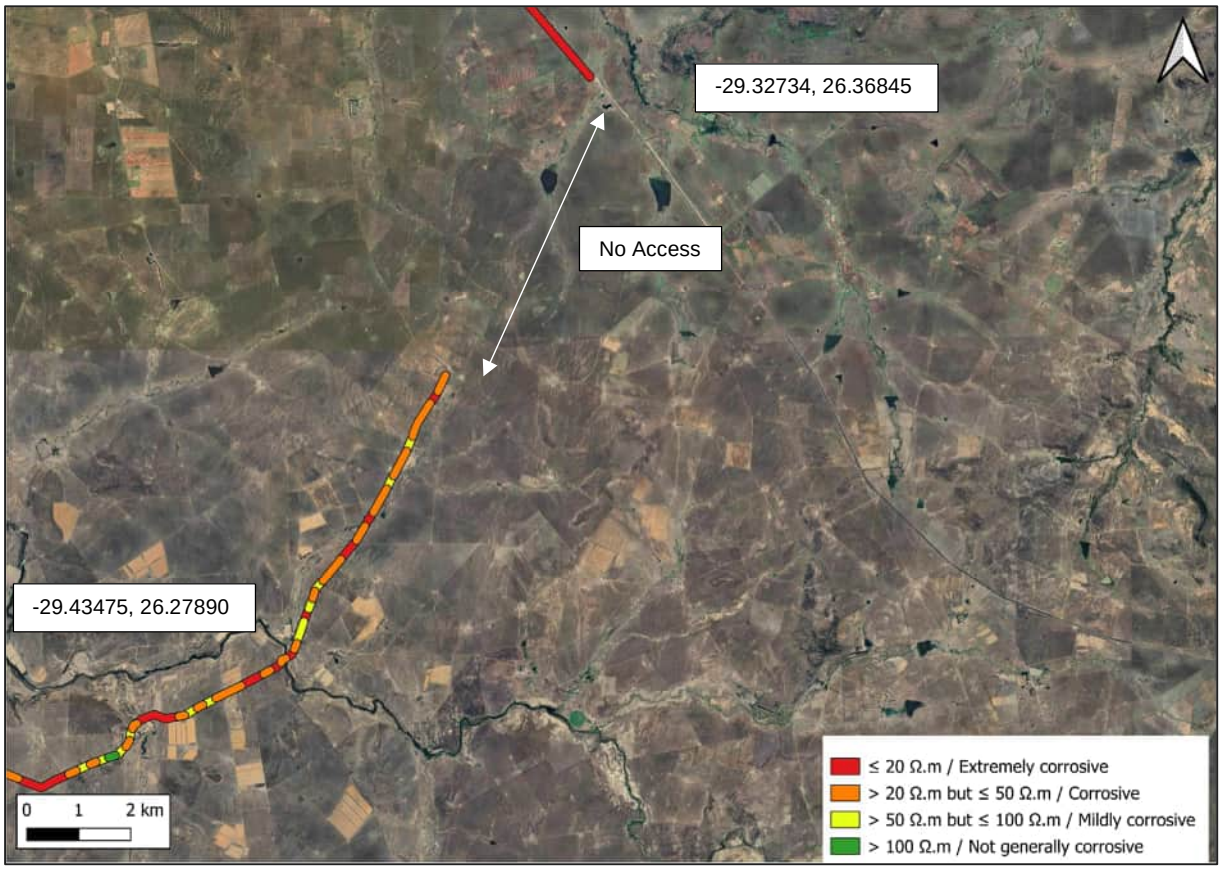


Figure 4-23: Map showing soil electrical resistivity results along pipeline route from -29.43475, 26.27890 to -29.32734, 26.36845

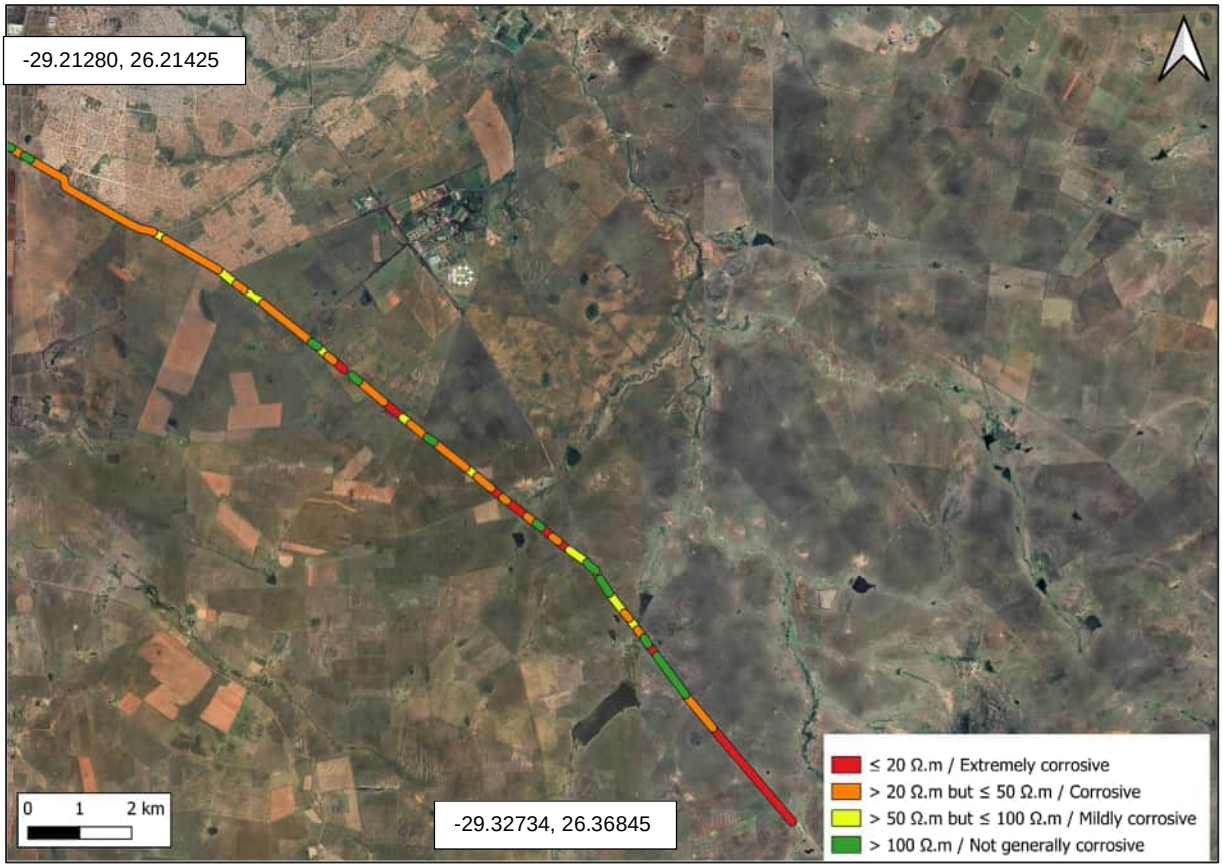


Figure 4-24: Map showing soil electrical resistivity results along pipeline route from -29.32734, 26.36845 to -29.21280, 26.21425

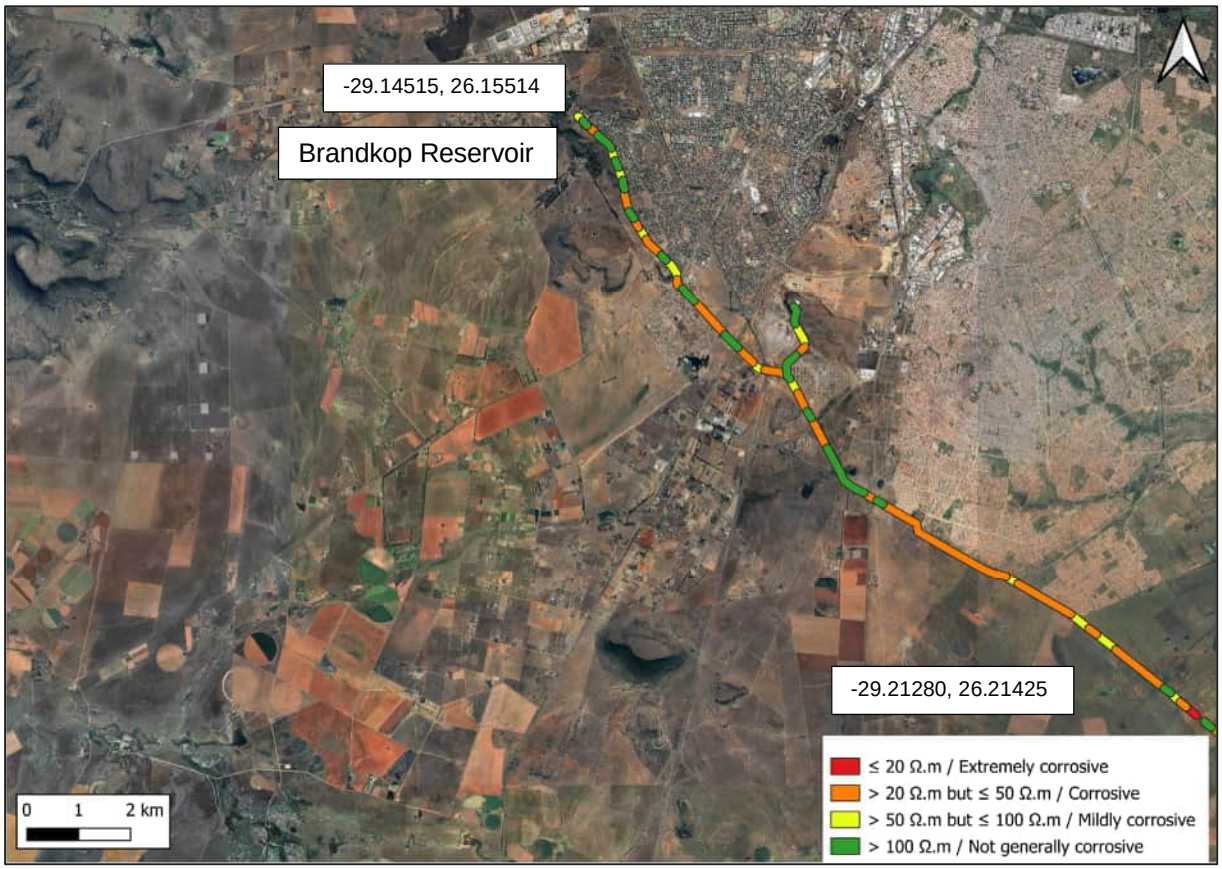


Figure 4-25: Map showing soil electrical resistivity results along pipeline route from -29.21280, 26.21425 to -29.14515, 26.15514

The analysis indicates that the ground conditions are generally not corrosive in the south and becomes more aggressive towards the north. Approximately 83% of the surveyed sections along the pipeline route traverse soils which range from mildly corrosive to extremely corrosive to buried steel, therefore cathodic protection will be required (Table 4-15). Regions classified as 'not generally corrosive' exhibit significant variations in resistivity, which may lead to localized corrosion.

Table 4-15: Classification of soil resistivity with cathodic protection requirements

Classification of Soil Resistivity				
Resistivity (Ω.m)	**Classification**		**Cathodic Protection Requirements**	**%**
≤ 20 Ω.m	Extremely corrosive		*Definitely required*	17
> 20 Ω.m but ≤ 50 Ω.m	Corrosive		*Definitely required*	42
> 50 Ω.m but ≤ 100 Ω.m	Mildly corrosive		*Usually required*	24
> 100 Ω.m	Not generally corrosive		**May be required*	17

5 Zoning of Xhariep pipeline

Based on the 'point data' obtained during this investigation from test pits and boreholes, the pipeline route can be subdivided into zones according to the encountered and anticipated ground profiles. It is important to note that this zoning represents a preliminary assessment of ground conditions as observed during the intrusive investigation. A supplementary geotechnical investigation can be undertaken during the detailed design phase, should it be considered necessary to further refine these zones.

The delineation of zones was determined by the invert level of the pipeline, set at an average depth of 3.0 meters below natural ground level. These zones are intended to indicate the different ground profiles expected at this specific depth. A total of 7 No. zones have been identified, represented in Table 5-1 and represented in Figure 5-1 to Figure 5-11.

Table 5-1: Representation of various zones encountered along the pipeline route

Zones	Material at invert level (3.0 – 3.5 m)	Overlying material	Excavatability (based on SANS 1200 D)
Zone 1	Colluvium	Fill	Soft excavation (0.0-3.2 m)
Zone 2	Alluvium	Fill, colluvium	Soft excavation (0.0-3.6 m)
Zone 3	Pedogenic	Fill, colluvium	Intermediate excavation (0.6-3.0 m)
Zone 4	Residual dolerite	Fill, colluvium, residual mudstone, mudstone	Intermediate excavation (0.0-3.0 m)
Zone 5	Dolerite	Fill, colluvium, alluvium, residual dolerite	Hard excavation (0.0-3.1 m)
Zone 6	Residual materials (residual shale, residual mudstone, residual sandstone)	Fill, colluvium, alluvium, pedogenic	Intermediate excavation (0.1-3.5 m)
Zone 7	Karoo Supergroup rocks (shale, mudstone, sandstone)	Fill, colluvium, alluvium, pedogenic, residual Karoo Supergroup rocks	Intermediate to hard excavation (0.0-3.2 m)

Zone 1 – The colluvium profile encountered generally comprises loose to medium dense, intact, silty sand, whilst occasionally being described as firm, intact, silty clay. The colluvium is typically overlain by fill material; however, the colluvium was also encountered at surface. The material ranges in depth from surface up to 3.2 m and is regarded as soft excavation.

Zone 2 – The alluvium profile expected in the lower lying areas / depressions and in areas near river passes which generally comprises silty sand, which is typically overlain by either fill, colluvium or combination of both, to depths up to 3.6 m. Occasionally the alluvium started from surface and is deemed as soft excavation.

Zone 3 – The pedogenic profile generally comprises well cemented, medium grained hardpan calcrete, at depths up to 3.0 m. The pedogenic material is regarded as soft to intermediate excavation.

Zone 4 – The residual dolerite profile generally comprises stiff, sandy clay with occasional dolerite gravel, cobbles and boulders. The residual material is typically overlain by fill, colluvium, residual mudstone and mudstone, however, the residual dolerite was also encountered at surface. The residual dolerite ranges in depth up to 3.0 m and classifies as intermediate excavation.

Zone 5 – The dolerite profile typically comprises moderately to highly weathered, very closely jointed, soft rock to a depth ranging from surface to 3.1 m. The dolerite is overlain by fill, colluvium, alluvium, residual dolerite. The dolerite is regarded as hard excavation.

Zone 6 – The residual material (residual shale, residual mudstone, residual sandstone) comprises soft to firm, sandy/silty clay with occasional gravel and medium dense, silty sand with occasional cobbles.

The material is generally overlain by fill, colluvium, alluvium and pedogenic material. The residual material ranges in depth from 0.1 m to 3.5 m and is classified as intermediate excavation.

Zone 7 – The Karoo Supergroup rocks (shale, mudstone, sandstone) generally comprises moderately to highly weathered, fine to medium grained, very closely jointed and occasionally thinly bedded, very soft to soft rock. The bedrock is typically overlain by fill, colluvium, alluvium, pedogenic material and residual materials. The Karoo Supergroup rock ranges in depth from surface to 3.2 m and classified as hard excavation.

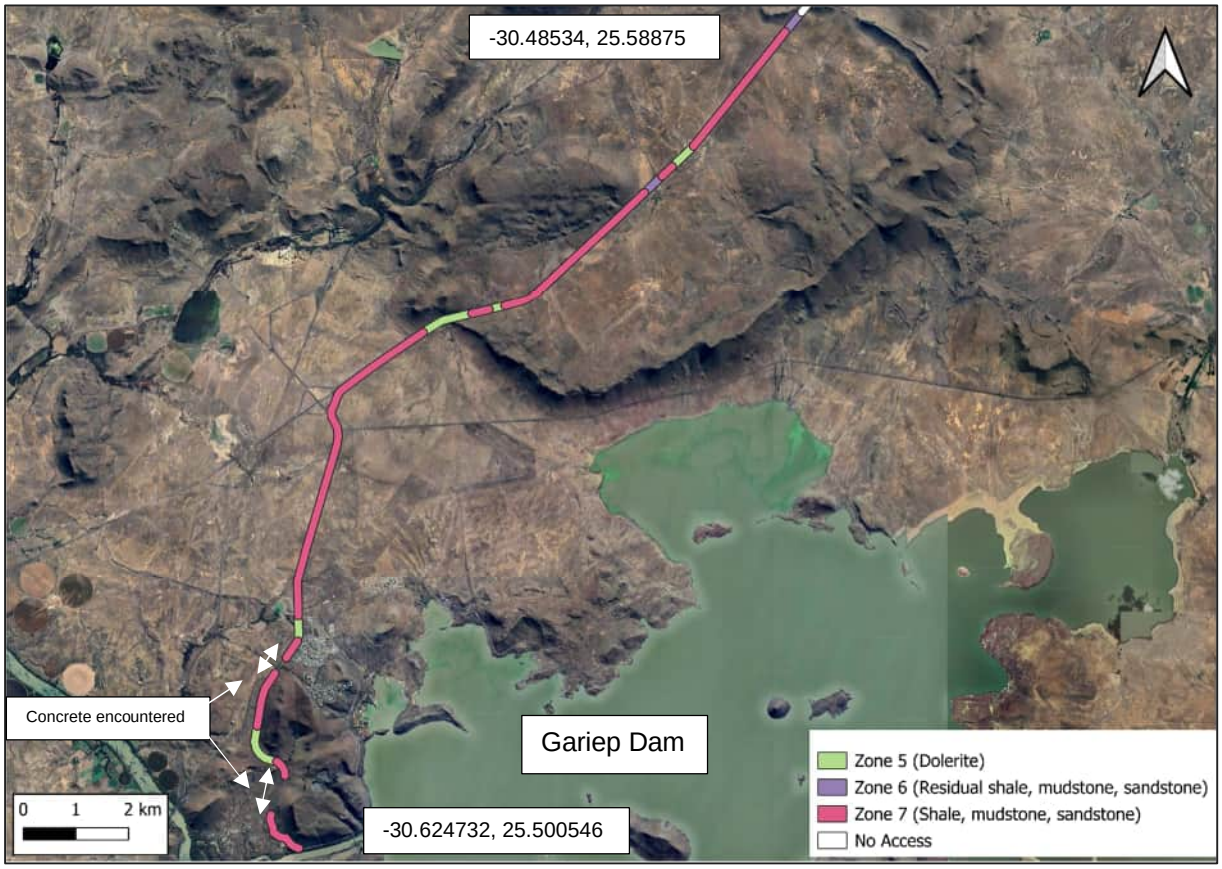


Figure 5-1: Map showing zoning along pipeline route from -30.624732, 25.500546 to -30.48534, 25.58875.

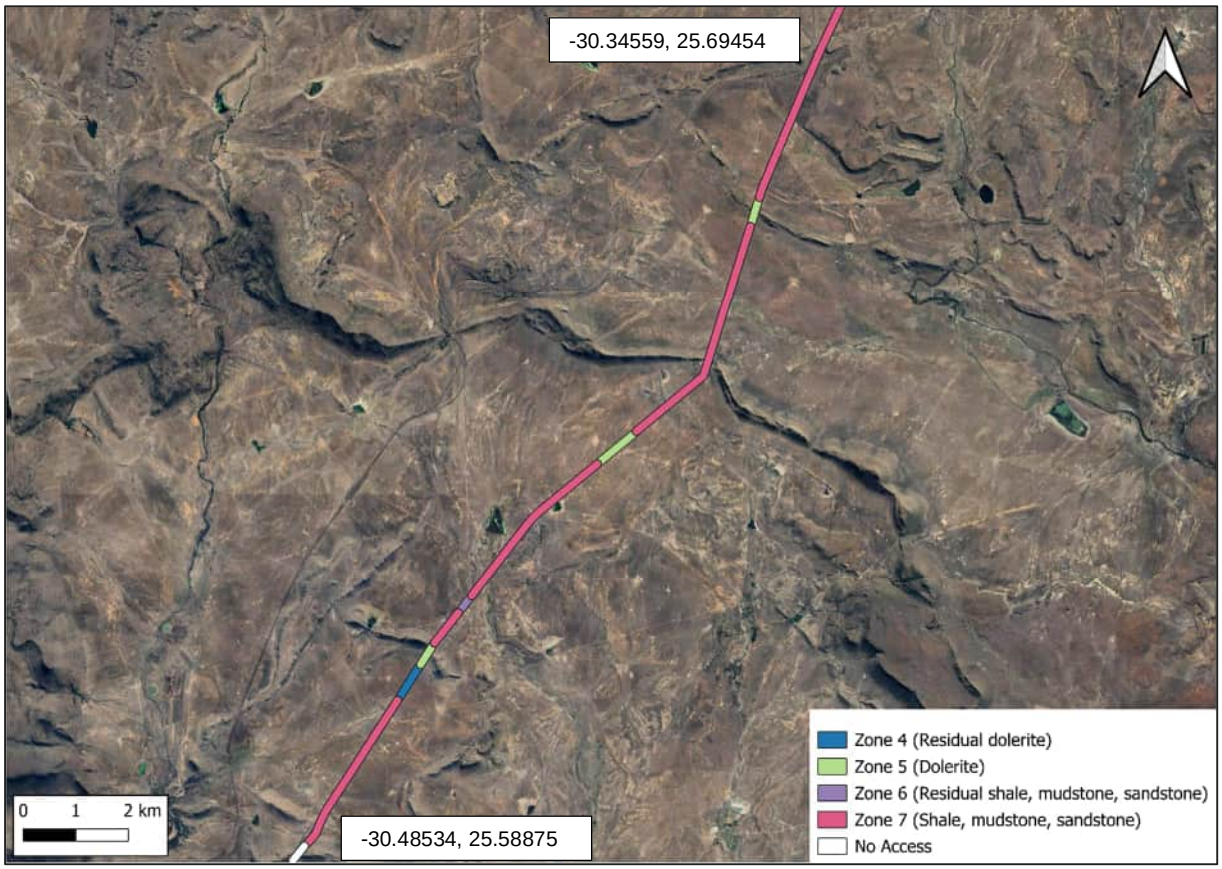


Figure 5-2: Map showing zoning along pipeline route from -30.48534, 25.58875 to -30.34559, 25.69454

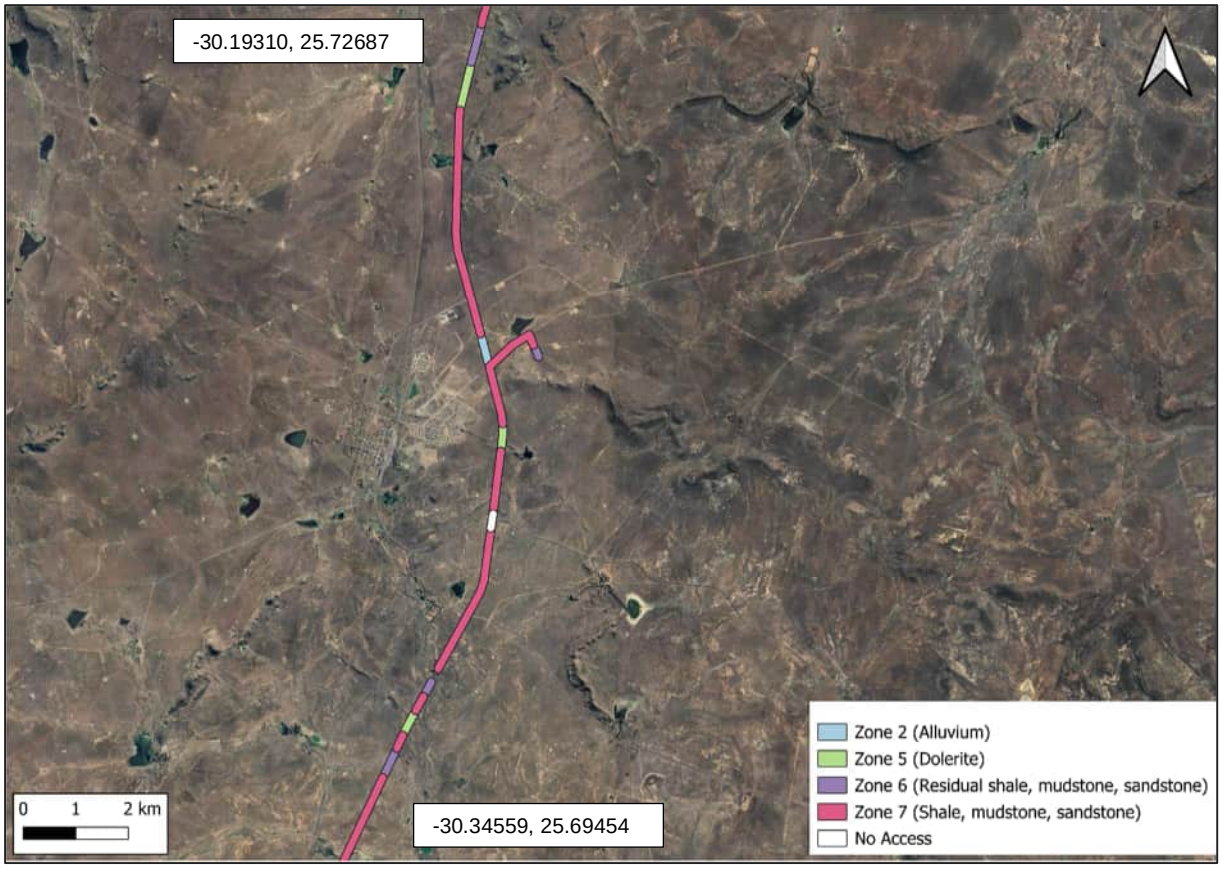


Figure 5-3: Map showing zoning along pipeline route from -30.34559, 25.69454 to -30.19310, 25.72687

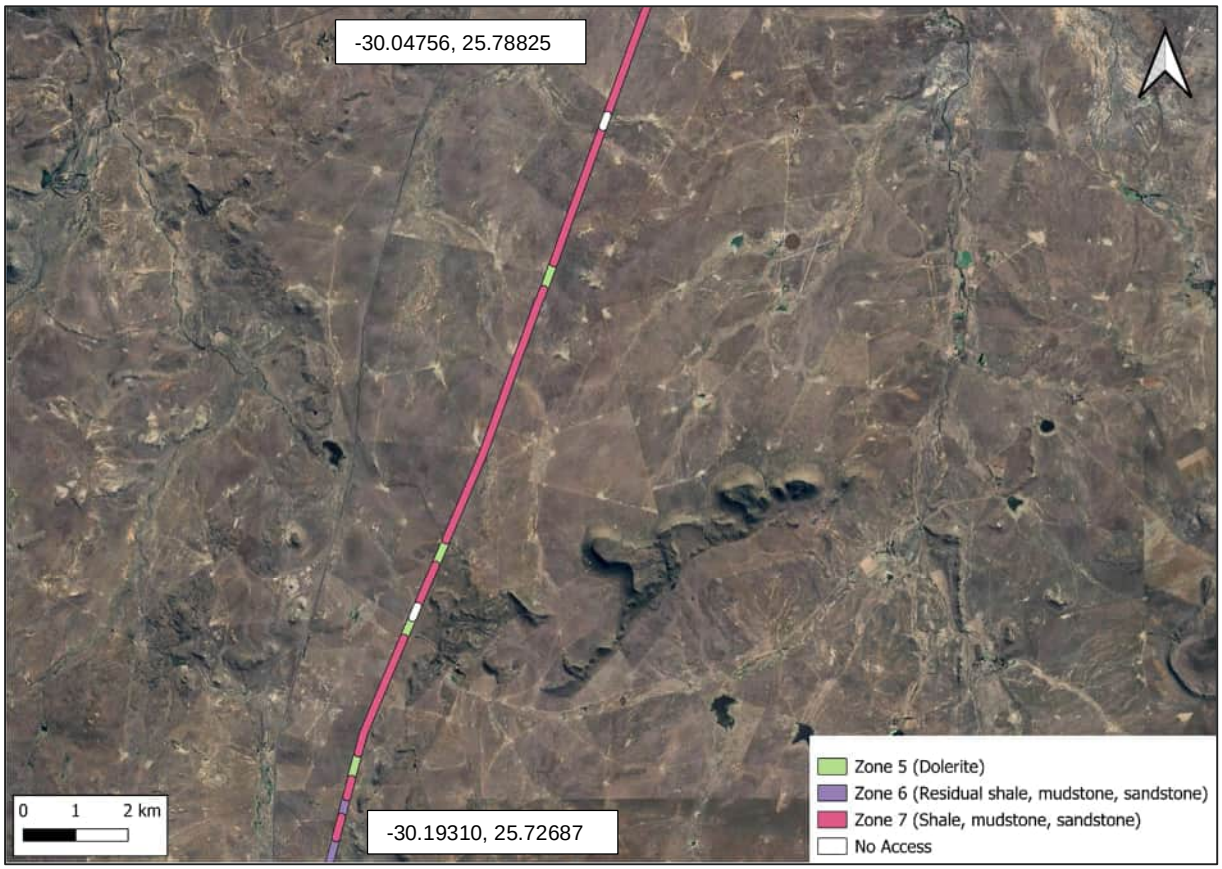


Figure 5-4: Map showing zoning along pipeline route from -30.19310, 25.72687 to -30.04756, 25.78825

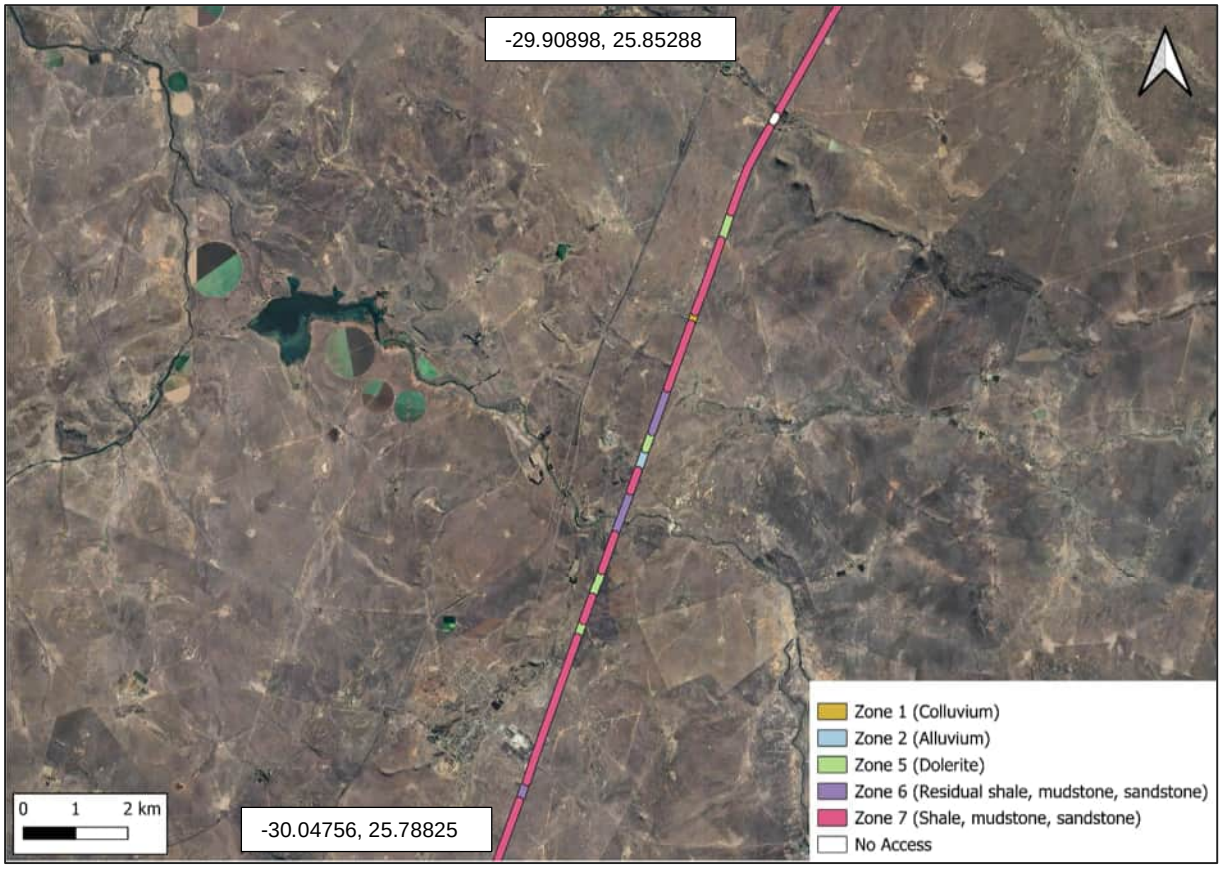


Figure 5-5: Map showing zoning along pipeline route from -30.04756, 25.78825 to -29.90898, 25.85288

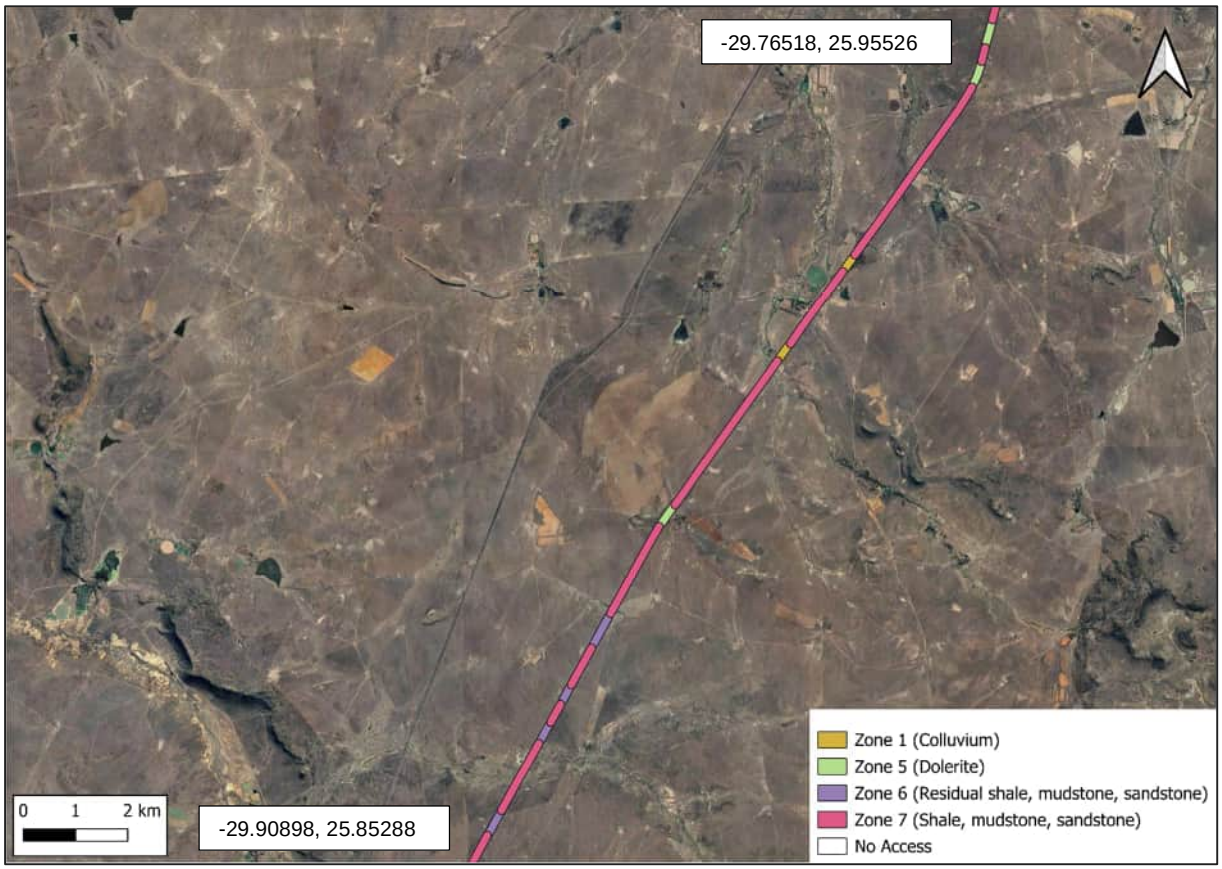


Figure 5-6: Map showing zoning along pipeline route from -29.90898, 25.85288 to -29.76518, 25.95526

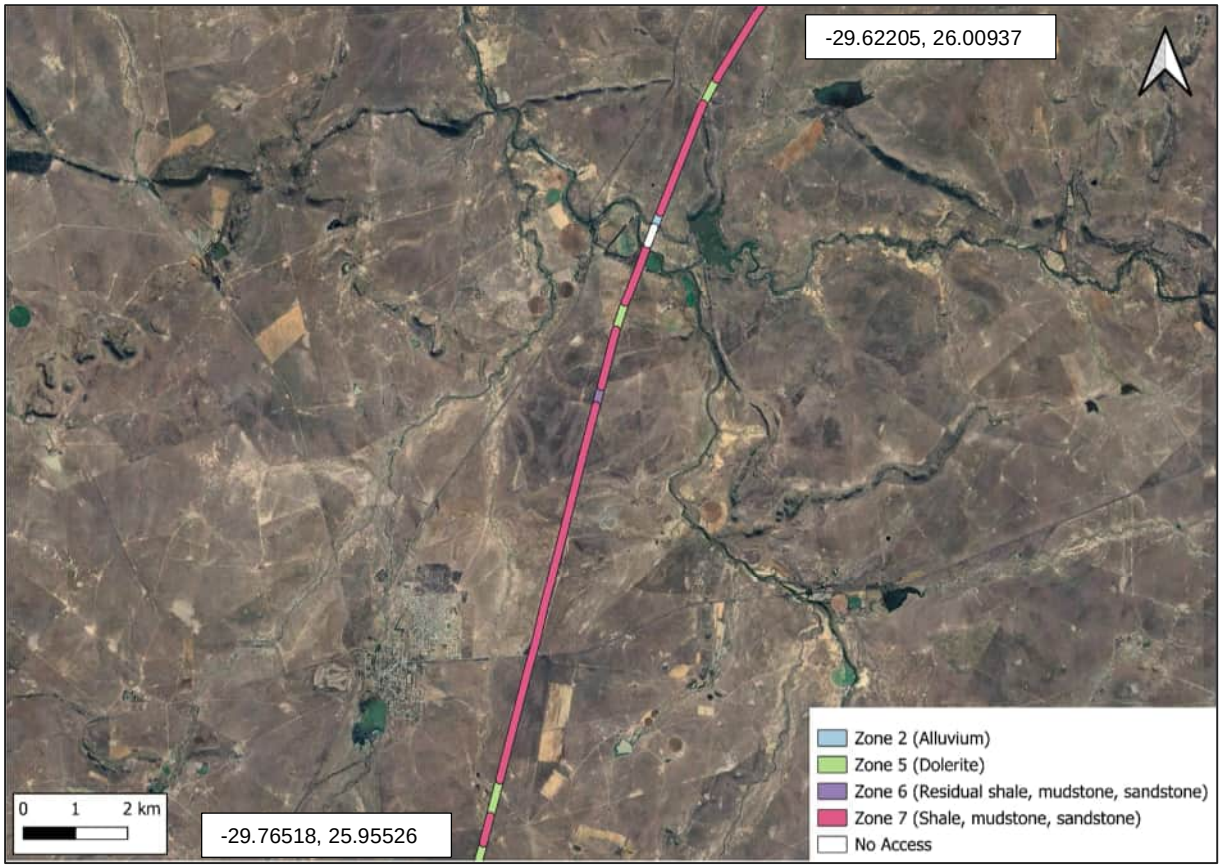


Figure 5-7: Map showing zoning along pipeline route from -29.76518, 25.95526 to -29.62205, 26.00937

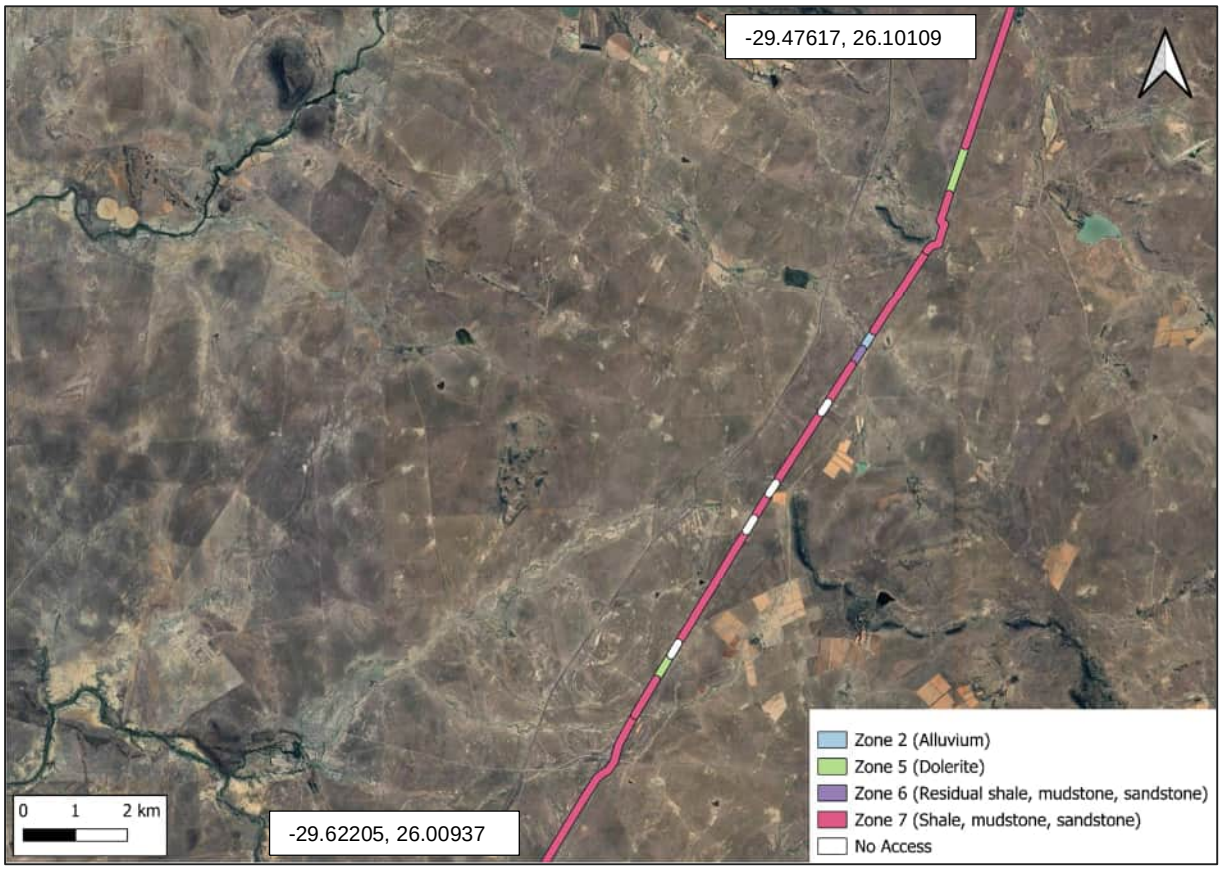


Figure 5-8: Map showing zoning along pipeline route from -29.62205, 26.00937 to -29.47617, 26.10109

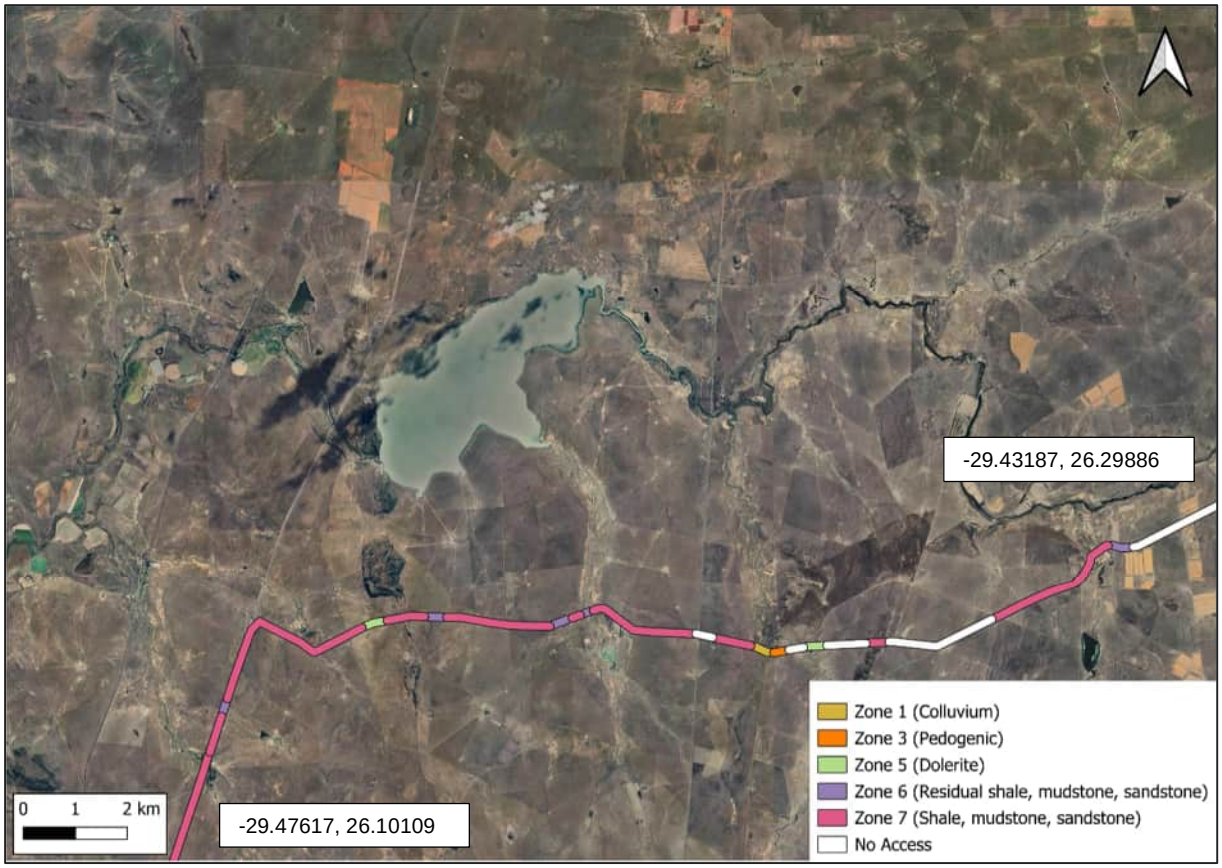


Figure 5-9: Map showing zoning along pipeline route from -29.47617, 26.10109 to -29.43187, 26.29886

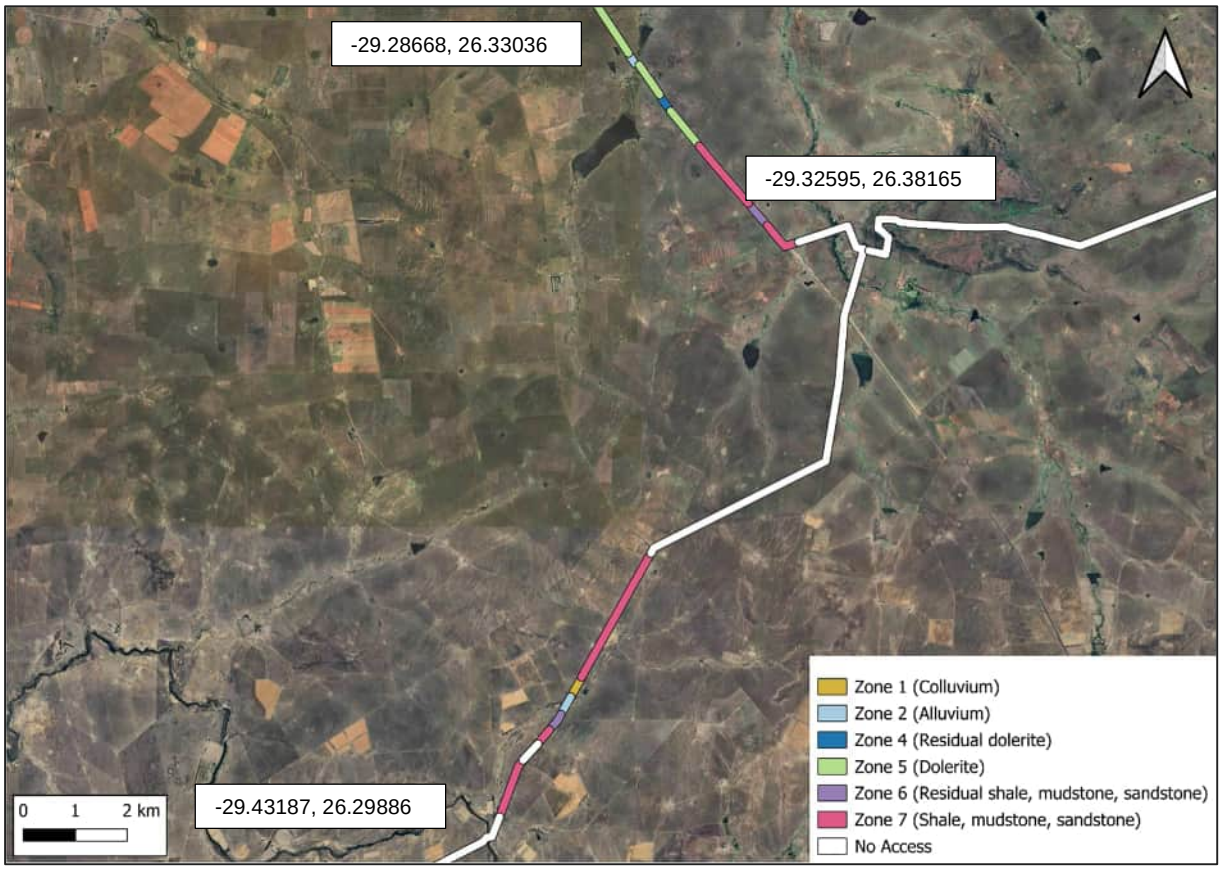


Figure 5-10: Map showing zoning along pipeline route from -29.43187, 26.29886 to -29.28668, 26.33036

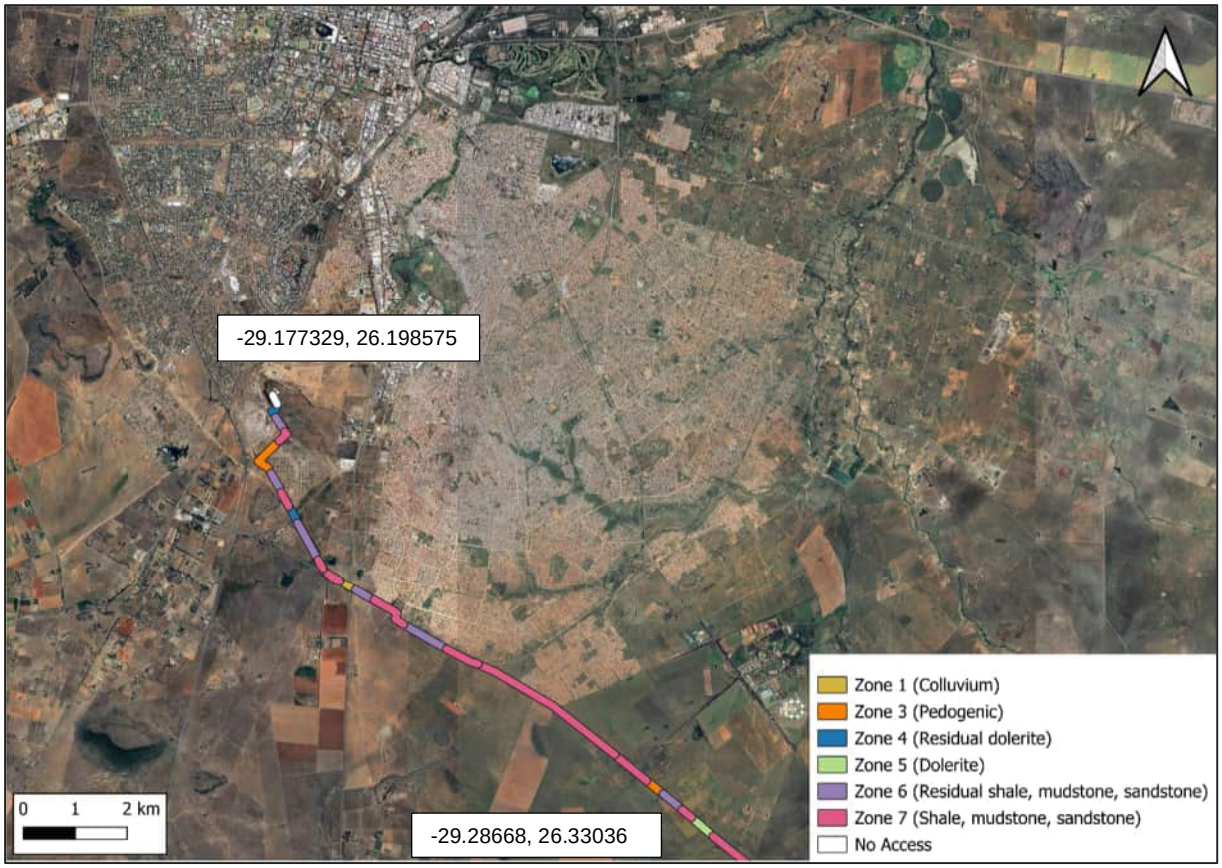


Figure 5-11: Map showing zoning along pipeline route from -29.28668, 26.33036 to -29.177329, 26.198575

6 Geotechnical Evaluation

A geotechnical investigation was conducted across the Xhariep pipeline and its respective structures to determine and assess the nature of existing ground conditions for the development of the proposed Xhariep infrastructure. The following geotechnical considerations may be noted in this regard.

6.1 Excavatability

In accordance with SANS 1200 D (1988), earthworks specification, “Soft to Intermediate” excavation would only be applicable up to the depths reached during this investigation where a TLB equipped with a rock bucket was used for excavations. Beyond these depths, “Hard Rock” excavation will be required. This may be broken down into the following:

- Fill, colluvium and alluvium (noted within the depth range from surface - 3.2 m) - “Soft Excavation”.
- Pedogenic material, residual material of mudstone, sandstone, shale, dolerite (noted from as shallow as 0.1 m and extending to >3.0 m) - “Intermediate Excavation”.
- Bedrock comprising all rock types (noted with varying starting depths from surface - 3.2 m) - “Hard Rock Excavation”.

6.1.1 Pipeline trenches

With the pipe invert level between 3.0 - 4.5 m below surface, most of the pipeline will be situated within bedrock (hard excavation). There are however local zones, along approximately 7% of the proposed alignment, with a thick soil cover that is generally related to the wetlands, rivers and streams. Zones with “soft to intermediate” excavation are indicated on Table 6-1 and the figures below.

Table 6-1: Table showing Start and end positions and associated test positions for excavatability zones along the pipeline route

Start co-ordinate		End co-ordinate		Approximate length (m)	Associated TPs	Associated BHs	DPSH Tests
Latitude	Longitude	Latitude	Longitude				
Bedrock within 3.0 m							
-30.627116°	25.489205°	-30.324633°	25.705541°	42610	TP01 - TP111	BH03 - BH05, BH07, BH09 - BH11	1 - 30, 35, 39, 44, 49, 56, 60, 63, 65, 660 - 661, D1 - D4, BH3 - BH5
-30.315079°	25.710796°	-30.305158°	25.716932°	1230	TP116 - TP118		
-30.304890°	25.717111°	-30.248369°	25.726948°	6570	TP119 - TP135, TP662	BH13 - BH14	126, 134
-30.247931°	25.726807°	-30.195070°	25.725842°	5970	TP139 - TP154	BH17 - BH19	145, 149, 150, 155
-30.194811°	25.725920°	-30.184513°	25.729032°	1180	TP156 - TP157		
-30.184250°	25.729110°	-30.114710°	25.760927°	8300	TP159 - TP177, TP663, TP674		160, 164, 166
-30.113612°	25.761384°	-30.043077°	25.791235°	8330	TP179 - TP199		191
-30.042876°	25.791310°	-29.996407°	25.810553°	5475	TP201 - TP214, TP663	BH21	206
-29.973637°	25.820053°	-29.904488°	25.855971°	8455	TP221 - TP243, TP664	BH23	227
-29.868688°	25.878944°	-29.826245°	25.911087°	5645	TP256 - TP270	BH25, BH26	
-29.819091°	25.917034°	-29.808083°	25.926117°	1500	TP273 - TP276, TP665		276, 665

Start co-ordinate		End co-ordinate		Approximate length (m)	Associated TPs	Associated BHs	DPSH Tests
Latitude	Longitude	Latitude	Longitude				
-29.806974°	25.927054°	-29.696482°	25.975582°	13290	TP278 - TP313	BH27, BH28, BH29,	278, 284, 307, 311
-29.688052°	25.978082°	-29.665217°	25.986383°	2650	TP317 - TP322		
-29.659185°	25.989092°	-29.536703°	26.070362°	15765	P326 - TP364, TP669, TP675	BH32 - BH33	329, 344, 358
-29.530121°	26.075302°	-29.474598°	26.101646°	6830	P368 - TP384, P656, TP658 - TP659		372
-29.474275°	26.101771°	-29.465623°	26.105064°	1000	TP385 - TP386		
-29.465319°	26.105183°	-29.449495°	26.146610°	5470	TP388 - TP401		390
-29.449522°	26.147827°	-29.450945°	26.170489°	2205	TP403 - TP407		
-29.448113°	26.179783°	-29.450148°	26.183902°	460	TP412		
-29.452110°	26.189646°	-29.452443°	26.196926°	705	TP415		
-29.452440°	26.197641°	-29.453929°	26.206985°	925	TP417 - TP418	BH38	
-29.454740°	26.220291°	-29.437912°	26.278789°	6320	TP423 - TP437		433
-29.437524°	26.283083°	-29.405555°	26.322270°	5530	TP440 - TP452	BH41	448, 452
-29.401347°	26.324939°	-29.377798°	26.340069°	3000	TP455 - TP461		456
-29.325272°	26.366643°	-29.320125°	26.361049°	780	TP486 - TP487	BH47	
-29.319657°	26.360579°	-29.311855°	26.352854°	1150	TP489 - TP490		
29.311332°	26.352286°	-29.272780°	26.313713°	5730	TP492 - TP505		498
-29.272244°	26.312900°	-29.268120°	26.306710°	740	TP507		
-29.260549°	26.295659°	-29.254957°	26.287472°	1005	TP512 - TP513		
-29.254562°	26.286923°	-29.247845°	26.277943°	1210	TP515 - TP516		
-29.247511°	26.277485°	-29.241249°	26.268456°	1180	TP518 - TP519		
-29.235864°	26.260747°	-29.232145°	26.255379°	660	TP523		
-29.231853°	26.254933°	-29.228603°	26.248729°	700	TP525		
-29.226269°	26.244264°	-29.220678°	26.231179°	1430	TP528 - TP530		
-29.211393°	26.215354°	-29.207304°	26.208517°	815	TP538 - TP540	BH48	
-29.198482°	26.203019°	-29.190299°	26.197952°	1030	TP544 - TP546		
-29.188909°	26.196127°	-29.184431°	26.201367°	710	TP549		
-29.184212°	26.201394°	-29.177430°	26.199059°	910	TP551 - TP554		
Bedrock between 3 - 4 m							
-30.324633°	25.705541°	-30.315079°	25.710796°	1185	TP112 - TP115	BH12	
-30.195070°	25.725842°	-30.194811°	25.725920°	30	TP155		155
-30.184513°	25.729032°	-30.184250°	25.729110°	30	TP158		158

Start co-ordinate		End co-ordinate		Approximate length (m)	Associated TPs	Associated BHs	DPSH Tests
Latitude	Longitude	Latitude	Longitude				
-30.114710°	25.760927°	-30.113612°	25.761384°	130	TP178		178
-30.043077°	25.791235°	-30.042876°	25.791310°	25	TP200		200
-29.996407°	25.810553°	-29.973637°	25.820053°	2695	TP214 - TP220	BH22	218, 220
-29.904488°	25.855971°	-29.868688°	25.878944°	4510	TP244 - TP255	BH24	244, 247, 249, 251, 254
-29.826245°	25.911087°	-29.819091°	25.917034°	980	TP271 - TP272		271
-29.808083°	25.926117°	-29.806974°	25.927054°	150	TP277		
-29.696482°	25.975582°	-29.688052°	25.978082°	955	TP314 - TP316		314, 316
-29.536703°	26.070362°	-29.530121°	26.075302°	870	TP365 - TP367	BH34	365 - 367
-29.465623°	26.105064°	-29.465319°	26.105183°	35	TP387		
-29.449495°	26.146610°	-29.449522°	26.147827°	120	TP402		402
-29.450945°	26.170489°	-29.448113°	26.179783°	950	TP408 - TP411		408
-29.450148°	26.183902°	-29.452110°	26.189646°	625	TP413 - TP414		
-29.452443°	26.196926°	-29.452440°	26.197641°	65	TP416		416
-29.453929°	26.206985°	-29.454702°	26.210785°	375	TP419		
-29.455301°	26.212243°	-29.454740°	26.220291°	805	TP421 - TP422	BH39	
-29.437912°	26.278789°	-29.437524°	26.283083°	440	TP438 - TP439	BH40	439
-29.405555°	26.322270°	-29.401347°	26.324939°	529	TP453 - TP454	BH42	
-29.320125°	26.361049°	-29.319657°	26.360579°	60	TP488		
-29.311855°	26.352854°	29.311332°	26.352286°	70	TP491		491
-29.272780°	26.313713°	-29.272244°	26.312900°	100	TP506		506
-29.268120°	26.306710°	-29.260549°	26.295659°	1365	TP508 - TP511		508, 511
-29.254957°	26.287472°	-29.254562°	26.286923°	65	TP514		514
-29.247845°	26.277943°	-29.247511°	26.277485°	60	TP517		517
-29.241249°	26.268456°	-29.235864°	26.260747°	960	TP520 - TP522		521
-29.232145°	26.255379°	-29.231853°	26.254933°	55	TP524		524
-29.228603°	26.248729°	-29.226269°	26.244264°	505	TP526 - TP527		527
-29.220678°	26.231179°	-29.211393°	26.215354°	1950	TP531 - TP537	BH20	531, 537
-29.207304°	26.208517°	-29.204241°	26.206561°	385	TP541		
-29.203465°	26.206094°	-29.198482°	26.203019°	630	TP543	BH31	
-29.190299°	26.197952°	-29.188909°	26.196127°	270	TP547 - TP548		547
-29.184431°	26.201367°	-29.184212°	26.201394°	30	TP550		550
Bedrock deeper than 4 m							

Start co-ordinate		End co-ordinate		Approximate length (m)	Associated TPs	Associated BHs	DPSH Tests
Latitude	Longitude	Latitude	Longitude				
-30.305158°	25.716932°	-30.304890°	25.717111°	35		BH6	
-30.248369°	25.726948°	-30.247931°	25.726807°	50	TP138		138
-29.665217°	25.986383°	-29.659185°	25.989092°	720	TP323 - TP325, TP668	BH30	668
-29.474598°	26.101646°	-29.474275°	26.101771°	35		BH37	
-29.454702°	26.210785°	-29.455301°	26.212243°	160	TP420		420
-29.267916°	26.615595°	-29.268027°	26.616231°	60		BH54	
-29.204241°	26.206561°	-29.203465°	26.206094°	95	TP542		542

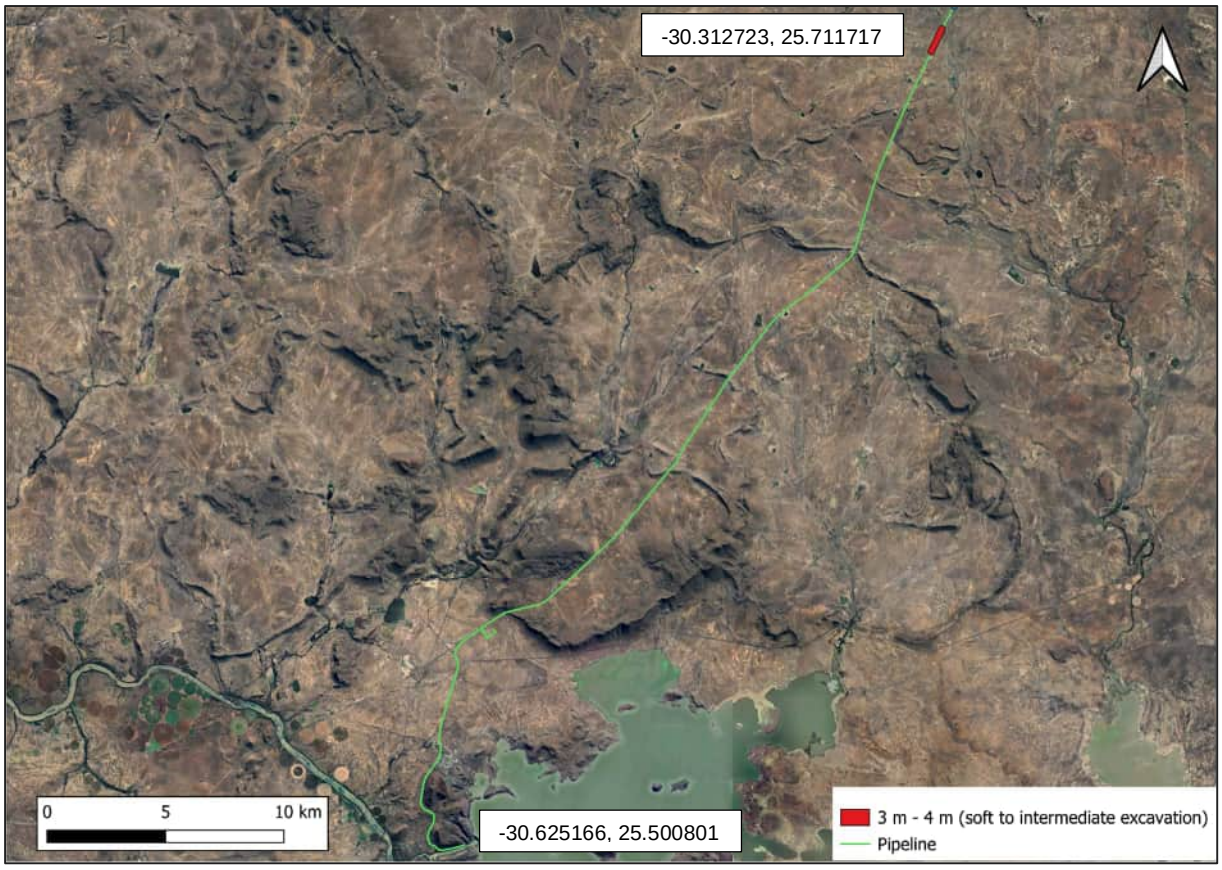


Figure 6-1: **Map showing soft to intermediate excavation at depths from 3 m – 4 m from -30.625166, 25.500801 to -30.312723, 25.711717**

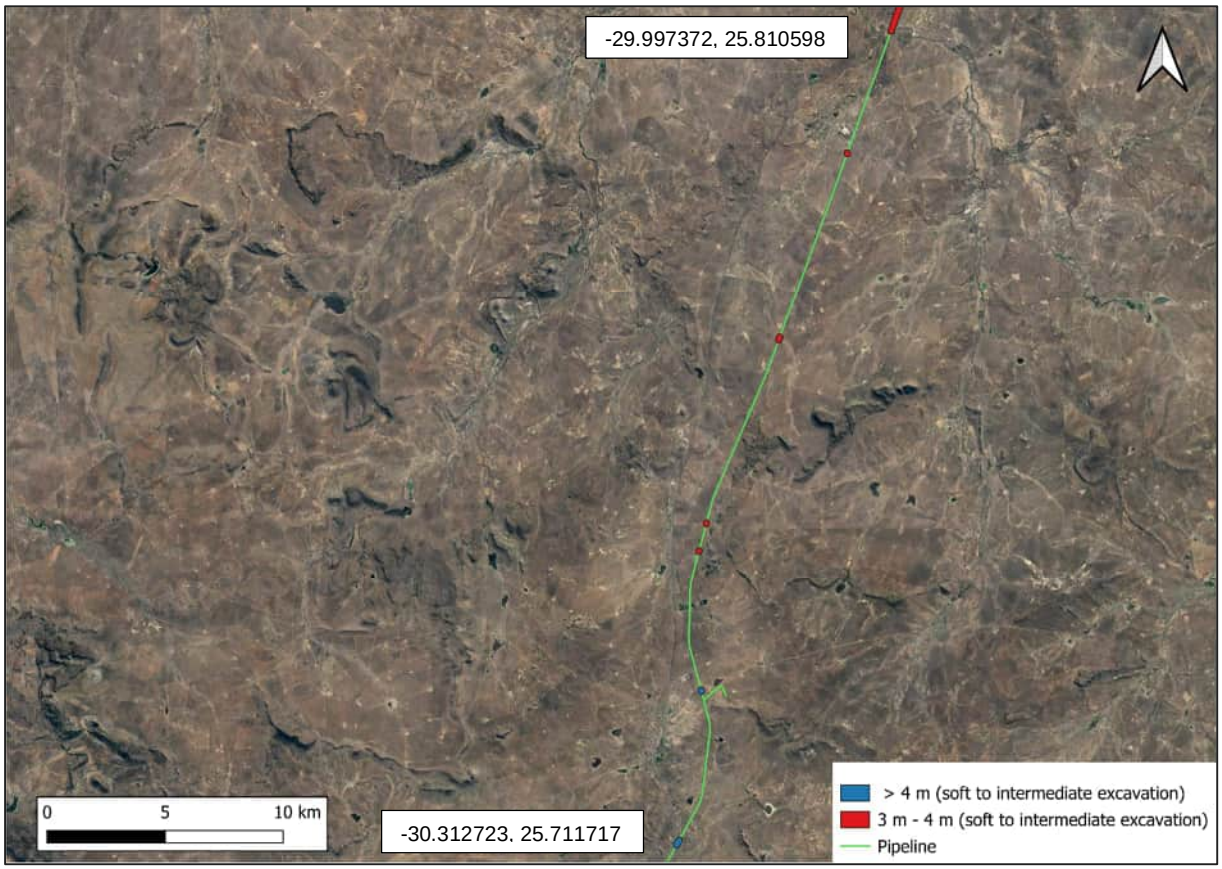


Figure 6-2: **Map showing soft to intermediate excavation at depths from 3 m – 4 m and greater than 4 m from -30.312723, 25.711717 to -29.997372, 25.810598**

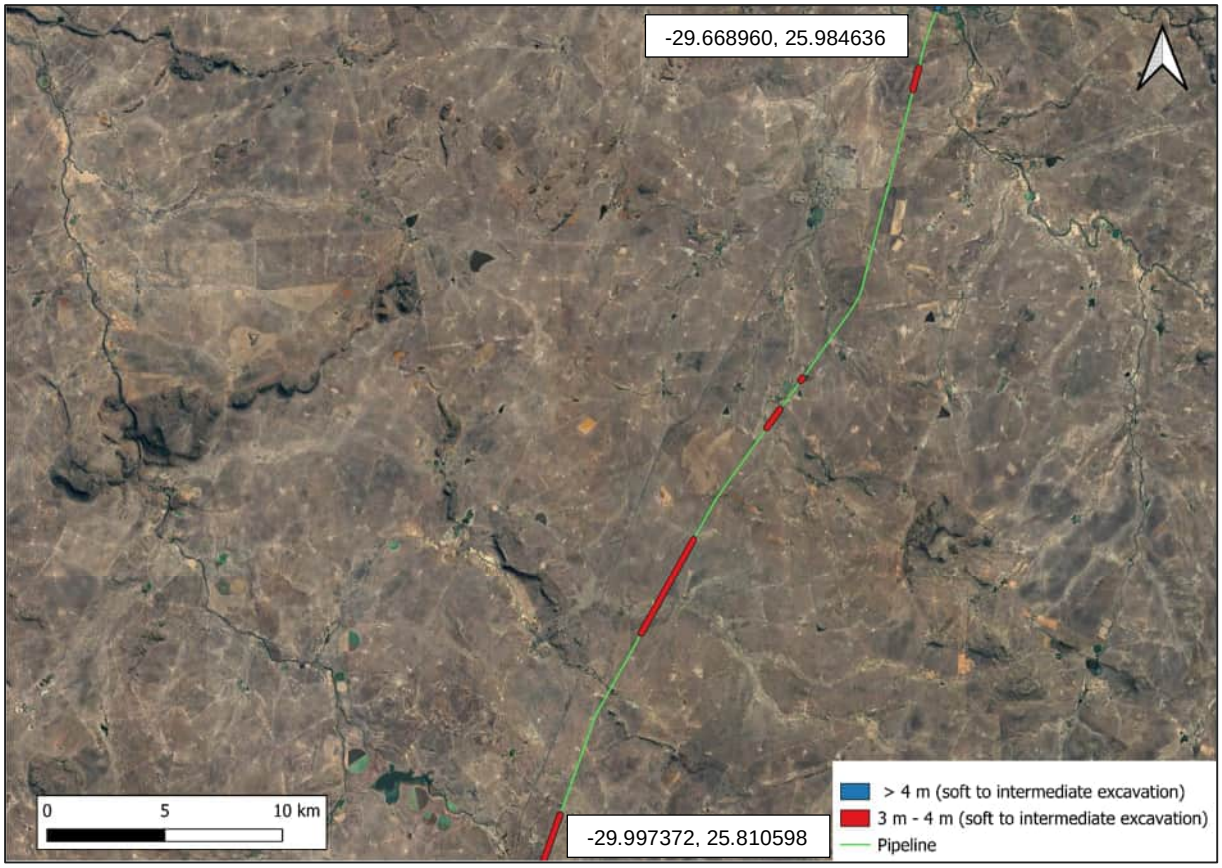


Figure 6-3: **Map showing soft to intermediate excavation at depths from 3 m – 4 m and greater than 4 m from -29.997372, 25.810598 to -29.668960, 25.984636**

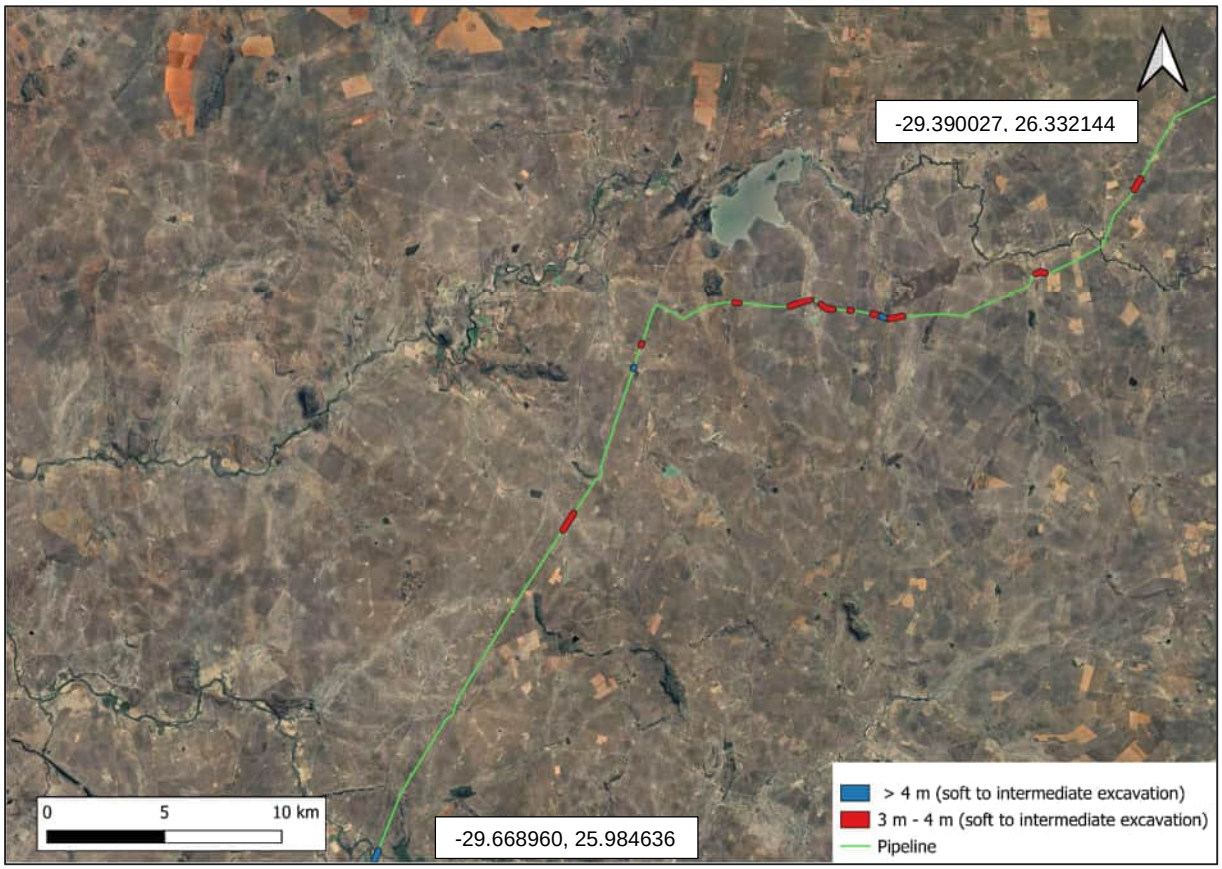


Figure 6-4: **Map showing soft to intermediate excavation at depths from 3 m – 4 m and greater than 4 m from -29.668960, 25.984636 to -29.390027, 26.332144**

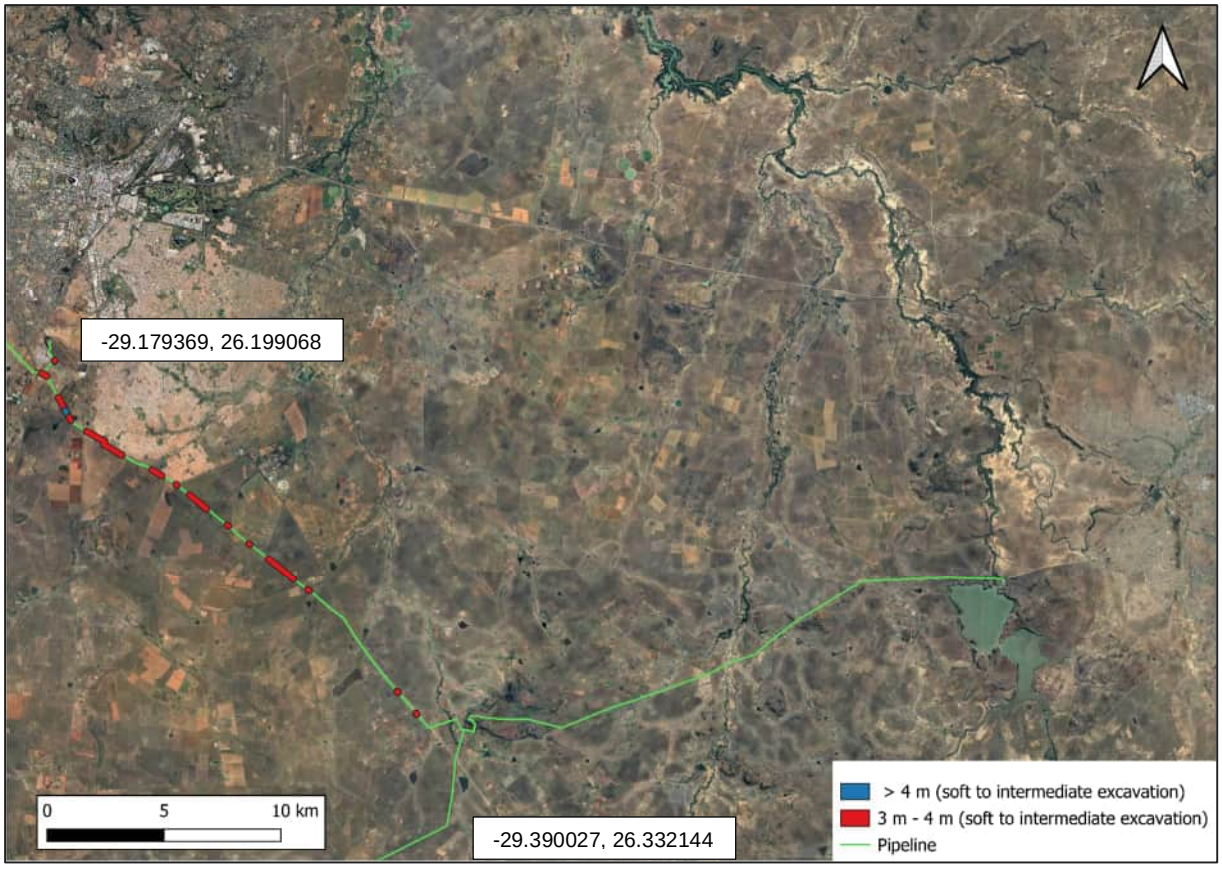


Figure 6-5: **Map showing soft to intermediate excavation at depths from 3 m – 4 m and greater than 4 m from -29.390027, 26.332144 to -29.179369, 26.199068**

The excavatability at each of the proposed structures is discussed below:

6.1.2 Raw Water Pump Station

The area is underlain by shallow bedrock from surface to a depth of 1.1 m. Most of the area is underlain by mudstone, with “soft to intermediate excavation” to 0.8 m that is covered by a hard rock dolerite sill towards the north-west, with “hard excavation” from surface.

6.1.3 WTP and High-Lift Pump Station

The area is underlain by shallow bedrock from 0.1 to 2.0 m below surface. Most of the area is underlain by mudstone, with “soft to intermediate” excavation to 0.5 m that is locally deeper along the southeastern boundary. A thin dolerite dyke intrusion traverses the site, with “hard excavation” to be encountered from 0.2 m.

6.1.4 Command Reservoir No 1

The site is underlain by interbedded sandstone and mudstone with “soft to intermediate” excavation from 1.3 m, with the competent bedrock becoming deeper towards the south (to 2.5 m). A local hard rock dolerite sill was intersected in one of the boreholes within the central eastern portion of the site, with “hard” excavation from 1.2 m.

6.1.5 Booster Pump Station and Suction Reservoir

The area is underlain by shallow interbedded mudstone and sandstone bedrock from 0.2 m to 0.5 m below surface. “Soft to intermediate” excavation is anticipated to 0.3 m. Beyond 0.3 m, intermediate to hard excavation is anticipated.

6.2 Groundwater and Site Drainage

Groundwater was encountered during test pitting ranging between 0.5 m to 3.8, and 0.20 m and 7.90 m in the drilled boreholes. In addition, the varying degrees of pedogenesis illustrate the seasonal fluctuation of groundwater level over time. The possibility of intersecting groundwater during construction cannot be ruled out.

6.3 Excavation Stability

No sidewall collapse was encountered within the test pits and based on this assessment excavations are considered stable. Should deep excavations be required (beyond 3.0 m), shoring or battering of excavation faces must be considered to ensure safety, which will need to be assessed by a geo-professional. It is recommended that the excavated face be inspected by a competent engineering geologist or geotechnical engineer to confirm the stability of excavations.

6.4 Suitability of material for construction

Samples taken were from test pits to determine the material quality to be considered for use during construction. The results showed that the excavated material over the area generally classifies as G9 – >G9 according to COLTO specifications and is not suitable for use as bedding or engineered fill. Locally some of the colluvium, residual dolerite and residual sandstone tested as G7 - G6, that could be suitable as engineered fill. The residual soil also generally classifies as SM, with a PI less than 15 that could be suitable as selected fill blanket. However, it should be noted that the test results are variable, and not all of the samples passed the required specifications. Good quality control would thus be required should this material be considered.

Based on the geological maps of the study area and the findings of the geotechnical investigation, no feasible locations for borrow pits, which could yield suitable material for use as pipe bedding, could be

identified. Enquiries have also been made with consultants and contractors that were involved on construction projects in the study area over the past decade to determine whether they used material from commercial sources or from borrow pits. All of them indicated that they used material imported from commercial sources.

6.5 Corrosivity

The results of the in-situ resistivity tests, the chemical pH tests and conductivity tests show that the soil and weathered rock ranges from corrosiveness to extremely corrosive towards steel. Utilization of protection measures, such as coatings, casings, cathodic protection, or increased steel thickness should be considered in the detailed design phase of the project.

6.6 Seismicity

The ground type, in accordance with Table 1 in SANS 10160-4:2017 along most of the pipeline route alignment and at each of the proposed structures classify as Ground type 1, with local zones along the pipeline that classify as Ground type 3 to Ground type 4. The zones that do not classify as Ground type 1 is summarised in Table 6-2 below.

Table 6-2: Areas along the pipeline route that classify as ground type 3 to 4 (after SANS 10160-4:2017)

Start co-ordinate		End co-ordinate		Approximate length (m)	Site description
Latitude	Longitude	Latitude	Longitude		
-30.305158°	25.716932°	-30.304890°	25.717111°	35	River floodplain
-30.248369°	25.726948°	-30.247931°	25.726807°	50	Wetland
-29.665217°	25.986383°	-29.659185°	25.989092°	720	River floodplain
-29.474598°	26.101646°	-29.474275°	26.101771°	35	River floodplain
-29.454702°	26.210785°	-29.455301°	26.212243°	160	Wetland
-29.267916°	26.615595°	-29.268027°	26.616231°	60	River floodplain
-29.204241°	26.206561°	-29.203465°	26.206094°	95	Wetland

6.7 Potential Problems Soils

The hardpan calcrete which was encountered in Zone 6 and Zone 7 was classified as intermediate excavations, however, there are potential issues that may be linked to this material. The material, in general, is a form of pedogenic material that has likely developed through the influence of water. Therefore, as in the case of typical pedogenic materials, there may be a degree of variability noted across this horizon in terms of thickness, consistency (softer or variably compressible zones present) or potentially the lateral extent of the horizon altogether. In addition, there is always a high possibility that a competent pedogenic layer overlies less competent soils.

While the investigation conducted has indicated that this horizon does cover majority of the lateral extent of the two zones, variability in terms of thickness and consistency were noted. Many of the test pits encountered refusal on this strongly cemented horizon but in some cases, it was possible to break through.

6.8 Founding Considerations

The foundation considerations for the various structures are summarised in Table 6-3 to Table 6-6. It should be noted the recommended allowable bearing pressures are included to guide the conceptional design. Geotechnical design, with verification of these estimates, and associated settlement calculations will need to be included at detailed design phase.

Table 6-3: Foundation considerations for Raw Water Pump Station

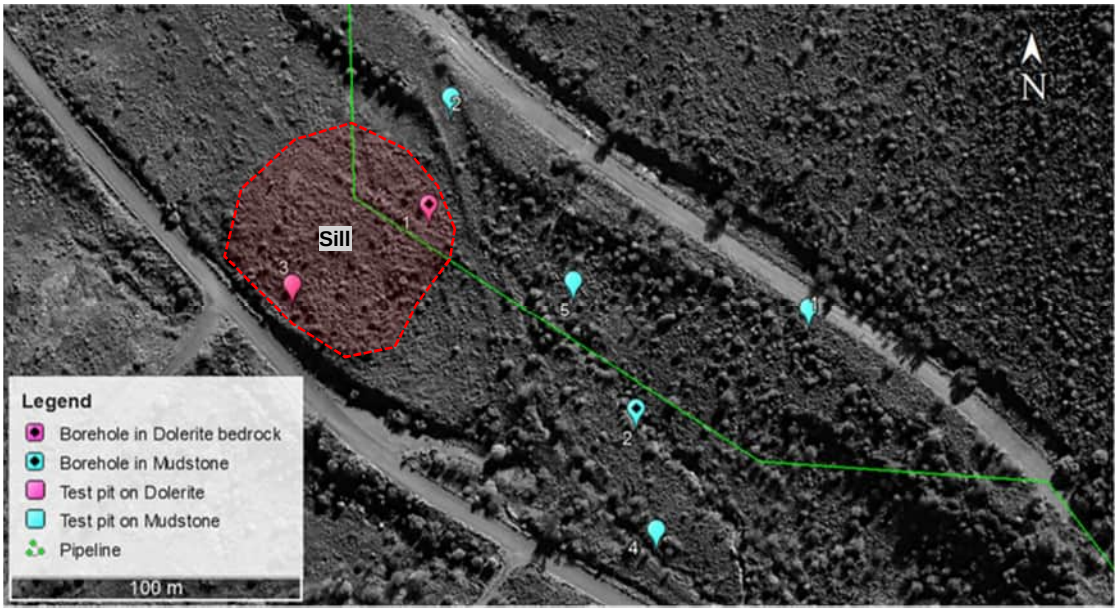
Raw Water Pump Station	
	
Investigation	5 No. test pits, 2 No. boreholes
Ground Condition	The area is underlain by shallow bedrock from surface to a depth of 1.1 m. Most of the area is underlain by mudstone that is covered by a hard rock dolerite sill towards the north-west. Groundwater was encountered from 2.3 m.
Geotechnical evaluation	“Soft to intermediate” excavation to 0.8 m over most of the site, becoming “hard” thereafter, with “hard excavation” from surface over the dolerite sill. An evaluation of seismicity found that the site classifies as ground type 1 (after SANS 10160-4:2017).
Foundation Consideration	Foundations should be placed at a depth of 1 m on bedrock, with an allowable bearing pressure (ABP) of 400 kPa. Allowance for local blasting should be made for the dolerite sill.

Table 6-4: Foundation considerations for the WTP and High-Lift Pump Station

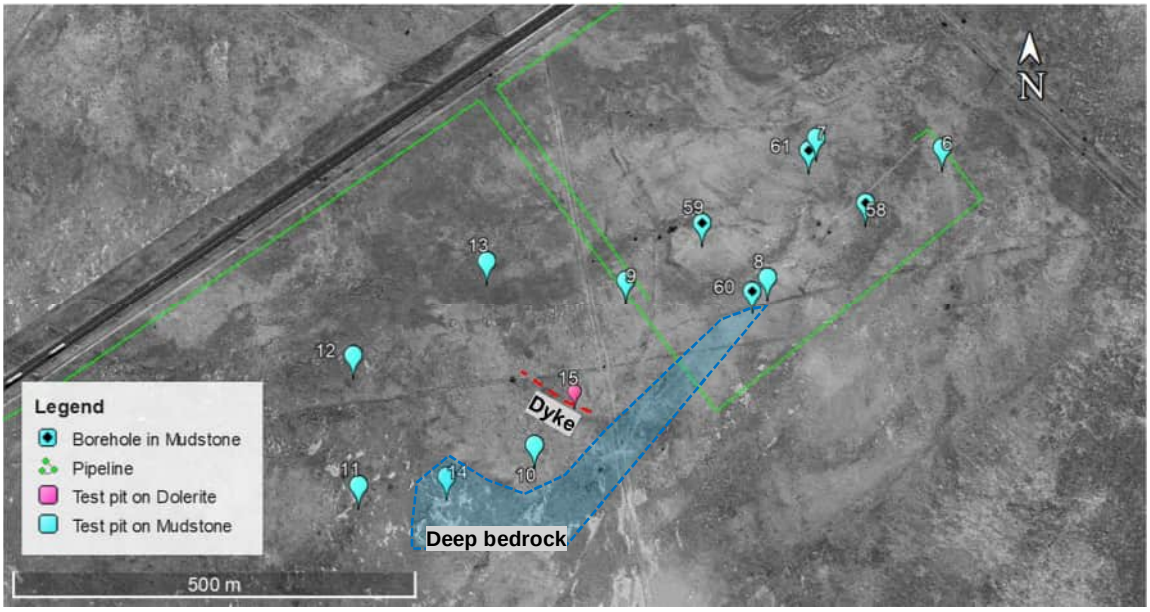
WTP and High-Lift Pump Station	
	
Investigation	10 No. test pits, 4 No. boreholes
Ground Condition	The area is underlain by shallow bedrock from 0.1 to 2.0 m below surface. Bedrock levels is generally within 0.5 m below surface but is locally deeper along the southeastern boundary (indicated on the figure above). Most of the area is underlain by mudstone, with a thin dolerite dyke intrusion that traverses the site. The groundwater table is variable between 1.6 – 5.7 m.
Geotechnical evaluation	"Soft to intermediate" excavation to 0.5 m, with "hard" excavation below, over most of the site. However, "hard" excavation is anticipated from 0.2 m over the dolerite sill. An evaluation of seismicity found that the site classifies as ground type 1 (after SANS 10160-4:2017).
Foundation Consideration	Foundations should be placed at a depth of 1.1 m on bedrock, with an allowable bearing pressure (ABP) of 400 kPa. Should the foundation footprint extend over the weathered zone (where bedrock is typically deeper), the foundation should be undercut to 1 m below foundation level or bedrock (whichever is the shallowest) and replaced with a G6 material, or better that is compacted to 95% MODAASHTO at +- 2% optimum moisture content in 300mm thick layers. The ABP should be limited to 200 kPa. Allowance should also be made for dewatering of excavations, especially after periods of heavy and / or continuous rain. local blasting should may be required at the dolerite dyke.

Table 6-5: Foundation considerations for Command Reservoir No 1

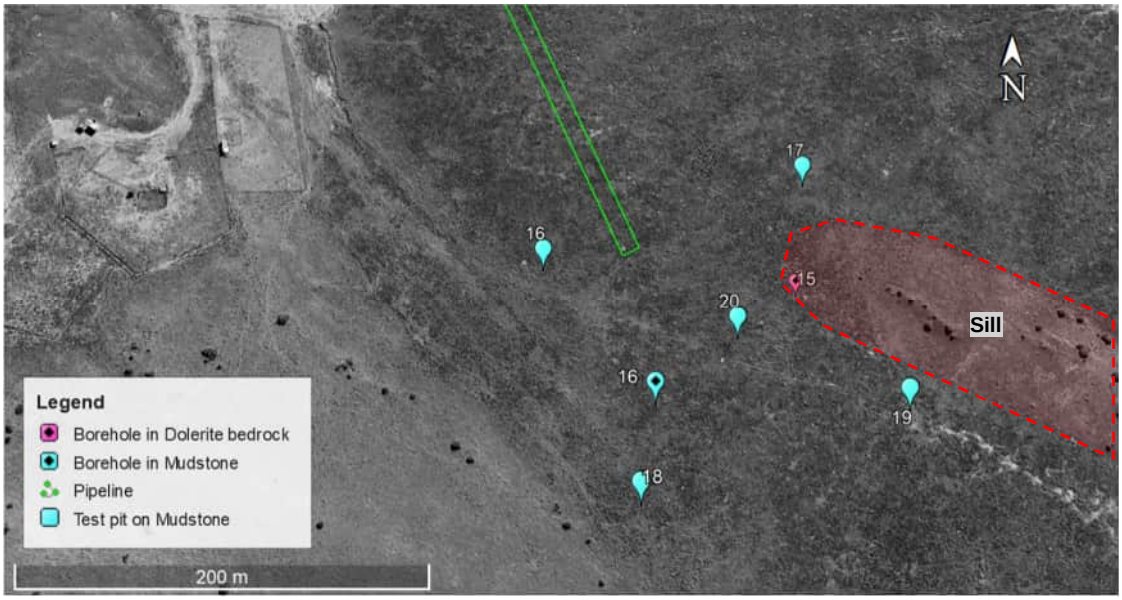
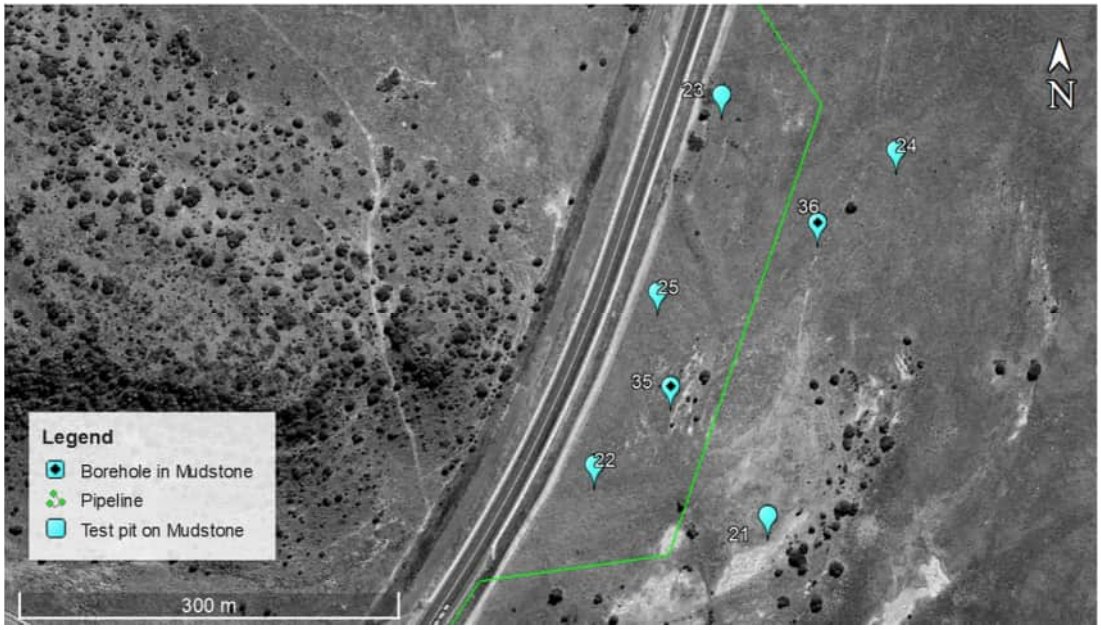
Command Reservoir No 1	
	
Investigation	5 No. test pits, 2 No. boreholes
Ground Condition	The site is underlain by interbedded sandstone and mudstone with the competent bedrock between 1.3 m becoming deeper towards the south (to 2.5 m). A local hard rock dolerite sill was intersected in one of the test pits within the central eastern portion of the site, with bedrock from 1.2 m. Groundwater is generally anticipated from 3.8 m.
Geotechnical evaluation	The foundation should extend through the colluvium and placed on a combination of bedrock and dense residual sandstone. Allowance for hard rock excavation should be made where an excavation deeper than 1.2 m is required. An evaluation of seismicity found that the site classifies as ground type 1 (after SANS 10160-4:2017).
Foundation Consideration	The foundation should extend through the colluvium and placed at a depth of 1.3 m on a combination of bedrock and dense residual sandstone, with an allowable bearing pressure of 200 kPa. Allowance for local hard rock excavation should be made for the dolerite intrusion.

Table 6-6: Foundation considerations for the Booster Pump Station and Suction Reservoir

Booster Pump Station and Suction Reservoir	
	
Investigation	5 No. test pits, 2 No. boreholes
Ground Condition	The area is underlain by shallow interbedded mudstone and sandstone bedrock from 0.2 m to 0.5 m below surface. Groundwater is anticipated at 1.20 to 5.90 m.
Geotechnical evaluation	“Soft to intermediate” excavation to 0.5 m. Beyond 0.5 m, intermediate to hard excavation is anticipated. An evaluation of seismicity found that the site classifies as ground type 1 (after SANS 10160-4:2017).
Foundation Consideration	Foundations should be placed at a depth of 0.5 m on bedrock, with an allowable bearing pressure (ABP) of 400 kPa.

7 Conclusions

As part of the appointment by the Department of Water and Sanitation (DWS), a geotechnical investigation was conducted for the development of the Xhariep Pipeline which is to be designed to convey water from the Gariep Dam (Southern Free State) to both the existing Longridge/Brandkop Reservoirs in Bloemfontein and the Rustfontein water treatment plant (WTP), approximately 50 km east of Bloemfontein.

The general area is characterised by a relatively flat topography with local hills that is mostly underlain by interbedded sandstone, shale and mudstone belonging to the Beaufort Group of the Karoo Supergroup, with dolerite intrusions throughout the site.

Most of the proposed route alignment is within or immediately adjacent to road reserves, with the northern section spanning over farmland.

The fieldwork investigation included:

- Test pits at 400 m intervals;
- In-situ DCP and DPSH tests;
- An electrical resistivity survey at 200 m intervals;
- Rotary core drilling, with in-situ SPT tests at 1.5 m intervals within the soil profile at the proposed structure positions, road / railway crossings and major river / stream crossings; and
- Laboratory testing.

Due to access not being available to some privately owned farmland, which the pipeline transects, and space restrictions between fences and local steep road embankments along the road reserve, sections along the pipeline were not excluded from the fieldwork investigation. It is recommended that the fieldwork investigations for these sections of the project be completed during the detailed design phase.

The investigation along the proposed pipeline route found that:

- The ground conditions are generally characterized by shallow bedrock that is covered by a combination of silty sand, clayey silt and silty to sandy clay that has calcrete formation towards the bottom of the transported deposits. Occasional hardpan calcrete was also encountered. The bedrock mostly consists of interbedded sandstone, mudstone and shale from the Karoo Supergroup, that is locally intruded by dolerite.
- Deeper rock levels were noted along approximately 7% of the pipeline route which is generally related to low lying areas, rivers and streams.
- Groundwater levels typically vary across the pipeline route, with seepage noted within 2 % of the test pits, ranging between 0.5 m to 3.8 m below surface. The groundwater rest levels in the drilled boreholes were encountered between 0.20 m and 7.90 m within bedrock at insecting stream and river crossings.
- The DPSH results indicate that the soil covering shallow bedrock (with refusal within 2 m) are generally firm to stiff, and the thicker deposits generally soft to firm.
- The electrical resistivity survey found that approximately 83% of the surveyed sections along the pipeline route traverse soils which range from mildly corrosive to extremely corrosive to buried steel, which is confirmed by the pH and conductivity test results. Therefore, cathodic protection will be required. It is highly recommended that BRE/DIN chemical testing be done during the detailed design phase to be more accurate in determining the corrosivity of the soil towards steel and aggressiveness towards buried concrete.
- Samples taken were from test pits to determine the material quality to be considered for use during construction. The results showed that the excavated material over the area generally classifies as G9 – >G9 according to COLTO specifications and is not suitable for use as bedding or engineered fill. Locally some of the colluvium, residual dolerite and residual sandstone tested as G7 - G6, that could be suitable as engineered fill. The residual soil also generally classifies as SM, with a PI less than 15 that could be suitable as selected fill blanket. However, it should be

noted that the test results are variable, and not all of the samples passed the required specifications. Good quality control would thus be required should this material be considered.

- With the pipe invert level between 3.0 – 4.5 m below surface, most of the pipeline will be situated within bedrock, thus requiring blasting operations. Additionally, the extracted materials are deemed unsuitable for use as pipeline bedding. Consequently, it is advised to source appropriate bedding materials from commercial sources for bedding purposes.
- It is important to note that the mudstone from the Beaufort Group undergoes rapid disintegration after exposure to air if it is not protected immediately after excavation.

The general foundation considerations at each of the structures are summarised below. It should be noted the recommended allowable bearing pressures are included to guide the conceptional design. Geotechnical design, with verification of these estimates, and associated settlement calculations will need to be included at detailed design phase.

Table 7-1: Foundation considerations at each of the proposed structure locations

Structure	Considerations
Raw Water Pump Station	Foundations should be placed at a depth of 1 m on medium hard bedrock, with an allowable bearing pressure (ABP) of 400 kPa. Allowance for local blasting should be made for the dolerite sill.
Xhariep WTP and high lift pumpstation	Foundations should be placed at a depth of 1.1 m on medium hard bedrock, with an allowable bearing pressure (ABP) of 400 kPa. Should the foundation footprint extend over the weathered zone (where bedrock is typically deeper), the foundation should be undercut to 1 m below foundation level or bedrock (whichever is the shallowest) and replaced with a G6 material, or better that is compacted to 95% MODAASHTO at +- 2% optimum moisture content in 300mm thick layers. The ABP should be limited to 200 kPa. Allowance should also be made for dewatering of excavations, especially after periods of heavy and / or continuous rain. local blasting should may be required at the dolerite dyke
Command Reservoir No 1	The foundation should extend through the colluvium and placed at a depth of 1.3 m on a combination of bedrock and dense residual sandstone, with an allowable bearing pressure of 200 kPa. Allowance for local hard rock excavation should be made for the dolerite intrusion.
Booster pumpstation with suction reservoir	Foundations should be placed at a depth of 0.5 m on medium hard bedrock, with an allowable bearing pressure (ABP) of 400 kPa.

8 References

1. Brink, A.B.A. (1983). Engineering Geology of Southern Africa Volume 3.
2. Brink, A.B.A. & Bruin, R.M.H. Eds. (2002). Guidelines for soil and rock logging in South Africa. 2nd Impression: Association of Engineering Geologists; South African Institution of Civil Engineering; and South African Institute for Engineering and Environmental Geologists.
3. CapeFarmMapper version 3.0. Western Cape Government, Department of Agriculture (2024). Available from: https://gis.elsenburg.com/apps/cfm/
4. CIRIA 143 (Clayton, 1995). Standard penetration test – Methods and use. London, UK
5. COLTO. (1998). Standard specifications for road and bridge works for state road authorities.
6. Dippenaar M.A., Van Rooy J.L., Davis G. (eds.) 2024. Engineering Geological Soil and Rock Description (Draft). South African Institute for Engineering and Environmental Geologists (SAIEG). Pretoria. South Africa.
7. Deere, D.U. and Miller, R.P. (1966). Engineering Classification and Index Properties for Intact Rock. Technical Report, AFWL-TR-65-116, Air Force Weapons Laboratory, Kirtland Air Base, New Mexico.
8. Duligal, E. (1996). Significance of Soil Resistivity on Corrosivity. Unpublished report compiled for Africon.
9. ISRM [International Society of Rock Mechanics]. 1981. Suggested Methods for the Rock Characterization, Testing and Monitoring. ISRM Commission on Testing Methods. Pergamon Press. Oxford.
10. Geological Survey of South Africa (1963). Sheet 1: 250 000 2926 Bloemfontein geological map.
11. Geological Survey of South Africa (1986). Sheet 1: 250 000 2924 Koffiefontein geological map.
12. Geological Survey of South (1997). Sheet 1: 250 000 3024 Colesberg geological map.
13. Google Earth imagery (2025).
14. MacRobert, C., Kalumba, D. and Beales, P. (2011). Correlating standard penetration test and dynamic probe super heavy penetration resistance values in sandy soils. Journal of the South African Institution of Civil Engineering= Joernaal van die Suid-Afrikaanse Instituut van Siviele Ingenieurswese, 53(1), pp.46-54.
15. SABS. (2017). Basis of structural design and actions for buildings and industrial structures, Part 4: Seismic actions and general requirements for buildings (SANS 10160-4:2017 Edition 2). South African Bureau of Standards (SABS): Pretoria.
16. SAICE. (2007). The safety of persons working in small diameter shafts and test pits for geotechnical engineering purposes – Code of Practice. South African Institution of Civil Engineering - Geotechnical Division.
17. SAICE. (2010). Site Investigation – Code of Practice. South African Institution of Civil Engineering - Geotechnical Division.
18. SANS 1200D (1988). South African National Standard: Standardised specification for civil engineering construction. D: Earthworks, South African Bureau of Standards, Pretoria.
19. SANS 10160-4:2017 (2017). South African National Standard: Basis of structural design and actions for buildings and industrial structures. Part 4: Seismic actions and general requirements for buildings. ISBN 978-0-626-26431-4.
20. Topographic-map.com. Free State, Mangaung Metropolitan Municipality, Bloemfontein (2025). Available from: https://en-us.topographic-map.com/map-cmxd3q/Bloemfontein/

21. van der Merwe, D. H. (1964). The prediction of heave from the plasticity index and percentage of clay fraction of soils. Trans. SA Inst. Civ. Eng., Vol. 6, No 6. p 103-107.

22. Weinert (1980). The natural road construction materials of southern Africa. National Institute for Transport and Road Research Pretoria.

9 Limitations of Report

The Zutari Ground Engineering Group has prepared this report for the use of our Client, Department of Water and Sanitation. This report has been written with the express intent of providing sufficient information for detail design purposes. The geotechnical investigation has been conducted in accordance with generally accepted engineering practice, and the report has been compiled in good faith based on the information available to the Zutari Ground Engineering Group at the time of preparing this report.

Zutari Ground Engineering Group has exercised all due care in reviewing supplied information. Zutari Ground Engineering Group does not accept responsibility for any errors or omissions in the supplied information and does not accept any consequential liability arising from commercial decisions or actions resulting from them.

There are always some variations in subsurface conditions across a site due to geological conditions that cannot be defined fully even by exhaustive investigation. Hence, it is possible that the measurements and values obtained from the investigation may not represent the extremes of conditions which exist within the site. The precision with which subsurface conditions are identified depends on the method of excavation, the frequency and recovery of samples, the method of sampling, and the uniformity of the subsurface conditions. Subsurface conditions at other than the test pit, borehole, DPSH and DCP positions may vary from the conditions encountered at the tested positions.

Seepage was encountered during this investigation, however, subsurface conditions, including groundwater levels can change over time. These conditions may vary seasonally or as a consequence of construction activities in the area. This should be borne in mind, particularly if the report is used after a protracted delay or a period of protracted climatic conditions.

Should conditions exposed at the site during subsequent investigation or construction works vary significantly from those provided in this report, we request that Zutari Ground Engineering be informed and be given the opportunity to review any of the findings or conclusions of this report. It is highly recommended that during construction the site conditions be inspected by a representative of Zutari Ground Engineering to confirm the geotechnical interpretations in this report.

Unless otherwise stated, this report does not address potential environmental hazards, or groundwater contamination that may be present. In addition to soil variability, fill material of variable physical and chemical composition can be present over portions of the site or on adjacent properties.

The test pit profiles represent the subsurface conditions at the specific test location only. Boundaries between zones on the logs are often not distinct but rather are transitional and have been interpreted. The soil descriptions in this report are based on commonly accepted methods of classification and identification employed in geotechnical practice, as stated in this report. Classification and identification of soil involves judgement, and the Zutari Ground Engineering Group infers accuracy in the classification and identification methods to the extent that is common in current geotechnical practice, and within the limitations of the ground investigation that was performed.

Appendix A - Standard Descriptions Used in Soil and Rock Profiling

STANDARD DESCRIPTION USED IN SOIL PROFILING

1. MOISTURE CONDITION

Term	Description
Dry	
Slightly moist	Requires addition of water to reach optimum moisture content for compaction
Moist	Near optimum content
Very Moist	Requires drying to attain optimum content
Wet	Fully saturated and generally below water table

2. COLOUR

The Predominant colours or colour combinations are described including secondary coloration described as banded, streaked, blotched, mottled, speckled or stained.

3. CONSISTENCY

3.1 Non-Cohesive Soils

Term	Description
Very Loose	Crumbles very easily when scraped with geological pick
Loose	Small resistance to penetration by sharp end of geological pick
Medium Dense	Considerable resistance to penetration by sharp end of geological pick
Dense	Very high resistance to penetration to sharp end of geological pick. Requires many blows of hand pick for excavation.
Very Dense	High resistance to repeated blows of geological pick. Requires power tools for excavation

3.2 Cohesive Soils

Term	Description
Very soft	Easily penetrated by thumb. Sharp end of pick can be pushed in 30 – 40mm. Easily moulded by fingers.
Soft	Pick head can easily be pushed into the shaft of handle. Moulded by fingers with some pressure.
Firm	Indented by thumb with effort. Sharp end of pick can be pushed in up to 10mm. Can just be penetrated with an ordinary spade.
Stiff	Penetrated by thumbnail. Slight indentation produced by pushing pick point into soil. Cannot be moulded by fingers. Requires hand pick for excavation.
Very Stiff	Indented by thumbnail. Slight indentation produced by blow of pick point. Requires power tools for excavation.

4. STRUCTURE

Term	Description
Intact	Absence of fissures or joints
Fissured	Presence of closed joints
Shattered	Presence of closely spaced air-filled joints giving cubical fragments
Micro-shattered	Small scale shattering with shattered fragments the size of sand grains
Slickensided	Polished planar surfaces representing shear movement in soil
Bedded Foliated	Many residual soils show structures of parent rock.

5. SOIL TYPE

5.1 Particle Size

Term	Size (mm)
Boulder	>200
Cobbles	60–200
Gravel	2-60
Sand	0,06-2
Silt	0.002-0.06
Clay	<0.002

6. ORIGIN

6.1 Transported Soils

Term	Agency of Transportation
Colluvium	Gravity deposits
Talus	Scree or coarse colluvium
Hilllwash	Fine colluvium
Alluvial	River deposits
Aeolian	Wind deposits
Litoral	Beach deposits
Estuarine	Tidal – river deposits
Lacustine	Lake deposits

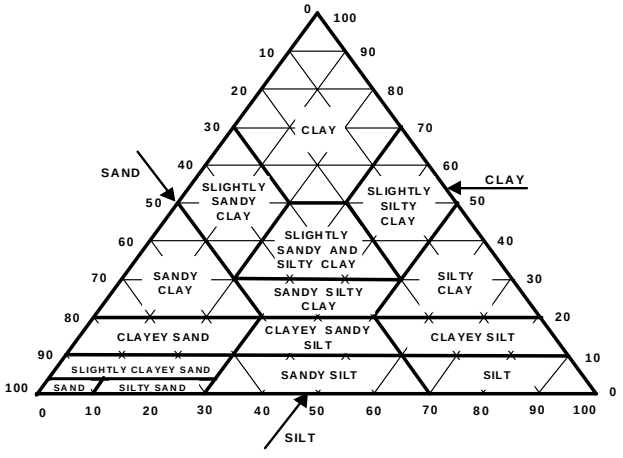
6.2 Residual soils

These are products of in-situ weathering of rocks and are described as e.g. Residual Shale

6.3 Pedocretes

Formed in transported and residual soils etc.
calcrete, silcrete, manganocrete and ferricrete.

5.2 Soil Classification



SUMMARY OF DESCRIPTIONS USED IN ROCK DESCRIPTIONS

1. WEATHERING

Term	Symbol	Diagnostic Features
Residual Soil	W5	Rock is discoloured and completely changed to a soil in which original rock fabric is completely destroyed. There is a large change in volume.
Completely Weathered	W5	Rock is discoloured and changed to a soil, but original fabric is mainly preserved. There may be occasional small corestones.
Highly Weathered	W4	Rock is discoloured, discontinuities may be open and have discoloured surfaces, and the original fabric of the rock near the discontinuities may be altered; alteration penetrates deeply inwards, but corestones are still present.
Moderately Weathered	W3	Rock is discoloured, discontinuities may be open and will have discoloured surfaces with alteration starting to penetrate inwards, intact rock is noticeably weaker than the fresh rock.
Slightly Weathered	W2	Rock may be slightly discoloured, particularly adjacent to discontinuities, which may be open and will have slightly discoloured surfaces, the intact rock is not noticeably weaker than the fresh rock.
Unweathered	W1	Parent rock showing no discolouration, loss of strength or any other weathering effects.

2. HARDNESS

Classification	Field Test	Compressive Strength Range MPa
Very Soft Rock	Can be peeled with a knife. Material crumbles under firm blows with the sharp end of a geological pick.	1 to 3
Soft Rock	Can be scraped with a knife, indentation of 2 to 4 mm with firm blows of the pick point.	3 to 10
Medium Hard Rock	Cannot be scraped or peeled with a knife. Hand held specimen breaks with firm blows of the pick.	10 to 25
Hard Rock	Point load tests must be carried out in order to distinguish between these classifications	25 - 70
Very Hard Rock	These results may be verified by uniaxial compressive strength tests on selected samples.	70 - 200
Extremely Hard Rock		>200

3. COLOUR

The predominant colours or colour combination are described including secondary colouration described as banded, streaked, blotched, mottled, speckled or stained.

4. FABRIC

4.1 Grain Size		4.2 Discontinuity Spacing		
Term	Size (mm)	Description for: Bedding, foliation, laminations	Spacing (mm)	Descriptions for joints, faults, etc.
Very Coarse	>2,0	Very Thickly Bedded	> 2000	Very Widely
Coarse	0,6 – 2,0	Thickly Bedded	600 – 2000	Widely
Medium	0,2 – 0,6	Medium Bedded	200 – 600	Medium
Fine	0,06 – 0,2	Thinly Bedded	20 – 200	Closely
Very Fine	< 0,06	Laminated	6 – 20	Very closely
		Thinly Laminated	<6	

5. ROCK NAME

Classified in terms of origin:	
IGNEOUS	Granite, Diorite, Gabbro, Syenite, Diabase, Dolerite, Trachyte, Andesite, Basalt.
METAMORPHIC	Slate, Quartzite, Gneiss, Schist,
SEDIMENTARY	Shale, Mudstone, Siltstone, Sandstone, Dolomite, Conglomerate, Tillite, Quartzite, Limestone.

6. STRATIGRAPHIC HORIZON

Identification of rock type in terms of stratigraphic horizons.

Appendix B - Test Pit Profiles

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP01
Sheet 1 of 1

JOB NUMBER: NVG013

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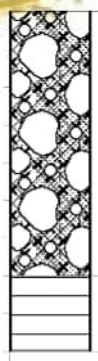

0.00 Moderately packed, angular GRAVEL with occasional subangular dolerite cobbles and boulders in a silty sand matrix. Overall consistency is loose to medium dense. **FILL**.

0.70 Greenish grey, highly to moderately weathered, fine grained, thinly bedded, very closely jointed , soft rock. **MUDSTONE**.

0.90

NOTES

1) Refusal @ 0.90m on medium hard rock Mudstone.
2) Sidewall collapsing on Fill.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

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PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

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Y-COORD : S30 37.627

HOLE No: TP01
Free State

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP02
Sheet 1 of 1

JOB NUMBER: NVG013

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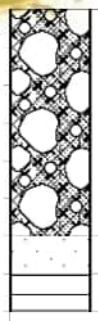

0.00 Moderately packed, angular GRAVEL with occasional subangular dolerite cobbles and boulders in a silty sand matrix. Overall consistency is loose to medium dense. **FILL**.

0.60 Slightly moist, reddish brown speckled grey, soft to firm, relic jointed, slightly coarse sandy CLAY with occasional subangular cobbles and boulders. **RESIDUAL MUDSTONE**.

0.70 Greenish grey, highly to moderately weathered, fine grained, thinly bedded, very closely jointed , soft rock. **MUDSTONE**.

0.80

NOTES

1) Refusal @ 0.80m on medium hard rock Mudstone.
2) Sidewall collapsing on Fill.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
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HOLE No: TP02

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP03
Sheet 1 of 1

JOB NUMBER: NVG013

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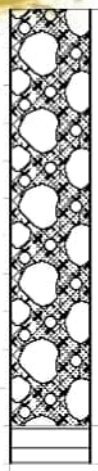

0.00 Moderately packed, angular GRAVEL with occasional subangular dolerite cobbles and boulders in a silty sand matrix. Overall consistency is loose to medium dense. **FILL**.

1.10 Greenish grey, highly to moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

1.20

NOTES

1) Refusal @ 1.20m on medium hard rock Mudstone.
2) Sidewall collapsing on Fill.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
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PROFILED BY : W Muofhe
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HOLE No: TP03

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP04
Sheet 1 of 1

JOB NUMBER: NVG013

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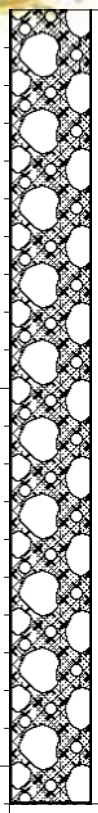

0.00

Loosely packed, angular GRAVEL with occasional subangular dolerite cobbles and boulders up to 45cm in a silty sand matrix. Overall consistency is loose. **FILL**.

2.10

NOTES

1) Refusal @ 2.10 on dolerite boulders.
2) Sidewall collapsing on Fill.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

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Y-COORD : S30 37.196

HOLE No: TP04

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP05
Sheet 1 of 1

JOB NUMBER: NVG013

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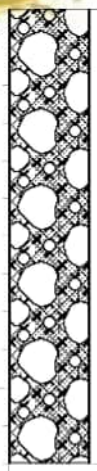

0.00

Moderately packed, angular GRAVEL with occasional subangular dolerite cobbles and boulders up to 45cm in a silty sand matrix. Overall consistency is loose to medium dense. **FILL**.

1.20m

1.20

NOTES

1) Refusal @ 1.20 on dolerite boulders.
2) Sidewall collapsing on Fill.
3) No water seepage.
4) Disturbed samples between 0.00m - 1.20m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
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DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : T Mashiane
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HOLE No: TP05

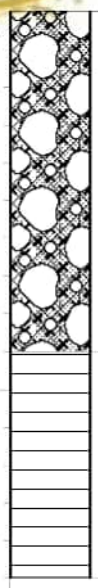
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP06
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Loosely packed, angular GRAVEL with occasional subangular dolerite cobbles and boulders in a silty sand matrix. Overall consistency is loose to medium dense. **FILL**.

0.90 Greenish grey, highly to moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

1.50

NOTES

1) Refusal @ 1.50m on medium hard rock Mudstone.
2) Sidewall collapsing on Fill.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

ELEVATION :
X-COORD : E25 29.191
Y-COORD : S30 36.818

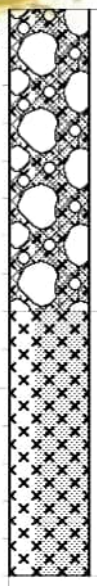
HOLE No: TP06

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP07
Sheet 1 of 1

JOB NUMBER: NVG013

0.00m
Scale 1:20



0.00 Loosely packed, angular GRAVEL with occasional subangular dolerite cobbles and boulders in a silty sand matrix. Overall consistency is loose to medium dense. **FILL**.

0.80m

0.80 Dark grey stained reddish brown, moderately weathered, loose to medium dense, very closely jointed, soft rock. **DOLERITE**.

1.50

NOTES

1) Refusal @ 1.50m on medium hard rock Dolerite.
2) Sidewall collapsing on Fill.
3) No water seepage.
4) Disturbed samples between 0.00m - 0.80m.
5) No DCP.
6) Profiled in-situ

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

ELEVATION :
X-COORD : E25 28.976
Y-COORD : S30 36.720

HOLE No: TP07

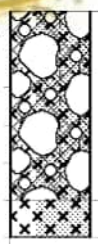
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP08
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Loosely packed, angular GRAVEL with occasional subangular dolerite cobbles and boulders in a silty sand matrix. Overall consistency is loose to medium dense. **FILL**.

0.50 Dark grey stained reddish brown, moderately weathered, medium grained, very closely jointed, soft rock. **DOLERITE**.

0.60

NOTES

1) Refusal @ 0.60 on medium hard rock Dolerite.
2) Sidewall collapsing on Fill.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024

DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

ELEVATION :
X-COORD : E25 28.852
Y-COORD : S30 36.546

HOLE No: TP08

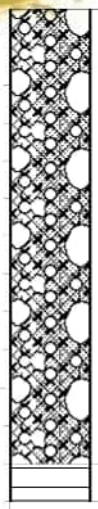
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP09
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Loosely packed, angular GRAVEL with occasional subangular dolerite cobbles in a silty sand matrix. Overall consistency is medium dense. **FILL**.

1.20 Greenish grey, highly to moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

1.30

NOTES

1) Refusal @ 1.30m on medium hard rock Mudstone.
2) Sidewall collapsing on Fill.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024

DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

ELEVATION :
X-COORD : E25 28.889
Y-COORD : S30 36.329

HOLE No: TP09

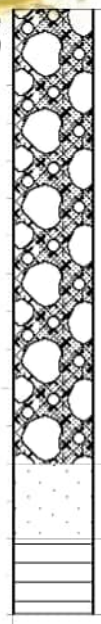
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP10
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Moderately packed, angular GRAVEL with occasional subangular dolerite cobbles and boulders in a silty sand matrix. Overall consistency is loose to medium dense. **FILL**.

1.20 Slightly moist, reddish brown speckled grey, soft to firm, relic jointed, sandy CLAY with occasional subangular gravel. **RESIDUAL MUDSTONE**.

1.40 Greenish grey, highly to moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

1.60

NOTES

1) Refusal @ 1.60m on medium hard rock Mudstone.
2) Sidewall collapsing on Fill.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

ELEVATION :
X-COORD : E25 28.926
Y-COORD : S30 36.114

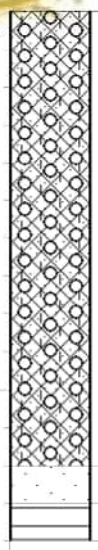
HOLE No: TP10

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP11
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Moderately packed, angular GRAVEL in a silty sand matrix. Overall consistency is loose to medium dense. **FILL**.

1.20 Slightly moist, reddish brown speckled grey, soft to firm, relic jointed, sandy CLAY with occasional subangular gravel. **RESIDUAL MUDSTONE**.

1.30 Greenish grey, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

1.40

NOTES

1) Refusal @ 1.40m on medium hard rock Mudstone.
2) Sidewall collapsing on Fill.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

ELEVATION :
X-COORD : E25 29.037
Y-COORD : S30 35.902

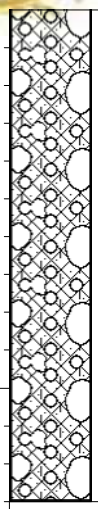
HOLE No: TP11

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP12
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00

Moderately packed, angular GRAVEL and COBBLES in a silty sand matrix. Overall consistency is loose to medium dense. **FILL**.

1.30

NOTES

1) Refusal @ 1.30m on Boulders.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024

ELEVATION :
X-COORD : E25 29.137
Y-COORD : S30 35.785

HOLE No: TP12

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

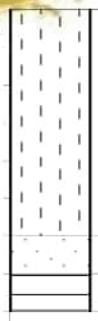
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP13
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled orange, loose to medium dense, intact, silty SAND with subangular mudstone cobbles. **COLLUVIUM**.

0.60 Slightly moist, reddish brown speckled grey, soft to firm, relic jointed, sandy CLAY. **RESIDUAL MUDSTONE**.

0.70 Greenish grey, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

0.80

NOTES

1) Refusal @ 0.80m on medium hard rock Mudstone.
2) Sidewall collapsing on Fill.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

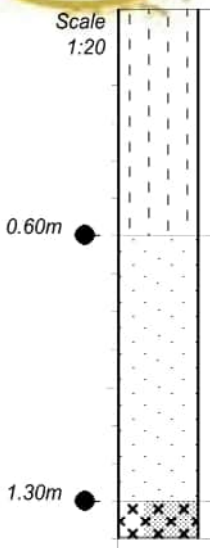
ELEVATION :
X-COORD : E25 29.292
Y-COORD : S30 35.606

HOLE No: TP13

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP14
Sheet 1 of 1

JOB NUMBER: NVG013



0.00 Slightly moist, dark brown speckled orange, loose to medium dense, intact, silty SAND with subangular mudstone cobbles. **COLLUVIUM**.

0.60 Slightly moist, reddish brown speckled grey, stiff, relic jointed, sandy CLAY with occasional gravel. **RESIDUAL DOLERITE**.

1.30 Dark grey blotched orange brown, highly weathered, medium grained, very closely jointed, soft rock. **DOLERITE**.

1.40

NOTES

1) Refusal @ 1.40m on medium hard rock Dolerite.
2) Sidewall stable.
3) No water seepage.
4) Disturbed sample between 0.60m - 1.30m
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

ELEVATION :
X-COORD : E25 29.373
Y-COORD : S30 35.407

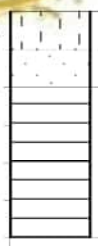
HOLE No: TP14

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP15
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled orange, loose to medium dense, intact, silty SAND with subangular mudstone cobbles. **COLLUVIUM**.

0.10 Slightly moist, reddish brown speckled grey, soft to firm, relic jointed, sandy CLAY with occasional subangular cobbles and boulders. **RESIDUAL MUDSTONE**.

0.20 Greenish grey, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

0.60

NOTES

1) Refusal @ 0.60m on medium hard rock Mudstone.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

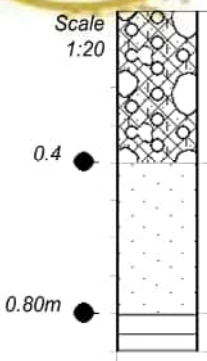
ELEVATION :
X-COORD : E25 29.367
Y-COORD : S30 35.197

HOLE No: TP15

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP16
Sheet 1 of 1

JOB NUMBER: NVG013



0.00 Loosely to moderately packed, angular GRAVEL and COBBLES in a silty sand matrix. Overall consistency is loose to medium dense. **FILL**.

0.40 Slightly moist, orangey brown stained yellow, firm to stiff, relic jointed, sandy CLAY. **RESIDUAL MUDSTONE**.

0.80 Greenish grey, highly to moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

0.90

NOTES

1) Refusal @ 0.90m on medium hard rock Mudstone.
2) Sidewall collapsing on Fill.
3) No water seepage.
4) Bulk Sample between 0.4 - 0.80m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

ELEVATION :
X-COORD : E25 29.361
Y-COORD : S30 34.982

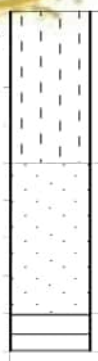
HOLE No: TP16

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP17
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled orange, loose to medium dense, intact, silty SAND with subangular mudstone cobbles. **COLLUVIUM**.

0.40 Slightly moist, orangey brown stained yellow, firm to stiff, relic jointed, sandy CLAY. **RESIDUAL MUDSTONE**.

0.80 Greenish grey stained brown, highly to moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

0.90

NOTES

1) Refusal @ 0.90m on medium hard rock Mudstone.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

ELEVATION :
X-COORD : E25 29.389
Y-COORD : S30 34.770

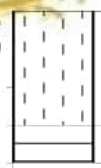
HOLE No: TP17

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP18
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled orange, loose to medium dense, intact, silty SAND with subangular mudstone cobbles. **COLLUVIUM**.

0.30 Greenish grey, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

0.40

NOTES

1) Refusal @ 0.40m on medium hard rock Mudstone.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

ELEVATION :
X-COORD : E25 29.463
Y-COORD : S30 34.559

HOLE No: TP18

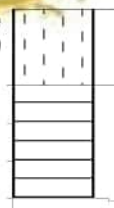
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP19
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled orange, loose to medium dense, intact, silty SAND with subangular mudstone cobbles. **COLLUVIUM**.

0.20 Greenish grey stained brown, highly to moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

0.50

NOTES

1) Refusal @ 0.50m on medium hard rock Mudstone.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

ELEVATION :
X-COORD : E25 29.535
Y-COORD : S30 34.355

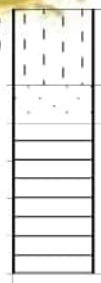
HOLE No: TP19

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP20
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled orange, loose to medium dense, intact, silty SAND with subangular mudstone cobbles. **COLLUVIUM**.

0.20 Slightly moist, orangey brown stained yellow, firm to stiff, relic jointed, sandy CLAY with occasional subangular boulders. **RESIDUAL MUDSTONE**.

0.30 Greenish grey stained brown, highly to moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

0.70

NOTES

1) Refusal @ 0.70m on medium hard rock Mudstone.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

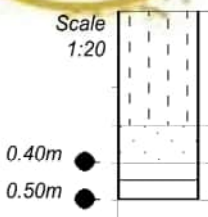
ELEVATION :
X-COORD : E25 29.605
Y-COORD : S30 34.149

HOLE No: TP20

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP21
Sheet 1 of 1

JOB NUMBER: NVG013



0.00 Slightly moist, dark brown speckled orange, loose to medium dense, intact, silty SAND with subangular mudstone cobbles. **COLLUVIUM**.

0.30 Slightly moist, orangey brown stained yellow, firm to stiff, relic jointed, sandy CLAY. **RESIDUAL MUDSTONE**.

0.40 Greenish grey, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

0.50

NOTES

1) Refusal @ 0.50m on medium hard rock Mudstone.
2) Sidewall stable.
3) No water seepage.
4) Bulk sample between 0.40m - 0.50m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

ELEVATION :
X-COORD : E25 29.676
Y-COORD : S30 33.942

HOLE No: TP21

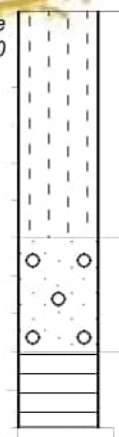
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP22
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled orange, loose to medium dense, intact, silty SAND with subangular mudstone cobbles. **COLLUVIUM**.

0.60 Slightly moist, orangey brown stained yellow, firm to stiff, relic jointed, slightly gravelly sandy CLAY. **RESIDUAL MUDSTONE**.

0.90 Greenish grey, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

1.10

NOTES

1) Refusal @ 1.10m on medium hard rock Mudstone.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

ELEVATION :
X-COORD : E25 29.767
Y-COORD : S30 33.687

HOLE No: TP22

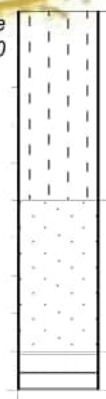
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP23
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled orange, loose to medium dense, intact, silty SAND with subangular mudstone cobbles. **COLLUVIUM**.

0.50 Slightly moist, orangey brown stained yellow, firm to stiff, relic jointed, sandy CLAY. **RESIDUAL MUDSTONE**.

0.90 Greenish grey, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

1.00

NOTES

1) Refusal @ 1.00m on medium hard rock Mudstone.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

ELEVATION :
X-COORD : E25 29.829
Y-COORD : S30 33.502

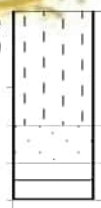
HOLE No: TP23

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP24
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled orange, medium dense, intact, silty SAND. **COLLUVIUM**.

0.30 Slightly moist, orangey brown stained yellow, firm, relic jointed, sandy CLAY with occasional subangular boulders. **RESIDUAL MUDSTONE**.

0.40 Greenish grey, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

0.50

NOTES

1) Refusal @ 0.50m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

ELEVATION :
X-COORD : E25 29.807
Y-COORD : S30 33.293

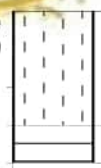
HOLE No: TP24

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP25
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled orange medium dense, intact, silty SAND with gravel. **COLLUVIUM**.

0.30 Greenish grey, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

0.40

NOTES

1) Refusal @ 0.40m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

ELEVATION :
X-COORD : E25 29.760
Y-COORD : S30 33.219

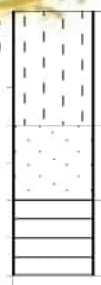
HOLE No: TP25

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP26
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown, medium dense, intact, silty SAND. **COLLUVIUM**.

0.30 Slightly moist, orangey brown, firm, relic jointed, sandy CLAY. **RESIDUAL MUDSTONE**.

0.50 Greenish grey, moderately weathered, fine grained, very thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

0.70

NOTES

1) Refusal @ 0.70m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

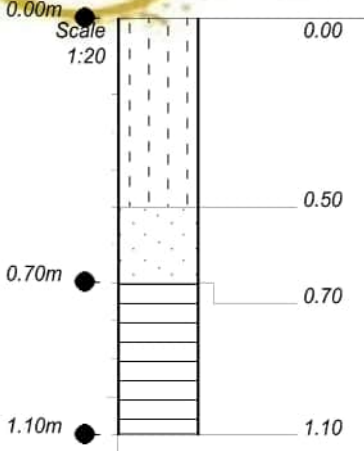
ELEVATION :
X-COORD : E25 29.811
Y-COORD : S30 33.013

HOLE No: TP26

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP27
Sheet 1 of 1

JOB NUMBER: NVG013



0.00	Slightly moist, dark brown speckled orange, loose, intact, silty SAND. **COLLUVIUM**.
0.50	
	Slightly moist, orangey brown stained yellow, firm, relic jointed, sandy CLAY with occasional subangular gravel. **RESIDUAL MUDSTONE**.
0.70	
	Greenish grey, highly to moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.
1.10	

NOTES

1) Refusal @ 1.10m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Bulk Sample between 0.00m - 0.70m.
5) Disturbed Sample between 0.70m - 1.10m
6) No DCP.
7) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

ELEVATION :
X-COORD : E25 29.997
Y-COORD : S30 32.856

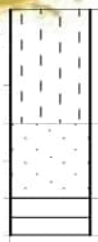
HOLE No: TP27

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP28
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled orange, medium dense, intact, silty SAND. **COLLUVIUM**.

0.30 Slightly moist, orangey brown, firm to stiff, relic jointed, sandy CLAY. **RESIDUAL MUDSTONE**.

0.50 Greenish grey, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

0.60

NOTES

1) Refusal @ 0.60m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

ELEVATION :
X-COORD : E25 30.214
Y-COORD : S30 32.721

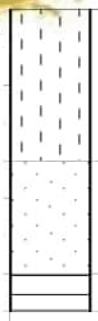
HOLE No: TP28

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP29
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled orange, loose to medium dense, intact, silty SAND. **COLLUVIUM**.

0.40 Slightly moist, orangey brown stained yellow, firm, relic jointed, sandy CLAY with. **RESIDUAL MUDSTONE**.

0.70 Greenish grey, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

0.80

NOTES

1) Refusal @ 0.80m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

ELEVATION :
X-COORD : E25 30.419
Y-COORD : S30 32.597

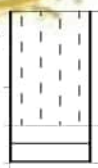
HOLE No: TP29

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP30
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown, medium dense, intact, silty SAND. **COLLUVIUM**.

0.30 Greenish grey, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

0.40

NOTES

1) Refusal @ 0.40m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

ELEVATION :
X-COORD : E25 30.627
Y-COORD : S30 32.476

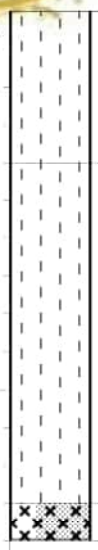
HOLE No: TP30

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP31
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown, medium dense, intact, silty SAND with subangular mudstone cobbles. **COLLUVIUM**.

0.40 Moist, dark brown speckled grey, medium dense to dense, intact, silty SAND with occasional subangular dolerite cobbles and boulders. **RESIDUAL DOLERITE**.

1.30 Dark grey stained reddish brown, moderately weathered, medium grained, closely jointed, soft rock. **DOLERITE**.

1.40

NOTES

1) Refusal @ 1.40m on medium hard rock Dolerite.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

ELEVATION :
X-COORD : E25 31.053
Y-COORD : S30 32.247

HOLE No: TP31

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP32
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Dark grey stained reddish brown, moderately weathered, medium grained, closely jointed, soft rock. **DOLERITE**.

0.10

NOTES

1) Refusal @ 0.10m on medium hard rock Dolerite.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024

ELEVATION :
X-COORD : E25 31.256
Y-COORD : S30 32.199

HOLE No: TP32

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

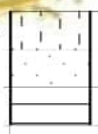
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP33
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown, medium dense, intact, silty SAND. **COLLUVIUM**.

0.10 Slightly moist, orangey brown stained yellow, firm, relic jointed, slightly sandy CLAY with occasional gravel. **RESIDUAL MUDSTONE**.

0.20 Greenish grey blotched bluish, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **INDURATED MUDSTONE**.

0.30

NOTES

1) Refusal @ 0.30m on medium hard rock Indurated Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024

DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

ELEVATION :
X-COORD : E25 31.504
Y-COORD : S30 32.149

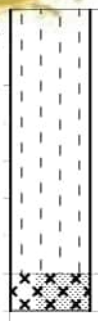
HOLE No: TP33

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP34
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown, medium dense, intact, silty SAND with subangular mudstone cobbles. **COLLUVIUM**.

0.70 Dark grey stained reddish brown, moderately weathered, medium grained, closely jointed, soft rock. **DOLERITE**.

0.80

NOTES

1) Refusal @ 0.80m on medium hard rock Dolerite.
2) Sidewall collapsing on Fill.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

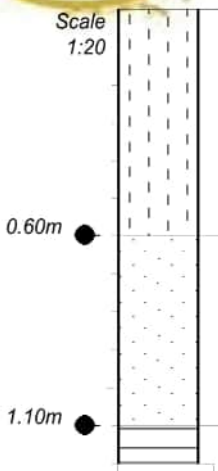
ELEVATION :
X-COORD : E25 31.747
Y-COORD : S30 32.099

HOLE No: TP34

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP35
Sheet 1 of 1

JOB NUMBER: NVG013



0.00 Slightly moist, dark brown, medium dense, intact, silty SAND. **COLLUVIUM**.

0.60 Slightly moist, orangey brown stained yellow, firm to stiff, relic jointed, sandy CLAY with occasional subangular cobbles. **RESIDUAL MUDSTONE**.

1.10 Reddish grey, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

1.20

NOTES

1) Refusal @ 1.20m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Bulk Sample between 0.60m - 1.10m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

ELEVATION :
X-COORD : E25 31.860
Y-COORD : S30 32.076

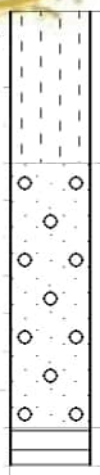
HOLE No: TP35

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP36
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled orange, loose, silty SAND with subangular mudstone gravel. **COLLUVIUM**.

0.40 Slightly moist, orangey brown stained yellow, firm to stiff, relic jointed, slightly gravelly sandy CLAY with occasional subangular cobbles. **RESIDUAL MUDSTONE**.

1.10 Greenish grey, moderately weathered, fine grained, very thinly bedded, closely jointed, soft rock. **MUDSTONE**.

1.20

NOTES

1) Refusal @ 1.20m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

ELEVATION :
X-COORD : E25 32.097
Y-COORD : S30 32.008

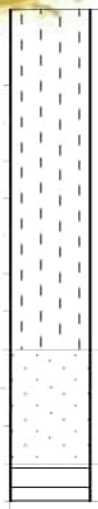
HOLE No: TP36

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP37
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.90m

1.20m

0.00 Slightly moist, dark brown speckled orange, medium dense, intact, silty SAND. **COLLUVIUM**.

0.90 Slightly moist, orangey brown stained yellow, firm, relic jointed, sandy CLAY with. **RESIDUAL MUDSTONE**.

1.20 Greenish grey, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

1.30

NOTES

1) Refusal @ 1.30m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Bulk Sample between 0.90m - 1.20m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

ELEVATION :
X-COORD : E25 32.292
Y-COORD : S30 31.872

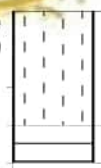
HOLE No: TP37

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP38
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled orange, medium dense, intact, silty SAND. **COLLUVIUM**.

0.30 Greenish grey, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

0.40

NOTES

1) Refusal @ 0.40m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

ELEVATION :
X-COORD : E25 32.477
Y-COORD : S30 31.724

HOLE No: TP38

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP39
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Slightly moist, dark brown speckled orange, loose, silty SAND with subangular mudstone cobbles. **COLLUVIUM**.

0.40 Slightly moist, orangey brown stained yellow, firm to stiff, relic jointed, sandy CLAY. **RESIDUAL MUDSTONE**.

1.00 Greenish grey, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

1.10

NOTES

1) Refusal @ 1.10m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

ELEVATION :
X-COORD : E25 32.659
Y-COORD : S30 31.577

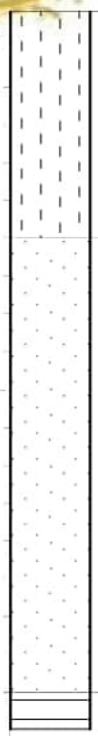
HOLE No: TP39

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP40
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown, loose silty SAND with subangular mudstone gravel. **COLLUVIUM**.

0.60 Slightly moist, orangey brown stained yellow, firm to stiff, relic jointed, sandy CLAY. **RESIDUAL MUDSTONE**.

1.80 Greenish grey, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

1.90

NOTES

1) Refusal @ 1.90m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

ELEVATION :
X-COORD : E25 32.843
Y-COORD : S30 31.432

HOLE No: TP40

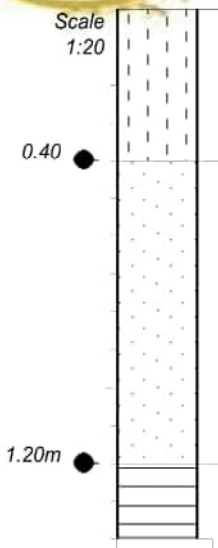
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP41
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled orange, medium dense, intact, silty SAND with subangular mudstone cobbles. **COLLUVIUM**.

0.40 Slightly moist, orangey brown stained yellow, stiff, relic jointed, sandy CLAY. **RESIDUAL MUDSTONE**.

1.20 Greenish grey, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

1.40

NOTES

1) Refusal @ 1.40m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed Samples between 0.40 - 1.20m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

ELEVATION :
X-COORD : E25 33.029
Y-COORD : S30 31.285

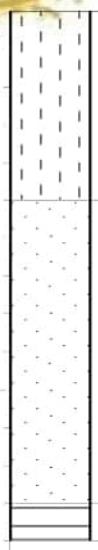
HOLE No: TP41

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP42
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown, medium dense, intact, silty SAND with subangular mudstone gravel. **COLLUVIUM**.

0.50 Slightly moist, orangey brown stained yellow, stiff, relic jointed, sandy CLAY with occasional subangular cobbles. **RESIDUAL MUDSTONE**.

1.30 Greenish grey, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

1.40

NOTES

1) Refusal @ 1.40m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

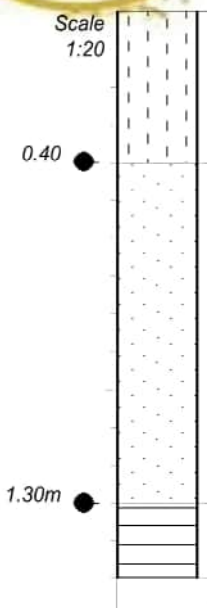
ELEVATION :
X-COORD : E25 33.211
Y-COORD : S30 31.136

HOLE No: TP42

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP43
Sheet 1 of 1

JOB NUMBER: NVG013



0.00 Slightly moist, dark brown, medium dense, intact, silty SAND with subangular mudstone gravel. **COLLUVIUM**.

0.40 Slightly moist, orangey brown stained yellow, firm, relic jointed, sandy CLAY. **RESIDUAL MUDSTONE**.

1.30 Greenish grey stained brown, highly to moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

1.50

NOTES

1) Refusal @ 1.50m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Bulk Samples between 0.40 - 1.30m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

ELEVATION :
X-COORD : E25 33.394
Y-COORD : S30 30.988

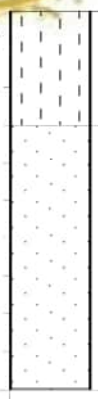
HOLE No: TP43

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP44
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled orange, medium dense, intact, silty SAND with subangular mudstone gravel. **COLLUVIUM**.

0.30 Slightly moist, orangey brown stained yellow, stiff to very stiff, relic jointed, sandy CLAY with occasional subangular boulders. **RESIDUAL MUDSTONE**.

1.00

NOTES

1) Refusal @ 1.00m on very stiff Clay with the TLB proving difficult excavation.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

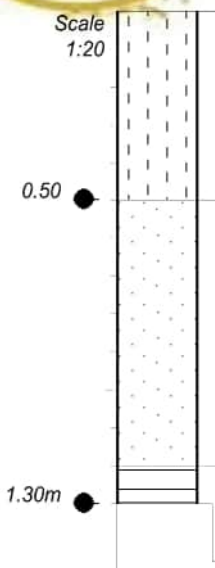
ELEVATION :
X-COORD : E25 33.564
Y-COORD : S30 30.850

HOLE No: TP44

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP45
Sheet 1 of 1

JOB NUMBER: NVG013



0.00 Slightly moist, dark brown speckled orange, loose to medium dense, intact, silty SAND with subangular mudstone gravel. **COLLUVIUM**.

0.50 Slightly moist, orangey brown stained yellow, stiff, relic jointed, sandy CLAY with subangular gravel. **RESIDUAL MUDSTONE**.

1.20 Greenish grey, moderately weathered, fine grained, very thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

1.30

NOTES

1) Refusal @ 1.30m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed Samples between 0.50 - 1.30m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

ELEVATION :
X-COORD : E25 33.759
Y-COORD : S30 30.695

HOLE No: TP45

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP46
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00

Dark grey stained reddish brown, moderately weathered, medium grained, closely jointed, soft rock. **DOLERITE**.

0.20

NOTES

1) Refusal @ 0.20m on medium hard rock Dolerite.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024

ELEVATION :
X-COORD : E25 33.944
Y-COORD : S30 30.548

HOLE No: TP46

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

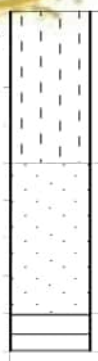
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP47
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown, medium dense, intact, silty SAND with subangular mudstone gravel and cobbles. **COLLUVIUM**.

0.40 Slightly moist, orangey brown stained yellow, firm, relic jointed, sandy CLAY with occasional subangular cobbles. **RESIDUAL MUDSTONE**.

0.80 Greenish grey, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

0.90

NOTES

1) Refusal @ 0.90m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

ELEVATION :
X-COORD : E25 34.114
Y-COORD : S30 30.395

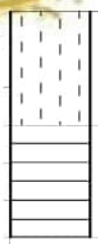
HOLE No: TP47

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 48
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown, loose, silty SAND with subangular mudstone gravel. **COLLUVIUM**.

0.30 Greenish grey stained brown, highly to moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

0.60

NOTES

1) Refusal @ 0.60m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

ELEVATION :
X-COORD : E25 34.270
Y-COORD : S30 30.229

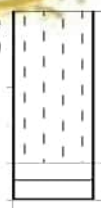
HOLE No: TP 48

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP49
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown, medium dense, intact, silty SAND. **COLLUVIUM**.

0.40 Greenish grey, moderately weathered, fine grained, very thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

0.50

NOTES

1) Refusal @ 0.50m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

ELEVATION :
X-COORD : E25 34.324
Y-COORD : S30 30.169

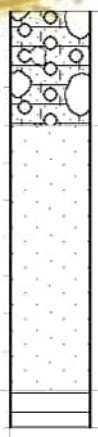
HOLE No: TP49

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP50
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown, medium dense, intact, silty SAND with subangular mudstone gravel and cobbles. **COLLUVIUM**.

0.30 Slightly moist, orangey brown stained yellow, firm to stiff with depth, shattered, sandy CLAY. **RESIDUAL MUDSTONE**.

1.00 Greenish grey, moderately weathered, fine grained, very thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

1.10

NOTES

1) Refusal @ 1.10m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

ELEVATION :
X-COORD : E25 34.479
Y-COORD : S30 30.000

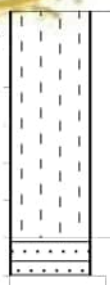
HOLE No: TP50

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP51
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown, loose to medium dense, intact, silty SAND with subangular mudstone gravel and cobbles. **COLLUVIUM**.

0.60 Light grey, moderately weathered, thinly bedded, closely jointed soft rock. **SANDSTONE**.

0.70

NOTES

1) Refusal @ 0.70m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

ELEVATION :
X-COORD : E25 34.637
Y-COORD : S30 29.832

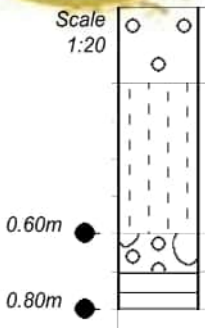
HOLE No: TP51

NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP52
Sheet 1 of 1

JOB NUMBER: NVG013



0.00	Slightly moist, yellowish brown speckled dark grey, medium dense, intact, gravelly SAND with occasional subangular dolerite cobbles and boulders. **FILL**.
0.20	Slightly moist, dark brown medium dense, intact, silty SAND with subangular mudstone gravel cobbles. **COLLUVIUM**.
0.60	Greenish grey stained reddish brown, angular, highly weathered mudstone GRAVEL and COBBLES in a silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.
0.70	Greenish grey, moderately weathered, fine grained, very thinly bedded, very closely jointed, soft rock. **MUDSTONE**.
0.80	

NOTES

1) Refusal @ 0.80m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed samples between 0.60m - 0.80m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

ELEVATION :
X-COORD : E25 34.795
Y-COORD : S30 29.665

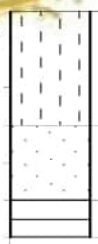
HOLE No: TP52

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP53
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown, medium dense, intact, silty SAND. **COLLUVIUM**.

0.30 Slightly moist, orangey brown stained yellow, firm, shattered, sandy CLAY. **RESIDUAL MUDSTONE**.

0.50 Greenish grey, moderately weathered, fine grained, thinly bedded, soft rock. **MUDSTONE**.

0.60

NOTES

1) Refusal @ 0.60m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

ELEVATION :
X-COORD : E25 34.952
Y-COORD : S30 29.494

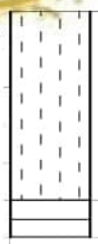
HOLE No: TP53

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP54
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled orange, medium dense, intact, silty SAND with gravel. **COLLUVIUM**.

0.50 Greenish grey, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

0.60

NOTES

1) Refusal @ 0.60m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

ELEVATION :
X-COORD : E25 35.264
Y-COORD : S30 29.161

HOLE No: TP54

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP55
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Dark grey stained reddish brown, moderately weathered, closely jointed, soft rock. **DOLERITE**.

0.00

NOTES

1) Road cut exposure on dolerite outcrop .

2) No water seepage.

3) No samples taken.

4) No DCP.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

INCLINATION :
DIAM : 600mm
DATE :
DATE : 20/09/2024

ELEVATION :
X-COORD : E25 35.422
Y-COORD : S30 28.993

HOLE No: TP55

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

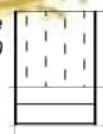
DATE : 07/12/2024 15:23
TEXT : ..\XhariepProfilesP1.0.txt

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP56
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown, medium dense, intact, silty SAND with subangular mudstone gravel and cobbles. **COLLUVIUM**.

0.20 Greenish grey, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

0.30

NOTES

1) Refusal @ 0.30m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

ELEVATION :
X-COORD : E25 35.630
Y-COORD : S30 28.794

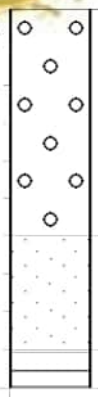
HOLE No: TP56
FREE STATE

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP57
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown speckled dark grey, loose to medium dense, intact, gravelly SAND with occasional subangular dolerite cobbles. **FILL**.

0.60 Slightly moist, orangey brown stained yellow, firm, shattered, sandy CLAY. **RESIDUAL MUDSTONE**.

0.90 Greenish grey, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

1.00

NOTES

1) Refusal @ 1.00m on medium hard rock Mudstone.
2) Sidewalls collapsing.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

ELEVATION :
X-COORD : E25 35.727
Y-COORD : S30 28.595

HOLE No: TP57

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP58
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Slightly moist, dark brown, medium dense, intact, silty SAND with gravel. **COLLUVIUM**.

0.10 Greenish grey stained brown, moderately weathered, fine grained, very thinly bedded, closely jointed, soft rock. **MUDSTONE**.

0.20

NOTES

1) Refusal @ 0.20m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

ELEVATION :
X-COORD : E25 35.861
Y-COORD : S30 28.411

HOLE No: TP58

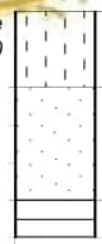
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP59
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, dark brown <u>medium dense</u>, intact, silty SAND with subangular mudstone gravel and cobbles. **COLLUVIUM**.
0.20	Slightly moist, orangey brown stained yellow, <u>firm to stiff</u> with depth, shattered, sandy CLAY. **RESIDUAL MUDSTONE**.
0.50	Greenish grey, moderately weathered, fine grained, thinly bedded, closely jointed, <u>soft rock</u>. **MUDSTONE**.
0.60	

NOTES

1) Refusal @ 0.60m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024

DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

ELEVATION :
X-COORD : E25 35.996
Y-COORD : S30 28.231

HOLE No: TP59

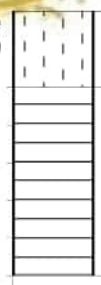
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP60
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled orange, medium dense, intact, silty SAND with subangular mudstone cobbles. **COLLUVIUM**.

0.20 Greenish grey stained brown, highly to moderately weathered, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

0.70

NOTES

1) Refusal @ 0.70m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

ELEVATION :
X-COORD : E25 36.132
Y-COORD : S30 28.049

HOLE No: TP60

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP61
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Slightly moist, dark brown speckled orange, loose, intact, silty SAND with subangular mudstone gravel and cobbles. **COLLUVIUM**.

0.10 Greenish grey, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

0.20

NOTES

1) Refusal @ 0.20m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

ELEVATION :
X-COORD : E25 36.270
Y-COORD : S30 27.867

HOLE No: TP61

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP62
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Slightly moist, dark brown speckled orange, loose, intact, silty SAND with gravel. **COLLUVIUM**.

0.10 Greenish grey, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

0.20

NOTES

1) Refusal @ 0.20m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

ELEVATION :
X-COORD : E25 36.409
Y-COORD : S30 27.684

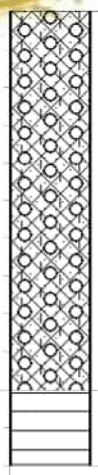
HOLE No: TP62

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP63
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Moderately packed, angular weathered GRAVEL in a silty sand matrix. Overall consistency is medium dense. **FILL**.

1.00 Greenish grey, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

1.20

NOTES

1) Refusal @ 1.20m on medium hard rock Mudstone.
2) Sidewalls collapse in Fill layer.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

ELEVATION :
X-COORD : E25 36.499
Y-COORD : S30 27.566

HOLE No: TP63

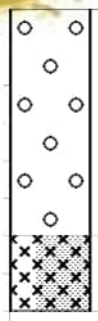
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP64
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown speckled dark grey, loose, intact, gravelly SAND with occasional subangular dolerite cobbles and boulders. **FILL**.

0.60 Dark grey stained reddish brown, moderately weathered, medium grained, closely jointed soft rock. **DOLERITE**.

0.80

NOTES

1) Refusal @ 0.80m on medium hard rock Dolerite.
2) Sidewalls collapse in the fill layer.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

ELEVATION :
X-COORD : E25 36.513
Y-COORD : S30 27.548

HOLE No: TP64

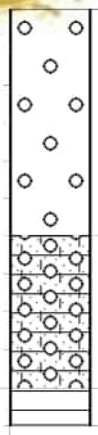
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP65
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown speckled dark grey, loose to medium dense, intact, gravelly SAND with occasional subangular dolerite and sandstone cobbles and boulders. **FILL**.

0.60 Well packed, angular , weathered mudstone GRAVEL in a silty sand matrix. Overall consistency, dense to very dense. **RESIDUAL MUDSTONE**.

1.00 Greenish grey, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

1.10

NOTES

1) Refusal @ 1.10m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

ELEVATION :
X-COORD : E25 36.541
Y-COORD : S30 27.510

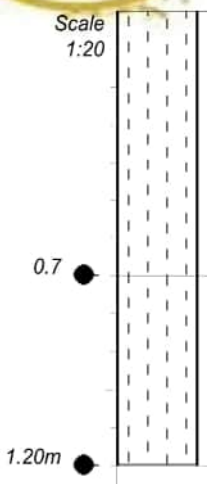
HOLE No: TP65

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP66
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown, medium dense, intact, silty SAND. **COLLUVIUM**.

0.7 — 0.70

Slightly moist, orangey brown stained grey, dense to very dense, intact, silty SAND with gravel and cobbles. **RESIDUAL DOLERITE**.

1.20m — 1.20

NOTES

1) Refusal @ 1.20m on very dense material.
2) Sidewalls stable.
3) No water seepage.
4) Bulk Samples between 0.7 1.20m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

ELEVATION :
X-COORD : E25 36.678
Y-COORD : S30 27.330

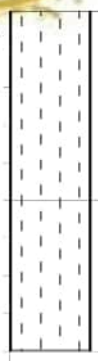
HOLE No: TP66

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP67
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown, medium dense, intact, silty SAND gravel. **COLLUVIUM**.

0.50 Slightly moist, orangey brown stained grey, dense to very dense, intact, silty SAND with gravel and cobbles. **RESIDUAL DOLERITE**.

0.90

NOTES

1) Refusal @ 0.90m on very dense material.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

ELEVATION :
X-COORD : E25 36.815
Y-COORD : S30 27.149

HOLE No: TP67

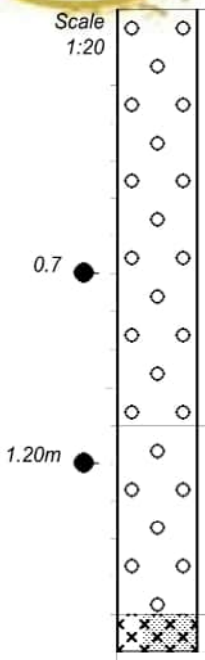
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP68
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown speckled dark grey, medium dense, intact, gravelly SAND with occasional subangular dolerite and sandstone cobbles and boulders, plastics. **FILL**.

1.10 Slightly moist, dark brown speckled grey, medium dense to dense, intact, gravelly SAND with occasional subangular dolerite cobbles and boulders. **RESIDUAL DOLERITE**.

1.60 Dark grey stained reddish brown, moderately weathered, medium grained, closely jointed soft rock. **DOLERITE**.

1.70

NOTES

1) Refusal @ 1.70m on medium hard rock Dolerite.
2) Sidewalls collapse in the Fill layer.
3) No water seepage.
4) Bulk Samples between 0.7 1.20m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

ELEVATION :
X-COORD : E25 36.941
Y-COORD : S30 26.983

HOLE No: TP68

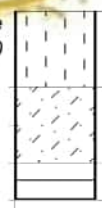
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP69
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled orange, loose to medium dense, intact, silty SAND with subangular mudstone gravel and cobbles. **COLLUVIUM**.

0.20 Slightly moist, greenish grey stained reddish brown, dense to very dense, relic jointed, clayey sandy GRAVEL. **RESIDUAL INDURATED MUDSTONE**.

0.40 Greenish grey stained brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **INDURATED MUDSTONE**.

0.50

NOTES

1) Refusal @ 0.50m on medium hard rock Indurated Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

ELEVATION :
X-COORD : E25 37.097
Y-COORD : S30 26.786

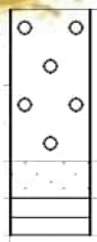
HOLE No: TP69

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP70
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown speckled dark grey, medium dense, intact, gravelly SAND with occasional subangular dolerite and sandstone cobbles and boulders. **FILL**.

0.40 Slightly moist, orangey brown stained yellow, firm, relic jointed, sandy CLAY. **RESIDUAL MUDSTONE**.

0.50 Reddish grey becoming greenish grey with depth, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

0.60

NOTES

1) Refusal @ 0.60m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

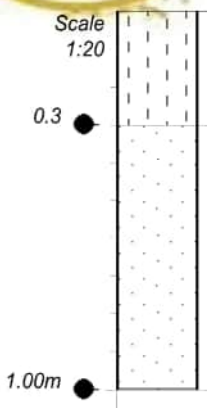
ELEVATION :
X-COORD : E25 37.250
Y-COORD : S30 26.619

HOLE No: TP70

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP71
Sheet 1 of 1

JOB NUMBER: NVG013



0.00 Slightly moist, dark brown speckled orange, medium dense, intact, silty SAND with subangular mudstone gravel and cobbles. **COLLUVIUM**.

0.30 Slightly moist, reddish brown speckled pinkish grey, very stiff, relic jointed, sandy CLAY. **RESIDUAL MUDSTONE**.

1.00 NOTES

1) Refusal @ 1.00m on very stiff CLAY.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed Samples 0.3 1.00m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

ELEVATION :
X-COORD : E25 37.404
Y-COORD : S30 26.446

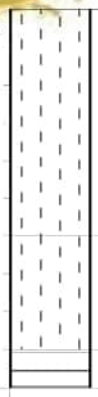
HOLE No: TP71

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP72
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled orange, medium dense, intact, silty SAND with gravel. **COLLUVIUM**.

0.60 Slightly moist, orangey brown speckled yellow, dense to very dense, intact, silty SAND with occasional subangular gravel and cobbles. **RESIDUAL MUDSTONE**.

0.90 Greenish grey, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

1.00

NOTES

1) Refusal @ 1.00m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

ELEVATION :
X-COORD : E25 37.556
Y-COORD : S30 26.277

HOLE No: TP72

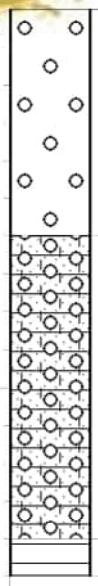
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP73
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown speckled dark grey, loose to medium dense, intact, gravelly SAND with occasional subangular dolerite and sandstone cobbles and boulders. **FILL**.

0.60 Well packed, angular , weathered mudstone GRAVEL in a silty sand matrix. Overall consistency is dense to very dense. **RESIDUAL MUDSTONE**.

1.40 Reddish grey becoming greenish grey with depth, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

1.50

NOTES

1) Refusal @ 1.50m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

ELEVATION :
X-COORD : E25 37.643
Y-COORD : S30 26.178

HOLE No: TP73

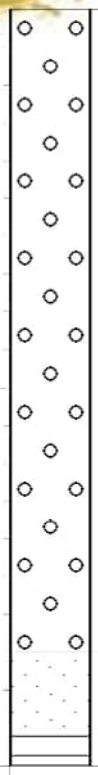
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP74
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown speckled dark grey, loose to medium dense, intact, gravelly SAND with subrounded and subangular dolerite and sandstone cobbles and boulders of up to 70cm long. **FILL**.

1.70 Slightly moist, orangey brown stained yellow, firm, relic jointed, sandy CLAY. **RESIDUAL MUDSTONE**.

1.90 Greenish grey, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

2.00

NOTES

1) Refusal @ 2.00m on medium hard rock Mudstone.
2) Sidewalls collapsing in the fill layer.
3) No water seepage.
4) No samples taken.
5) No DCP due to sidewalls collapsing.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

ELEVATION :
X-COORD : E25 37.684
Y-COORD : S30 26.137

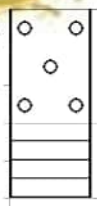
HOLE No: TP74

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP75
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown speckled dark grey, medium dense, intact, gravelly SAND with occasional subangular dolerite gravel and cobbles. **FILL**.

0.30 Greenish grey stained brown, highly to moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

0.50

NOTES

1) Refusal @ 0.50m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

ELEVATION :
X-COORD : E25 37.836
Y-COORD : S30 25.965

HOLE No: TP75

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP76
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00	Slightly moist, yellowish brown speckled dark grey, medium dense, intact, gravelly SAND with occasional subangular dolerite and mudstone cobbles and boulders. **FILL**.
0.30	Slightly moist, dark brown, medium dense, intact, silty SAND with gravel. **COLLUVIUM**.
0.60	Slightly moist, orangey brown stained yellow, firm, relic jointed, sandy CLAY. **RESIDUAL MUDSTONE**.
0.80	Greenish grey stained brown, highly to moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.
2.00	

NOTES

1) Refusal @ 2.00m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

ELEVATION :
X-COORD : E25 37.988
Y-COORD : S30 25.796

HOLE No: TP76

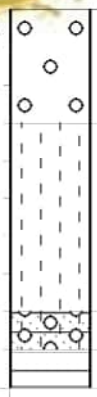
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP77
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown speckled dark grey, loose to medium dense, intact, gravelly SAND with occasional subangular dolerite and mudstone cobbles and boulders. **FILL**.

0.30 Slightly moist, dark brown, medium dense, intact, silty SAND with subangular mudstone gravel and cobbles. **COLLUVIUM**.

0.80 Well packed, angular , weathered mudstone GRAVEL in a silty sand matrix. Overall consistency is dense to very dense. **RESIDUAL MUDSTONE**.

0.90 Greenish grey stained brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

1.00

NOTES

1) Refusal @ 1.00m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

ELEVATION :
X-COORD : E25 38.142
Y-COORD : S30 25.626

HOLE No: TP77

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP78
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Greenish grey stained brown, moderately weathered, fine grained, thinly bedded, closely jointed, medium rock, **MUDSTONE**.

0.10

NOTES

1) Mudstone outcrop.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024

DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

ELEVATION :
X-COORD : E25 38.336
Y-COORD : S30 25.461

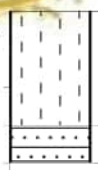
HOLE No: TP78

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP79
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled orange, medium dense, intact, silty SAND with subangular sandstone gravel and cobbles. **COLLUVIUM**.

0.30 Light grey stained brown, moderately weathered, medium grained, thinly bedded, closely jointed, soft rock. **SANDSTONE**.

0.40

NOTES

1) Refusal @ 0.40m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

ELEVATION :
X-COORD : E25 38.530
Y-COORD : S30 25.324

HOLE No: TP79

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP80
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Light grey stained brown, moderately weathered, medium grained, closely jointed soft rock. **SANDSTONE**.

0.10

NOTES

1) Sandstone outcrop.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024

ELEVATION :
X-COORD : E25 38.723
Y-COORD : S30 25.186

HOLE No: TP80

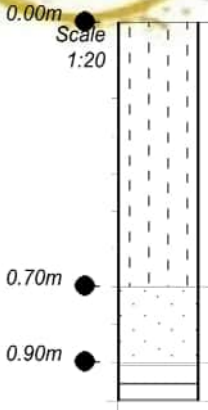
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP81
Sheet 1 of 1

JOB NUMBER: NVG013



0.00	Slightly moist, dark brown speckled orange, medium dense, intact, silty SAND with gravel. **COLLUVIUM**.
0.70	Slightly moist, orangey brown stained yellow, firm, relic jointed, sandy CLAY with occasional gravel and cobbles. **RESIDUAL MUDSTONE**.
0.90	Greenish grey, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.
1.00	

NOTES

1) Refusal @ 1.00m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed samples between 0.00m 0.70m and 0.70m 0.90m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

ELEVATION :
X-COORD : E25 38.917
Y-COORD : S30 25.048

HOLE No: TP81

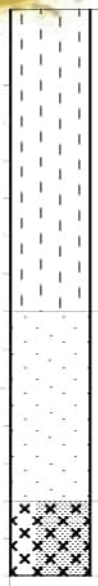
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP82
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled orange, medium dense, intact, silty SAND with gravel and cobbles. **COLLUVIUM**.

0.80 Slightly moist, orangey brown stained grey, firm, relic jointed, sandy CLAY. **RESIDUAL DOLERITE**.

1.30 Light grey stained brown, highly to moderately weathered, medium grained, closely jointed, soft rock. **DOLERITE**.

1.50

NOTES

1) Refusal @ 1.50m on medium hard rock Dolerite.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

ELEVATION :
X-COORD : E25 39.110
Y-COORD : S30 24.910

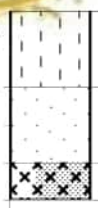
HOLE No: TP82

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP83
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled orange, medium dense, intact, silty SAND with gravel and cobbles. **COLLUVIUM**.

0.20 Slightly moist, orangey brown stained grey, firm, relic jointed, sandy CLAY. **RESIDUAL DOLERITE**.

0.40 Light grey stained brown, moderately weathered, medium grained, closely jointed soft rock .**DOLERITE**.

0.50

NOTES

1) Refusal @ 0.50m on medium hard rock Dolerite.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

ELEVATION :
X-COORD : E25 39.302
Y-COORD : S30 24.772

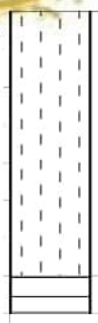
HOLE No: TP83

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP84
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled orange, medium dense, intact, silty SAND with gravel and cobbles. **FILL**.

0.70 Light grey blotched olive brown, moderately weathered, fine grained, thinly bedded, closely jointed, spheroidal weathering, soft rock. **INDURTAED MUDSTONE**.

0.80

NOTES

1) Refusal @ 0.80m on medium hard rock Indurated Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

ELEVATION :
X-COORD : E25 39.494
Y-COORD : S30 24.637

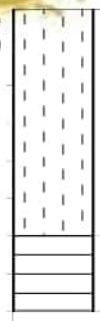
HOLE No: TP84

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP85
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled orange, loose to medium dense, intact, silty SAND with subangular sandstone gravel, cobbles and boulders. **FILL**.

0.60 Light grey blotched olive brown, moderately weathered, medium grained, thinly bedded, closely jointed, spheroidal weathering, soft rock. **INDURATED MUDSTONE**.

0.80

NOTES

1) Refusal @ 0.80m on medium hard rock Indurated Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

ELEVATION :
X-COORD : E25 39.687
Y-COORD : S30 24.501

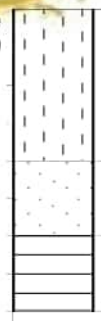
HOLE No: TP85

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP86
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled orange, medium dense, intact, silty SAND with subangular gravel, cobbles and boulders. **FILL**.

0.40 Well packed, weathered mudstone GRAVEL in a sandy clay matrix. Overall consistency is dense. **RESIDUAL INDURATED MUDSTONE**.

0.60 Greenish grey stained brown, highly to moderately weathered, medium grained, thinly bedded, closely jointed, soft rock. **INDURATED MUDSTONE**.

0.80

NOTES

1) Refusal @ 0.80m on medium hard rock Indurated Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

ELEVATION :
X-COORD : E25 39.883
Y-COORD : S30 24.360

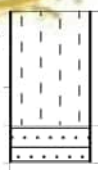
HOLE No: TP86

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP87
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown medium dense, intact, silty SAND with gravel and cobbles and isolated boulders. **FILL**.

0.30 Light grey stained brown, moderately weathered, medium grained, closely jointed soft rock. **SANDSTONE**.

0.40

NOTES

1) Refusal @ 0.40m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024

DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

ELEVATION :
X-COORD : E25 40.074
Y-COORD : S30 24.225

HOLE No: TP87

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP88
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Slightly moist, dark brown speckled orange, medium dense, intact, silty SAND with subangular sandstone gravel and cobbles. **FILL**.

0.10 Pale brown, moderately weathered, medium grained, closely jointed, soft rock. **SANDSTONE**.

0.20

NOTES

1) Refusal @ 0.20m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

ELEVATION :
X-COORD : E25 40.251
Y-COORD : S30 24.072

HOLE No: TP88

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP89
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Well packed, angular weathered mudstone GRAVEL in a sandy clay matrix. Overall consistency is dense to very dense. **RESIDUAL MUDSTONE**.

0.60 Greenish grey stained brown, highly to moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

0.80

NOTES

1) Refusal @ 0.80m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

ELEVATION :
X-COORD : E25 40.349
Y-COORD : S30 23.871

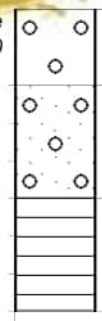
HOLE No: TP89

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP90
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown speckled dark grey, loose to medium dense, intact, slightly gravelly SAND with occasional subangular dolerite and sandstone cobbles and boulders. **FILL**.

0.20 Slightly moist, reddish brown stained yellow, firm, relic jointed, slightly gravelly sandy CLAY with occasional subangular boulders. **RESIDUAL MUDSTONE**.

0.50 Greenish grey stained brown, highly to moderately weathered, fine grained, thinly bedded, closely jointed, soft rock, **MUDSTONE**.

0.80

NOTES

1) Refusal @ 0.80m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

ELEVATION :
X-COORD : E25 40.420
Y-COORD : S30 23.662

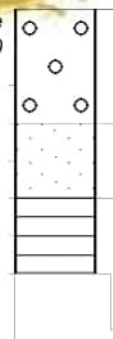
HOLE No: TP90

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP91
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown speckled dark grey, medium dense, intact, slightly gravelly SAND with occasional subangular dolerite and sandstone cobbles and boulders. **FILL**.

0.30 Slightly moist, reddish brown stained yellow, firm, relic jointed, sandy CLAY with occasional subangular cobbles. **RESIDUAL MUDSTONE**.

0.50 Greenish grey stained brown, highly to moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

0.70

NOTES

1) Refusal @ 0.70m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

ELEVATION :
X-COORD : E25 40.492
Y-COORD : S30 23.454

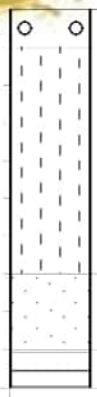
HOLE No: TP91

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP92
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown speckled dark grey, medium dense, intact, slightly gravelly SAND with occasional subangular dolerite and sandstone cobbles. **FILL**.

0.10 Slightly moist, dark brown speckled orange, loose to medium dense, intact, silty SAND with subangular mudstone cobbles. **COLLUVIUM**.

0.70 Slightly moist, dark brown blotched grey, firm, relic jointed, sandy CLAY with. **RESIDUAL MUDSTONE**.

0.90 Greenish grey stained brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

1.00

NOTES

1) Refusal @ 1.00m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

ELEVATION :
X-COORD : E25 40.567
Y-COORD : S30 23.240

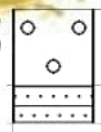
HOLE No: TP92

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP93
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown, medium dense, intact, gravelly SAND . **FILL**.

0.20 Light grey stained brown, moderately weathered, medium grained, closely jointed soft rock. **SANDSTONE**.

0.30

NOTES

1) Refusal @ 0.30m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

ELEVATION :
X-COORD : E25 40.639
Y-COORD : S30 23.034

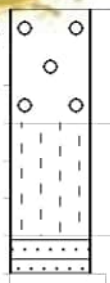
HOLE No: TP93

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP94
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown speckled dark grey, medium dense, intact, gravelly SAND . **FILL**.

0.30 Slightly moist, dark brown, medium dense, intact, silty SAND with subangular mudstone gravel and cobbles. **COLLUVIUM**.

0.60 Pale brown blotched pinkish brown, moderately weathered, medium grained, closely jointed soft rock. **SANDSTONE**.

0.70

NOTES

1) Refusal @ 0.70m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

ELEVATION :
X-COORD : E25 40.712
Y-COORD : S30 22.825

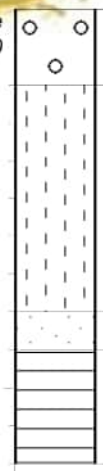
HOLE No: TP94

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP95
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown speckled dark grey, medium dense, intact, gravelly SAND. **FILL**.

0.20 Slightly moist, dark brown speckled orange, medium dense, intact, silty SAND with subangular mudstone cobbles. **COLLUVIUM**.

0.80 Slightly moist, reddish brown speckled pink, stiff, relic jointed, sandy CLAY with occasional subangular gravel and cobbles. **RESIDUAL MUDSTONE**.

0.90 Dark purple brown, highly to moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

1.20

NOTES

1) Refusal @ 1.20m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

ELEVATION :
X-COORD : E25 40.785
Y-COORD : S30 22.616

HOLE No: TP95

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP96
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Dark grey stained reddish brown, moderately weathered, medium grained, medium hard rock. **DOLERITE**.

0.10

NOTES

1) Dolerite outcrop.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024

ELEVATION :
X-COORD : E25 40.858
Y-COORD : S30 22.410

HOLE No: TP96

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

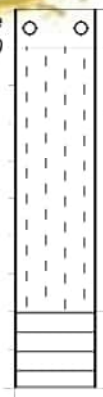
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP97
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown, loose, intact, gravelly SAND with occasional subangular dolerite and sandstone cobbles. **FILL**.

0.10 Slightly moist, dark brown, loose to medium dense, intact, silty SAND with subangular mudstone gravel and cobbles. **COLLUVIUM**.

0.80 Greenish grey stained brown, highly to moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

1.00

NOTES

1) Refusal @ 1.00m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

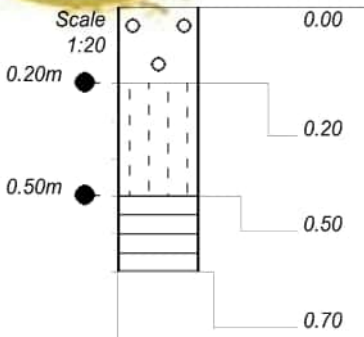
ELEVATION :
X-COORD : E25 40.932
Y-COORD : S30 22.201

HOLE No: TP97

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP98
Sheet 1 of 1

JOB NUMBER: NVG013



Slightly moist, yellowish brown speckled dark grey, medium dense, intact, slightly gravelly SAND with occasional subangular dolerite and sandstone cobbles. **FILL**.

Slightly moist, dark brown, medium dense, intact, silty SAND with gravel. **COLLUVIUM**.

Greenish grey stained reddish brown, highly to moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

NOTES

1) Refusal @ 0.70m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed Samples between 0.20m - 0.50m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

ELEVATION :
X-COORD : E25 41.026
Y-COORD : S30 22.001

HOLE No: TP98

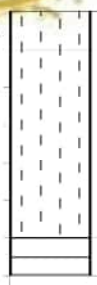
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP99
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, yellowish brown speckled dark grey, medium dense, intact, silty SAND with occasional subangular dolerite and sandstone gravel and cobbles. **FILL**.
0.10	Slightly moist, dark brown, medium dense, intact, silty SAND with subangular mudstone gravel and cobbles. **COLLUVIUM**.
0.60	Greenish grey stained reddish brown, highly to moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.
0.70	

NOTES

1) Refusal @ 0.70m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPart1.1.txt

ELEVATION :
X-COORD : E25 41.122
Y-COORD : S30 21.802

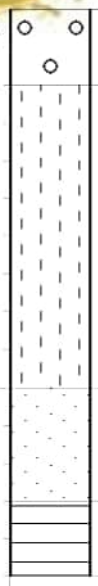
HOLE No: TP99

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP100
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, yellowish brown, loose, intact, gravelly SAND. **FILL**.
0.20	Slightly moist, dark brown, medium dense, intact, silty SAND with subangular mudstone gravel. **COLLUVIUM**.
1.00	Slightly moist, orangey brown speckled grey, stiff, relic jointed, sandy CLAY. **RESIDUAL MUDSTONE**.
1.30	Greenish grey, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.
1.50	

NOTES

1) Refusal @ 1.50m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024

DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 41.156
Y-COORD : S30 21.743

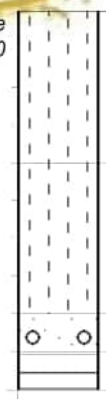
HOLE No: TP100
FREE STATE

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP101
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown, medium dense, intact, silty SAND with gravel and cobbles and isolated boulders. **FILL**.

0.40 Slightly moist, dark brown, medium dense, intact, silty SAND with subangular mudstone gravel and cobbles. **COLLUVIUM**.

0.80 Slightly moist, orangey brown speckled grey, firm, relic jointed, gravelly sandy CLAY with occasional subangular cobbles. **RESIDUAL MUDSTONE**.

0.90 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

1.00

NOTES

1) Refusal @ 1.00m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 41.244
Y-COORD : S30 21.549

HOLE No: TP101

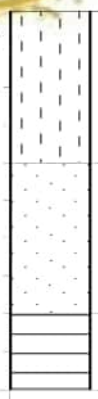
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP102
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, yellowish brown speckled dark grey, medium dense, intact, silty SAND with gravel. **FILL**.
0.40	Slightly moist, orangey brown, firm, shattered, sandy CLAY with occasional subangular gravel and cobbles. **RESIDUAL MUDSTONE**.
0.80	Greenish grey stained reddish brown, highly to moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.
1.00	

NOTES

1) Refusal @ 1.00m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024

DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 41.268
Y-COORD : S30 21.498

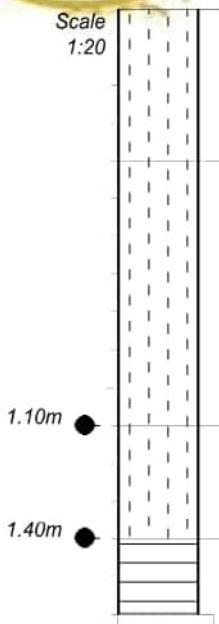
HOLE No: TP102

NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP103
Sheet 1 of 1

JOB NUMBER: NVG013



0.00	Slightly moist, yellowish brown speckled dark grey, medium dense, intact, silty SAND with gravel. **FILL**.
0.40	Slightly moist, dark brown, medium dense, intact, silty SAND with subangular mudstone gravel. **COLLUVIUM**.
1.10	Slightly moist, orangey brown speckled grey, soft to firm, shattered, silty CLAY. **RESIDUAL MUDSTONE**.
1.40	Greenish grey, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.
1.60	

NOTES

1) Refusal @ 1.60m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed samples from 1.10m 1.40m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 41.366
Y-COORD : S30 21.296

HOLE No: TP103

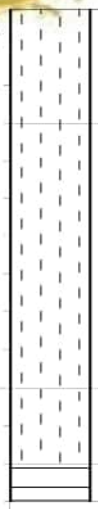
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP104
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown, medium dense, intact, silty SAND with occasional subangular dolerite and mudstone cobbles and boulders. **FILL**.

0.30 Slightly moist, dark brown, medium dense, intact, silty SAND with subangular mudstone gravel. **COLLUVIUM**.

1.00 Slightly moist, orangey brown speckled grey, stiff, shattered, silty CLAY. **RESIDUAL MUDSTONE**.

1.20 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

1.30

NOTES

1) Refusal @ 1.30m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 41.465
Y-COORD : S30 21.099

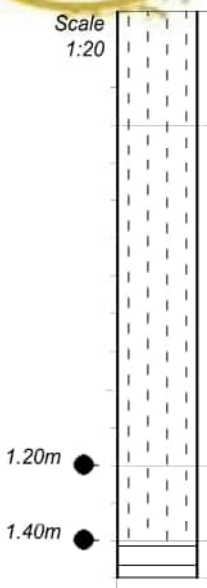
HOLE No: TP104

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP105
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown speckled dark grey, medium dense, intact, silty SAND with gravel and cobbles. **FILL**.

0.30 Slightly moist, dark brown speckled orange, medium dense, intact, silty SAND with subangular mudstone gravel. **COLLUVIUM**.

1.20 Slightly moist, orangey brown speckled grey, soft to firm, shattered, silty CLAY with occasional subangular gravel and cobbles. **RESIDUAL MUDSTONE**.

1.40 Greenish grey, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

1.50

NOTES

1) Refusal @ 1.50m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed samples from 1.20m 1.40m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 41.563
Y-COORD : S30 20.901

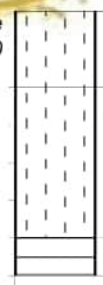
HOLE No: TP105

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP106
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown speckled dark grey, loose, silty SAND with occasional subangular dolerite and mudstone cobbles and boulders. **FILL**.

0.20 Slightly moist, dark brown speckled orange, medium dense, intact, silty SAND with subangular mudstone gravel. **COLLUVIUM**.

0.60 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

0.70

NOTES

1) Refusal @ 0.70m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 41.701
Y-COORD : S30 20.631

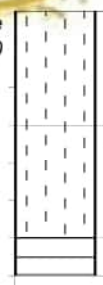
HOLE No: TP106

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP107
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown speckled dark grey, medium dense, intact, silty SAND with occasional subangular dolerite and mudstone cobbles and boulders. **FILL**.

0.30 Slightly moist, dark brown, medium dense, intact, silty SAND with subangular mudstone gravel and cobbles. **COLLUVIUM**.

0.60 Greenish grey, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

0.70

NOTES

1) Refusal @ 0.70m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 41.808
Y-COORD : S30 20.433

HOLE No: TP107

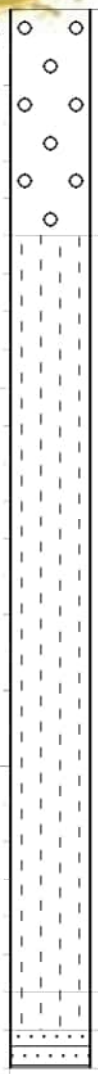
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP108
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown speckled dark grey, loose to medium dense, intact, slightly gravelly SAND with isolated boulders. **FILL**.

0.60 Slightly moist, light grey speckled dark grey, medium dense to dense, intact, silty SAND. **FILL**.

2.60 Slightly moist, olive greenish grey speckled orange, medium dense, intact, silty SAND with occasional subangular cobbles. **RESIDUAL SANDSTONE**.

2.70 Light grey, moderately weathered, medium grained, thinly bedded, closely jointed, soft rock. **SANDSTONE**.

2.80

NOTES

1) Refusal @ 2.80m on medium hard rock Sandstone.
2) Sidewalls collapsing on fill.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 41.917
Y-COORD : S30 20.231

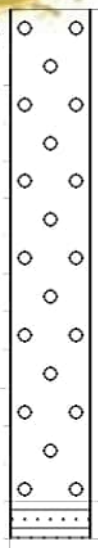
HOLE No: TP108

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP109
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown speckled dark grey, loose to medium dense, intact, slightly gravelly SAND with occasional subangular dolerite and sandstone cobbles and boulders. **FILL**.

1.30 Light grey, moderately weathered, medium grained, thinly bedded, closely jointed, soft rock. **SANDSTONE**.

1.40

NOTES

1) Refusal @ 1.40m on medium hard rock Sandstone.
2) Sidewalls collapse on fill.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 42.029
Y-COORD : S30 20.027

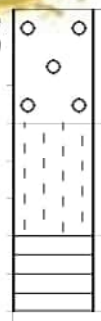
HOLE No: TP109

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP110
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown, medium dense, intact, slightly gravelly SAND with occasional subangular dolerite and mudstone gravel and cobbles. **FILL**.

0.30 Slightly moist, dark brown speckled orange, medium dense, intact, silty SAND with subangular mudstone gravel. **COLLUVIUM**.

0.60 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

0.80

NOTES

1) Refusal @ 0.80m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 42.137
Y-COORD : S30 19.831

HOLE No: TP110

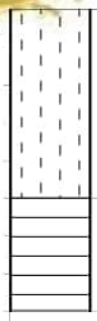
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP111
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown speckled dark grey, loose to medium dense, intact, silty SAND with occasional subangular dolerite and sandstone gravel, cobbles and boulders. **FILL**.

0.50 Greenish grey stained reddish brown, highly to moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

0.80

NOTES

1) Refusal @ 0.80m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 42.245
Y-COORD : S30 19.635

HOLE No: TP111

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP112
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Slightly moist, yellowish brown speckled dark grey, medium dense, intact, silty SAND with occasional subangular dolerite and sandstone gravel, cobbles and boulders. **FILL**.

0.40 Slightly moist, dark brown, medium dense, intact, silty SAND with subangular mudstone gravel. **COLLUVIUM**.

1.40 Slightly moist, orangey brown speckled grey firm, shattered, sandy CLAY with occasional subangular cobbles. **RESIDUAL MUDSTONE**.

2.90 Greenish grey stained reddish brown, highly weathered, fine grained, very thinly bedded, very closely jointed, very soft rock. **MUDSTONE**.

3.10

NOTES

1) Terminated @ 3.10m.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed samples from 1.40m 2.90m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

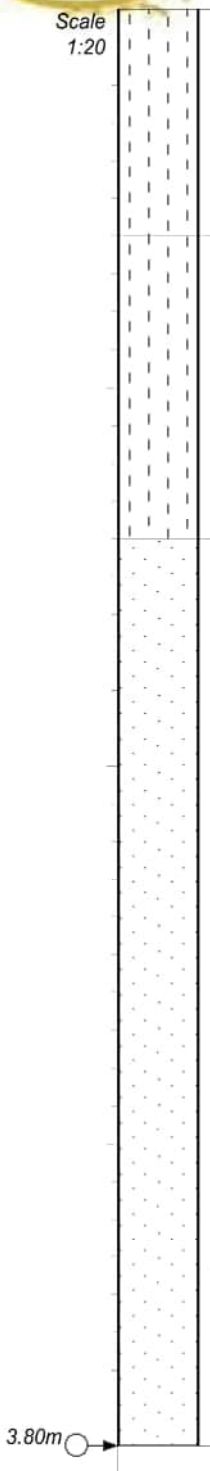
ELEVATION :
X-COORD : E25 42.355
Y-COORD : S30 19.433

HOLE No: TP112

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP113
Sheet 1 of 1

JOB NUMBER: NVG013



0.00 Slightly moist, yellowish brown speckled dark grey, loose to medium dense, intact, silty SAND with occasional subangular dolerite and sandstone cobbles and boulders. **FILL**.

0.60 Slightly moist, dark brown speckled orange, medium dense, intact, silty SAND with subangular mudstone gravel and cobbles. **COLLUVIUM**.

1.40 Slightly moist, orangey brown speckled grey firm, shattered, sandy CLAY with occasional subangular gravel and cobbles. **RESIDUAL MUDSTONE**.

3.80

NOTES

1) Terminated @ 3.80m.
2) Sidewalls collapsing on fill.
3) Water seepage @ 3.80m.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

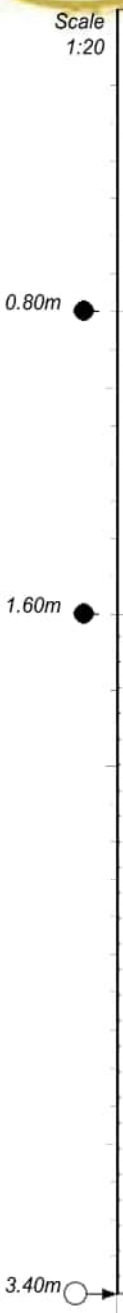
ELEVATION :
X-COORD : E25 42.463
Y-COORD : S30 19.236

HOLE No: TP113

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP114
Sheet 1 of 1

JOB NUMBER: NVG013



0.00 Slightly moist, yellowish brown, loose to medium dense, intact, silty SAND with occasional subangular dolerite and sandstone gravel, cobbles and boulders. **FILL**.

0.80 Slightly moist, dark brown speckled orange, medium dense, intact, silty SAND with subangular mudstone gravel. **COLLUVIUM**.

1.60 Slightly moist, orangey brown speckled grey firm, shattered, sandy CLAY with occasional subangular gravel. **RESIDUAL MUDSTONE**.

3.40

NOTES

1) Terminated @ 3.40m.
2) Sidewalls collapsing on fill.
3) Water seepage @ 3.40m.
4) Disturbed samples from 0.80m 1.60m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 42.510
Y-COORD : S30 19.153

HOLE No: TP114

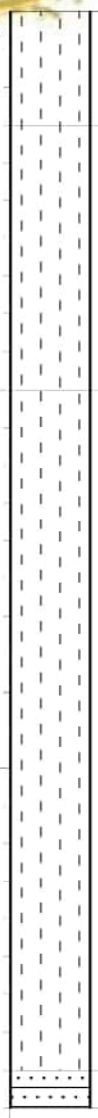
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP115
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown speckled dark grey, medium dense, intact, silty SAND with gravel and cobbles. **FILL**.

0.30 Slightly moist, dark brown speckled orange, medium dense, intact, silty SAND with subangular mudstone gravel and cobbles. **COLLUVIUM**.

1.00m

1.00 Slightly moist, orangey brown speckled grey medium dense, relic jointed, silty SAND with occasional subangular gravel and cobbles. **RESIDUAL SANDSTONE**.

2.80m

2.80 Light grey, highly to moderately weathered, medium grained, thinly bedded, closely jointed, soft rock. **SANDSTONE**.

2.90

NOTES

1) Refusal @ 2.90m on medium hard rock Sandstone.
2) Sidewalls collapsing on fill.
3) No water seepage.
4) Disturbed samples from 1.00m - 2.80m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 42.618
Y-COORD : S30 18.955

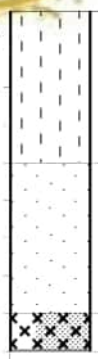
HOLE No: TP115

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP116
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown speckled dark grey, medium dense, intact, silty SAND with occasional subangular dolerite and sandstone gravel, cobbles and boulders. **FILL**.

0.40 Slightly moist, dark brown speckled grey, dense to very dense, intact, sandy GRAVEL with subangular boulders. **RESIDUAL DOLERITE**.

0.80 Dark grey stained reddish brown, moderately weathered, fine grained, closely jointed, soft rock. **DOLERITE**

0.90

NOTES

1) Refusal @ 0.90m on medium hard rock Dolerite.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 42.720
Y-COORD : S30 18.776

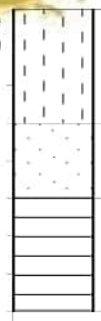
HOLE No: TP116

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP117
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown speckled dark grey, medium dense, intact, silty SAND with occasional subangular mudstone gravel and cobbles **FILL**.

0.30 Slightly moist, reddish brown speckled grey, soft to firm, shattered, sandy CLAY with occasional subangular gravel and cobbles. **RESIDUAL MUDSTONE**.

0.50 Greenish grey stained reddish brown, highly to moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock, **MUDSTONE**.

0.80

NOTES

1) Refusal @ 0.80m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

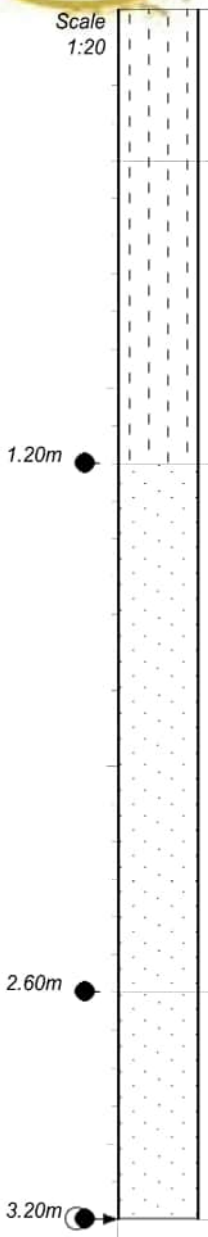
ELEVATION :
X-COORD : E25 42.838
Y-COORD : S30 18.589

HOLE No: TP117

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP118
Sheet 1 of 1

JOB NUMBER: NVG013



0.00 Slightly moist, yellowish brown speckled dark grey, medium dense, intact, silty SAND with gravel. **FILL**.

0.40 Slightly moist, dark brown speckled orange, medium dense, intact, silty SAND with gravel. **COLLUVIUM**.

1.20 Slightly moist, orangey brown speckled grey firm, shattered, sandy CLAY. **RESIDUAL MUDSTONE**.

2.60 Moist to wet, greenish grey, soft, shattered, sandy CLAY with occasional subangular cobbles. **RESIDUAL MUDSTONE**.

3.20

NOTES

1) Terminated @ 3.20m.
2) Sidewalls stable.
3) Water seepage @ 3.20m.
4) Disturbed samples from 1.20m 2.60m and 2.60m 3.20m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 42.958
Y-COORD : S30 18.398

HOLE No: TP118

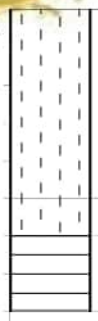
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP119
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown speckled dark grey, medium dense, intact, silty SAND with gravel and cobbles **FILL**.

0.50 Slightly moist, dark brown speckled orange, medium dense, intact, silty SAND with subangular mudstone gravel and cobbles. **COLLUVIUM**.

0.60 Greenish grey stained reddish brown, highly to moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

0.80

NOTES

1) Refusal @ 0.80m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 43.141
Y-COORD : S30 18.109

HOLE No: TP119

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP120
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Slightly moist, yellowish brown speckled dark grey, medium dense, intact, silty SAND with gravel and cobbles **FILL**.

0.10 Light grey, moderately to slightly weathered, medium grained, thinly bedded, closely jointed soft rock. **SANDSTONE**.

0.20

NOTES

1) Refusal @ 0.20m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 43.260
Y-COORD : S30 17.924

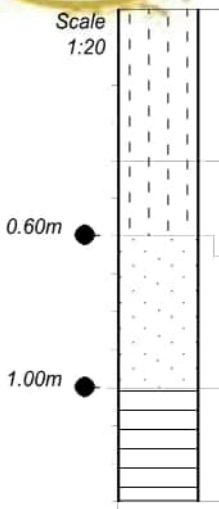
HOLE No: TP120

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP121
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, yellowish brown speckled dark grey, medium dense, intact, silty SAND with gravel. **FILL**.
0.40	
	Slightly moist, dark brown speckled orange, medium dense, intact, silty SAND with subangular mudstone gravel and cobbles. **COLLUVIUM**.
0.60	
	Slightly moist, reddish brown speckled grey firm, shattered, sandy CLAY. **RESIDUAL MUDSTONE**.
1.00	
	Greenish grey stained reddish brown, highly to moderately weathered, fine grained, thinly bedded ,very closely jointed, soft rock. **MUDSTONE**.
1.30	

NOTES

1) Refusal @ 1.30m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed samples from 0.60m 1.00m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 43.382
Y-COORD : S30 17.734

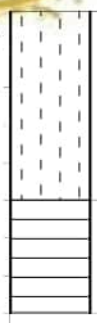
HOLE No: TP121

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP122
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown, medium dense, intact, silty SAND with gravel and cobbles. **FILL**.

0.50 Greenish grey stained reddish brown, highly to moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

0.80

NOTES

1) Refusal @ 0.80m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 43.439
Y-COORD : S30 17.645

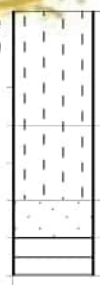
HOLE No: TP122

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP123
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, yellowish brown speckled dark grey, loose, intact, silty SAND with occasional subangular mudstone gravel and cobbles **FILL**.
0.30	Slightly moist, dark brown speckled orange, loose, intact, silty SAND with subangular mudstone gravel. **COLLUVIUM**.
0.50	Slightly moist, reddish brown speckled grey, stiff, relic jointed, sandy CLAY. **RESIDUAL MUDSTONE**.
0.60	Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**
0.70	

NOTES

1) Refusal @ 0.70m on medium hard rock Mudstone.
2) Sidewalls collapsing.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 43.556
Y-COORD : S30 17.455

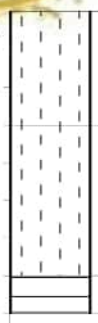
HOLE No: TP123

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP124
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown speckled dark grey, medium dense, intact, silty SAND with occasional subangular mudstone cobbles **FILL**.

0.30 Slightly moist, dark brown, loose, intact, silty SAND with subangular mudstone cobbles. **COLLUVIUM**.

0.70 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

0.80

NOTES

1) Refusal @ 0.80m on medium hard rock Mudstone.
2) Sidewalls collapsing.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 43.632
Y-COORD : S30 17.250

HOLE No: TP124

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP125
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00

Light grey, moderately to slightly weathered, medium grained, thinly bedded, closely jointed, soft rock. **SANDSTONE**

0.10

NOTES

1) Sandstone outcrop.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024

ELEVATION :
X-COORD : E25 43.651
Y-COORD : S30 17.114

HOLE No: TP125

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

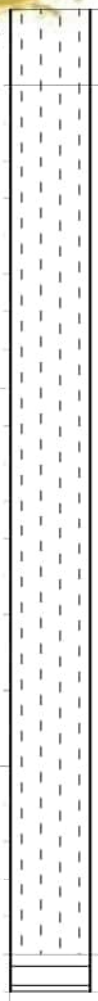
Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP126
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.20m-2.50m



0.00 Slightly moist, yellowish brown, medium dense, intact, silty SAND with occasional subangular mudstone gravel and cobbles. **FILL**.

0.20 Slightly moist, orangey brown speckled grey, medium dense to dense, intact, silty SAND with occasional subangular mudstone cobbles. **COLLUVIUM**.

2.50 Greenish grey stained reddish brown, highly to moderately weathered, fine grained, thinly bedded, soft rock. **MUDSTONE**.

2.60

NOTES

1) Terminated @ 2.60m, end of reach by TLB due to space.
2) Sidewalls collapsing.
3) No water seepage.
4) Disturbed samples from 0.20m-2.50m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

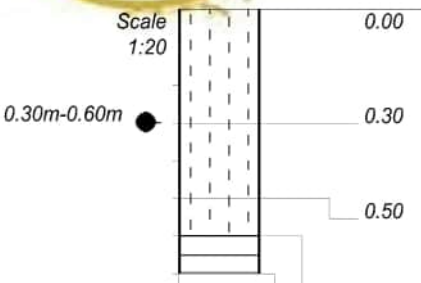
ELEVATION :
X-COORD : E25 43.683
Y-COORD : S30 16.898

HOLE No: TP126

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP128
Sheet 1 of 1

JOB NUMBER: NVG013



0.00	Slightly moist, yellowish brown speckled dark grey, medium dense, intact, silty SAND with gravel and cobbles . **FILL**.
0.30	Slightly moist, dark brown speckled orange, medium dense, intact, silty SAND with subangular mudstone gravel and cobbles. **COLLUVIUM**.
0.50	Slightly moist, orangey brown speckled grey, medium dense to dense, intact, silty SAND with occasional subangular gravel. **RESIDUAL MUDSTONE**.
0.60	Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**
0.70	

NOTES

1) Refusal @ 0.70m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed samples from 0.30m-0.60m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 43.742
Y-COORD : S30 16.486

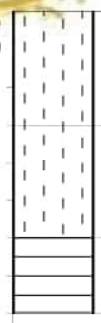
HOLE No: TP128

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP129
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, yellowish brown speckled dark grey, medium dense, intact, silty SAND with occasional subangular mudstone gravel and cobbles **FILL**.
0.30	Slightly moist, dark brown speckled orange, medium dense, intact, silty SAND with subangular mudstone gravel and cobbles. **COLLUVIUM**.
0.60	Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.
0.80	

NOTES

1) Refusal @ 0.80m on medium hard rock Mudstone.
2) Sidewalls collapsing.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024

DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 43.774
Y-COORD : S30 16.269

HOLE No: TP129

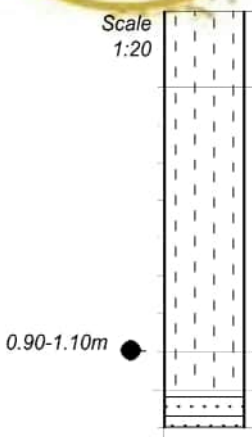
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP130
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, yellowish brown speckled dark grey, medium dense, intact, silty SAND with occasional subangular mudstone gravel and cobbles **FILL**.
0.20	Slightly moist, dark brown, medium dense, intact, silty SAND with subangular mudstone gravel. **COLLUVIUM**.
0.90	Slightly moist, pinkish brown speckled grey, very dense, intact, silty SAND. **RESIDUAL SANDSTONE**.
1.00	Pale grey stained reddish brown, moderately weathered, medium grained, thinly bedded, closely jointed, soft rock. **SANDSTONE**.
1.10	

NOTES

1) Refusal @ 1.10m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed sample from 0.90-1.10m.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 43.804
Y-COORD : S30 16.057

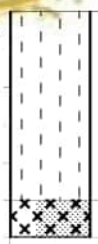
HOLE No: TP130

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP131
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown speckled dark grey, loose to medium dense, intact, silty SAND with gravel and cobbles **FILL**.

0.50 Dark grey stained reddish brown, moderately weathered, medium grained, closely jointed, soft rock. **DOLERITE**

0.60

NOTES

1) Refusal @ 0.60m on medium hard rock Dolerite.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Moved to a nearby position due to position
7) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 43.838
Y-COORD : S30 15.817

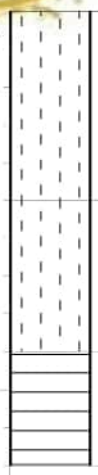
HOLE No: TP131

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP132
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown speckled dark grey, loose to medium dense, intact, silty SAND with occasional subangular mudstone gravel and cobbles **FILL**.

0.50 Slightly moist, dark brown speckled orange, medium dense, intact, silty SAND with subangular mudstone gravel and cobbles. **COLLUVIUM**.

0.90 Greenish grey stained reddish brown, highly to moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

1.20

NOTES

1) Refusal @ 1.20m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 43.831
Y-COORD : S30 15.628

HOLE No: TP132

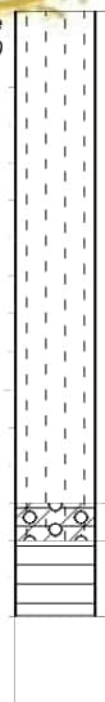
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP133
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, orangey brown speckled grey, medium dense to dense, intact, silty SAND with occasional mudstone gravel and cobbles. **COLLUVIUM**.

1.30 Well packed, subangular weathered mudstone GRAVEL in a silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

1.40 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

1.60

NOTES

1) Refusal @ 1.60m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 43.768
Y-COORD : S30 15.417

HOLE No: TP133

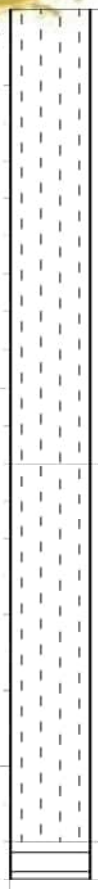
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP134
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled orange, loose to medium dense, intact, silty SAND with subangular mudstone gravel, cobbles and occasional pieces of plastics. **FILL**.

1.20 Slightly moist, orangey brown speckled grey, medium dense to dense, intact, silty SAND with occasional subangular mudstone gravel. **COLLUVIUM**.

2.20 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

2.30

NOTES

1) Refusal @ 2.30m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 43.705
Y-COORD : S30 15.205

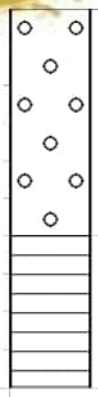
HOLE No: TP134

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP135
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown speckled dark grey, loose to medium dense, intact, slightly gravelly SAND with occasional subangular mudstone cobbles and dolerite boulders. **FILL**.

0.60 Greenish grey stained reddish brown, highly to moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

1.00

NOTES

1) Refusal @ 1.00m on medium hard rock Mudstone.
2) Sidewalls collapsing.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 43.675
Y-COORD : S30 15.104

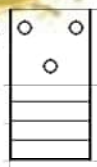
HOLE No: TP135

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP136
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, medium dense, intact, slightly gravelly SAND with subangular dolerite cobbles and boulders. **COLLUVIUM**.

0.20 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

0.40

NOTES

1) Refusal @ 0.40m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 43.951
Y-COORD : S30 14.885

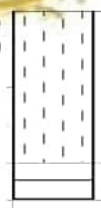
HOLE No: TP136

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP137
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown, medium dense, intact, silty SAND with subangular dolerite cobbles and boulders. **COLLUVIUM**.

0.40 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

0.50

NOTES

1) Refusal @ 0.50m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

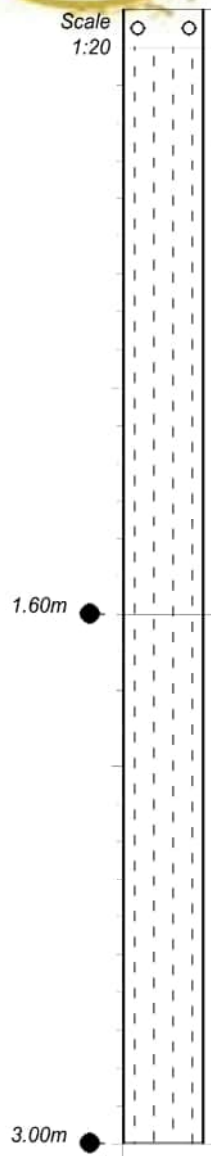
ELEVATION :
X-COORD : E25 44.154
Y-COORD : S30 14.777

HOLE No: TP137

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP138
Sheet 1 of 1

JOB NUMBER: NVG013



0.00 — Slightly moist, yellowish brown speckled dark grey, loose, intact, slightly gravelly SAND with occasional subangular dolerite and sandstone cobbles. **FILL**.

0.10 — Slightly moist, dark brown speckled orange, loose to medium dense, intact, silty SAND with subangular mudstone cobbles. **ALLUVIUM**.

1.60 — Slightly moist, light grey speckled dark grey, medium dense to dense, intact, silty SAND. **ALLUVIUM**.

3.00

NOTES

1) Terminated @ 3.00m.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed Samples from 1.60m 3.00m.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 43.608
Y-COORD : S30 14.881

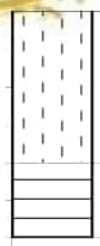
HOLE No: TP138

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP139
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown speckled dark grey, loose to medium dense, intact, silty SAND with occasional subangular dolerite and sandstone gravel and cobbles. **FILL**.

0.40 Greenish grey stained brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

0.60

NOTES

1) Refusal @ 0.60m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 43.543
Y-COORD : S30 14.675

HOLE No: TP139

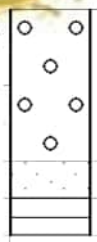
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP140
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown speckled dark grey, medium dense, intact, slightly gravelly SAND with occasional subangular dolerite and sandstone cobbles. **FILL**.

0.40 Well packed, moderately weathered, angular mudstone GRAVEL, in a sandy clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

0.50 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

0.60

NOTES

1) Refusal @ 0.60m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : S30 14.463
Y-COORD : E25 43.481

HOLE No: TP140

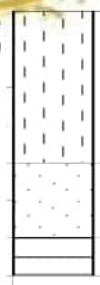
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP141
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown speckled dark grey, medium dense, intact, silty SAND with occasional subangular dolerite and sandstone gravel and cobbles. **FILL**.

0.40 Well packed, moderately weathered, angular mudstone GRAVEL, in a sandy clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

0.60 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

0.70

NOTES

1) Refusal @ 0.70m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 43.459
Y-COORD : S30 14.382

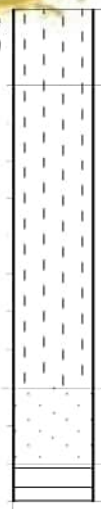
HOLE No: TP141

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP142
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, dark brown speckled orange, medium dense, intact, silty SAND with subangular sandstone boulders and cobbles. **FILL**.
0.20	Slightly moist, dark brown speckled orange, medium dense, intact, silty SAND with occasional subangular mudstone cobbles. **COLLUVIUM**.
1.00	Slightly moist, orangey brown speckled pink, stiff, relic jointed, sandy CLAY with cobbles. **RESIDUAL MUDSTONE**.
1.20	Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.
1.30	

NOTES

1) Refusal @ 1.30m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 43.392
Y-COORD : S30 14.173

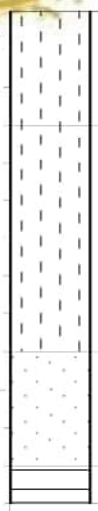
HOLE No: TP142

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP143
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled orange, medium dense, intact, silty SAND with subangular sandstone boulders and cobbles. **FILL**.

0.30 Slightly moist, dark brown speckled orange, loose to medium dense, intact, silty SAND with subangular mudstone cobbles. **COLLUVIUM**.

0.90 Slightly moist, orangey brown speckled pink, firm to stiff, relic jointed, sandy CLAY. **RESIDUAL MUDSTONE**.

1.20 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

1.30

NOTES

1) Refusal @ 1.30m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 43.327
Y-COORD : S30 13.966

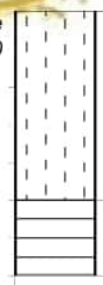
HOLE No: TP143

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP144
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled orange, loose to medium dense, intact, silty SAND with subangular sandstone boulders and cobbles. **FILL**.

0.50 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

0.70

NOTES

1) Refusal @ 0.70m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 43.287
Y-COORD : S30 13.753

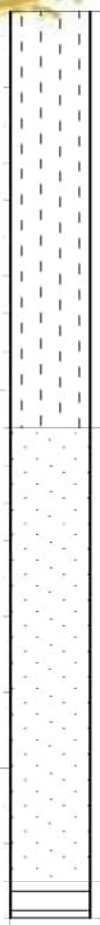
HOLE No: TP144

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP145
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled pinkish grey, loose to medium dense, intact, silty SAND with subangular mudstone cobbles. **COLLUVIUM**.

1.10 Well packed, highly to moderately weathered, angular mudstone GRAVEL, in a sandy clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

2.30 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

2.40

NOTES

1) Refusal @ 2.40m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 43.291
Y-COORD : S30 13.534

HOLE No: TP145

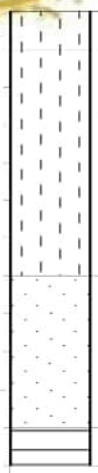
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP146
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 – 0.10	Slightly moist, dark brown speckled orange, loose, intact, silty SAND with subangular mudstone cobbles. **FILL**.
0.10 – 0.70	Slightly moist, dark brown speckled pinkish grey medium dense, intact, silty SAND with subangular mudstone gravel and cobbles. **COLLUVIUM**.
0.70 – 1.10	Well packed, moderately weathered, angular mudstone GRAVEL, in a sandy clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.
1.10 – 1.20	Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

NOTES

1) Refusal @ 1.20m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

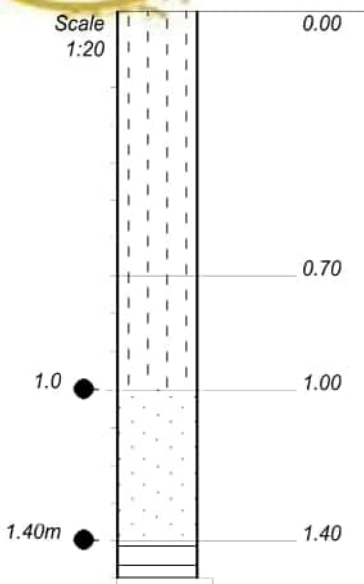
ELEVATION :
X-COORD : E25 43.297
Y-COORD : S30 13.320

HOLE No: TP146

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP147
Sheet 1 of 1

JOB NUMBER: NVG013



0.00 Slightly moist, dark brown, loose to medium dense, intact, silty SAND with subangular mudstone gravel and cobbles and isolated boulders. **FILL**.

0.70 Slightly moist, dark brown speckled pinkish grey, medium dense, intact, silty SAND with subangular mudstone gravel and cobbles. **COLLUVIUM**.

1.00 Slightly moist, orangey brown stained pinkish grey, firm, relic jointed, sandy CLAY. **RESIDUAL MUDSTONE**.

1.40 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

1.50

NOTES

1) Refusal @ 1.50m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed samples from 1.0 1.40m
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 43.303
Y-COORD : S30 13.120

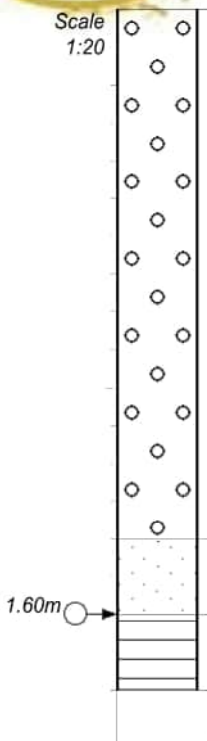
HOLE No: TP147

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP148
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark grey stained brown, medium dense to dense, intact, slightly gravelly SAND with occasional subangular dolerite and mudstone cobbles and boulders. **FILL**.

1.40 Slightly moist, orangey brown stained pinkish grey, stiff, relic jointed, sandy CLAY with subangular cobbles. **RESIDUAL MUDSTONE**.

1.60 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

1.80

NOTES

1) Refusal @ 1.80m on medium hard rock Mudstone.
2) Sidewalls stable.
3) Water seepage @ 1.60m.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 43.304
Y-COORD : S30 13.040

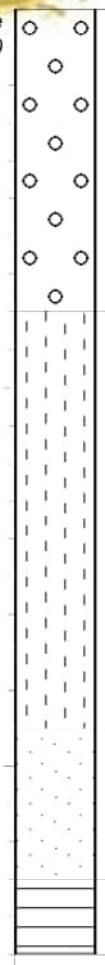
HOLE No: TP148

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP149
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark grey stained brown, medium dense to dense, intact, slightly gravelly SAND with occasional subangular dolerite and mudstone cobbles and boulders. **FILL**

0.80 Slightly moist, dark brown speckled pinkish grey, medium dense, intact, silty SAND with subangular mudstone gravel and cobbles. **COLLUVIUM**.

1.90 Slightly moist, orangey brown stained pinkish grey, firm, relic jointed, sandy CLAY with subangular gravel and cobbles. **RESIDUAL MUDSTONE**.

2.30 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

2.50

NOTES

1) Refusal @ 2.50m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 43.307
Y-COORD : S30 12.975

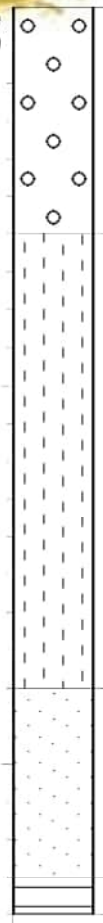
HOLE No: TP149

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP150
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark grey stained brown, medium dense to dense, intact, slightly gravelly SAND with occasional subangular dolerite and mudstone cobbles and boulders. **FILL**

0.60 Slightly moist, dark brown, loose to medium dense, intact, silty SAND with subangular mudstone gravel and cobbles. **COLLUVIUM**.

1.80 Slightly moist, orangey brown stained pinkish grey, firm, relic jointed, sandy CLAY with subangular cobbles. **RESIDUAL MUDSTONE**.

2.30 Greenish grey stained brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

2.40

NOTES

1) Refusal @ 2.40m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:23
TEXT : ..pelineProjectPART1.3.txt

ELEVATION :
X-COORD : E25 43.314
Y-COORD : S30 12.761

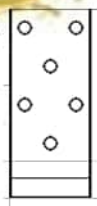
HOLE No: TP150

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP151
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown speckled dark grey, medium dense, intact, slightly gravelly SAND with occasional subangular mudstone cobbles and boulders. **FILL**.

0.40 Greenish grey stained brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

0.50

NOTES

1) Refusal @ 0.50m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 43.322
Y-COORD : S30 12.545

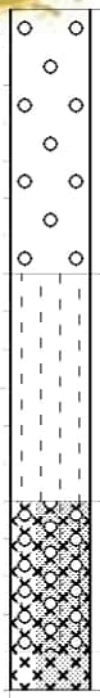
HOLE No: TP151
FREE STATE

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP152
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark grey stained brown, medium dense to dense, intact, slightly gravelly SAND with occasional subangular dolerite and mudstone gravel and cobbles. **FILL**

0.70 Slightly moist, reddish brown speckled pinkish grey, medium dense, intact, silty SAND with subangular mudstone cobbles. **COLLUVIUM**.

1.30 Well packed, subangular, weathered dolerite GRAVEL in a silty sand matrial. Overall consistency is dense. **RESIDUAL DOLERITE**.

1.70 Dark grey stained reddish brown, moderately weathered, medium grained, closely jointed, soft rock. **DOLERITE**.

1.80

NOTES

1) Refusal @ 1.80m on medium hard rock Dolerite.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 43.362
Y-COORD : S30 12.331

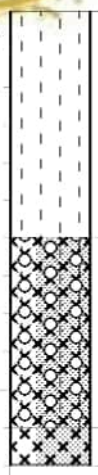
HOLE No: TP152

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP153
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, reddish brown speckled pinkish grey, medium dense, intact, silty SAND with subangular mudstone cobbles. **COLLUVIUM**.

0.60 Well packed, subangular, weathered dolerite GRAVEL in a silty sand matrix. Overall consistency is dense. **RESIDUAL DOLERITE**.

1.10 Dark grey stained reddish brown, moderately weathered, very closely jointed, soft rock. **DOLERITE**.

1.20

NOTES

1) Refusal @ 1.20m on medium hard rock Dolerite
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 43.424
Y-COORD : S30 12.120

HOLE No: TP153

NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP154
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Slightly moist, dark grey stained brown, medium dense to dense, intact, slightly gravelly SAND with occasional subangular dolerite and mudstone cobbles. **FILL**

0.6

0.60 Slightly moist, reddish brown speckled pinkish grey, medium dense, intact, silty SAND with subangular mudstone cobbles. **COLLUVIUM**.

1.70m

1.70 Slightly moist, orangey brown stained pinkish grey, stiff to very stiff, relic jointed, sandy CLAY. **RESIDUAL MUDSTONE**.

2.10

NOTES

1) Refusal @ 2.10m on very stiff CLAY.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed samples from 0.6 1.70m
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 43.489
Y-COORD : S30 11.910

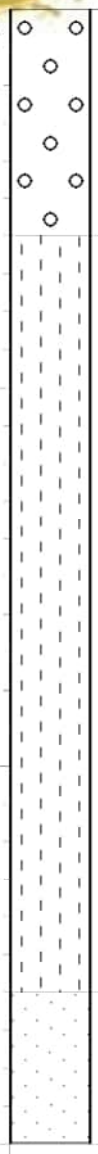
HOLE No: TP154

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP155
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark grey stained brown, medium dense to dense, intact, slightly gravelly SAND with occasional subangular dolerite and mudstone cobbles. **FILL**

0.60 Slightly moist, reddish brown speckled pinkish grey medium dense, intact, silty SAND with subangular mudstone cobbles. **COLLUVIUM**.

2.60 Slightly moist, orangey brown stained pinkish grey, firm, relic jointed, sandy CLAY with subangular gravel and cobbles. **RESIDUAL MUDSTONE**.

3.00

NOTES

1) Terminated @ 3.00m.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 43.554
Y-COORD : S30 11.699

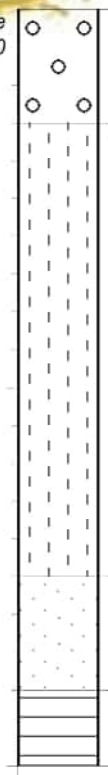
HOLE No: TP155

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP156
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark grey stained brown, medium dense to dense, intact, slightly gravelly SAND with occasional subangular dolerite and mudstone cobbles. **FILL**.

0.30 Slightly moist, reddish brown speckled pinkish grey, medium dense, intact, silty SAND with subangular mudstone cobbles. **COLLUVIUM**.

1.50 Slightly moist, orangey brown stained pinkish grey, firm, relic jointed, sandy CLAY with subangular cobbles. **RESIDUAL MUDSTONE**.

1.80 Greenish grey stained brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

2.00

NOTES

1) Refusal @ 2.00m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 43.617
Y-COORD : S30 11.489

HOLE No: TP156

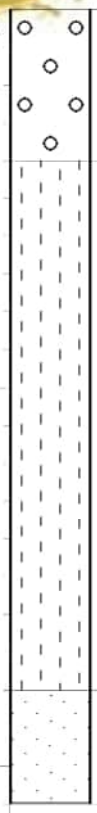
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP157
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark grey stained brown, medium dense to dense, intact, slightly gravelly SAND with occasional subangular dolerite and mudstone cobbles. **FILL**.

0.40 Slightly moist, reddish brown speckled pinkish grey, medium dense, intact, silty SAND with subangular mudstone gravel and cobbles. **COLLUVIUM**.

1.80 Slightly moist, orangey brown stained pinkish grey, stiff to very stiff, relic jointed, sandy CLAY. **RESIDUAL MUDSTONE**.

2.10

NOTES

1) Refusal @ 2.10m on very stiff CLAY.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 43.680
Y-COORD : S30 11.279

HOLE No: TP157

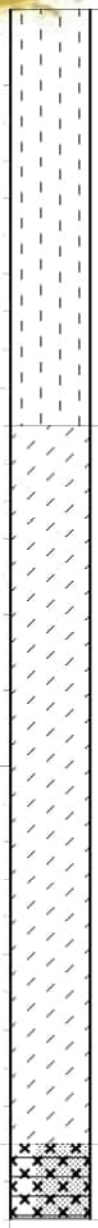
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP158
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown, possibly firm, intact, silty CLAY with roots. **ALLUVIUM**.

1.10 Moist, orange brown, possibly firm, intact, clayey SILT with subrounded gravel. **ALLUVIUM**.

3.00 Pale olive, blotched off white, moderately weathered, fine grained, very thinly bedded, closely jointed, soft rock. **MUDSTONE**.

Notes:
1. Blotched dark bluish, possibly dolerite contact @ 3.20m

3.20

NOTES

1) Terminated @ 3.20m.
2) Sidewalls stable.
3) No water seepage.
4) Bulk Sample TP158/01 From 1.10 3.00m.
5) No DCP due to the water pipe.
6) Profiled from spoil due to a water pipe.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 43.743
Y-COORD : S30 11.067

HOLE No: TP158

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP159
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Slightly moist, dark brown, loose, intact, silty SAND with gravel and roots. **FILL**.

0.20 Moist, brown, firm, intact, silty CLAY. **COLLUVIUM**.

0.90 Moist, orange brown blotched pale brown, stiff, relic jointed, fine sandy clayey SILT. **RESIDUAL DOLERITE**.

1.70 Moist, dark olive brown, stiff, , relic jointed, clayey SILT with dolerite and sandstone cobbles and gravel. **RESIDUAL DOLERITE**.

2.40 Dark bluish blotched off white, moderately weathered, medium grained, closely jointed, soft rock. **DOLERITE**

2.50

NOTES

1) Refusal @ 2.50m on medium hard rock Dolerite.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 43.807
Y-COORD : S30 10.857

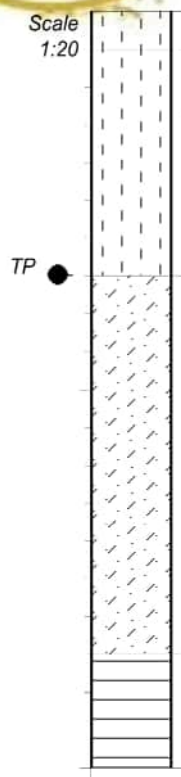
HOLE No: TP159

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP160
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, intact, loose, silty SAND with gravel, roots and isolated boulders. **FILL**.

0.10 Moist, dark brown, intact, firm, silty CLAY. **COLLUVIUM**.

0.70 Moist, orange brown, stiff, relic jointed, fine sandy clayey SILT with weathered rock gravel. **RESIDUAL MUDSTONE**.

1.70 Olive brown and purple brown, highly to moderately weathered, fine grained, very thinly bedded, closely jointed, soft rock. **MUDSTONE**.

2.00

NOTES

1) Refusal @ 2.00m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Bulk Sample TP 160/01 0.7-1.30m.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 43.870
Y-COORD : S30 10.648

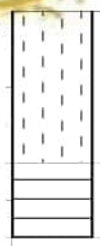
HOLE No: TP160

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP161
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Moist, brown, firm, intact, silty CLAY with gravel and cobbles. **COLLUVIUM**.

0.40 Olive brown, moderately weathered, fine grained, very thinly bedded, very closely jointed, soft rock. **INDURATED MUDSTONE**.

Notes:
1. With evidence of spheroidal weathering @ 0.60m.

0.60

NOTES

1) Refusal @ 0.60m on medium hard rock Indurated Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 43.946
Y-COORD : S30 10.444

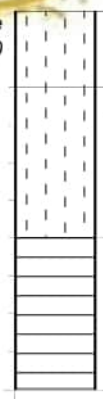
HOLE No: TP161

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 162
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown, loose, intact, silty SAND with subrounded gravel, cobbles and isolated boulders. **FILL**.

0.20 Moist, brown, firm, intact, silty CLAY with subangular mudstone gravel and cobbles. **COLLUVIUM**.

0.60 Olive brown blotched purple brown, moderately weathered, fine grained, very thinly bedded, soft rock. **MUDSTONE**.

Notes:
1. Interbedded maroon and olive brown @ 1.00m.

1.00

NOTES

1) Refusal @ 1.00m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 44.045
Y-COORD : S30 10.238

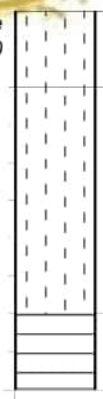
HOLE No: TP 162

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 163
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown, loose, intact, silty SAND with subrounded gravel and cobbles. **FILL**.

0.20 Moist, brown, firm, intact, silty CLAY. **COLLUVIUM**.

0.80 Olive brown, moderately weathered, fine grained, very thinly bedded, spheroidal weathering, soft rock. **INDURATED MUDSTONE**.

1.00

NOTES

1) Refusal @ 1.00m on medium hard rock Indurated Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 44.145
Y-COORD : S30 10.039

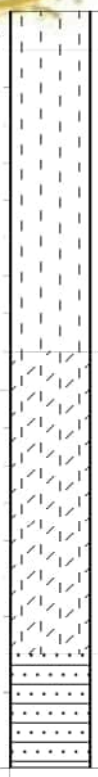
HOLE No: TP 163

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 164
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, brown, loose, intact, silty SAND with subangular gravel and cobbles. **FILL**.
0.10	Moist, brown, firm, intact, silty CLAY with gravel and cobbles. **COLLUVIUM**.
0.90	Slightly moist, orange brown speckled black, dense, clayey silty SAND. **RESIDUAL SANDSTONE**.
1.70	Dark purple brown, moderately weathered, medium grained, closely jointed, soft rock. **SANDSTONE**.
2.00	

NOTES

1) Refusal @ 2.00m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) Bulk sample TP 164/01 from 0.9-1.70m
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 44.242
Y-COORD : S30 09.840

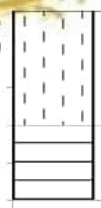
HOLE No: TP 164

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 165
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, loose, intact, silty SAND with abundant angular gravel. **FILL**.

0.30 Olive brown blotched dark purple brown, moderately weathered, fine grained, very thinly bedded, closely jointed, soft rock. **MUDSTONE**.

0.50

NOTES

1) Refusal @ 0.50m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 44.330
Y-COORD : S30 09.667

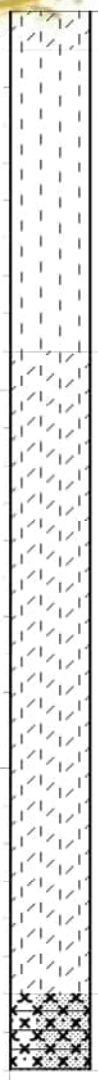
HOLE No: TP 165

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 166
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, olive brown, loose, intact, clayey silty SAND with abundant angular gravel. **FILL**.

0.10 Moist, brown, firm, intact, silty CLAY with gravel and cobbles. **COLLUVIUM**.

0.90 Well packed, angular and subrounded highly weathered dolerite, mudstone and sandstone GRAVEL and COBBLES in a silty clayey sand matrix. Overall consistency is dense. **RESIDUAL DOLERITE/SANDSTONE**

2.60 Olive brown and dark bluish, moderately weathered, medium grained, closely jointed, soft rock. **DOLERITE/SANDSTONE CONTACT**.

2.80

NOTES

1) Refusal @ 2.80m on medium hard rock Dolerite/Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) Bulk sample TP 166/01 from 0.9-2.60m.
5) No DCP material dense.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 44.527
Y-COORD : S30 09.268

HOLE No: TP 166

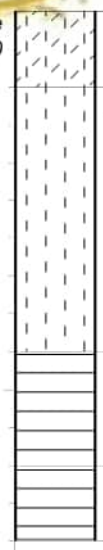
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 167
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, olive brown, loose, intact, silty clayey SAND with angular gravel and cobbles. **FILL**.

0.20 Moist, brown, firm, intact, silty CLAY. **COLLUVIUM**.

0.90 Olive brown, highly weathered, fine grained, very thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

1.20 Olive brown, blotched off-white, moderately weathered, medium grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

1.40

NOTES

1) Refusal @ 1.40m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 44.625
Y-COORD : S30 09.069

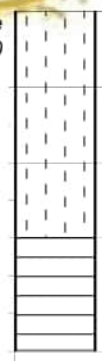
HOLE No: TP 167

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 168
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, olive brown, loose, silty SAND with angular gravel and cobbles. **FILL**.
0.20	Moist, brown, firm, intact, silty CLAY. **COLLUVIUM**.
0.40	Moist, olive grey brown, firm, relic jointed, silty CLAY with mudstone weathered gravel. **RESIDUAL MUDSTONE**.
0.60	Olive brown, moderately weathered, fine grained, very thinly bedded, closely jointed, soft rock. **MUDSTONE**.
0.90	

NOTES

1) Depth ends @ 0.90m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 44.725
Y-COORD : S30 08.869

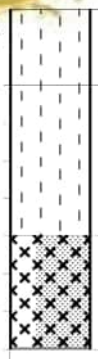
HOLE No: TP 168

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 169
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, olive brown, loose, silty SAND with subangular gravel and cobbles. **FILL**.

0.20 Slightly moist, orange brown, dense, silty SAND with weathered dolerite gravel. **RESIDUAL DOLERITE**

0.60 Bluish blotched pale purple brown, moderately weathered, medium grained, very closely jointed, soft rock. **DOLERITE**.

0.90

NOTES

1) Refusal @ 0.90m on medium hard rock Dolerite.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 44.823
Y-COORD : S30 08.671

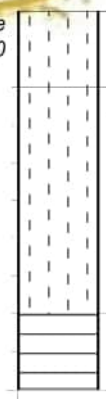
HOLE No: TP 169

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 170
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown, loose, silty SAND with abundant angular gravel and cobbles. **FILL**.

0.20 Slightly moist, brown, medium dense, intact, silty SAND with subrounded gravel and cobbles. **ALLUVIUM**.

0.80 Olive brown blotched dark purple, moderately weathered, medium grained, thinly bedded, closely jointed, soft rock. **INDURATED MUDSTONE**.

1.00

NOTES

1) Refusal @ 1.00m on medium hard rock Indurated Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 44.923
Y-COORD : S30 08.470

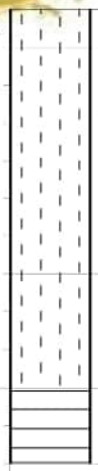
HOLE No: TP 170

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 171
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown, loose, intact, silty SAND with gravel and cobbles. **FILL**.

0.10 Very moist, brown, medium dense, intact, silty SAND with subrounded gravel and cobbles. **ALLUVIUM**.

0.70 Slightly moist, dark purple, stiff, relic jointed, silty CLAY. **RESIDUAL MUDSTONE**.

1.00 Dark purple brown, highly weathered, fine grained, very thinly bedded, closely jointed, soft rock. **MUDSTONE**.

1.20

NOTES

1) Refusal @ 1.20m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage (near a culvert and water ponding nearby).
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 45.021
Y-COORD : S30 08.270

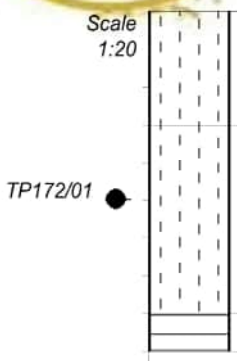
HOLE No: TP 171

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 172
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown, loose, silty SAND with abundant gravel and cobbles. **FILL**.

0.30 Moist, brown, firm, intact, silty CLAY. **COLLUVIUM**

0.80 Olive brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

0.90

NOTES

1) Refusal @ 0.90m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed Sample TP172/01 0.50m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 45.120
Y-COORD : S30 08.071

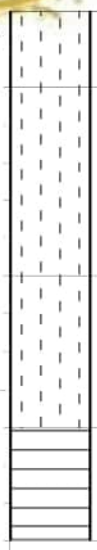
HOLE No: TP 172

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 173
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, dark brown, loose, intact, silty SAND with gravel. **FILL**.
0.20	Moist, brown, firm, intact, silty CLAY. **COLLUVIUM**.
0.70	Slightly moist, orange brown speckled off-white, stiff, relic jointed, silty CLAY with numerous angular mudstone rock gravel. **RESIDUAL MUDSTONE**.
1.10	Olive brown blotched dark purple, highly to moderately weathered, fine grained, very thinly bedded, closely jointed, soft rock. **MUDSTONE**.
1.40	

NOTES

1) Refusal @ 1.40m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 45.219
Y-COORD : S30 07.872

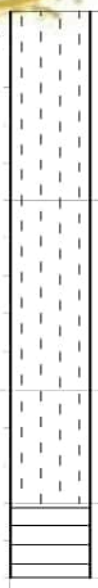
HOLE No: TP 173

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 174
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown, loose, intact, silty SAND with abundant gravel and cobbles. **FILL**.

0.50 Moist, brown, firm, intact, silty CLAY. **COLLUVIUM**.

1.00 Slightly moist, dark purple brown, stiff, slickensided, silty CLAY with weathered mudstone gravel. **RESIDUAL MUDSTONE**

1.30 Dark purple brown streaked off-white, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**

1.50

NOTES

1) Refusal @ 1.50m on medium hard rock Mudstone.
2) Sidewall slight collapse to 0.50m.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 45.318
Y-COORD : S30 07.673

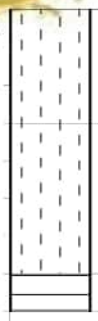
HOLE No: TP 174

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 175
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown, loose, intact, silty SAND with abundant gravel and roots. **FILL**.

0.30 Moist, brown, firm, intact, silty CLAY. **COLLUVIUM**.

0.70 Pale olive brown blotched black, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

0.80

NOTES

1) Refusal @ 0.80m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 45.407
Y-COORD : S30 07.471

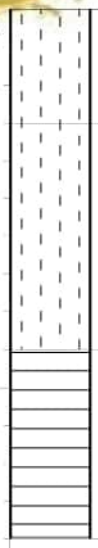
HOLE No: TP 175

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 176
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Very moist, dark brown, loose, intact, silty SAND with abundant angular roots and gravel. **FILL**.
0.30	Moist, brown, firm, intact, silty CLAY with occasional gravel. **COLLUVIUM**
0.90	Dark purple brown to olive brown, highly to moderately weathered, fine grained, closely jointed, soft rock. **MUDSTONE**
1.40	

NOTES

1) Refusal @ 1.40m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

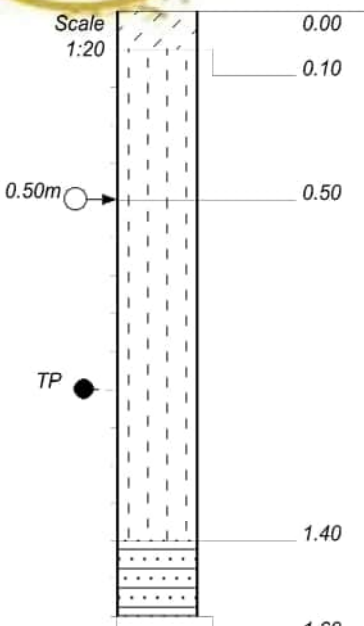
ELEVATION :
X-COORD : E25 45.493
Y-COORD : S30 07.268

HOLE No: TP 176

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 177
Sheet 1 of 1

JOB NUMBER: NVG013



0.00	Moist, dark brown, loose, intact, clayey SAND with gravel. **FILL**.
0.10	Moist, brown, firm, intact, silty CLAY. **COLLUVIUM**.
0.50	Slightly moist, olive brown blotched off-white, dense, silty SAND with calcrete gravel. **RESIDUAL SANDSTONE**
1.40	Olive brown and dark purple brown, highly weathered, medium grained, soft rock. **SANDSTONE**
1.60	

NOTES

1) Refusal @ 1.60m on medium hard rock Mudstone.
2) Sidewalls stable.
3) Water seepage @ 0.50m.
4) Disturbed Sample TP 177/01 @ 1.00m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 45.579
Y-COORD : S30 07.065

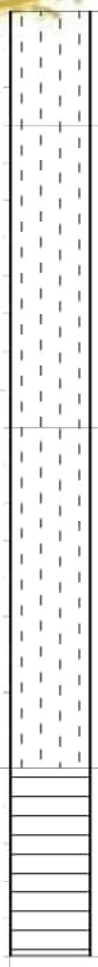
HOLE No: TP 177

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 178
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Moist, dark brown, medium dense, intact, silty SAND with gravel. **FILL**.

0.30 Moist, dark grey brown, firm, intact, silty CLAY with subrounded gravel and cobbles. **ALLUVIUM**.

1.10 Moist, orange brown, firm, relic jointed, silty CLAY with mudstone weathered rock gravel. **RESIDUAL MUDSTONE**.

2.00 Olive brown blotched black, highly to moderately weathered, fine grained, very thinly bedded, closely jointed, very soft rock. **MUDSTONE**.

2.50

NOTES

1) Refusal @ 2.50m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 45.665
Y-COORD : S30 06.861

HOLE No: TP 178

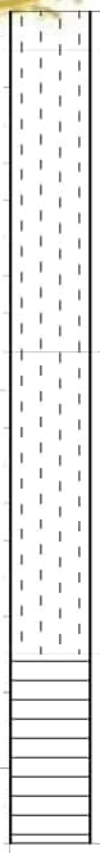
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 179
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, dark brown, loose, intact, silty SAND with abundant roots and gravel. **FILL**.
0.10	Moist, dark grey brown, firm, intact, silty CLAY with localised subrounded gravel. **ALLUVIUM**.
0.90	Slightly moist, dark orange brown streaked brown, stiff, relic jointed, silty CLAY. **RESIDUAL MUDSTONE**.
1.70	Olive brown, highly to moderately weathered, fine grained, very thinly bedded, closely jointed soft rock. **MUDSTONE**.
2.20	

NOTES

1) Refusal @ 2.20m on medium hard rock Mudstone
2) Sidewalls stable.
3) No water seepage.
4) Disturbed Sample TP 179/01 @ 2.00m
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

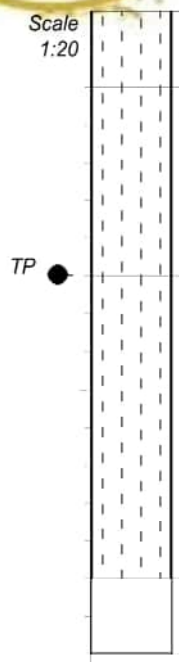
ELEVATION :
X-COORD : E25 45.683
Y-COORD : S30 06.814

HOLE No: TP 179

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 180
Sheet 1 of 1

JOB NUMBER: NVG013



0.00 Slightly moist, dark brown, loose, intact, silty SAND with abundant gravel. **FILL**.

0.20 Moist, brown, firm, intact, silty CLAY. **COLLUVIUM**.

0.70 Slightly moist, yellow brown, dense, silty fine SAND. **RESIDUAL SANDSTONE**.

1.50 Dark brown streaked off-white, highly weathered, medium grained, thinly bedded, soft rock. **SANDSTONE**.

Notes:
1. Interlayered with calcrete veins @ 1.70m.

1.70

NOTES

1) Refusal @ 1.70m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) Bulk Sample TP 180/01 from 0.7-1.50m.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 45.768
Y-COORD : S30 06.615

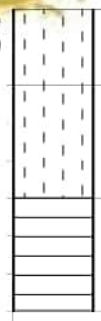
HOLE No: TP 180

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 181
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown, loose, intact, silty SAND with abundant angular gravel. **FILL**.

0.20 Moist, orange brown, firm, intact, silty CLAY. **COLLUVIUM**.

0.50 Dark brown, moderately weathered, fine grained, very thinly bedded, closely jointed, soft rock. **MUDSTONE**.

0.80

NOTES

1) Refusal @ 0.80m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 45.854
Y-COORD : S30 06.412

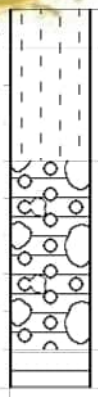
HOLE No: TP 181

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 182
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, dark brown, loose, intact, silty SAND with abundant gravel. **FILL**.
0.10	Moist, brown, firm, intact, silty CLAY. **COLLUVIUM**.
0.40	Brown blotched pale brown, angular, weathered mudstone rock, GRAVEL and COBBLES. Overall consistency is dense. **RESIDUAL MUDSTONE**.
0.90	Dark brown, highly weathered, fine grained, very thinly bedded, closely jointed, soft rock. **MUDSTONE**.
1.00	

NOTES

1) Refusal @ 1.00m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 45.941
Y-COORD : S30 06.209

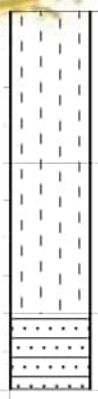
HOLE No: TP 182

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 183
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown, loose, intact, silty SAND with abundant gravel. **FILL**.

0.40 Moist, orange brown, medium dense, intact, silty SAND. **COLLUVIUM**.

0.80 Olive brown streaked dark brown, highly weathered, medium grained, soft rock. **SANDSTONE**.

1.00

NOTES

1) Refusal @ 1.00m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 46.028
Y-COORD : S30 06.004

HOLE No: TP 183

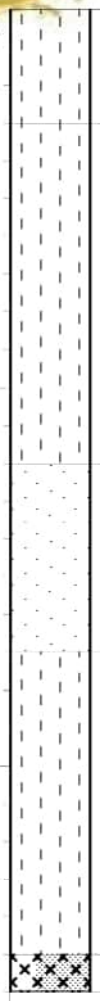
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 184
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown, loose, intact, silty SAND with abundant angular gravel. **FILL**.

0.30 Moist, brown, firm, intact, silty CLAY. **COLLUVIUM**.

1.20 Moist, orange brown speckled off-white, stiff, relic jointed, fine sandy CLAY. **REWORKED RESIDUAL DOLERITE**

1.70 Slightly moist, olive brown speckled black, dense, relic jointed, silty coarse SAND. **RESIDUAL DOLERITE**

2.50 Brown blotched black, moderately weathered, medium grained, closely jointed, soft rock. **DOLERITE**

2.60

NOTES

1) Refusal @ 2.60m on medium hard rock Dolerite.
2) Sidewalls stable.
3) No water seepage.
4) Bulk Sample TP 184/01 from 1.3-1.70m.
5) Disturbed Sample TP 184/02 @ 2.00m.
6) No DCP.
7) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 46.112
Y-COORD : S30 05.801

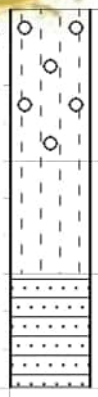
HOLE No: TP 184

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 185
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown, loose, intact, gravelly silty SAND. **FILL**.

0.40 Moist, brown, firm, intact, silty CLAY. **COLLUVIUM**.

0.70 Olive brown blotched off-white, highly weathered, medium grained, closely jointed, soft rock. **SANDSTONE**.

1.00

NOTES

1) Refusal @ 1.00m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 46.197
Y-COORD : S30 05.598

HOLE No: TP 185

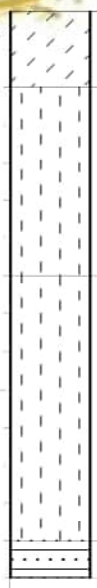
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 186
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, dark brown, loose, intact, clayey SAND with abundant gravel. **FILL**.
0.20	Moist, brown, firm, intact, silty CLAY. **COLLUVIUM**.
0.70	Slightly moist, pale orange brown, dense, relic jointed, silty SAND with zones of weathered sandstone rock. **RESIDUAL SANDSTONE**.
1.40	Brown speckled off-white, highly weathered, coarse grained, soft rock. **SANDSTONE**
1.50	

NOTES

1) Refusal @ 1.50m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) Bulk sample TP 186/01 from 0.7-1.40m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 46.283
Y-COORD : S30 05.396

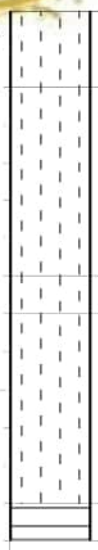
HOLE No: TP 186

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 187
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, brown, medium dense, intact, silty SAND with gravel and cobbles. **FILL**.
0.20	Moist, dark brown, stiff, intact, silty CLAY. **COLLUVIUM**
0.70	Moist, dark purple brown, firm, relic jointed, silty CLAY with angular weathered mudstone rock gravel. **RESIDUAL MUDSTONE**.
0.80	Well packed, angular, weathered mudstone GRAVEL and COBBLES with minor silty sand matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.
1.30	Olive brown, moderately weathered, fine grained, very thinly bedded, closely jointed, soft rock. **MUDSTONE**.
1.40	

NOTES

1) Refusal @ 1.40m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024

DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 46.369
Y-COORD : S30 05.193

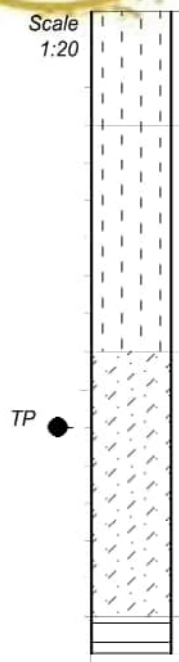
HOLE No: TP 187

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 188
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, medium dense, intact, silty SAND with gravel and cobbles. **FILL**.

0.30 Moist, dark brown, stiff, intact, silty CLAY. **COLLUVIUM**

0.90 Slightly moist, olive brown blotched orange brown, stiff, relic jointed, clayey sandy SILT. **RESIDUAL MUDSTONE**.

1.60 Olive brown, highly weathered, fine grained, very thinly bedded, closely jointed, soft rock. **MUDSTONE**.

1.70

NOTES

1) Refusal @ 1.70m medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed Sample TP 188/01 @ 1.10m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 46.455
Y-COORD : S30 04.989

HOLE No: TP 188

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 189
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Slightly moist, brown, medium dense, intact, silty SAND with gravel and cobbles. **FILL**.

0.30 Moist, dark brown, stiff, intact, silty CLAY. **COLLUVIUM**.

0.60 Olve brown blotched orange brown and dark purple brown, highly weathered, fine grained, very thinly bedded, closely jointed, soft rock. **MUDSTONE**.

1.60

NOTES

1) Refusal @ 1.60m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 46.539
Y-COORD : S30 04.787

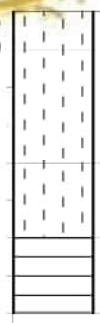
HOLE No: TP 189

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 190
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, brown, medium dense, intact, silty SAND with gravel and cobbles. **FILL**.
0.10	Moist, brown, stiff, intact, silty CLAY. **COLLUVIUM**.
0.40	Moist, olive brown blotched brown, stiff, relic jointed, silty CLAY with weathered mudstone gravel. **RESIDUAL MUDSTONE**.
0.60	Olive brown, moderately weathered, fine grained, very thinly bedded, soft rock. **MUDSTONE**.
0.80	

NOTES

1) Refusal @ 0.80m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 46.623
Y-COORD : S30 04.583

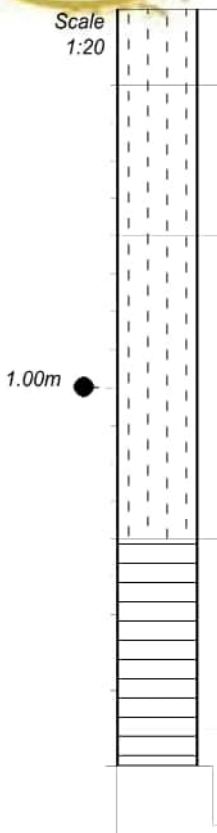
HOLE No: TP 190

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 191
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, brown, medium dense, intact, silty SAND. **FILL**
0.20	Slightly moist, dark grey, stiff, shattered, silty CLAY. **ALLUVIUM**.
0.60	Moist, brown speckled black and orange brown, firm, relic jointed, silty CLAY with angular weathered mudstone rock gravel. **RESIDUAL MUDSTONE**.
1.40	Dark purple brown, highly weathered, fine grained, very thinly bedded, very soft rock. **MUDSTONE**.
1.90	Olive brown, moderately weathered, fine grained, very thinly bedded, closely jointed, soft rock. **MUDSTONE**.
2.00	

NOTES

1) Refusal @ 2.00m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed sample TP 191 @ 1.00m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 46.699
Y-COORD : S30 04.412

HOLE No: TP 191

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 192
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00

MUDSTONE OUTCROP

0.00

NOTES

1) Mudstone outcrop.

2) Stretch of almost 300m of outcrop.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024

DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 46.786
Y-COORD : S30 04.208

HOLE No: TP 192

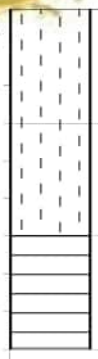
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 193
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, medium dense, intact, silty SAND with gravel and cobbles. **FILL**.

0.30 Moist, dark brown, stiff, intact, silty CLAY. **COLLUVIUM**

0.60 Olive brown, moderately weathered, fine grained, very thinly bedded, closely jointed, soft rock. **MUDSTONE**.

0.90

NOTES

1) Refusal @ 0.90m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 46.871
Y-COORD : S30 04.005

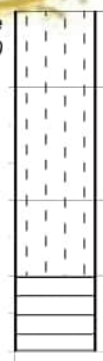
HOLE No: TP 193

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 194
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, medium dense, intact, silty SAND with gravel and cobbles. **FILL**.

0.20 Moist, brown, stiff, intact, silty CLAY. **COLLUVIUM**.

0.50 Moist, olive brown, stiff, relic jointed, silty CLAY with mudstone cobbles and isolated boulders up to (1.00m). **RESIDUAL MUDSTONE**.

0.70 Olive brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

0.90

NOTES

1) Refusal @ 0.90m on medium hard Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 46.953
Y-COORD : S30 03.800

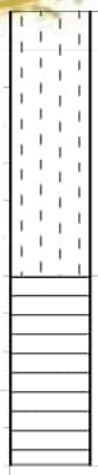
HOLE No: TP 194

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 195
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, medium dense, intact, silty SAND with gravel and cobbles. **FILL**.

0.10 Moist, dark brown, firm to stiff, intact, silty CLAY. **COLLUVIUM**.

0.70 Off-white blotched dark brown, moderately weathered, medium grained, closely jointed, soft rock. **MUDSTONE**

1.20

NOTES

1) Refusal @ 1.20m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Bulk sample TP 195/01 from 0.9-1.20m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 47.041
Y-COORD : S30 03.597

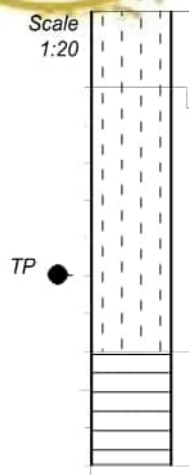
HOLE No: TP 195

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 196
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, medium dense, intact, silty SAND with abundant gravel and cobbles. **FILL**.

0.20 Moist, dark brown, stiff, intact, silty CLAY. **COLLUVIUM**.

0.90 Off-white and olive brown, moderately weathered, fine grained, very thinly bedded, closely jointed, soft rock. **MUDSTONE**.

1.20

NOTES

1) Refusal @ 1.20m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed sample TP 196/01 @ 0.70m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 47.127
Y-COORD : S30 03.394

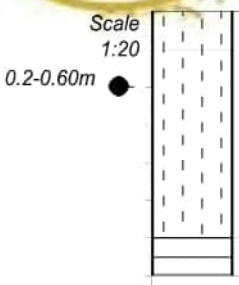
HOLE No: TP 196

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 197
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, brown, medium dense, intact, silty SAND with angular gravel. **FILL**.
0.10	Moist, brown, firm, intact, silty CLAY, with weathered gravel. **COLLUVIUM**
0.60	Off-white, moderately weathered, fine grained, very thinly bedded,closely jointed, soft rock. **MUDSTONE**.
0.70	

NOTES

1) Refusal @ 0.70m on medium hard rock Mudstone.
2) Sidewalls are stable.
3) No water seepage.
4) Bulk samples 0.2-0.60m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 47.213
Y-COORD : S30 03.190

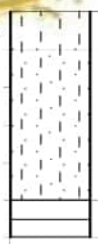
HOLE No: TP 197

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 198
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, brown, medium dense, intact, silty SAND with gravel. **FILL**.
0.10	Moist, brown, firm, intact, sandy silty CLAY with gravel and cobbles. **COLLUVIUM**.
0.50	Off-white blotched brown, moderately weathered, medium grained, very thinly bedded, closely jointed, soft rock. **MUDSTONE**.
0.60	

NOTES

1) Refusal @ 0.60m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 47.297
Y-COORD : S30 02.986

HOLE No: TP 198

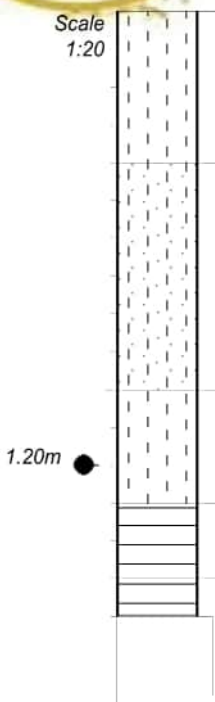
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 199
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, medium dense, intact, silty SAND with abundant gravel and cobbles. **FILL**.

0.40 Slightly moist, brown, firm, intact, fine sandy silty CLAY with gravel. **COLLUVIUM**.

1.00 Slightly moist, olive brown, firm, relic jointed, silty CLAY with abundant weathered mudstone rock gravel. **RESIDUAL MUDSTONE**.

1.30 Olive brown blotched orange, highly weathered, fine grained, very thinly bedded, closely jointed, soft rock with depth. **MUDSTONE**.

1.50 Olive brown, moderately weathered, fine grained, very thinly bedded, closely jointed, soft rock. **MUDSTONE**.

1.60

NOTES

1) Refusal @ 1.60m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed Sample @ 1.20m
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 47.386
Y-COORD : S30 02.785

HOLE No: TP 199

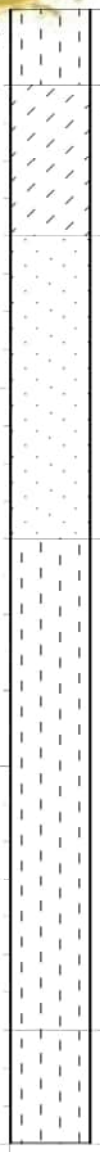
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 200
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, loose, intact, silty SAND with gravel and cobbles. **FILL**.

0.20 Moist, brown, medium dense, intact, clayey SAND with gravel. **COLLUVIUM**.

0.60 Moist, brown blotched orange, firm, intact, sandy CLAY. **COLLUVIUM**.

1.40 Moist, yellow brown speckled off-white, firm, relic jointed, silty CLAY with weathered sandstone gravel and cobbles. **RESIDUAL SHALE**.

2.70 Moist, olive brown blotched off white, stiff, relic jointed, silty CLAY with abundant weathered shale rock, gravel and cobbles. **RESIDUAL SHALE**.

Notes:
1. Soft rock encountered at 3.00m+

3.00

NOTES

1) Terminated @ 3.00m.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.4.txt

ELEVATION :
X-COORD : E25 47.470
Y-COORD : S30 02.581

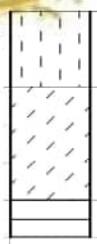
HOLE No: TP 200

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 201
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, medium dense, intact, silty SAND, with roots and gravel. **FILL**.

0.20 Moist, brown, medium dense, intact, clayey SAND with gravel. **COLLUVIM**.

0.50 Olive brown, highly weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

0.60

NOTES

1) Refusal @ 0.60m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 47.560
Y-COORD : S30 02.378

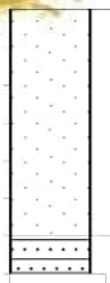
HOLE No: TP 201

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP202
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark grey and brown, very dense, intact, sandy GRAVEL with dolerite cobbles. **FILL**.

0.60 Light grey, moderately weathered, medium grained, thinly bedded, very closely jointed, soft rock. **SANDSTONE**.

0.70

NOTES

1) Refusal @ 0.70m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 47.602
Y-COORD :

HOLE No: TP202

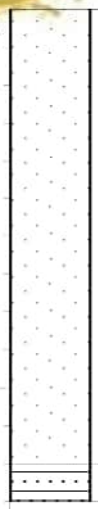
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP203
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark grey and brown, very dense, intact, sandy GRAVEL with dolerite cobbles. **FILL**.

1.20 Light grey, moderately weathered, medium grained, thinly bedded, very closely jointed, soft rock. **SANDSTONE**.

1.30

NOTES

1) Refusal @ 1.30m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 47.672
Y-COORD : S30 02.098

HOLE No: TP203

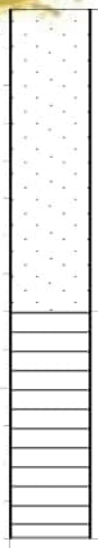
Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP204
Sheet 1 of 1

JOB NUMBER: NVG013

0.00m

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, soft to firm, shattered, sandy CLAY. **COLLUVIUM**.

0.80 Greenish grey stained reddish brown, highly weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

1.40

NOTES

1) Refusal @ 1.40m on medium hard Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed sample from 0.00m 1.80m.
5) No DCP.
6) Profiled in-situ.

1.80m

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 47.754
Y-COORD : S30 01.893

HOLE No: TP204

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP205
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Slightly moist, dark brown speckled grey, soft to firm, shattered, sandy CLAY. **COLLUVIUM**.

0.60 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

0.80

NOTES

1) Refusal @ 0.80m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 47.838
Y-COORD : S30 01.690

HOLE No: TP205

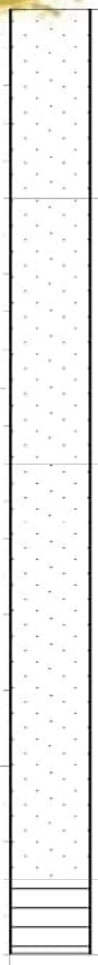
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP206
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, soft to firm, intact, sandy CLAY with dolerite cobbles and boulders. **COLLUVIUM**.

0.50 Slightly moist, dark brown speckled grey, firm, shattered, sandy CLAY. **COLLUVIUM**.

1.20 Slightly moist to moist, orangey brown speckled grey, soft to firm, relic jointed, sandy CLAY with occasional gravel. **RESIDUAL MUDSTONE**.

2.30 Greenish grey stained reddish brown, fine grained, moderately weathered, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

2.50

NOTES

1) Refusal @ 2.50m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 47.924
Y-COORD : S30 01.486

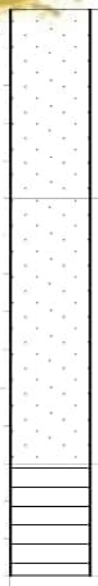
HOLE No: TP206

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP207
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, firm, intact, sandy CLAY with dolerite cobbles and isolated boulders. **COLLUVIUM**

0.50 Slightly moist, dark grey speckled brown, firm, shattered, sandy CLAY with occasional gravel. **COLLUVIUM**

1.20 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**

1.50

NOTES

1) Refusal @ 1.50m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 48.017
Y-COORD : S30 01.260

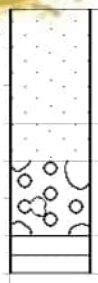
HOLE No: TP207

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP208
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, dark brown, firm, intact, sandy CLAY with dolerite cobbles and boulders. **COLLUVIUM**
0.30	Slightly moist, dark brown speckled grey, stiff, shattered, sandy CLAY. **COLLUVIUM**.
0.40	Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.
0.60	Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**
0.70	

NOTES

1) Refusal @ 0.70m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 48.102
Y-COORD : S30 01.056

HOLE No: TP208

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP209
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Slightly moist, dark brown speckled grey, soft to firm, shattered, sandy CLAY with boulders. **COLLUVIUM**.

0.30 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**

0.40

NOTES

1) Refusal @ 0.40m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024

DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 48.188
Y-COORD : S30 00.852

HOLE No: TP209

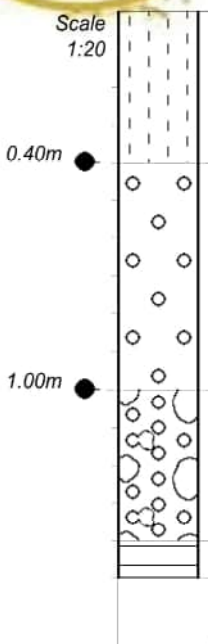
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP210
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, orangey brown, loose to medium dense, intact, silty SAND with dolerite cobbles. **FILL**
0.40	Slightly moist, dark brown speckled grey, medium dense to dense, intact, slightly gravelly SAND with occasional dolerite boulders. **COLLUVIUM**
1.00	Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.
1.40	Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**
1.50	

NOTES

1) Refusal @ 1.50m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed sample from 0.40m 1.00m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 48.273
Y-COORD : S30 00.649

HOLE No: TP210

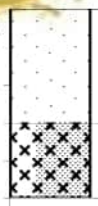
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP211
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, orangey brown speckled grey, soft to firm, shattered, sandy CLAY with dolerite cobbles and isolated boulders. **COLLUVIUM**.

0.30 Dark grey stained brown, highly to moderately weathered, medium grained, closely jointed, soft rock. **DOLERITE**

0.50

NOTES

1) Refusal @ 0.50m on medium hard rock Dolerite.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024

DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 48.358
Y-COORD : S30 00.446

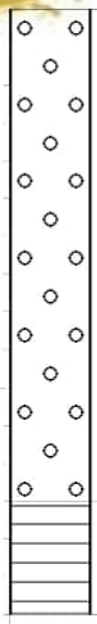
HOLE No: TP211

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP212
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, medium dense to dense, intact, slightly gravelly SAND with occasional dolerite boulders. **FILL**

1.30 Greenish grey stained reddish brown, highly weathered, thinly bedded, very closely jointed, soft rock. **MUDSTONE**

1.60

NOTES

1) Refusal @ 1.60m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 48.443
Y-COORD : S30 00.242

HOLE No: TP212

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP213
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00

Light grey, moderately weathered, medium grained, thinly bedded, very closely jointed, soft rock. **SANDSTONE**.

0.20

NOTES

1) Refused @ 0.20m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024

DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 48.527
Y-COORD : S30 00.039

HOLE No: TP213

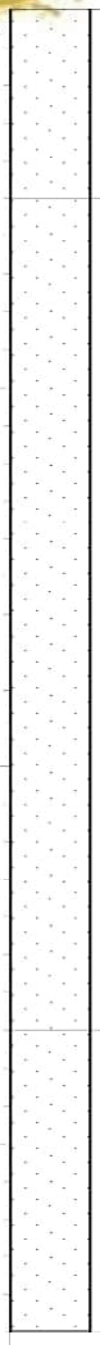
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP214
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, orangey brown speckled grey, firm, intact, sandy CLAY with dolerite cobbles and isolated boulders. **COLLUVIUM**

0.50m

0.50 Slightly moist, dark brown speckled white, stiff, shattered, sandy CLAY with sporadic ferruginous concretions. **COLLUVIUM**.

2.70m

2.70 Moist, orangey brown blotched grey, soft to firm, shattered, sandy CLAY. **RESIDUAL MUDSTONE**.

3.50

3.50m

NOTES

1) Terminated @ 3.50m.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed sample from 0.50m 2.70m and 2.70m 3.50m.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 48.631
Y-COORD : S29 59.790

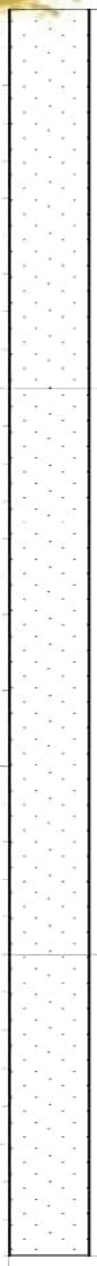
HOLE No: TP214

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP215
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, orangey brown speckled grey, firm, intact, sandy CLAY with dolerite cobbles and boulders. **COLLUVIUM**.

1.00 Slightly moist, dark brown speckled white, stiff, shattered, sandy CLAY with sporadic ferruginous concretions. **COLLUVIUM**.

2.50 Moist, orangey brown blotched grey, soft to firm, relic jointed, sandy CLAY with weathered mudstone gravel. **RESIDUAL MUDSTONE**.

3.30

NOTES

1) Terminated @ 3.30m.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 48.716
Y-COORD : S29 59.587

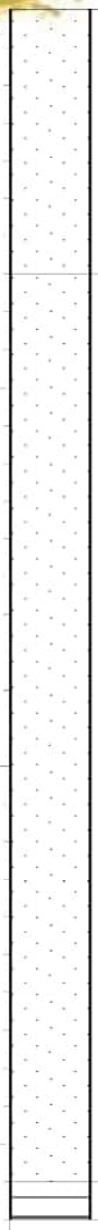
HOLE No: TP215

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP216
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, orangey brown speckled grey, soft to firm, intact, sandy CLAY with dolerite cobbles and boulders. **COLLUVIUM**

0.70 Slightly moist, dark brown speckled off-white, stiff, shattered, sandy CLAY with sporadic ferruginous concretions. **COLLUVIUM**.

3.10 Orangey brown stained grey, highly weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

3.20

NOTES

1) Terminated @ 3.20m.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 48.801
Y-COORD : S29 59.383

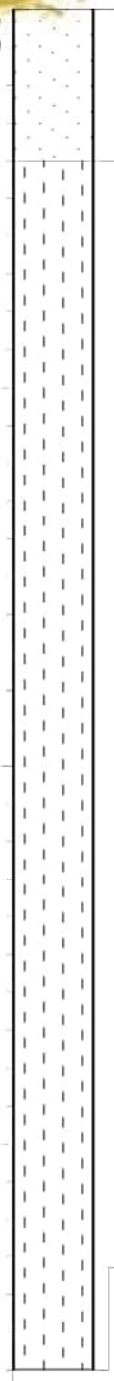
HOLE No: TP216

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP217
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, firm, shattered, sandy CLAY with dolerite gravel, cobbles and boulders. **COLLUVIUM**.

0.40 Slightly moist, orangey brown speckled grey, dense, intact, silty SAND with occasional cobbles. **ALLUVIUM**.

3.60

NOTES

1) Terminated @ 3.60m.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 48.885
Y-COORD : S29 59.178

HOLE No: TP217

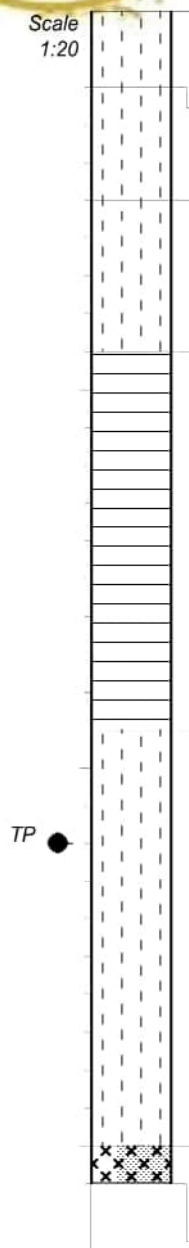
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 218
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, brown, medium dense, intact, silty SAND with gravel and cobbles. **FILL**.
0.20	Slightly moist, dark brown, stiff, intact, silty CLAY. **COLLUVIUM**
0.50	Slightly moist, dark purple, stiff, relic jointed, silty CLAY. **RESIDUAL SHALE**.
0.90	Purple blotched orange, highly weathered, fine grained, thinly bedded, closely jointed, very soft rock. **SHALE**.
1.90	Slightly moist, olive brown speckled black, dense, relic jointed, silty SAND. **RESIDUAL DOLERITE**.
3.00	Dark olive and blotched dark bluish, moderately weathered, medium grained, closely jointed, soft rock. **DOLERITE**.
3.10	

NOTES

1) Terminated @ 3.10m.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed sample TP 218/01 @ 2.20m.
5) DCP refusal on very soft rock.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 48.970
Y-COORD : S29 58.976

HOLE No: TP 218

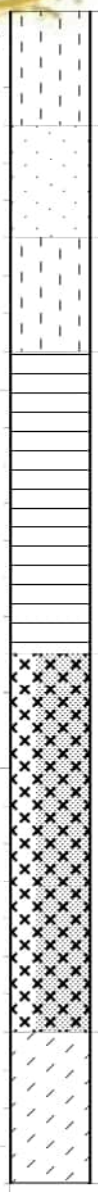
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 219
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, brown, medium dense, intact, silty SAND with gravel. **FILL**.
0.30	Moist, dark brown, firm, intact, sandy CLAY with roots. **COLLUVIUM**.
0.60	Moist, brown blotched orange, firm, relic jointed, silty CLAY. **RESIDUAL SHALE**.
0.90	Purple brown blotched orange, highly weathered, medium grained, thinly bedded, very soft rock. **SHALE**. Notes: 1. Laminated and blotched orange along the layers
1.70	Grey brown speckled black, highly weathered, medium grained, closely jointed, very soft rock. **DOLERITE**
2.70	Slightly moist, olive brown speckled off-white, stiff, relic jointed, clayey SILT with subrounded calcrete and weathered in some places. **RESIDUAL SILTSTONE**.
3.10	

NOTES

1) Terminated @ 3.10m.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 49.054
Y-COORD : S29 58.773

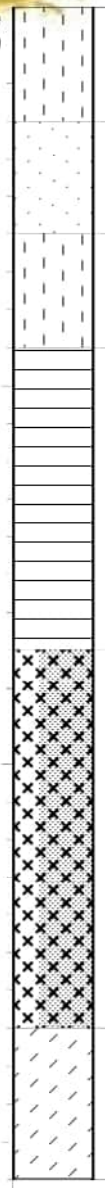
HOLE No: TP 219

NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 220
Sheet 1 of 1

JOB NUMBER: NVG013



0.00 Slightly moist, brown, medium dense, intact, silty SAND with gravel. **FILL**.

0.30 Moist, dark brown, firm, intact, sandy CLAY with gravel. **COLLUVIUM**

0.60 Moist, brown blotched orange, firm, relic jointed, silty CLAY. **RESIDUAL SHALE**.

0.90 Purple brown blotched orange, highly weathered, medium grained, thinly layered, very soft rock. **SHALE**.

Notes:
1. Laminated and blotched orange along the layers

1.70 Grey brown speckled black, highly weathered rock, medium grained, closely jointed, very soft rock. **DOLERITE**

2.70 Slightly moist, olive brown speckled off-white, stiff, relic jointed, clayey SILT with subrounded calcrete and weathered in some places. **RESIDUAL SILTSTONE**.

3.10

NOTES

1) Terminated @ 3.10m.
2) Sidewalls stable.
3) No water seepage.
4) Bulk sample TP 220/01 from 0.8-1.80m
5) Bulk sample TP 220/02 from 1.8-2.80m
6) No DCP.
7) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 49.139
Y-COORD : S29 58. 569

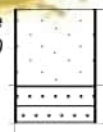
HOLE No: TP 220

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP221
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, orangey brown speckled grey, firm, shattered, sandy CLAY. **COLLUVIUM**.

0.20 Light grey, highly to moderately weathered, medium grained, thinly bedded, very closely jointed, soft rock. **SANDSTONE**.

0.30

NOTES

1) Refusal @ 0.30 on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 49.224
Y-COORD : S29 58.365

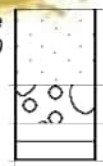
HOLE No: TP221

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP222
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, soft to firm, shattered, sandy CLAY with cobbles. **COLLUVIUM**.

0.20 Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

0.30 Greenish grey stained reddish brown, highly weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**

0.40

NOTES

1) Refusal @ 0.40m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024

DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 49.311
Y-COORD : S29 58.160

HOLE No: TP222

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP223
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Slightly moist, dark brown speckled grey, firm, intact, sandy CLAY with gravel and cobbles. **COLLUVIUM**.

0.70 Slightly moist, orangey brown speckled grey, stiff, relic jointed, sandy CLAY with weathered mudstone gravel. **RESIDUAL MUDSTONE**.

1.10 Greenish grey stained reddish brown, highly weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**

1.30

NOTES

1) Refusal @ 1.30m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

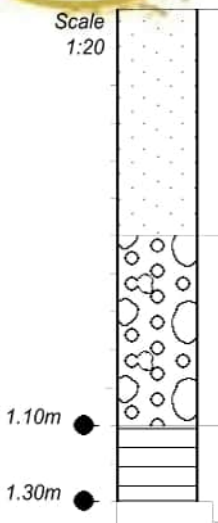
ELEVATION :
X-COORD : E25 49.397
Y-COORD : S29 57.954

HOLE No: TP223

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP224
Sheet 1 of 1

JOB NUMBER: NVG013



0.00 Slightly moist, orangey brown speckled grey, firm, intact, sandy CLAY with dolerite cobbles and boulders. **COLLUVIUM**.

0.60 Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

1.10 Greenish grey stained reddish brown, highly weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**

1.30

NOTES

1) Refusal @ 1.30m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed samples from 1.10m 1.30m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 49.451
Y-COORD : S29 57.824

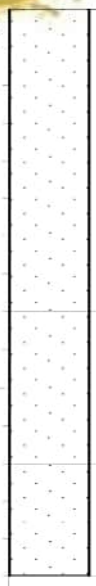
HOLE No: TP224

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP225
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, orangey brown speckled grey, soft to firm, shattered, sandy CLAY with dolerite gravel, cobbles and boulders. **COLLUVIUM**.

0.80 Slightly moist, reddish brown stained greenish grey, dense to very dense, intact, sandy GRAVEL. **RESIDUAL MUDSTONE**.

1.20 Slightly moist, orangey brown speckled grey, firm, intact, sandy CLAY with dolerite cobbles and boulders. **COLLUVIUM**.

1.50

NOTES

1) Refusal @ 1.50m on medium hard rock Colluvium.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 49.501
Y-COORD : S29 57.709

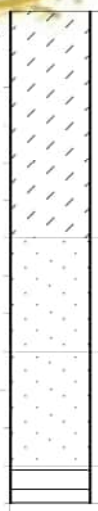
HOLE No: TP225

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP226
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, orangey brown speckled grey, medium dense, intact, clayey SAND with dolerite gravel, cobbles and boulders. **FILL**
0.60	Slightly moist, dark brown speckled grey, stiff, shattered, sandy CLAY with gravel and cobbles. **COLLUVIUM**.
0.90	Slightly moist, orangey brown speckled grey, firm to stiff, relic jointed, sandy CLAY. **RESIDUAL MUDSTONE**.
1.20	Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**
1.30	

NOTES

1) Refusal @ 1.30m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 49.554
Y-COORD : S29 57.578

HOLE No: TP226

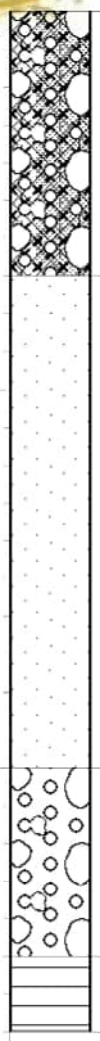
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP227
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Well packed, angular, dolerite GRAVEL and COBBLES in a silty sand matrix. Overall consistency is dense. **FILL**.

0.70 Slightly moist, orangey brown speckled grey, firm to stiff, shattered, sandy CLAY.**COLLUVIUM**.

2.00 Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

2.50 Greenish grey stained reddish brown, highly weathered, fine grained, very thinly bedded, very closely jointed, soft rock. **MUDSTONE**

2.70

NOTES

1) Refusal @ 2.70m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 49.641
Y-COORD : S29 57.372

HOLE No: TP227

NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP228
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Slightly moist, dark grey and brown, dense, intact, sandy GRAVEL with dolerite cobbles. **FILL**.

0.50 Slightly moist, dark brown speckled grey, firm, shattered, sandy CLAY with gravel and cobbles. **COLLUVIUM**.

1.00 Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

1.20 Greenish grey stained reddish brown, highly weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**

1.30

NOTES

1) Refusal @ 1.30m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 49.725
Y-COORD : S29 57.168

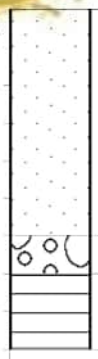
HOLE No: TP228

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP229
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, firm, shattered, sandy CLAY with cobbles. **COLLUVIUM**.

0.60 Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

0.70 Greenish grey stained reddish brown, highly weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**

0.90

NOTES

1) Refusal @ 0.90m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 49.808
Y-COORD : S29 56.965

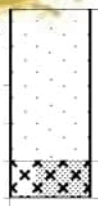
HOLE No: TP229

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP230
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, soft to firm, shattered, sandy CLAY with dolerite cobbles and boulders. **COLLUVIUM**

0.40 Dark grey stained reddish brown, moderately weathered, medium grained, very closely jointed, soft rock. **DOLERITE**.

0.50

NOTES

1) Refusal @ 0.50m on medium hard rock Dolerite.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024

DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 49.892
Y-COORD : S29 56.759

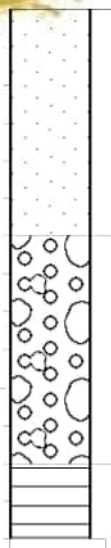
HOLE No: TP230

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP231
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, firm, shattered, sandy CLAY with dolerite cobbles and boulders. **COLLUVIUM**

0.60 Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

1.20 Greenish grey stained reddish brown, highly weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**

1.40

NOTES

1) Refusal @ 1.40m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 49.976
Y-COORD : S29 56.555

HOLE No: TP231

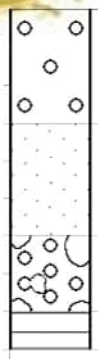
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP232
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, dark brown speckled grey, loose to medium dense, intact, slightly gravelly SAND with dolerite cobbles and boulders. **FILL**
0.30	Slightly moist, dark brown speckled grey, firm, shattered, sandy CLAY with occasional cobbles. **COLLUVIUM**.
0.60	Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.
0.80	Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**
0.90	

NOTES

1) Refusal @ 0.90m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024

DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 50.060
Y-COORD : S29 56.352

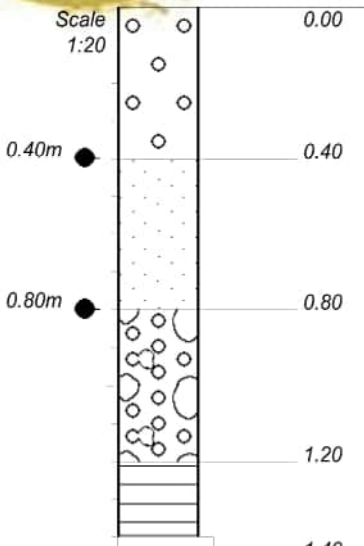
HOLE No: TP232

NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP233
Sheet 1 of 1

JOB NUMBER: NVG013



0.00	Slightly moist, dark brown speckled grey, medium dense, intact, slightly gravelly SAND with dolerite cobbles and boulders. **FILL**
0.40	Slightly moist, dark brown speckled grey, firm, shattered, sandy CLAY with occasional cobbles. **COLLUVIUM**.
0.80	Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.
1.20	Greenish grey stained reddish brown, highly weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**
1.40	

NOTES

1) Refusal @ 1.40m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed samples from 0.40m 0.80m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 50.153
Y-COORD : S29 56.148

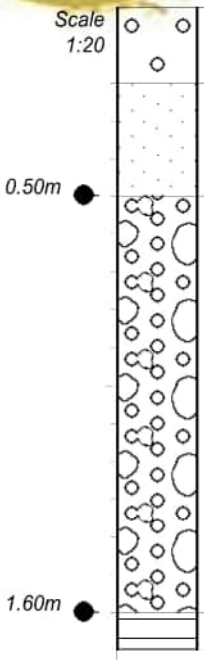
HOLE No: TP233

NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP234
Sheet 1 of 1

JOB NUMBER: NVG013



0.00	Slightly moist, dark brown speckled grey, medium dense, intact, slightly gravelly SAND with dolerite cobbles and boulders. **FILL**
0.20	Slightly moist, dark brown speckled grey, firm, shattered, sandy CLAY with occasional gravel and cobbles. **COLLUVIUM**.
0.50	Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense, **RESIDUAL MUDSTONE**.
1.60	Greenish grey stained reddish brown, highly weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**
1.70	

NOTES

1) Refusal @ 1.70m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed samples from 0.50m 1.60m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 50.272
Y-COORD : S29 55.957

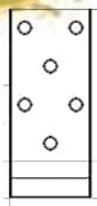
HOLE No: TP234

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP235
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, loose to medium dense, intact, slightly gravelly SAND with dolerite cobbles and boulders. **FILL**

0.40 Greenish grey stained reddish brown, highly weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**

0.50

NOTES

1) Refusal @ 0.50m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 50.393
Y-COORD : S29 55.767

HOLE No: TP235

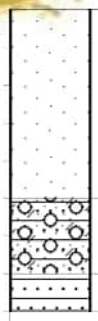
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP237
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, firm, shattered, sandy CLAY with occasional cobbles and boulders. **COLLUVIUM**.

0.50 Slightly moist, orange brown, medium dense, clayey SAND with weathered sandstone gravel. **RESIDUAL SANDSTONE**.

0.70 Light grey, moderately weathered, medium grained, thinly bedded, closely jointed, soft rock. **SANDSTONE**

0.80

NOTES

1) Refusal @ 0.80m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 50.514
Y-COORD : S29 55.578

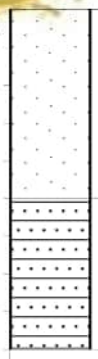
HOLE No: TP237

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP238
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, firm, shattered, sandy CLAY with occasional gravel. **COLLUVIUM**.

0.50 Light grey stained brown, moderately weathered, medium grained, thinly bedded, closely jointed, soft rock. **SANDSTONE**.

0.90

NOTES

1) Refusal @ 0.90m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 50.635
Y-COORD : S29 55.388

HOLE No: TP238

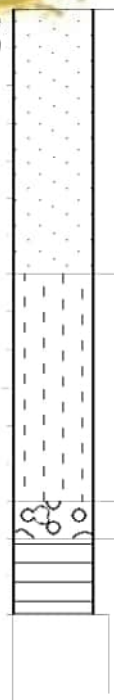
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP239
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, firm, shattered, sandy CLAY with occasional cobbles. **COLLUVIUM**.

0.70 Slightly moist, orangey brown speckled grey, medium dense, intact, silty SAND. **COLLUVIUM**.

1.30 Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

1.40 Greenish grey stained reddish brown, highly weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**

1.60

NOTES

1) Refusal @ 1.60m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 50.759
Y-COORD : S29 55.197

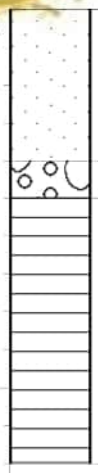
HOLE No: TP239

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP240
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, firm, shattered, sandy CLAY with occasional cobbles. **COLLUVIUM**.

0.40 Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

0.50 Greenish grey stained reddish brown, moderately weathered, thinly bedded, very closely jointed, soft rock. **MUDSTONE**

1.20

NOTES

1) Refusal @ 1.20m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 50.885
Y-COORD : S29 55.007

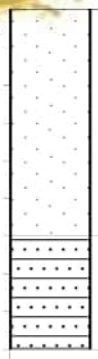
HOLE No: TP240

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP241
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, firm, shattered, sandy CLAY with occasional dolerite and sandstone cobbles and boulders. **COLLUVIUM**.

0.60 Light grey stained brown, moderately weathered, medium grained, thinly bedded, closely jointed, soft rock. **SANDSTONE**.

0.90

NOTES

1) Refusal @ 0.90m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 51.005
Y-COORD : S29 54.816

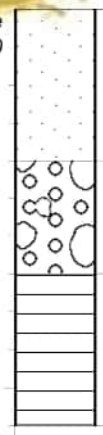
HOLE No: TP241

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP242
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, firm, shattered, sandy CLAY with occasional cobbles. **COLLUVIUM**.

0.40 Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

0.70 Greenish grey stained reddish brown, highly weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**

1.10

NOTES

1) Refusal @ 1.10m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 51.127
Y-COORD : S29 54.629

HOLE No: TP242

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP243
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Slightly moist, dark brown speckled grey, firm, shattered, sandy CLAY with cobbles and boulders. **COLLUVIUM**

0.70 Light grey stained brown, moderately weathered, medium grained, thinly bedded, closely jointed, soft rock. **SANDSTONE**.

0.80

NOTES

1) Refusal @ 0.80m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 51.247
Y-COORD : S29 54.439

HOLE No: TP243

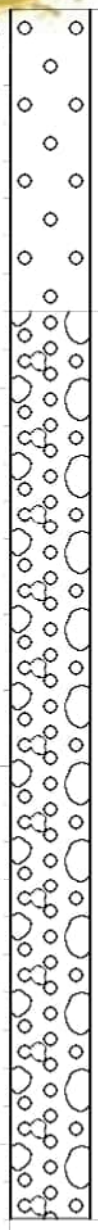
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP244
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, loose to medium dense, intact, slightly gravelly SAND with dolerite cobbles and boulders. **FILL**

0.80m

0.80 Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

3.20

NOTES

1) Terminated @ 3.20m.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed samples from 0.80m -3.20m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 51.368
Y-COORD : S29 54.249

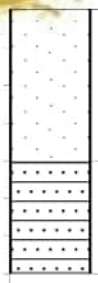
HOLE No: TP244

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP245
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, firm, shattered, sandy CLAY with cobbles. **COLLUVIUM**

0.40 Light grey stained brown, moderately weathered, medium grained, thinly bedded, closely jointed, soft rock. **SANDSTONE**.

0.70

NOTES

1) Refusal @ 0.70m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 51.488
Y-COORD : S29 54.062

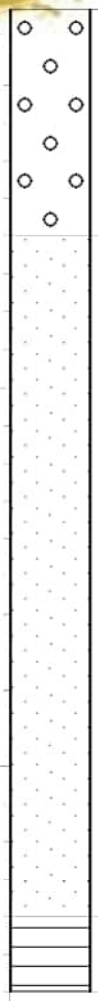
HOLE No: TP245

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP246
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, medium dense, intact, slightly gravelly SAND with dolerite cobbles and boulders. **FILL**

0.60 Slightly moist to moist with depth, brownish grey speckled off-white, firm, shattered, sandy CLAY. **COLLUVIUM**.

2.40 Greenish grey stained reddish brown, highly weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**

2.60

NOTES

1) Refusal @ 2.60m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed samples from 0.60m -2.40m.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 51.608
Y-COORD : S29 53.872

HOLE No: TP246

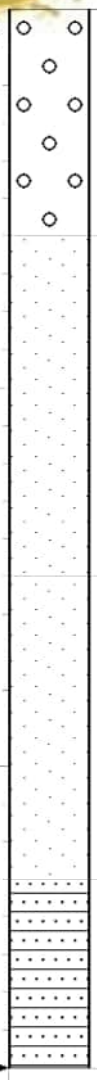
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP247
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, dark brown speckled grey, medium dense, intact, slightly gravelly SAND with dolerite cobbles and boulders. **FILL**
0.60	Slightly moist , brownish grey speckled off-white, firm, shattered, sandy CLAY. **COLLUVIUM**.
1.50	Moist, orangey brown blotched grey, firm, shattered, sandy CLAY with cobbles. **ALLUVIUM**.
2.30	Light grey stained brown, moderately weathered, medium grained, thinly bedded, closely jointed, soft rock. **SANDSTONE**.
2.80	

NOTES

1) Terminated @ 2.80, maximum reach of TLB.
2) Sidewalls stable.
3) Water seepage @ 2.80m.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 51.731
Y-COORD : S29 53.679

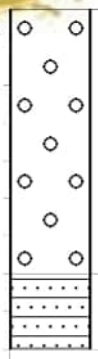
HOLE No: TP247

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP248
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, medium dense, intact, slightly gravelly SAND with dolerite cobbles and boulders. **FILL**

0.70 Light grey stained brown, moderately weathered, medium grained, thinly bedded, closely jointed, soft rock. **SANDSTONE**.

0.90

NOTES

1) Refusal @ 0.90m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 51.855
Y-COORD : S29 53.492

HOLE No: TP248

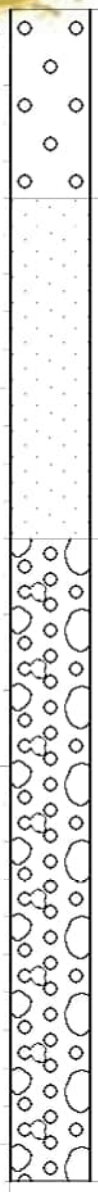
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP249
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, medium dense, intact, slightly gravelly SAND with dolerite cobbles and boulders. **FILL**

0.50 Slightly moist , brownish grey speckled white, firm, shattered, sandy CLAY. **COLLUVIUM**.

1.40 Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

3.10

NOTES

1) Terminated @ 3.10m.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 51.977
Y-COORD : S29 53.304

HOLE No: TP249

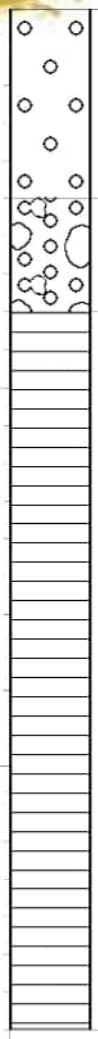
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP250
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, to medium dense, intact, slightly gravelly SAND with dolerite cobbles and boulders. **FILL**

0.50 Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

0.80 Greenish grey stained reddish brown, highly to moderately weathered, fine grained, very closely jointed, soft rock. **MUDSTONE**

2.70

NOTES

1) Refusal @ 2.70m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/09/2024
DATE : 07/12/2024 15:24
TEXT : ..pelineProjectPART1.5.txt

ELEVATION :
X-COORD : E25 52.098
Y-COORD : S29 53.115

HOLE No: TP250

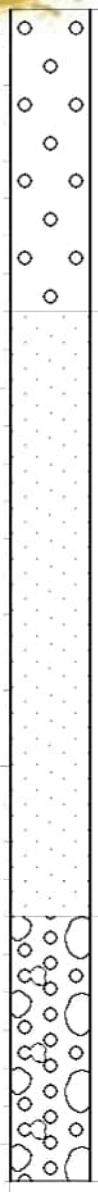
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP251
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, medium dense, intact, slightly gravelly SAND with dolerite cobbles and boulders. **FILL**

0.80 Slightly moist, brownish grey speckled white, firm, shattered, sandy CLAY. **COLLUVIUM**.

2.40 Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

3.10

NOTES

1) Terminated @ 3.10.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 52.222
Y-COORD : S29 52.926

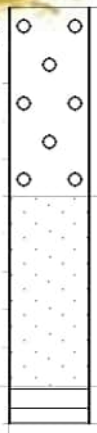
HOLE No: TP251

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP252
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, medium dense, intact, slightly gravelly SAND with dolerite cobbles and boulders. **FILL**

0.50 Slightly moist, dark brown speckled grey, firm, shattered, sandy CLAY with occasional cobbles. **COLLUVIUM**.

1.00 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**

1.10

NOTES

1) Refusal @ 1.10m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 52.342
Y-COORD : S29 52.734

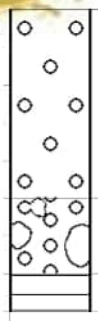
HOLE No: TP252

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP253
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, medium dense, intact, slightly gravelly SAND with dolerite cobbles and boulders. **FILL**

0.50 Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

0.70 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**

0.80

NOTES

1) Refusal @ 0.80m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 52.461
Y-COORD : S29 52.545

HOLE No: TP253

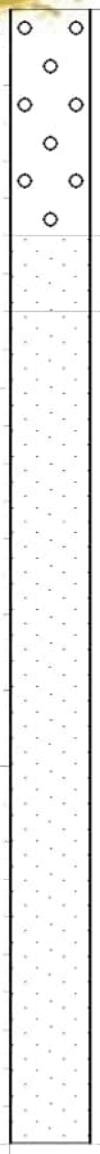
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP254
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, loose to medium dense, intact, slightly gravelly SAND with dolerite cobbles and boulders. **FILL**

0.60 Slightly moist, dark brown speckled grey, firm, shattered, sandy CLAY with occasional cobbles. **COLLUVIUM**.

0.80 Moist, reddish brown becoming greenish grey speckled off-white with depth, firm to stiff, relic jointed, sandy CLAY with cobbles. **RESIDUAL MUDSTONE**.

3.00

NOTES

1) Terminated @ 3.00m.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed samples from 0.80m - 3.00m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 52.582
Y-COORD : S29 52.357

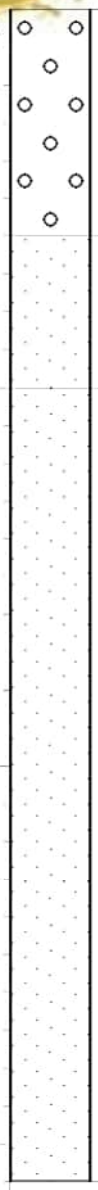
HOLE No: TP254

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP255
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, loose to medium dense, intact, slightly gravelly SAND with dolerite cobbles and boulders. **FILL**

0.60 Slightly moist, dark brown speckled grey, firm, micro shattered, sandy CLAY with occasional cobbles. **COLLUVIUM**.

1.00 Slightly moist, reddish brown becoming greenish grey speckled off-white with depth, firm to stiff, relic jointed, sandy CLAY with cobbles. **RESIDUAL MUDSTONE**.

3.10

NOTES

1) Terminated @ 3.10m.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 52.703
Y-COORD : S29 52.170

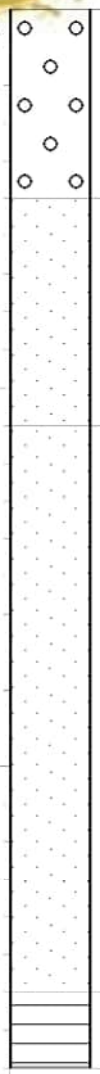
HOLE No: TP255

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP256
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



	0.00	Slightly moist, dark brown speckled grey, loose to medium dense, intact, slightly gravelly SAND with dolerite cobbles and boulders. **FILL**
	0.50	Slightly moist, dark brown speckled grey, firm, shattered, sandy CLAY with occasional cobbles. **COLLUVIUM**.
1.10m	1.10	Slightly moist, reddish brown speckled white with depth, stiff, shattered, sandy CLAY with cobbles. **RESIDUAL MUDSTONE**.
2.60m	2.60	Reddish brown stained grey, highly to moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**
	2.80	

NOTES

1) Refusal @ 2.80m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed samples from 1.10m 2.60m.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 52.794
Y-COORD : S29 52.029

HOLE No: TP256

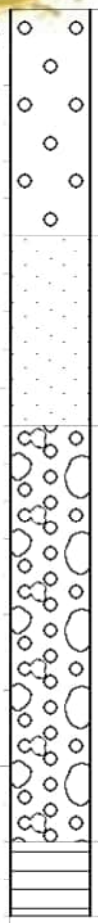
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP257
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, loose to medium dense, intact, slightly gravelly SAND with dolerite cobbles and boulders. **FILL**

0.60 Slightly moist, dark brown speckled grey, firm, shattered, sandy CLAY with occasional gravel. **COLLUVIUM**.

1.10 Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

2.20 Greenish grey stained reddish brown, highly to moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**

2.40

NOTES

1) Refusal @ 2.40m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 52.914
Y-COORD : S29 51.838

HOLE No: TP257

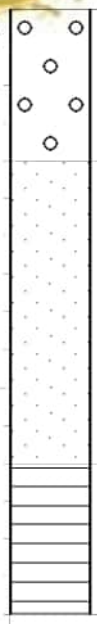
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP258
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, loose to medium dense, intact, slightly gravelly SAND with dolerite cobbles and boulders. **FILL**

0.40 Slightly moist, reddish brown speckled off-white with depth, firm to stiff, relic jointed, sandy CLAY with cobbles. **RESIDUAL MUDSTONE**.

1.20 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**

1.60

NOTES

1) Refusal @ 1.60m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 53.034
Y-COORD : S29 51.649

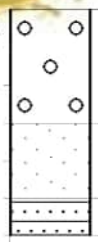
HOLE No: TP258

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP259
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, medium dense, intact, slightly gravelly SAND with dolerite cobbles and boulders. **FILL**

0.30 Slightly moist, dark brown speckled grey, firm, shattered, sandy CLAY with occasional gravel. **COLLUVIUM**.

0.50 Light grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **SANDSTONE**.

0.60

NOTES

1) Refusal @ 0.60m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024

DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

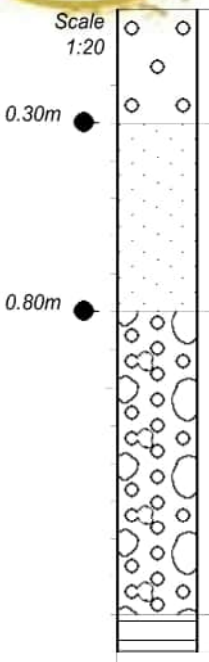
ELEVATION :
X-COORD : E25 53.155
Y-COORD : S29 51.461

HOLE No: TP259

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP260
Sheet 1 of 1

JOB NUMBER: NVG013



0.00	Slightly moist, dark brown speckled grey, medium dense, intact, slightly gravelly SAND with dolerite cobbles and boulders. **FILL**
0.30	Slightly moist, dark brown speckled grey, firm, shattered, sandy CLAY. **COLLUVIUM**.
0.80	Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.
1.60	Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**
1.70	

NOTES

1) Refusal @ 1.70m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed samples from 0.30m 0.80m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 53.276
Y-COORD : S29 51.272

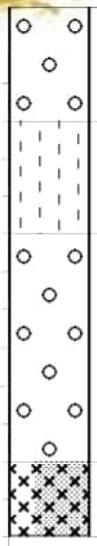
HOLE No: TP260

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP261
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, dark brown speckled grey, medium dense, intact, slightly gravelly SAND with dolerite cobbles and boulders. **FILL**
0.30	Slightly moist, reddish brown speckled grey, medium dense to dense, intact, silty SAND with occasional cobbles. **COLLUVIUM**.
0.60	Slightly moist, brownish grey, dense, intact, gravelly SAND with cobbles and boulders. **RESIDUAL DOLERITE**.
1.20	Dark grey stained reddish brown, moderately weathered, medium jointed, very closely jointed, soft rock. **DOLERITE**.
1.40	

NOTES

1) Refusal @ 1.40m on hard rock Dolerite.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 53.410
Y-COORD : S29 51.089

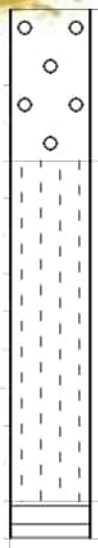
HOLE No: TP261

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP262
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, medium dense, intact, slightly gravelly SAND with dolerite cobbles and boulders. **FILL**

0.40 Slightly moist, reddish brown speckled grey, medium dense to dense, intact, silty SAND with occasional cobbles. **COLLUVIUM**.

1.30 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**

1.40

NOTES

1) Refusal @ 1.40m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 53.557
Y-COORD : S29 50.914

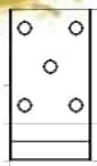
HOLE No: TP262

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP263
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, medium dense, intact, slightly gravelly SAND with dolerite cobbles and boulders. **FILL**

0.30 Reddish brown stained greenish grey, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**

0.40

NOTES

1) Refusal @ 0.40m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024

DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 53.702
Y-COORD : S29 50.739

HOLE No: TP263

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP264
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00	Slightly moist, dark brown speckled grey, medium dense, intact, slightly gravelly SAND with dolerite cobbles and boulders. **FILL**
0.40	Slightly moist, reddish brown speckled grey, medium dense to dense, intact, clayey SAND with occasional cobbles. **COLLUVIUM**.
0.80	Slightly moist, reddish brown speckled grey, firm, shattered, sandy CLAY with cobbles and boulders. **RESIDUAL SANDSTONE**.
1.30	Greenish grey, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.
1.50	

NOTES

1) Refusal @ 1.50m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed samples from 0.80m 1.30m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 53.846
Y-COORD : S29 50.563

HOLE No: TP264

NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP265
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00	Slightly moist, dark brown speckled grey, loose to medium dense, intact, slightly gravelly SAND with dolerite cobbles and boulders. **FILL**
0.40	Slightly moist, reddish brown speckled grey, medium dense to dense, intact, clayey SAND with occasional cobbles. **COLLUVIUM**.
0.80	Slightly moist, reddish brown speckled grey, firm, relic jointed, sandy CLAY. **RESIDUAL MUDTSONE**.
1.30	Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.
1.40	

NOTES

1) Refusal @ 1.40m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 53.992
Y-COORD : S29 50.387

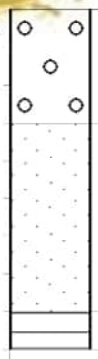
HOLE No: TP265

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP266
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, medium dense, intact, slightly gravelly SAND with dolerite cobbles and boulders. **FILL**

0.30 Slightly moist, reddish brown speckled grey, firm, relic jointed, sandy CLAY. **RESIDUAL INDURATED MUDSTONE**.

0.80 Olive grey stained reddish brown, moderately weathered, fine grained, very closely jointed, soft rock. **INDUARTED MUDSTONE**.

0.90

NOTES

1) Refusal @ 0.90m on medium hard rock Indurated Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 54.138
Y-COORD : S29 50.212

HOLE No: TP266

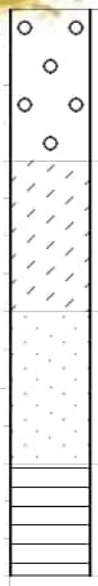
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP267
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, dark brown speckled grey, medium dense, intact, slightly gravelly SAND with dolerite cobbles and boulders. **FILL**
0.40	Slightly moist, reddish brown speckled grey, medium dense to dense, intact, clayey SAND with occasional cobbles. **COLLUVIUM**.
0.80	Slightly moist, reddish brown speckled grey, firm, relic jointed, sandy CLAY with cobbles and boulders. **RESIDUAL MUDSTONE**.
1.20	Greenish grey stained reddish brown, moderately weathered, fine grained, very closely jointed, soft rock. **MUDSTONE**
1.50	

NOTES

1) Refusal @ 1.50m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024

DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 54.284
Y-COORD : S29 50.035

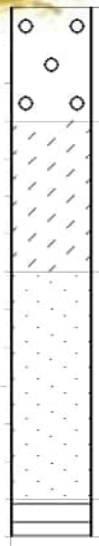
HOLE No: TP267

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP268
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, dark brown speckled grey, medium dense, intact, slightly gravelly SAND with dolerite cobbles and boulders. **FILL**
0.30	Slightly moist, reddish brown speckled grey, medium dense, intact, clayey SAND with occasional cobbles. **COLLUVIUM**.
0.70	Slightly moist, reddish brown speckled grey, firm, relic jointed, sandy CLAY. **RESIDUAL MUDSTONE**.
1.30	Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**
1.40	

NOTES

1) Refusal @ 1.40m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 54.429
Y-COORD : S29 49.859

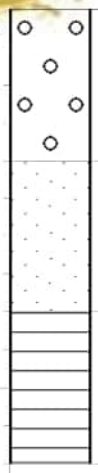
HOLE No: TP268

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP269
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, medium dense, intact, slightly gravelly SAND with dolerite cobbles and boulders. **FILL**

0.40 Slightly moist, reddish brown speckled grey, firm, relic jointed, sandy CLAY. **RESIDUAL MUDSTONE**.

0.80 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**

1.20

NOTES

1) Refusal @ 1.20m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 54.575
Y-COORD : S29 49.683

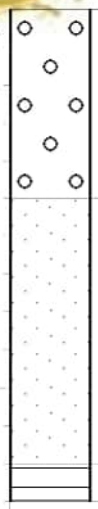
HOLE No: TP269

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP270
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, medium dense, intact, slightly gravelly SAND with dolerite cobbles and boulders. **FILL**

0.50 Slightly moist, dark brown speckled white, stiff, shattered, sandy CLAY with sporadic ferruginous concretions. **COLLUVIUM**.

1.20 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**

1.30

NOTES

1) Refusal @ 1.30m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 54.657
Y-COORD : S29 49.583

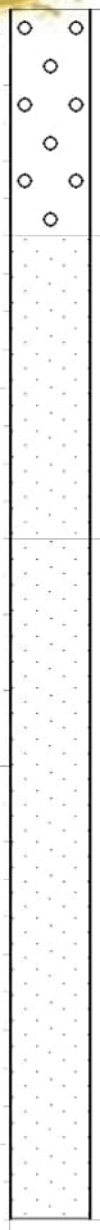
HOLE No: TP270

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP271
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, loose to medium dense, intact, slightly gravelly SAND with dolerite cobbles and boulders. **FILL**

0.60m

0.60 Slightly moist, black speckled brown, soft to firm, shattered, sandy CLAY. **ALLUVIUM**

1.40m

1.40 Slightly moist, dark brown speckled white, firm, shattered, sandy CLAY with sporadic ferruginous concretions. **ALLUVIUM**.

3.20

NOTES

1) Terminated @ 3.20m.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed samples from 0.60m 1.40m
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 54.803
Y-COORD : S29 49.406

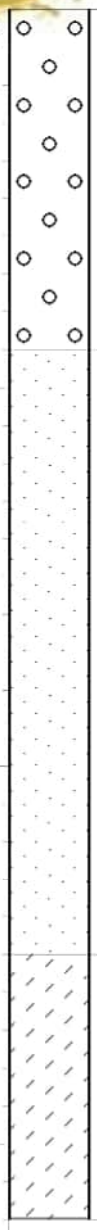
HOLE No: TP271

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP272
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown interlayered with reddish brown speckled grey, medium dense, intact, slightly gravelly SAND with dolerite and mudstone cobbles and boulders. **FILL**

0.90 Slightly moist, dark brown speckled off-white, firm to stiff, shattered, sandy CLAY. **COLLUVIUM**.

2.50m 2.50 Slightly moist, olive grey blotched orange speckled off-white, medium dense to dense, intact, clayey SAND with weathered calcrete. **SANDSTONE**.

3.20m 3.20

NOTES

1) Terminated @ 3.20m.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed samples from 2.50m 3.20m.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 54.949
Y-COORD : S29 49.231

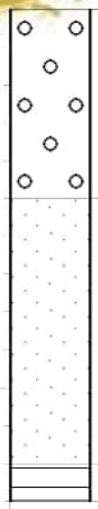
HOLE No: TP272

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP273
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, medium dense, intact, slightly gravelly SAND with dolerite cobbles and boulders. **FILL**

0.50 Slightly moist, dark brown speckled white, stiff, shattered, sandy CLAY. **COLLUVIUM**.

1.20 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**

1.30

NOTES

1) Refusal @ 1.30m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 55.094
Y-COORD : S29 49.055

HOLE No: TP273

NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP274
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Slightly moist, dark brown speckled grey, loose, intact, slightly gravelly SAND with dolerite cobbles and boulders. **FILL**

0.10 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**

0.20

NOTES

1) Refusal @ 0.20m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024

DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 55.240
Y-COORD : S29 48.878

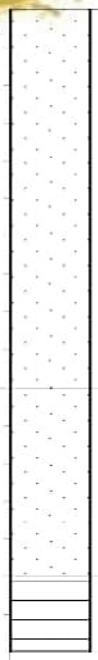
HOLE No: TP274

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP275
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, medium dense, intact, sandy CLAY with dolerite and sandstone cobbles and boulders. **FILL**

1.00 Slightly moist, dark brown speckled white, stiff, shattered, sandy CLAY. **COLLUVIUM**.

1.50 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**

1.70

NOTES

1) Refusal @ 1.70m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 55.387
Y-COORD : S29 48.703

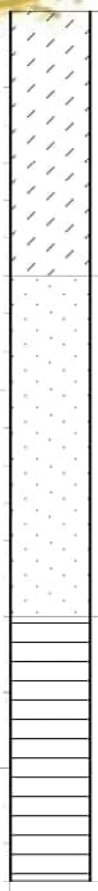
HOLE No: TP275

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP276
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, medium dense, intact, clayey SAND with dolerite and sandstone cobbles and boulders. **FILL**

0.70 Slightly moist, dark brown speckled white, stiff, shattered, sandy CLAY. **COLLUVIUM**.

1.60 Reddish brown becoming greenish grey, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

2.30

NOTES

1) Refusal @ 2.30m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 55.444
Y-COORD : S29 48.637

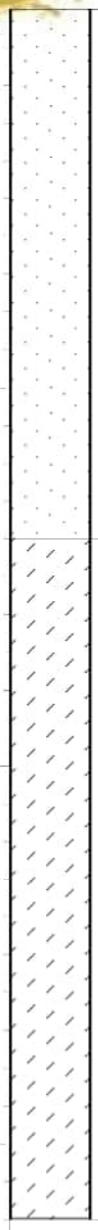
HOLE No: TP276

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP277
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, black speckled brown, soft to firm, shattered, sandy CLAY. **COLLUVIUM**

1.40m ● 1.40

Slightly moist, orangey brown speckled white, dense, intact, clayey SAND. **COLLUVIUM**.

3.20m ● 3.20

NOTES

1) Terminated @ 3.20m.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed samples from 1.40m 3.20m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 55.587
Y-COORD : S29 48.462

HOLE No: TP277

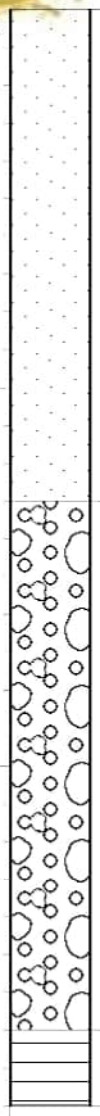
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP278
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, black speckled brown, firm, shattered, sandy CLAY. **COLLUVIUM**

1.30 Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

2.70 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**

2.90

NOTES

1) Terminated @ 2.90, maximum reach of TLB, due to the position.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 55.720
Y-COORD : S29 48.307

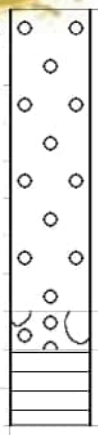
HOLE No: TP278

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP279
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, loose to medium dense, intact, slightly gravelly SAND with cobbles. **FILL**

0.80 Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

0.90 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**

1.10

NOTES

1) Refusal @ 1.10m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 55.795
Y-COORD : S29 48.219

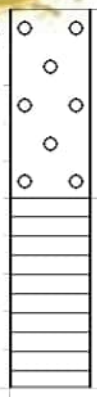
HOLE No: TP279

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP280
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, loose to medium dense, intact, slightly gravelly SAND with cobbles. **FILL**

0.50 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**

1.00

NOTES

1) Refusal @ 1.00m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 55.890
Y-COORD : S29 48.107

HOLE No: TP280

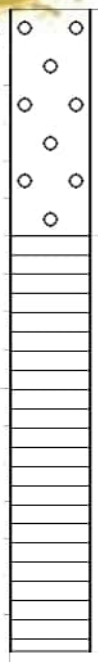
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP281
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, loose to medium dense, intact, slightly gravelly SAND with cobbles. **FILL**

0.60 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**

1.70

NOTES

1) Refusal @ 1.70m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 56.026
Y-COORD : S29 47.927

HOLE No: TP281

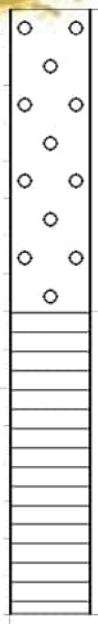
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP282
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, loose to medium dense, intact, slightly gravelly SAND with dolerite cobbles and boulders. **FILL**

0.80 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**

1.60

NOTES

1) Refusal @ 1.60m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 56.172
Y-COORD : S29 47.751

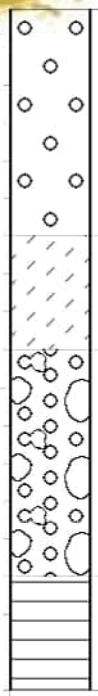
HOLE No: TP282

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP283
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, dark brown speckled grey, loose to medium dense, intact, slightly gravelly SAND with dolerite cobbles .**FILL**
0.60	Slightly moist, light brown speckled grey, medium dense, intact, clayey SAND. **COLLUVIUM**.
0.90	Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.
1.50	Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**
1.80	

NOTES

1) Refusal @ 1.80m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 56.317
Y-COORD : S29 47.573

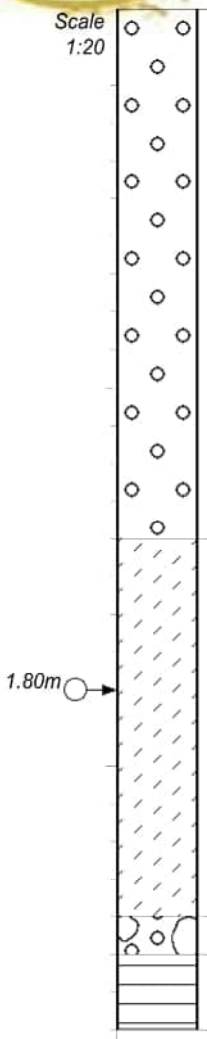
HOLE No: TP283

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP284
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, loose to medium dense, intact, slightly gravelly SAND with dolerite cobbles and boulders. **FILL**

1.40 Wet, dark reddish brown speckled grey, loose to medium dense, intact, clayey SAND. **FILL**

2.40 Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

2.50 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**

2.70

NOTES

1) Terminated @ 2.70, maximum reach of TLB.
2) Sidewalls collapsing from 1.80m.
3) Water seepage @ 1.80m.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 56.419
Y-COORD : S29 47.450

HOLE No: TP284

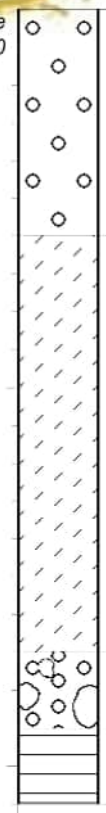
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP285
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, loose to medium dense, intact, slightly gravelly SAND with dolerite cobbles and boulders. **FILL**

0.60 Moist, dark reddish brown speckled grey, medium dense, intact, clayey SAND. **COLLUVIUM**

1.70 Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

1.90 Greenish grey, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**

2.10

NOTES

1) Refusal @ 2.10m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 56.436
Y-COORD : S29 47.430

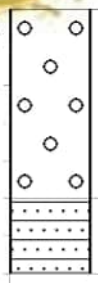
HOLE No: TP285

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP286
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, medium dense, intact, slightly gravelly SAND with dolerite cobbles and boulders. **FILL**

0.50 Light grey stained brown, moderately weathered, medium grained, thinly bedded, very closely jointed, soft rock. **SANDSTONE**.

0.70

NOTES

1) Refusal @ 0.70m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 56.582
Y-COORD : S29 47.253

HOLE No: TP286

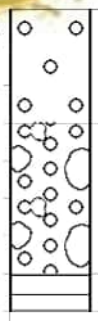
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP287
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, yellowish brown speckled grey, medium dense, intact, slightly gravelly SAND with dolerite cobbles. **FILL**
0.30	Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.
0.70	Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**
0.80	

NOTES

1) Refusal @ 0.80m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 56.728
Y-COORD : S29 47.077

HOLE No: TP287

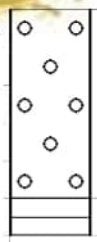
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP288
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, medium dense, intact, slightly gravelly SAND with dolerite cobbles. **FILL**

0.50 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**

0.60

NOTES

1) Refusal @ 0.60m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024

DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 56.873
Y-COORD : S29 46.901

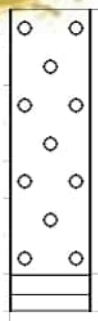
HOLE No: TP288

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP289
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, loose to medium dense, intact, slightly gravelly SAND with pieces of timber and dolerite cobbles. **FILL**

0.70 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**

0.80

NOTES

1) Refusal @ 0.80m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 57.007
Y-COORD : S29 46.719

HOLE No: TP289

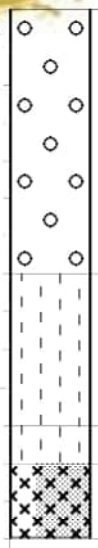
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP290
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, loose to medium dense, intact, slightly gravelly SAND with dolerite cobbles and boulders. **FILL**

0.70 Slightly moist, orangey brown speckled grey, medium dense to dense, intact, silty SAND with occasional cobbles. **COLLUVIUM**.

1.10 Slightly moist, dark grey stained brown, medium dense to dense, intact, silty SAND with gravel, cobbles and boulders. **RESIDUAL DOLERITE**.

1.20 Dark grey stained reddish brown, moderately weathered, medium grained, closely jointed, soft rock. **DOLERITE**.

1.40

NOTES

1) Refusal @ 1.40m on medium hard rock Dolerite.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 57.113
Y-COORD : S29 46.523

HOLE No: TP290

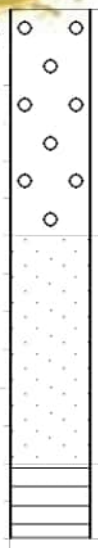
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP291
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, loose to medium dense, intact, slightly gravelly SAND with dolerite cobbles **FILL**

0.60 Slightly moist, greenish grey blotched orangey brown, firm, relic jointed, sandy CLAY with occasional weathered mudstone gravel. **RESIDUAL MUDSTONE**.

1.20 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**

1.40

NOTES

1) Refusal @ 1.40m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 57.189
Y-COORD : S29 46.317

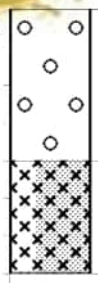
HOLE No: TP291

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP292
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, loose to medium dense, intact, slightly gravelly SAND with dolerite cobbles **FILL**

0.40 Dark grey stained orangey brown, moderately weathered, medium grained, closely jointed, soft rock. **DOLERITE**

0.70

NOTES

1) Refusal @ 0.70m on hard rock Dolerite.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024

DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

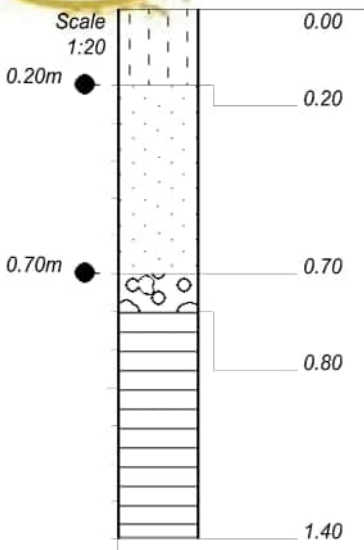
ELEVATION :
X-COORD : E25 57.250
Y-COORD : S29 46.107

HOLE No: TP292

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP293
Sheet 1 of 1

JOB NUMBER: NVG013



0.00 Slightly moist, dark brown speckled grey, medium dense, intact, silty SAND with dolerite gravel. **FILL**

0.20 Slightly moist, dark brown speckled grey, firm, shattered, sandy CLAY with occasional cobbles. **COLLUVIUM**.

0.70 Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

0.80 Greenish grey stained reddish brown, highly to moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**

1.40

NOTES

1) Refusal @ 1.40m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed samples from 0.20m 0.70m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 57.313
Y-COORD : S29 45.897

HOLE No: TP293

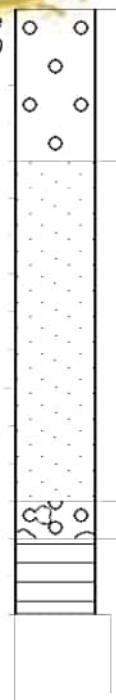
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP294
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, medium dense, intact, slightly gravelly SAND with cobbles and boulders. **FILL**

0.40 Slightly moist, dark brown speckled grey, firm, shattered, sandy CLAY with occasional gravel. **COLLUVIUM**.

1.30 Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

1.40 Reddish brown becoming greenish grey with depth, moderately weathered, fine grained, closely jointed, soft rock. **MUDSTONE**

1.60

NOTES

1) Refusal @ 1.60m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 57.358
Y-COORD : S29 45.747

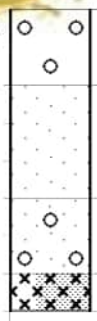
HOLE No: TP294

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP295
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, dark brown speckled grey, medium dense, intact, slightly gravelly SAND with cobbles and boulders. **FILL**
0.20	Slightly moist, dark brown speckled grey, firm, shattered, sandy CLAY. **COLLUVIUM**.
0.50	Slightly moist, dark grey stained brown, firm, shattered, slightly gravelly sandy CLAY. **RESIDUAL DOLERITE**.
0.70	Dark grey stained reddish brown, moderately weathered, medium grained, closely jointed, soft rock. **DOLERITE**.
0.80	

NOTES

1) Refusal @ 0.80m on hard rock Dolerite.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 57.421
Y-COORD : S29 45.538

HOLE No: TP295

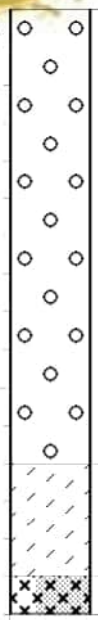
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP296
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown interlayered with pinkish grey speckled white, medium dense to dense, intact, gravelly SAND with cobbles and boulders. **FILL**

1.20 Slightly moist, dark grey stained brown, dense, intact, clayey SAND with gravel. **RESIDUAL DOLERITE**.

1.50 Dark grey stained orangey brown, moderately weathered, medium grained, closely jointed, soft rock. **DOLERITE**

1.60

NOTES

1) Refusal @ 1.60m on hard rock Dolerite.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 57.449
Y-COORD : S29 45.457

HOLE No: TP296

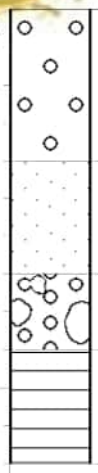
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP297
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, dark brown speckled grey, to medium dense, intact, slightly gravelly SAND with cobbles and boulders. **FILL**
0.40	Slightly moist, dark brown speckled grey, firm, shattered, sandy CLAY with occasional gravel. **COLLUVIUM**.
0.70	Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.
0.90	Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**
1.20	

NOTES

1) Refusal @ 1.20m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024

DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 57.506
Y-COORD : S29 45.246

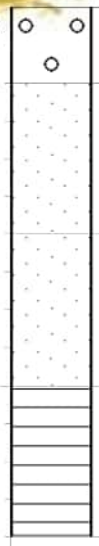
HOLE No: TP297

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP298
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, dark brown speckled grey, medium dense, intact, slightly gravelly SAND with cobbles and boulders. **FILL**
0.20	Slightly moist, dark brown speckled grey, firm, shattered, sandy CLAY. **COLLUVIUM**.
0.60	Slightly moist, orangey brown speckled grey, firm, shattered, sandy CLAY. **RESIDUAL MUDSTONE**.
1.00	Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**
1.40	

NOTES

1) Refusal @ 1.40m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 57.569
Y-COORD : S29 45.035

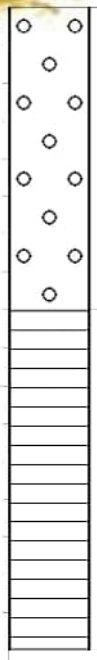
HOLE No: TP298

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP299
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, medium dense, intact, slightly gravelly SAND with dolerite gravel, cobbles and boulders. **FILL**

0.80m ● 0.80

Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**

1.70m ● 1.70

NOTES

1) Refusal @ 1.70m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed samples from 0.80m 1.70m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 57.629
Y-COORD : S29 44.826

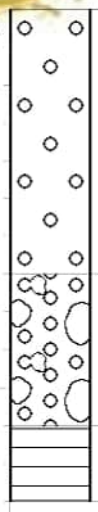
HOLE No: TP299

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP300
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, medium dense, intact, slightly gravelly SAND with dolerite gravel, cobbles and boulders. **FILL**

0.70 Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

1.10 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**

1.30

NOTES

1) Refusal @ 1.30m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/09/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPART1.6.txt

ELEVATION :
X-COORD : E25 57.692
Y-COORD : S29 44.617

HOLE No: TP300

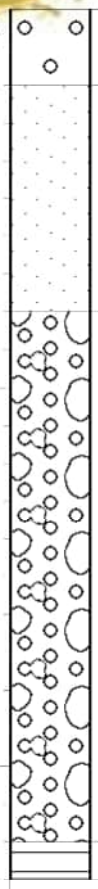
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP301
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, dark brown speckled grey, loose, intact, slightly gravelly SAND with dolerite gravel, cobbles and boulders. **FILL**.
0.20	Slightly moist, dark brown speckled grey, soft to firm, shattered, sandy CLAY. **COLLUVIUM**.
0.80	Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.
2.20	Greenish grey stained reddish brown, highly weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.
2.30	

NOTES

1) Refusal @ 2.30m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E25 57.754
Y-COORD : S29 44.407

HOLE No: TP301

NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP302
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Slightly moist, dark brown stained greenish grey, medium dense, intact, clayey SAND with some pieces of wires, cloths and plastics. **FILL**

1.20 Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

1.60 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

1.70

NOTES

1) Refusal @ 1.70m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E25 57.827
Y-COORD : S29 44.184

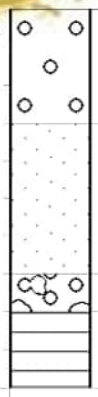
HOLE No: TP302

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP303
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, medium dense, intact, slightly gravelly SAND with dolerite cobbles. **FILL**

0.30 Slightly moist, dark brown speckled grey, soft to firm, shattered, sandy CLAY with occasional gravel and cobbles. **COLLUVIUM**.

0.70 Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

0.80 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**

1.00

NOTES

1) Refusal @ 1.00m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E25 57.881
Y-COORD : S29 44.007

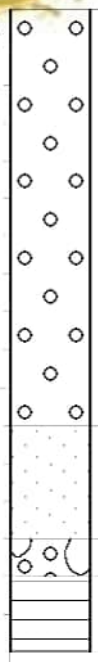
HOLE No: TP303

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP304
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, loose to medium dense, intact, slightly gravelly SAND with dolerite cobbles. **FILL**

1.10 Slightly moist, dark brown speckled grey, firm, shattered, sandy CLAY. **COLLUVIUM**.

1.40 Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

1.50 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded closely jointed, soft rock. **MUDSTONE**

1.70

NOTES

1) Refusal @ 1.70m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E25 57.931
Y-COORD : S29 43.864

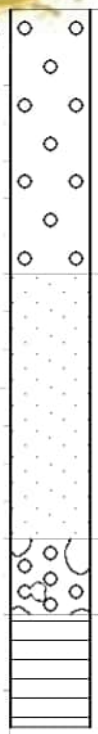
HOLE No: TP304

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP305
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, loose to medium dense, intact, slightly gravelly SAND with dolerite gravel, cobbles and boulders. **FILL**

0.70 Slightly moist, dark brown speckled grey, firm, shattered, sandy CLAY. **COLLUVIUM**.

1.40 Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

1.60 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**

1.90

NOTES

1) Refusal @ 1.90m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E25 57.981
Y-COORD : S29 43.652

HOLE No: TP305

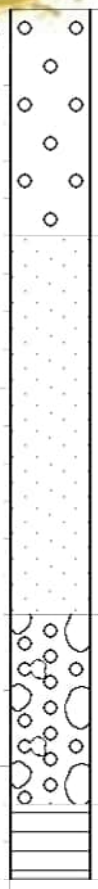
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP306
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, medium dense, intact, slightly gravelly SAND with dolerite gravel, cobbles and boulders. **FILL**

0.60 Slightly moist, dark brown speckled grey, firm, shattered, sandy CLAY. **COLLUVIUM**.

1.60 Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

2.10 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**

2.30

NOTES

1) Refusal @ 2.30m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E25 58.044
Y-COORD : S29 43.440

HOLE No: TP306

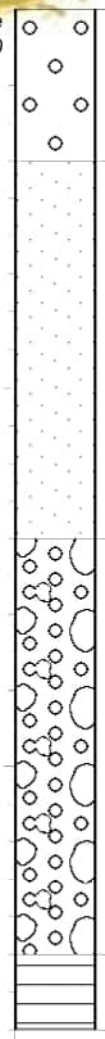
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP307
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, medium dense, intact, slightly gravelly SAND with cobbles. **FILL**

0.40 Slightly moist, dark brown speckled grey, firm, shattered, sandy CLAY. **COLLUVIUM**.

1.40 Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

2.50 Bluish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **INDURATED MUDSTONE**

2.70

NOTES

1) Refusal @ 2.70m on medium hard rock Indurated Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E25 58.106
Y-COORD : S29 43.230

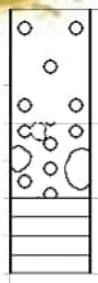
HOLE No: TP307

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP308
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, medium dense, intact, slightly gravelly SAND with cobbles. **FILL**

0.30 Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

0.50 Bluish grey stained reddish brown, moderately weathered, fine grained, thinly, very closely jointed, soft rock. **INDURATED MUDSTONE**

0.70

NOTES

1) Refusal @ 0.70m on medium hard rock Indurated Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E25 58.168
Y-COORD : S29 43.021

HOLE No: TP308

NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP309
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Slightly moist, dark brown speckled grey, medium dense, intact, slightly gravelly SAND with cobbles. **FILL**

0.30 Slightly moist, dark brown speckled grey, firm, shattered, sandy CLAY. **COLLUVIUM**.

0.70 Slightly moist, bluish grey blotched pink, firm to stiff, intact, sandy CLAY with occasional cobbles. **RESIDUAL MUDSTONE**.

1.80 Bluish grey stained reddish brown, highly to moderately weathered, very closely jointed and thinly bedded, soft rock. **INDURATED MUDSTONE**

2.10

NOTES

1) Refusal @ 2.10m on medium hard rock Indurated Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E25 58.230
Y-COORD : S29 42.812

HOLE No: TP309

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP310
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00

Light grey stained reddish brown, moderately weathered, medium grained, medium rock. **SANDSTONE**.

0.10

NOTES

1) Sandstone outcrop.

2) Sidewalls stable.

3) No water seepage.

4) No samples taken.

5) No DCP.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024

ELEVATION :
X-COORD : E25 58.290
Y-COORD : S29 42.601

HOLE No: TP310

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

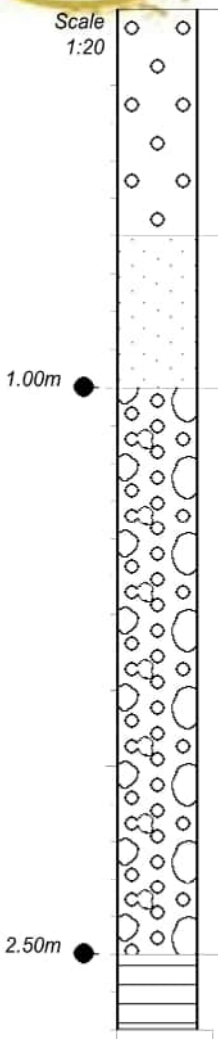
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP311
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, dark brown speckled grey, medium dense, intact, slightly gravelly SAND with cobbles. **FILL**
0.60	Slightly moist, dark brown speckled grey, firm, shattered, sandy CLAY with occasional cobbles. **COLLUVIUM**.
1.00	Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.
2.50	Greenish grey stained reddish brown, moderately weathered, fine grained, very closely jointed, soft rock. **MUDSTONE**
2.70	

NOTES

1) Refusal @ 2.70m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed samples from 1.00m 2.50m.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E25 58.356
Y-COORD : S29 42.391

HOLE No: TP311

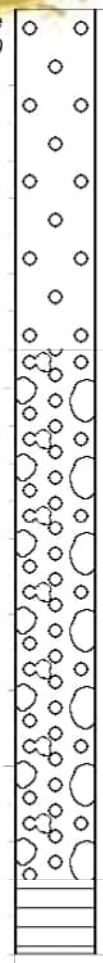
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP312
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, medium dense, intact, slightly gravelly SAND with cobbles. **FILL**.

0.90 Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

2.30 Reddish brown stained greenish grey, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

2.50

NOTES

1) Refusal @ 2.50m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E25 58.418
Y-COORD : S29 42.181

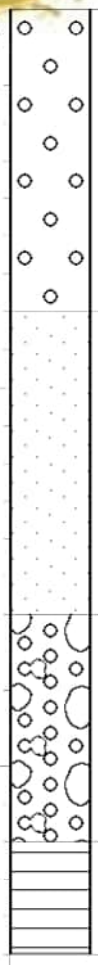
HOLE No: TP312

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP313
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, dark brown speckled grey, loose to medium dense, intact, slightly gravelly SAND with gravel and cobbles. **FILL**
0.80	Slightly moist, dark brown speckled grey, soft to firm, shattered, sandy CLAY with occasional cobbles. **COLLUVIUM**.
1.60	Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.
2.20	Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**
2.50	

NOTES

1) Refusal @ 2.50m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E25 58.480
Y-COORD : S29 41.973

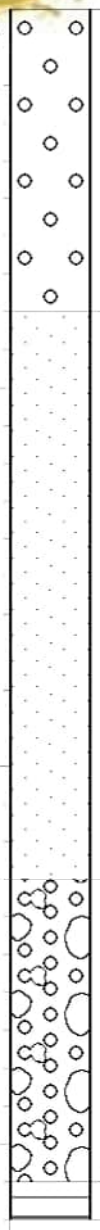
HOLE No: TP313

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP314
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, loose to medium dense, intact, slightly gravelly SAND with cobbles. **FILL**.

0.80 Slightly moist, dark brown speckled grey, firm, shattered, sandy CLAY with occasional gravel. **COLLUVIUM**.

2.30 Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

3.10 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**

3.20

NOTES

1) Terminated @ 3.20m.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E25 58.542
Y-COORD : S29 41.764

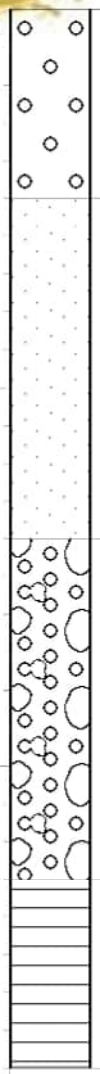
HOLE No: TP314

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP315
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00		Slightly moist, dark brown speckled grey, <u>medium dense</u>, intact, slightly gravelly SAND with cobbles. **FILL**.
0.50m	0.50	Slightly moist, dark brown speckled grey, <u>soft to firm</u>, shattered, sandy CLAY. **COLLUVIUM**.
1.40m	1.40	Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is <u>dense</u>. **RESIDUAL MUDSTONE**.
	2.30	Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, closely jointed, <u>soft rock</u>. **MUDSTONE**.
	2.80	

NOTES

1) Refusal @ 2.80m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed samples from 0.50m 1.40m.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E25 58.604
Y-COORD : S29 41.555

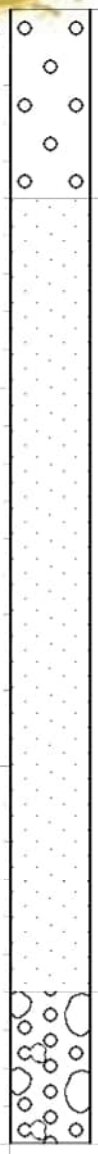
HOLE No: TP315

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP316
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, medium dense, intact, slightly gravelly SAND with gravel and cobbles. **FILL**

0.50 Slightly moist, dark brown speckled grey, firm, shattered, sandy CLAY. **COLLUVIUM**.

2.60 Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

3.00

NOTES

1) Terminated @ 3.00m.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E25 58.667
Y-COORD : S29 41.346

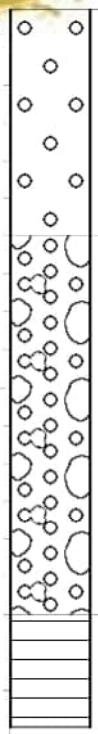
HOLE No: TP316

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP317
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown blotched olive grey, medium dense, intact, gravelly SAND with dolerite and mudstone cobbles and boulders. **FILL**

0.60 Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

1.60 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly, closely jointed, soft rock. **MUDSTONE**

1.90

NOTES

1) Refusal @ 1.90m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E25 58.730
Y-COORD : S29 41.137

HOLE No: TP317

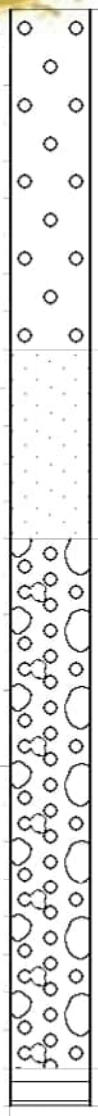
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP318
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown blotched olive grey, medium dense, intact, gravelly SAND with dolerite and mudstone cobbles and boulders. **FILL**

0.90 Slightly moist, dark brown speckled grey, firm, shattered, sandy CLAY with occasional cobbles. **COLLUVIUM**.

1.40 Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

2.80 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**

2.90

NOTES

1) Refusal @ 2.90m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E25 58.792
Y-COORD : S29 40.928

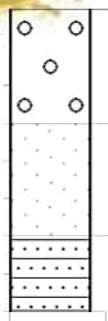
HOLE No: TP318

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP319
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, medium dense, intact, slightly gravelly SAND with cobbles. **FILL**

0.30 Slightly moist, dark brown speckled grey, firm, shattered, sandy CLAY with occasional cobbles. **COLLUVIUM**.

0.60 Light grey stained reddish brown, moderately weathered, medium grained, thinly bedded, closely jointed, soft rock. **SANDSTONE**.

0.80

NOTES

1) Refusal @ 0.80m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E25 58.855
Y-COORD : S29 40.717

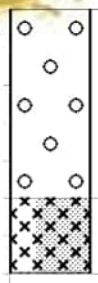
HOLE No: TP319

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP320
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown blotched olive grey, medium dense, intact, gravelly SAND with dolerite and mudstone cobbles and boulders. **FILL**

0.50 Dark grey stained reddish brown, moderately weathered, medium grained, closely jointed, soft rock. **DOLERITE**.

0.70

NOTES

1) Refusal @ 0.70m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024

DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E25 58.929
Y-COORD : S29 40.512

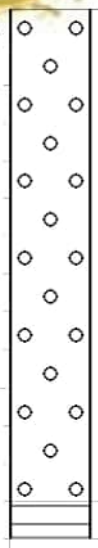
HOLE No: TP320

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP321
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark grey and brown, dense, intact, gravelly SAND with dolerite cobbles. **FILL**.

1.30 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**

1.40

NOTES

1) Refusal @ 1.40m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E25 59.011
Y-COORD : S29 40.308

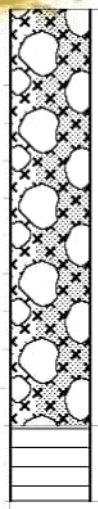
HOLE No: TP321

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP322
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark grey and brown, very dense, intact, sandy GRAVEL with tar, dolerite cobbles and boulders. **FILL**.

1.10 Greenish grey stained reddish brown, highly to moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

1.30

NOTES

1) Refusal @ 1.30m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E25 59.101
Y-COORD : S29 40.106

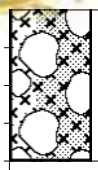
HOLE No: TP322

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP323
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00

Slightly moist, dark grey and brown, very dense, intact, sandy GRAVEL with tar, dolerite cobbles and boulders. **FILL**.

0.40

NOTES

1) Refusal @ 0.40m on concrete.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024

DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E25 59.187
Y-COORD : S29 39.904

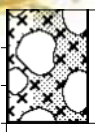
HOLE No: TP323

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP326
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00

Slightly moist, dark grey and brown, very dense, intact, sandy GRAVEL with tar, dolerite cobbles and boulders. **FILL**.

0.30

NOTES

1) Refusal @ 0.30m on concrete.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) No DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024

ELEVATION :
X-COORD : E25 59.424
Y-COORD : S29 39.379

HOLE No: TP326

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

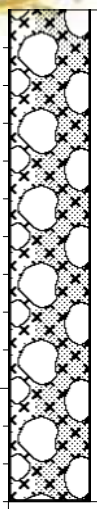
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP327
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark grey and brown, very dense, intact, sandy GRAVEL with tar, dolerite cobbles and boulders. **FILL**.

1.30

NOTES

1) Refusal @ 1.30m on concrete.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024

DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E25 59.515
Y-COORD : S29 39.181

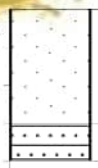
HOLE No: TP327

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP328
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, firm, shattered, sandy CLAY with dolerite cobbles. **COLLUVIUM**

0.30 Light grey, moderately weathered, medium grained, thinly bedded, closely jointed, soft rock. **SANDSTONE**.

0.40

NOTES

1) Refusal @ 0.40m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

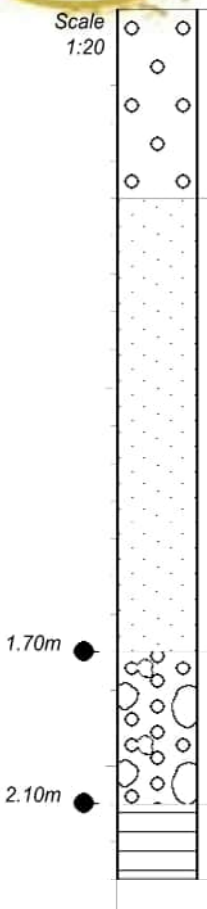
ELEVATION :
X-COORD : E25 59.604
Y-COORD : S29 38.982

HOLE No: TP328

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP329
Sheet 1 of 1

JOB NUMBER: NVG013



0.00 Slightly moist, dark brown speckled grey, loose to medium dense, intact, slightly gravelly SAND with dolerite cobbles. **FILL**

0.50 Slightly moist, dark brown speckled grey, firm, shattered, sandy CLAY. **COLLUVIUM**.

1.70 Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

2.10 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**

2.30

NOTES

1) Refusal @ 2.30m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed samples from 1.70m 2.10m.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E25 59.691
Y-COORD : S29 38.781

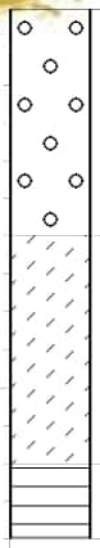
HOLE No: TP329

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP330
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, loose to medium dense, intact, slightly gravelly SAND with dolerite gravel. **FILL**

0.60 Slightly moist, orangey brown speckled grey, dense, intact, clayey SAND. **COLLUVIUM**.

1.20 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**

1.40

NOTES

1) Refusal @ 1.40m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E25 59.780
Y-COORD : S29 38.583

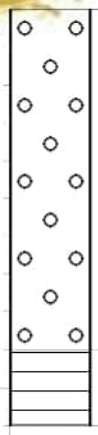
HOLE No: TP330

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP331
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown stained olive grey, medium dense, intact, slightly gravelly SAND with dolerite and mudstone cobbles and boulders. **FILL**

0.90 Greenish grey stained reddish brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**

1.10

NOTES

1) Refusal @ 1.10m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E25 59.881
Y-COORD : S29 38.380

HOLE No: TP331

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP332
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Slightly moist, dark grey stained brown, medium dense, intact, gravelly SAND with cobbles and boulders. **RESIDUAL DOLERITE**

0.10 Dark grey stained reddish brown, moderately weathered, medium grained, closely jointed, soft rock. **DOLERITE**.

0.20

NOTES

1) Refusal @ 0.20m on medium hard rock Dolerite.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E25 59.987
Y-COORD : S29 38.183

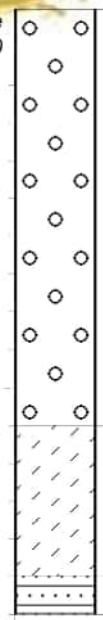
HOLE No: TP332

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP333
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, loose to medium dense, intact, slightly gravelly SAND with dolerite cobbles. **FILL**

1.10 Slightly moist, orangey brown speckled grey, dense, intact, clayey SAND. **COLLUVIUM**.

1.50 Light grey stained reddish brown, moderately weathered, medium grained, thinly bedded, very closely jointed, soft rock. **SANDSTONE**.

1.60

NOTES

1) Refusal @ 1.60m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E26 00.112
Y-COORD : S29 37.996

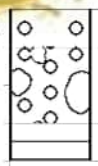
HOLE No: TP333

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP334
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, loose, intact, slightly gravelly SAND with dolerite cobbles. **FILL**

0.10 Well packed, angular, weathered mudstone GRAVEL and COBBLES with silty clay matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

0.30 Reddish brown stained greenish grey, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock, **MUDSTONE**

0.40

NOTES

1) Refusal @ 0.40m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E26 00.243
Y-COORD : S29 37.807

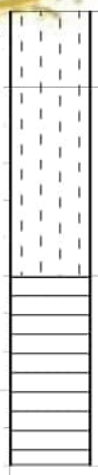
HOLE No: TP334

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 335
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, brown, loose, intact, silty SAND with gravel. **FILL**.
0.20	Moist, dark brown, soft, slickensided, silty CLAY. **RESIDUAL MUDSTONE**.
0.70	Olive brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.
1.20	

NOTES

1) Refusal @ 1.20m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E26 00.373
Y-COORD : S29 37.626

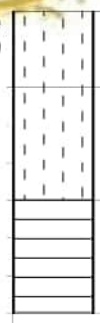
HOLE No: TP 335

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 336
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, orange brown, loose, intact, silty SAND with abundant gravel. **FILL**.

0.20 Moist, dark brown, firm, slickensided, silty CLAY with weathered mudstone rock gravel. **RESIDUAL MUDSTONE**.

0.50 Olive brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

0.80

NOTES

1) Refusal @ 0.80m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E26 00.502
Y-COORD : S29 37.438

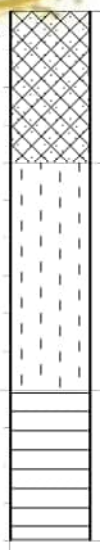
HOLE No: TP 336

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 337
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Moist, orange brown, medium dense, intact, SAND. **FILL**.

0.40 Moist, grey brown, firm, slickensided, silty CLAY with weathered mudstone gravel. **RESIDUAL MUDSTONE**.

1.00 Olive brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

1.40

NOTES

1) Refusal @ 1.40m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed Sample @ 1.00m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E26 00.631
Y-COORD : S29 37.252

HOLE No: TP 337

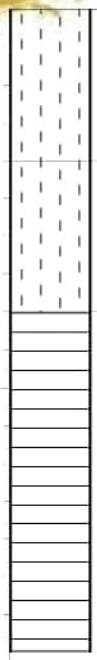
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 338
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, orange brown, loose to medium dense, intact, silty SAND with abundant angular gravel and grass. **FILL**.

0.40 Moist, grey brown, firm, shattered, silty CLAY. **RESIDUAL MUDSTONE**.

0.80 Dark purple brown grading into olive green with depth, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**

1.70

NOTES

1) Refusal @ 1.70m on medium hard rock.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E26 00.889
Y-COORD : S29 36.884

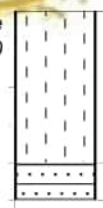
HOLE No: TP 338

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 339
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, medium dense, intact, silty SAND with abundant angular gravel. **FILL**.

0.40 Olive brown, moderately weathered, medium grained, thinly bedded, closely jointed, soft rock. **SANDSTONE**.

0.50

NOTES

1) Refusal @ 0.50m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E26 00.889
Y-COORD : S29 36.884

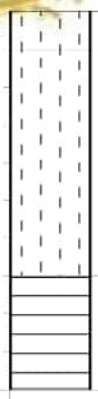
HOLE No: TP 339

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 340
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, loose, intact, silty SAND with gravel. **FILL**.

0.10 Moist, brown. firm, relic jointed, silty CLAY with weathered mudstone gravel. **RESIDUAL MUDSTONE**.

0.70 Olive brown blotched dark purple brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

1.00

NOTES

1) Refusal @ 1.00m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Profiled in-situ

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E26 01.020
Y-COORD : S29 36.699

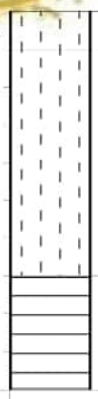
HOLE No: TP 340

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP 341
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, loose, intact, silty SAND with gravel. **FILL**.

0.10 Moist, dark purple brown, firm, slickensided, silty CLAY with weathered mudstone rock. **RESIDUAL MUDSTONE**.

0.70 Dark purple brown interlayered with olive brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

1.00

NOTES

1) Refusal @ 1.00m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Profiled in-situ

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E26 01.153
Y-COORD : S29 36.526

HOLE No: TP 341

NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP342
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Well packed, angular, moderately weathered GRAVEL and COBBLES in a silty sand matrix. **FILL**.

0.60 Olive brown interlayered with dark purple brown, moderately weathered, fine grained, thinly bedded, very closely bedded, soft rock. **MUDSTONE**.

1.50

NOTES

1) Refusal @ 1.50 on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage
4) No sample taken.
5) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E26 01.346
Y-COORD : S29 36.358

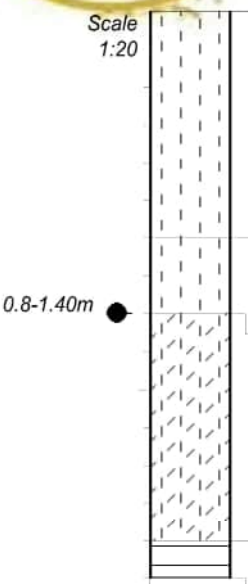
HOLE No: TP342

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP343
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, medium dense, intact, silty SAND with gravel and cobbles. **FILL**.

0.60 Moist, purple brown, firm, relic jointed, silty CLAY. **RESIDUAL MUDSTONE**.

0.80 Moist, yellow brown, medium dense, relic jointed, silty clayey SAND. **RESIDUAL DOLERITE**.

1.40 Dark purple brown, highly weathered, fine grained, thinly bedded, soft rock. **MUDSTONE**.

1.50

NOTES

1) Refusal @ 1.50m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage
4) Bulk sample 0.8-1.40m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E26 01.418
Y-COORD : S29 36.154

HOLE No: TP343

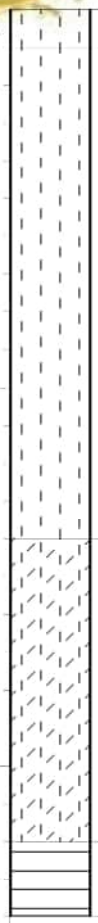
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP344
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



	0.00	Slightly moist, brown, loose, intact, silty SAND with ravel. **FILL**.
	0.10	Moist, dark brown, firm, intact, silty CLAY. **ALLUVIUM**.
1.4-2.20m	1.40	Moist, yellow brown, medium dense, relic jointed, silty clayey SAND. **RESIDUAL DOLERITE**.
	2.20	Olive brown blotched bluish brown, moderately weathered, fine grained, closely jointed, spheroidal weathering. **INDURATED MUDSTONE**.
	2.40	

NOTES

1) Refusal @ 2.40m on Mudstone contact with Dolerite.
2) Sidewalls stable.
3) No water seepage
4) Bulk sample 1.4-2.20m.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E26 01.537
Y-COORD : S29 35.965

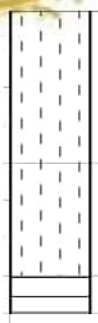
HOLE No: TP344

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP345
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, orange brown, loose, intact, silty SAND with abundant angular gravel. **FILL**.

0.40 Moist, brown, firm, shattered, silty CLAY with weathered mudstone rock gravel and cobbles. **RESIDUAL MUDSTONE**.

0.70 Olive brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

0.80

NOTES

1) Refusal @ 0.80m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage
4) No sample taken .
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E26 01.664
Y-COORD : S29 35.778

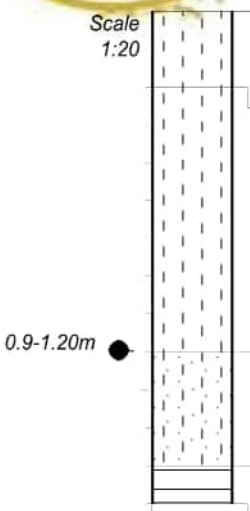
HOLE No: TP345

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP346
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, loose, intact, silty SAND with subrounded gravel and cobbles. **COLLUVIUM**.

0.20 Moist, brown speckled orange, firm, relic jointed, silty CLAY with weathered mudstone gravel. **REWORKED RESIDUAL MUDSTONE**.

0.90 Moist, orange brown, stiff, relic jointed, sandy silty CLAY with weathered mudstone gravel. **RESIDUAL MUDSTONE**

1.20 Olive brown blotched bluish, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **INDURATED MUDSTONE**.

1.30

NOTES

1) Refusal @ 1.30m on medium hard rock Indurated Mudstone.
2) Sidewalls stable.
3) No water seepage
4) Bulk sample from 0.9-1.20m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E26 01.793
Y-COORD : S29 35.592

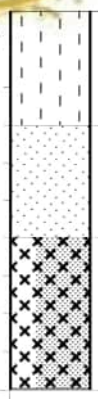
HOLE No: TP346

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP347
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, loose, intact, silty SAND with gravel and cobbles. **FILL**.

0.30 Moist, orange brown, medium dense, intact, SAND. **ALLUVIUM**.

0.60 Bluish blotched olive brown and orange brown, highly to moderately weathered, medium grained, very closely jointed and becoming less jointed with depth, soft rock. **DOLERITE**.

1.00

NOTES

1) Refusal @1.00m on medium hard rock Dolerite.
2) Sidewalls stable.
3) No water seepage
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E26 01.921
Y-COORD : S29 35.408

HOLE No: TP347

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP348
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Moist, orange brown, medium dense, intact, SAND. **ALLUVIUM**.

0.70 Dark orange brown, well cemented calcrete, medium grained, soft rock. **HARDPAN**.

0.80

NOTES

1) Refusal @ 0.80m on Hardpan.
2) Sidewalls stable.
3) No water seepage
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E26 02.050
Y-COORD : S29 35.224

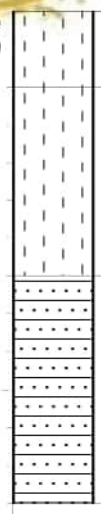
HOLE No: TP348

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP349
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, orange brown, loose, intact, silty SAND with gravel and cobbles. **FILL**.
0.20	Moist, red brown streaked orange, medium dense, relic jointed, silty SAND with weathered sandstone gravel. **RESIDUAL SANDSTONE**.
0.70	Olive brown speckled off white, highly weathered, medium grained, thinly bedded, closely jointed, soft rock. **SANDSTONE**.
1.30	

NOTES

1) Refusal @ 1.30m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E26 02.179
Y-COORD : S29 35.038

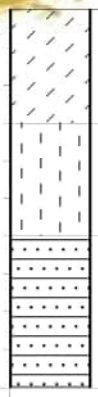
HOLE No: TP349

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP350
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, grey brown, loose, intact, clayey SAND with gravel. **FILL**.
0.30	Moist, orange brown, medium dense, relic jointed, silty SAND with weathered mudstone gravel and cobbles. **RESIDUAL SANDSTONE**.
0.60	Pinkish brown, moderately weathered, medium grained, thinly bedded, closely jointed. **SANDSTONE**.
1.00	

NOTES

1) Refusal @ 1.00m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 30/09/2024
DATE : 07/12/2024 15:54
TEXT : ..pelineProjectPART1.7.txt

ELEVATION :
X-COORD : E26 02.309
Y-COORD : S29 34.853

HOLE No: TP350

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP351
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Slightly moist, brown, loose, intact, clayey SAND with gravel. **FILL**.

0.10 Brown, highly weathered, medium grained, thinly bedded, closely jointed, soft rock. **MICACEOUS SANDSTONE**.

0.20

NOTES

1) Refusal @ 0.20m on medium hard rock Micaceous Sandstone.
2) Sidewalls stable.
3) No water seepage
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 02.437
Y-COORD : S29 34.668

HOLE No: TP351

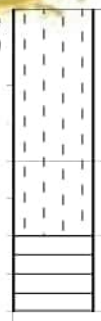
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP352
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, orange brown, medium dense, intact, silty SAND with gravel. **COLLUVIUM**

0.40 Moist, grey brown, firm, relic jointed, silty CLAY with highly weathered mudstone rock cobbles. **RESIDUAL MUDSTONE**.

0.60 Olive brown blotched bluish, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **INDURATED MUDSTONE**.

0.80

NOTES

1) Refusal @ 0.80m on medium hard rock Indurated Mudstone.
2) Sidewalls stable.
3) No water seepage
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 02.567
Y-COORD : S29 34.483

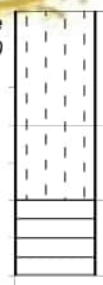
HOLE No: TP352

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP353
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, medium dense, intact, silty SAND with gravel. **FILL**.

0.30 Moist, grey brown, firm, relic jointed, silty CLAY with weathered mudstone rock. **RESIDUAL MUDSTONE**.

0.50 Olive brown blotched bluish, moderately weathered, medium grained, very thinly bedded, closely jointed, soft rock. **INDURATED MUDSTONE**.

0.70

NOTES

1) Refusal @ 0.70m on medium hard rock Indurated Mudstone.
2) Sidewalls stable.
3) No water seepage
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 02.697
Y-COORD : S29 34.298

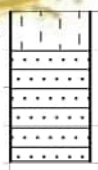
HOLE No: TP353

Zutari
Xhariep Pipeline Project Part 1

HOLE No: TP354
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, brown, loose, intact, silty SAND with gravel. **FILL** .
0.10	Brown blotched olive brown and black, highly weathered, medium grained, thinly bedded, very soft rock. **MICACEOUS SANDSTONE**.
0.30	Brown blotched olive brown and black, moderately weathered, medium grained, thinly bedded, very closely jointed, soft rock. **MICACEOUS SANDSTONE**.
0.40	

NOTES

1) Refusal @ 0.40m on medium hard rock Micaceous Sandstone.
2) Sidewalls stable.
3) No water seepage
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024

DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 02.825
Y-COORD : S29 34.113

HOLE No: TP354

Zutari
Xhariep Project

HOLE No: TP355
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 **SANDSTONE OUTCROP**.

0.00

NOTES

1) Sandstone outcrop.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024

DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 02.954
Y-COORD : S29 33.928

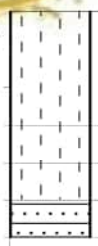
HOLE No: TP355

Zutari
Xhariep Project

HOLE No: TP356
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, brown, loose, intact, silty SAND with abundant gravel. **FILL**.
0.30	Moist, brown, firm, intact, silty SAND. **COLLUVIUM**.
0.40	Moist, brown blotched olive brown, firm, relic jointed, silty SAND. **RESIDUAL SANDSTONE**.
0.50	Olive blotched black, highly weathered, medium grained, very thinly bedded, very closely jointed, soft rock. **MICACEOUS SANDSTONE**.
0.60	

NOTES

1) Refusal @ 0.60m on medium hard rock Micaceous Sandstone.
2) Sidewalls stable.
3) No water seepage
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 03.084
Y-COORD : S29 33.743

HOLE No: TP356

Zutari
Xhariep Project

HOLE No: TP357
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 **SANDSTONE OUTCROP**.
0.00

NOTES

1) Sandstone outcrop.

2) No water seepage.

3) No samples taken.

4) No DCP.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024

DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 03.214
Y-COORD : S29 33.559

HOLE No: TP357

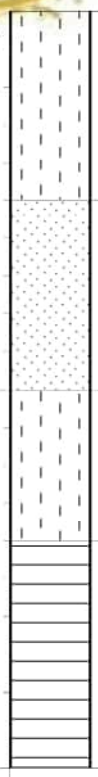
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Project

HOLE No: TP358
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, loose, intact, silty SAND with abundant gravel and cobbles. **FILL**.

0.50 Moist, orange brown, medium dense, intact, SAND. **COLLUVIUM**.

1.00m

1.00

1.20m

Moist, olive brown, firm, relic jointed, silty CLAY with highly weathered mudstone gravel. **RESIDUAL MUDSTONE**.

1.40 Olive blotched black, highly weathered, fine grained, very thinly bedded, very closely jointed, soft rock. **INDURATED MUDSTONE**.

2.00

NOTES

1) Refusal @ 2.00m on medium hard rock Indurated Mudstone.
2) Sidewalls stable.
3) No water seepage
4) Disturbed samples @ 1.00m and 1.20m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 03.349
Y-COORD : S29 33.378

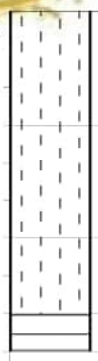
HOLE No: TP358

Zutari
Xhariep Project

HOLE No: TP359
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, brown, loose, intact, silty SAND with gravel and cobbles. **FILL**.
0.30	Moist, orange brown, firm, intact, silty CLAY. **COLLUVIUM**.
0.60	Moist, olive brown, firm, relic jointed, silty CLAY with weathered mudstone gravel. **RESIDUAL MUDSTONE**.
0.80	Olive blotched black, moderately weathered, fine grained, very thinly bedded, very closely jointed, soft rock. **INDUARETED MUDSTONE**.
0.90	

NOTES

1) Refusal @ 0.90m on medium hard rock Indurated Mudstone.
2) Sidewalls stable.
3) No water seepage
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 03.484
Y-COORD : S29 33.197

HOLE No: TP359

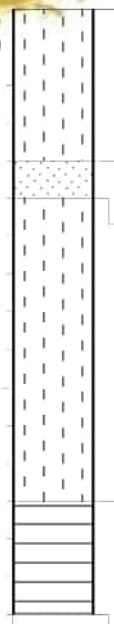
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Project

HOLE No: TP360
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, brown, loose, intact, silty SAND with abundant gravel and cobbles. **FILL**.
0.40	Very moist, orange brown, medium dense, intact, SAND. **COLLUVIUM**.
0.50	Moist, yellow brown, firm, relic jointed, silty CLAY with weathered mudstone gravel. **RESIDUAL MUDSTONE**.
1.30	Olive brown blotched black, highly to moderately weathered, fine grained, very thinly bedded, very closely jointed, soft rock. **INDURATED MUDSTONE**.
1.60	

NOTES

1) Refusal @ 1.60m on medium hard rock Indurated Mudstone.
2) Sidewalls stable.
3) No water seepage
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 03.619
Y-COORD : S29 33.015

HOLE No: TP360

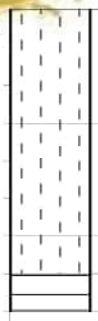
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Project

HOLE No: TP361
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, loose, intact, silty SAND with gravel and cobbles. **FILL**.

0.30 Moist, dark brown, firm, intact, silty CLAY. **COLLUVIUM**.

0.60 Moist, brown blotched olive, firm, relic jointed, silty CLAY with weathered mudstone gravel. **RESIDUAL MUDSTONE**.

0.70 Olive brown, moderately weathered, fine grained, very thinly bedded, closely jointed, soft rock. **MUDSTONE**.

0.80

NOTES

1) Refusal @ 0.80m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 03.754
Y-COORD : S29 32.833

HOLE No: TP361

Zutari
Xhariep Project

HOLE No: TP362
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00
0.00

MUDSTONE ROAD CUT.

NOTES

1) Mudstone road cut.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024

DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 03.827
Y-COORD : S29 32.735

HOLE No: TP362

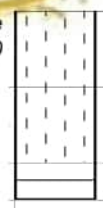
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Project

HOLE No: TP363
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, medium dense, intact, silty SAND with abundant gravel and cobbles. **FILL**.

0.20 Well packed, highly weathered, angular, mudstone gravel and cobbles in a silty CLAY. Overall consistency is medium dense. **RESIDUAL MUDSTONE**.

0.40 Olive brown, moderately weathered, medium grained, very thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

0.50

NOTES

1) Refusal@ 0.50m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage
4) No sample taken.
5) No DCP.
6) Excavated on top of road cutting.
7) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 03.962
Y-COORD : S29 32.554

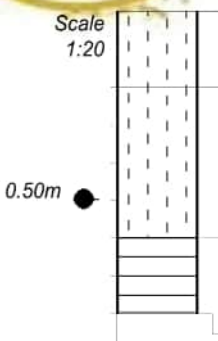
HOLE No: TP363

Zutari
Xhariep Project

HOLE No: TP364
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, loose, intact, silty SAND with abundant gravel. **FILL**.

0.20 Moist, brown speckled olive grey, firm, relic jointed, silty CLAY with weathered mudstone gravel. **RESIDUAL MUDSTONE**.

0.60 Olive brown blotched bluish, moderately weathered, fine grained, very thinly bedded, closely jointed, soft rock. **MUDSTONE**

0.80

NOTES

1) Refusal@ 0.80m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage
4) Disturbed sample @ 0.50m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 04.097
Y-COORD : S29 32.371

HOLE No: TP364

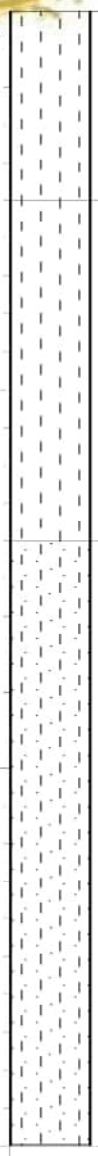
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Project

HOLE No: TP365
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, loose, intact, silty SAND with gravel and cobbles. **FILL**.

0.50 Moist, dark brown, firm, intact, silty CLAY. **COLLUVIUM**.

1.4-3.00m

1.40 Moist, orange brown, stiff becoming firm with depth, relic jointed, fine sandy silty CLAY. **RESIDUAL MUDSTONE**.

3.00

NOTES

1) Terminated @ 3.00m.
2) Sidewalls stable.
3) No water seepage
4) Bulk sample from 1.4-3.00m.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 04.234
Y-COORD : S29 32.189

HOLE No: TP365

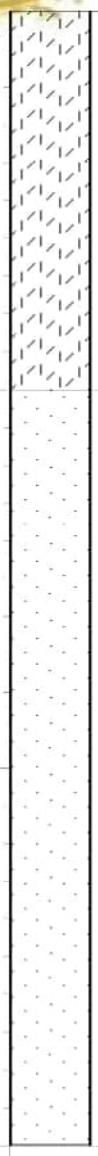
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Project

HOLE No: TP366
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Moist, brown, medium dense, intact, silty clayey SAND with gravel and cobbles. **FILL**.

1.00 Moist, brown speckled black and orange, stiff, slickensided, sandy CLAY with subrounded gravel. **ALLUVIUM**.

3.00

NOTES

1) Terminated @ 3.00m.
2) Sidewalls stable.
3) No water seepage
4) No sample taken.
5) Excavated near a River bridge.
6) DCP done.
7) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 04.355
Y-COORD : S29 32.025

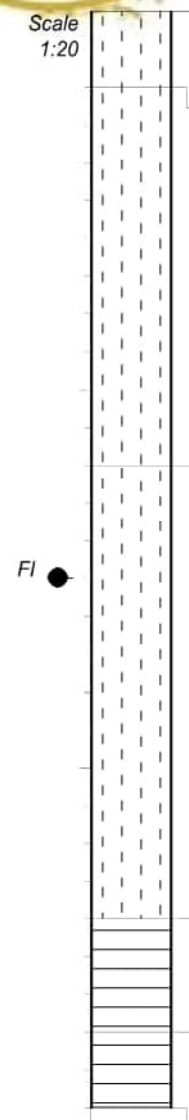
HOLE No: TP366

Zutari
Xhariep Project

HOLE No: TP367
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, loose, intact, silty SAND with angular gravel and grass. **FILL**.

0.20 Moist, dark brown, firm, intact, silty CLAY. **COLLUVIUM**.

1.20 Moist, brown speckled orange brown, stiff, relic jointed, silty CLAY with localised weathered mudstone gravel. **RESIDUAL MUDSTONE**.

2.40 Green, highly weathered, fine grained, very thinly bedded, very closely jointed, very soft rock. **MUDSTONE**.

2.70 Olive brown blotched bluish, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

2.90

NOTES

1) Refusal @ 2.90m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage
4) Sample of FI @ 1.50m.
5) DCP done refusal on stiff CLAY.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 04.491
Y-COORD : S29 31.842

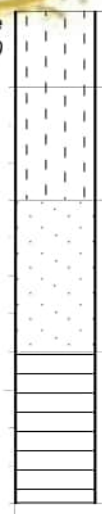
HOLE No: TP367

Zutari
Xhariep Project

HOLE No: TP368
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, brown, loose, intact, silty SAND with gravel and cobbles. **FILL**.
0.20	Moist, dark brown, firm, intact, silty CLAY. **COLLUVIUM**.
0.50	Moist, orange brown blotched off white, firm, relic jointed, sandy CLAY. **RESIDUAL MUDSTONE**.
0.90	Olive brown blotched bluish, moderately weathered, medium grained, thinly bedded, closely jointed, soft rock. **INDURATED MUDSTONE**.
1.30	

NOTES

1) Refusal @1.30m on medium hard rock Indurated Mudstone.
2) Sidewalls stable.
3) No water seepage
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 04.629
Y-COORD : S29 31.662

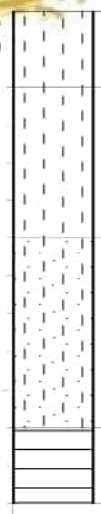
HOLE No: TP368

Zutari
Xhariep Project

HOLE No: TP369
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, brown, loose, intact, silty SAND with gravel and grass. **FILL**.
0.20	Moist, dark brown, firm, intact, silty CLAY with subrounded gravel. **COLLUVIUM**.
0.60	Slightly moist, orange brown blotched off white, stiff, relic jointed sandy silty CLAY with layers of sandstone. **RESIDUAL MUDSTONE**.
1.10	Olive brown, highly to moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.
1.30	

NOTES

1) Refusal @ 1.30m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:25
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 04.764
Y-COORD : S29 31.479

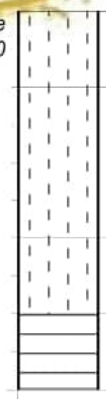
HOLE No: TP369

Zutari
Xhariep Project

HOLE No: TP370
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, brown, loose, intact, silty SAND with abundant gravel and grass. **FILL**.
0.20	Moist, dark brown, firm, intact, silty CLAY. **COLLUVIUM**.
0.60	Moist, pale olive brown, stiff, relic jointed, silty CLAY. **RESIDUAL MUDSTONE**.
0.80	Olive brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.
1.00	

NOTES

1) Refusal @ 1.00m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024

DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 04.899
Y-COORD : S29 31.296

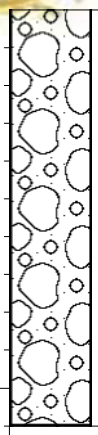
HOLE No: TP370

Zutari
Xhariep Project

HOLE No: TP371
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00

Angular, highly weathered gravel cobbles and boulders of mudstone in a sandy CLAY matrix. Overall consistency is medium dense. **FILL**.

1.10

NOTES

1) Refusal @ 1.10m on boulders.
2) Sidewalls stable.
3) No water seepage
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024

DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 05.034
Y-COORD : S29 31.115

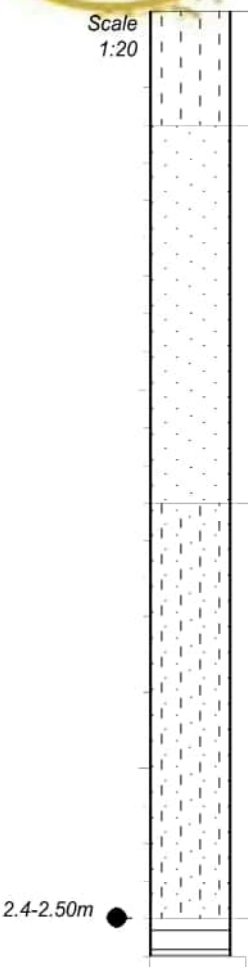
HOLE No: TP371

Zutari
Xhariep Project

HOLE No: TP372
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, loose, intact, silty SAND with angular gravel. **FILL**.

0.30 Moist, orange brown, firm, intact, sandy CLAY with subrounded gravel. **COLLUVIUM**.

1.30 Moist, pale olive brown, stiff, relic jointed, sandy silty CLAY with weathered gravel. **RESIDUAL MUDSTONE**.

2.40 Olive brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

2.50

NOTES

1) Refusal @ 2.50m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage
4) Bulk sample from 2.4-2.50m.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 05.101
Y-COORD : S29 31.026

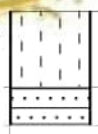
HOLE No: TP372

Zutari
Xhariep Project

HOLE No: TP373
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, brown, loose, intact, silty SAND with gravel and roots. **FILL**.
0.20	Pale brown, highly weathered, medium grained, thinly bedded, soft rock. **SANDSTONE**.
0.30	

NOTES

1) Refusal @ 0.30m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage
4) No samples taken.
5) No DCP.
6) Excavated on top of the road cut.
7) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 05.224
Y-COORD : S29 30.765

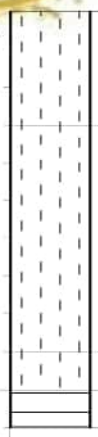
HOLE No: TP373

Zutari
Xhariep Project

HOLE No: TP374
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, loose, intact, silty SAND with angular gravel, cobbles and roots. **FILL**.

0.30 Moist, dark brown, firm, intact, silty CLAY. **COLLUVIUM**.

0.90 Moist, Orange brown speckled black and olive, firm, relic jointed silty CLAY with weathered mudstone gravel. **RESIDUAL MUDSTONE**.

1.00 Olive brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

1.10

NOTES

1) Refusal @ 1.10m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 05.303
Y-COORD : S29 30.562

HOLE No: TP374

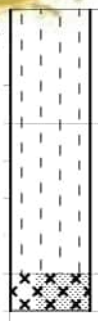
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Project

HOLE No: TP375
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, brown, loose, intact, silty SAND with gravel. **FILL**.
0.30	Moist, brown speckled black, firm, intact, silty CLAY. **COLLUVIUM**.
0.70	Bluish brown blotched orange brown, highly weathered, medium grained, closely jointed, soft rock. **DOLERITE**
0.80	

NOTES

1) Refusal @0.80m on medium hard rock Dolerite.
2) Sidewalls stable.
3) No water seepage
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 05.382
Y-COORD : S29 30.347

HOLE No: TP375

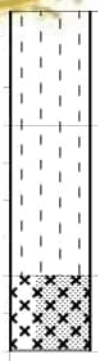
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Project

HOLE No: TP376
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, loose, intact, silty SAND with gravel, cobbles and boulders. **FILL**.

0.30 Moist, dark brown, firm, intact, silty CLAY. **COLLUVIUM**.

0.70 Olive brown and off white blotched orange brown and black, highly weathered, medium grained, closely jointed, soft rock. **DOLERITE**.

0.90

NOTES

1) Refusal @ 0.90m on medium hard rock Dolerite.
2) Sidewalls stable.
3) No water seepage
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 05.462
Y-COORD : S29 30.141

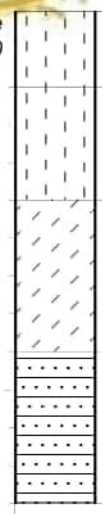
HOLE No: TP376

Zutari
Xhariep Project

HOLE No: TP377
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, brown, loose, intact, silty SAND with gravel and cobbles. **FILL**.
0.20	Moist, dark brown, firm, intact, silty CLAY. **COLLUVIUM**.
0.50	Moist, orange brown blotched off white, medium dense, relic jointed, clayey SAND. **RESIDUAL SANDSTONE**.
0.90	Olive brown, moderately weathered, medium grained, thinly bedded, closely jointed, soft rock. **SANDSTONE**.
1.30	

NOTES

1) Refusal @ 1.30m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 05.541
Y-COORD : S29 29.937

HOLE No: TP377

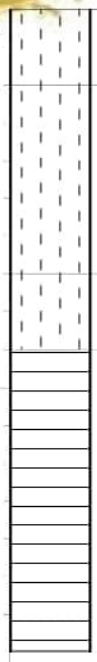
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Project

HOLE No: TP378
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, brown, loose, intact, silty SAND with angular gravel and grass. **FILL**.
0.20	Moist, dark brown, firm, intact, silty CLAY. **COLLUVIUM**.
0.70	Moist, orange brown speckled olive brown, firm, relic jointed silty CLAY with weathered mudstone gravel. **RESIDUAL MUDSTONE**.
0.90	Olive brown blotched dark brown, highly to moderately weathered, fine grained, very thinly bedded, closely jointed, soft rock. **MUDSTONE**
1.70	

NOTES

1) Refusal @ 1.70m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 05.617
Y-COORD : S29 29.733

HOLE No: TP378

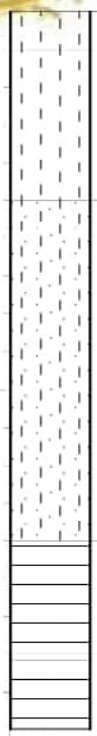
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Project

HOLE No: TP379
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, brown, medium dense, intact, silty SAND with angular rock gravel and grass. **FILL**.
0.10	Moist, dark brown, firm, intact, silty CLAY with subrounded gravel. **COLLUVIUM**.
0.50	Moist, orange brown speckled black and off white, stiff, relic jointed sandy silty CLAY. **RESIDUAL MUDSTONE**.
1.40	Dark purple brown, highly weathered, fine grained, very thinly bedded, closely jointed, soft rock. **MUDSTONE**.
1.70	Olive brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.
1.90	

NOTES

1) Refusal @ 1.90m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage
4) No sample taken.
5) No DCP rock started from 1.40m.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 05.701
Y-COORD : S29 29.523

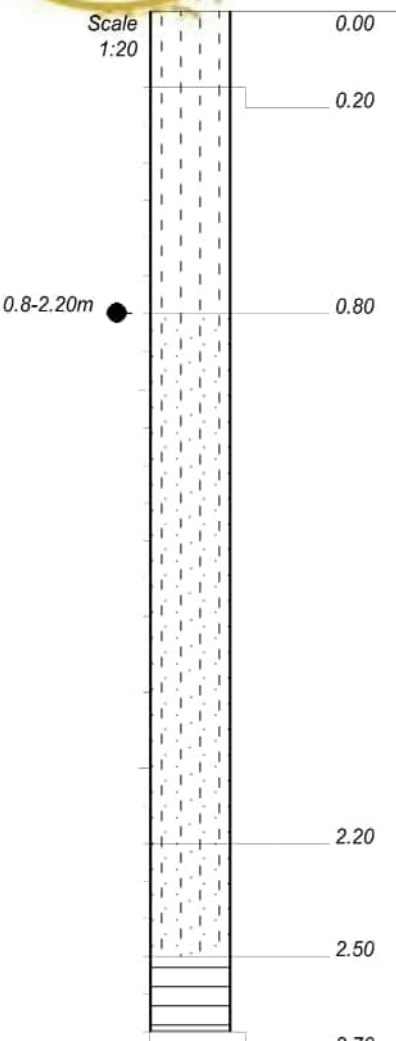
HOLE No: TP379

Zutari
Xhariep Project

HOLE No: TP380
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, loose, intact, silty SAND with angular gravel and roots. **FILL**.

0.20 Moist, dark brown, firm, intact, silty CLAY. **COLLUVIUM**.

0.80 Slightly moist, brown streaked orange off white, stiff, relic jointed, sandy silty CLAY with weathered calcrete gravel. **REWORKED RESIDUAL MUDSTONE**.

2.20 Slightly moist, olive green blotched off white, stiff, slickensided, sandy silty CLAY with weathered calcrete gravel . **RESIDUAL MUDSTONE**.

2.50 Greenish brown, highly weathered, fine grained, very thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

2.70

NOTES

1) Refusal @ 2.70m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage
4) Bulk sample from 0.8-2.20m.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 05.779
Y-COORD : S29 29.314

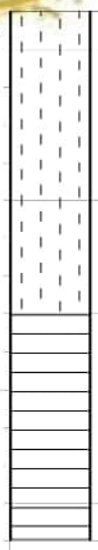
HOLE No: TP380

Zutari
Xhariep Project

HOLE No: TP381
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, brown, loose, intact, silty SAND with gravel and roots. **FILL**.
0.10	Moist, dark brown, firm, intact, silty CLAY. **COLLUVIUM**.
0.50	Moist, olive brown and orange, firm, relic jointed silty CLAY with weathered mudstone gravel. **RESIDUAL MUDSTONE**.
0.80	Greenish brown, highly weathered, fine grained, very thinly bedded, closely jointed, soft rock. **MUDSTONE**.
1.30	Olive brown blotched black, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.
1.40	

NOTES

1) Refusal @ 1.40m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 05.858
Y-COORD : S29 29.108

HOLE No: TP381

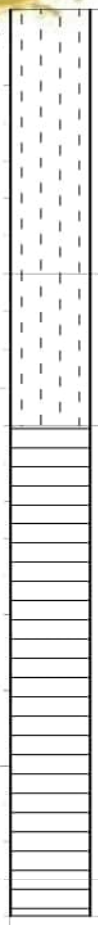
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Project

HOLE No: TP382
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, firm, intact, silty CLAY with gravel and roots. **COLLUVIUM**.

0.70 Moist, olive and orange brown, firm, intact, silty CLAY. **COLLUVIUM**.

1.10 Olive brown blotched black, highly weathered with zones of residual soils, very thinly bedded, closely jointed, very soft rock. **MUDSTONE**.

2.30 Olive brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

2.40

NOTES

1) Refusal @ 2.40m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 05.937
Y-COORD : S29 28.897

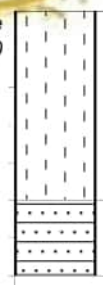
HOLE No: TP382

Zutari
Xhariep Project

HOLE No: TP383
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Moist, orange brown, loose, intact, silty SAND with gravel and roots. **COLLUVIUM**.

0.50 Orange brown, highly weathered, medium grained, thinly bedded, closely jointed, soft rock. **SANDSTONE**

0.70

NOTES

1) Refusal @ 0.70m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 06.017
Y-COORD : S29 28.689

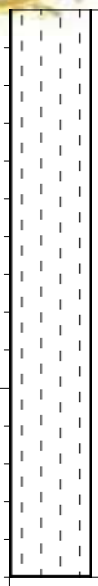
HOLE No: TP383

Zutari
Xhariep Project

HOLE No: TP384
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, possibly loose, intact, silty SAND with abundant gravel, cobbles and boulders. **FILL**.

1.50

NOTES

1) Refusal @ 1.50m on boulders.
2) Sidewalls collapsing.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Excavated @ the base of a bridge embankment.
7) Profiled from spoil due to sidewall collapsing.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024

DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 06.096
Y-COORD : S29 28.477

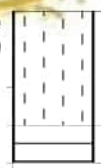
HOLE No: TP384

Zutari
Xhariep Project

HOLE No: TP385
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, olive brown, firm, relic jointed, silty CLAY with abundant weathered mudstone gravel. **RESIDUAL MUDSTONE**.

0.30 Olive brown, moderately weathered, medium grained, thinly bedded, closely jointed, soft rock. **INDURATED MUDSTONE**.

0.40

NOTES

1) Refusal @ 0.40m on medium hard rock Indurated Mudstone.
2) Sidewalls stable.
3) No water seepage
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 06.176
Y-COORD : S29 28.272

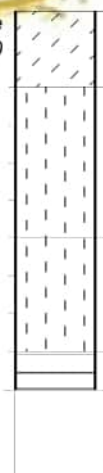
HOLE No: TP385

Zutari
Xhariep Project

HOLE No: TP386
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, brown, loose, intact, clayey SAND with abundant angular gravel and grass. **FILL**.
0.20	Moist, dark brown, stiff, intact, silty CLAY. **COLLUVIUM**.
0.60	Moist, olive brown blotched off white, stiff, relic jointed silty CLAY with abundant angular slightly weathered mudstone gravel and weathered sandstone gravel. **RESIDUAL MUDSTONE**.
0.90	Olive brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.
1.00	

NOTES

1) Refusal @ 1.00m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 06.255
Y-COORD : S29 28.067

HOLE No: TP386

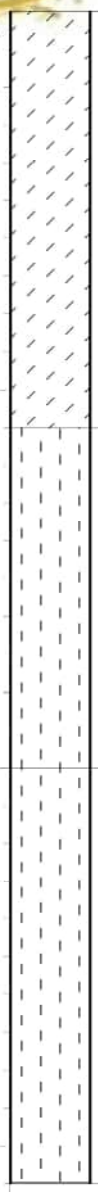
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Project

HOLE No: TP387
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, grey brown, medium dense, intact, clayey SAND with gravel, cobbles and plastic. **FILL**.

1.10 Moist, dark grey brown, stiff, intact, silty CLAY. **ALLUVIUM**.

2.00 Moist, olive brown blotched orange, stiff, relic jointed silty CLAY. **RESIDUAL MUDSTONE**.

3.10

NOTES

1) Terminated @ 3.10m.
2) Sidewalls stable.
3) No water seepage
4) No sample taken.
5) DCP done.
6) Excavated near a bridge.
7) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 06.307
Y-COORD : S29 27.930

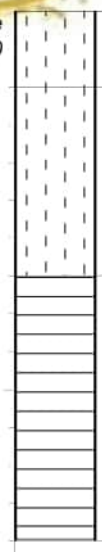
HOLE No: TP387

Zutari
Xhariep Project

HOLE No: TP388
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, loose, intact, silty SAND with angular gravel and roots. **FILL**.

0.20 Moist, dark purple brown, stiff, slickensided, silty CLAY. **RESIDUAL MUDSTONE**.

0.70 Greenish brown, highly weathered, fine grained, very thinly bedded, closely jointed, soft rock. **MUDSTONE**.

1.40

NOTES

1) Refusal @ 1.40m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 06.385
Y-COORD : S29 27.725

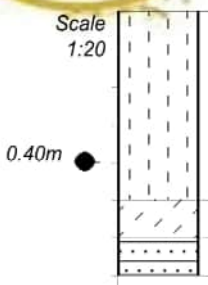
HOLE No: TP388

Zutari
Xhariep Project

HOLE No: TP389
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Moist, orange brown, loose, intact, silty SAND with gravel and roots. **COLLUVIUM**.

0.50 Moist, grey blotched yellow brown, medium dense, intact, clayey SAND with abundant weathered sandstone cobbles. **RESIDUAL SANDSTONE**.

0.60 Olive brown blotched bluish, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **SANDSTONE**.

0.70

NOTES

1) Refusal @ 0.70m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage
4) Disturbed sample @ 0.40m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 06.464
Y-COORD : S29 27.520

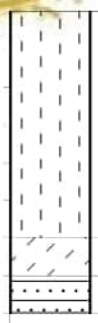
HOLE No: TP389

Zutari
Xhariep Project

HOLE No: TP390
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Moist, brown, loose, intact, silty SAND with gravel and roots. **COLLUVIUM** .

0.60 Moist, olive brown and orange brown, medium dense, intact, clayey silty SAND. **RESIDUAL SANDSTONE**.

0.70 Orange and olive brown, highly weathered, medium grained, thinly bedded, closely jointed. **MICACEOUS SANDSTONE**.

0.80

NOTES

1) Refusal @ 0.80m on medium hard rock Micaceous Sandstone.
2) Sidewalls stable.
3) No water seepage
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 06.546
Y-COORD : S29 27.316

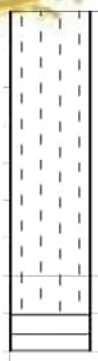
HOLE No: TP390

Zutari
Xhariep Project

HOLE No: TP391
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Moist, dark brown, firm, intact, silty SAND with roots. **COLLUVIUM**.

0.70 Moist, olive brown, firm, relic jointed silty CLAY with weathered mudstone gravel. **RESIDUAL MUDSTONE**.

0.80 Olive brown, moderately weathered, medium grained, thinly bedded, closely jointed, soft rock. **INDURATED MUDSTONE**.

0.90

NOTES

1) Refusal @ 0.90m on medium hard rock Indurated Mudstone.
2) Sidewalls stable.
3) No water seepage
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 06.639
Y-COORD : S29 27.115

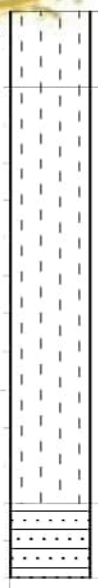
HOLE No: TP391

Zutari
Xhariep Project

HOLE No: TP 392
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown, soft, intact, silty CLAY with roots. **COLLUVIUM**.

0.20 Loosely packed, angular, weathered sandstone, GRAVEL, COBBLES and BOULDERS in silty sand matrix. Overall consistency is loose. **RESIDUAL SANDSTONE**.

1.30 Pale brown blotched dark brown, highly weathered, medium grained, soft rock. **SANDSTONE**.

1.50

NOTES

1) Refusal @ 1.50m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 06.738
Y-COORD : S29 27.024

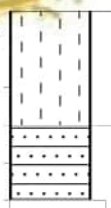
HOLE No: TP 392

Zutari
Xhariep Project

HOLE No: TP393
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, orange brown, loose, intact, silty SAND with subrounded gravel and roots. **COLLUVIUM**.

0.30 Pale brown blotched dark brown and orange, highly to moderately weathered, medium grained, soft rock. **SANDSTONE**.

0.50

NOTES

1) Refusal @ 0.50m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage
4) No sample taken.
5) No DCP.
6) Profiled in-situu.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

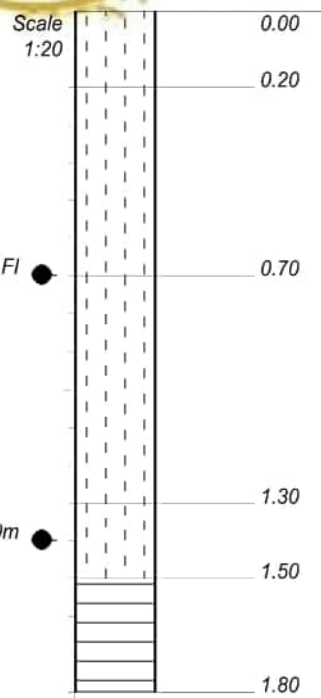
ELEVATION :
X-COORD : E26 06.965
Y-COORD : S29 27.120

HOLE No: TP393

Zutari
Xhariep Project

HOLE No: TP394
Sheet 1 of 1

JOB NUMBER: NVG013



0.00	Slightly moist, orange brown, loose, intact, silty SAND with gravel. **FILL**.
0.20	Moist, dark brown, firm, intact, silty CLAY. **COLLUVIUM**.
0.70	Moist, light brown, stiff, relic jointed, silty CLAY with weathered calcrete gravel. **REWORKED RESIDUAL MUDSTONE**.
1.30	Moist, olive brown, stiff, relic jointed, silty CLAY. **RESIDUAL MUDSTONE**.
1.50	Greenish grey, moderately weathered, fine grained, very thinly bedded, very closely jointed, soft rock. **MUDSTONE**.
1.80	

NOTES

1) Refusal @ 1.80m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage
4) Bulk sample from 0.7-1.30m & FI 1.40m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 07.189
Y-COORD : S29 27.217

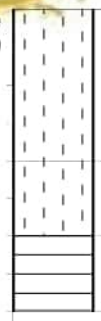
HOLE No: TP394

Zutari
Xhariep Project

HOLE No: TP 395
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Moist, dark brown, firm, intact, silty SAND with gravel and roots. **COLLUVIUM**.

0.40 Moist, olive brown, stiff, intact, silty CLAY with weathered rock gravel. **RESIDUAL MUDSTONE**.

0.60 Greenish grey stained brown, moderately weathered, fine grained, very thinly bedded, closely jointed, soft rock. **MUDSTONE**.

0.80

NOTES

1) Refusal @ 0.80m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Profiled in-situ

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E26 07.381
Y-COORD : S29 27.342

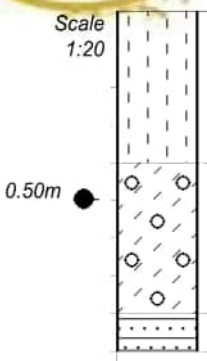
HOLE No: TP 395

Zutari
Xhariep Project

HOLE No: TP 396
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, loose, intact, silty SAND with abundant gravel and cobbles. **FILL**.

0.40 Moist, dark reddish brown, medium dense, friable, clayey gravelly SAND. **RESIDUAL SANDSTONE**.

0.80 Pale brown, moderately weathered, medium grained, medium bedded, soft rock. **SANDSTONE**.

0.90

NOTES

1) Refusal @ 0.90m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed Sample @ 0.50m.
5) No DCP.
6) Profiled in-situ

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

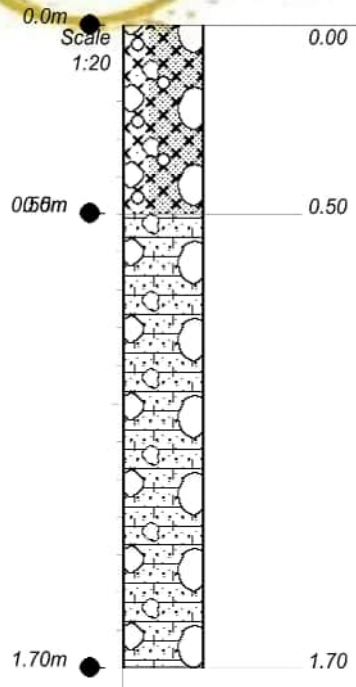
ELEVATION :
X-COORD : E26 07.425
Y-COORD : S29 27.326

HOLE No: TP 396

Zutari
Xhariep Project

HOLE No: TP 655
Sheet 1 of 1

JOB NUMBER: NVG013



0.00 Slightly moist, dark brown speckled grey, loose to medium dense, intact, slightly gravelly SAND with subangular dolerite cobbles. **COLLUVIUM**.

0.50 Slightly moist, orangey brown speckled grey, dense to very dense, intact, silty SAND with occasional cobbles. **RESIDUAL SANDSTONE**.

1.70

NOTES

1) Refusal @ 1.70m on very dense Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed Sample @ 0.0m 0.50m and 0.5m 1.70m.
5) No DCP.
6) Profiled in-situ

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E25 44.250
Y-COORD : S30 14.975

HOLE No: TP 655

Zutari
Xhariep Project

HOLE No: TP656
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Pale brown, highly weathered, coarse grained, thinly bedded, closely jointed, soft rock. **SANDSTONE**

0.10

NOTES

1) Refusal on Sandstone outcrop.

2) Sidewall stable.

3) No water seepage.

4) No samples taken.

5) No DCP.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024

ELEVATION :
X-COORD : S29 31.015
Y-COORD : E26 05.192

HOLE No: TP656

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

Zutari
Xhariep Project

HOLE No: TP658
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Pale brown, highly weathered, coarse grained, thinly bedded, closely jointed, soft rock. **SANDSTONE**

0.10

NOTES

1) Refusal on Sandstone outcrop.

2) Sidewall stable.

3) No water seepage.

4) No samples taken.

5) No DCP.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024

DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : S29 30.825
Y-COORD : E26 05.268

HOLE No: TP658

Zutari
Xhariep Project

HOLE No: TP659
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Pale brown, highly weathered, coarse grained, thinly bedded, closely jointed, soft rock. **SANDSTONE**

0.10

NOTES

1) Refusal on Sandstone outcrop.

2) Sidewall stable.

3) No water seepage.

4) No samples taken.

5) No DCP.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024

DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : S29 30.913
Y-COORD : E26 05.232

HOLE No: TP659

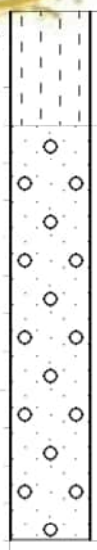
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Project

HOLE No: TP660
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled orange, medium dense, intact, silty SAND with subangular mudstone gravel. **COLLUVIUM**.

0.30 Slightly moist, orangey brown stained yellow, stiff to very stiff, relic jointed, slightly gravelly sandy CLAY with occasional subangular boulders. **RESIDUAL MUSDTONE**.

1.40

NOTES

1) Refusal @ 1.00m on very stiff Clay with the TLB proving difficult excavation.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E25 33.624
Y-COORD : S30 30.807

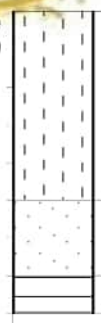
HOLE No: TP660

Zutari
Xhariep Project

HOLE No: TP661
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown, medium dense, intact, silty SAND with gravel. **COLLUVIUM**.

0.50 Slightly moist, orangey brown stained yellow, firm, relic jointed, sandy CLAY. **RESIDUAL MUDSTONE**.

0.70 Greenish grey, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

0.80

NOTES

1) Refusal @ 0.80m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E25 35.107
Y-COORD : S30 29.331

HOLE No: TP661

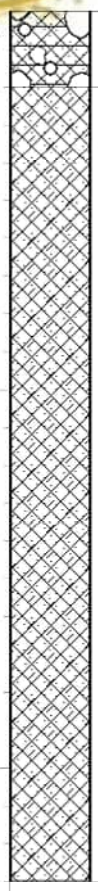
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Project

HOLE No: TP662
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown speckled dark grey, loose to medium dense, intact, slightly gravelly SAND with occasional subangular mudstone cobbles. **FILL**.

0.20 Slightly moist, orangey brown becoming greenish grey with depth, medium dense to dense, intact, clayey SAND. **FILL**.

2.30

NOTES

1) Refusal @ 2.30m on a concrete slab.
2) Sidewall collapse.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : S30 18.292
Y-COORD : E25 43.027

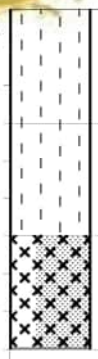
HOLE No: TP662

Zutari
Xhariep Project

HOLE No: TP 663
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, brown, medium dense, intact, silty SAND with gravel, cobbles and isolated boulders up to 0.4m. **FILL**.
0.30	Slightly moist, dark brown, stiff, intact, silty CLAY. **COLLUVIUM**.
0.60	Orange brown blotched black, highly weathered, medium grained, closely jointed, soft rock. **DOLERITE**.
0.90	

NOTES

1) Refusal @ 0.90 on medium hard rock Dolerite.
2) Sidewalls stable.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Profiled in-situ

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E25 48.178
Y-COORD : S30 00.877

HOLE No: TP 663

Zutari
Xhariep Project

HOLE No: TP664
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Slightly moist, dark brown speckled grey, firm, shattered, sandy CLAY with occasional cobbles and boulders. **COLLUVIUM**.

0.60 Slightly moist, brown speckled grey, medium dense to dense, intact, gravelly SAND. **RESIDUAL DOLERITE**.

0.70 Dark grey stained reddish brown, moderately weathered, medium grained, very closely jointed, soft rock. **DOLERITE**

0.80

NOTES

1) Refusal @ 0.80m on medium hard rock Dolerite.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Moved to nearby position due to a barricading fence.
7) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E25 50.433
Y-COORD : S29 55.707

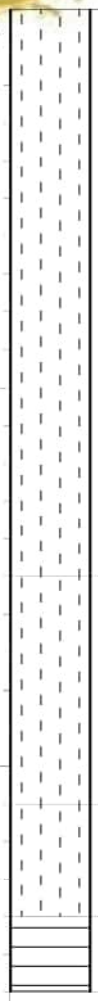
HOLE No: TP664

Zutari
Xhariep Project

HOLE No: TP665
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, medium dense, silty SAND with abundant gravel, cobbles and boulders. **FILL**.

1.50 Moist, light grey, firm to stiff, silty CLAY. **ALLUVIUM**

2.10 Moist, olive brown, stiff, silty CLAY with abundant weathered mudstone gravel. **RESIDUAL MUDSTONE**

2.40 Olive grey, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**

2.60

NOTES

1) Terminated @ 2.60m on medium hard rock Mudstone.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) Position moved due to space.
6) DCP done
7) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : S29 48.657
Y-COORD : E25 55.427

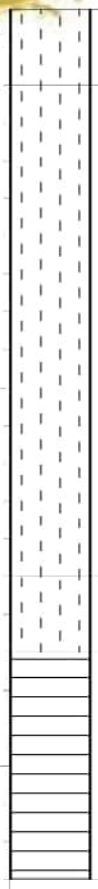
HOLE No: TP665

Zutari
Xhariep Project

HOLE No: TP666
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Moist, brown, stiff, intact, silty CLAY with gravel and cobbles. **FILL**
0.20	Moist, dark brown, firm, intact, silty CLAY with localised subrounded gravel. **ALLUVIUM**.
1.50	Moist, olive brown blotched purple brown, stiff, silty CLAY with abundant weathered mudstone gravel. **RESIDUAL MUDSTONE**.
1.70	Olive brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.
2.30	

NOTES

1) Refusal @ 2.30m on medium hard rock Mudstone.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) DCP done
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : S29 45.765
Y-COORD : E25 57.353

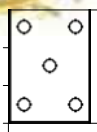
HOLE No: TP666

Zutari
Xhariep Project

HOLE No: TP667
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark grey and brown, very dense, intact, gravelly SAND with tar, dolerite cobbles and boulders. **PAVEMENT LAYERS**

0.30

NOTES

1) Refusal @ 0.30m on concrete.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024

ELEVATION :
X-COORD : S29 39.804
Y-COORD : E25 59.232

HOLE No: TP667

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

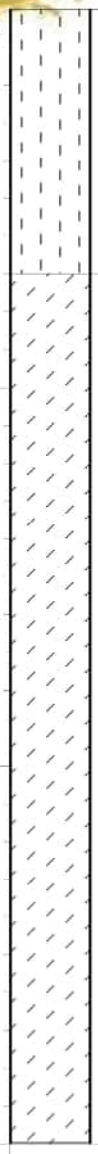
DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

Zutari
Xhariep Project

HOLE No: TP668
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, pale brown, medium dense, silty SAND with abundant sandstone and dolerite gravel. **FILL**.

0.70 Slightly moist, grey brown, medium dense to dense, clayey SAND with localised subrounded gravel. **ALLUVIUM**.

3.00

NOTES

1) Terminated @ 3.00m.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) DCP done.
6) Position moved due to access.
7) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : S29 39.550
Y-COORD : E26 59.346

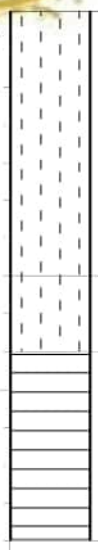
HOLE No: TP668

Zutari
Xhariep Project

HOLE No: TP669
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown, firm to stiff, silty CLAY with gravel and roots. **COLLUVIUM**.

0.70 Moist, purple brown and olive, stiff, silty CLAY with abundant mudstone gravel. **MUDSTONE**

0.90 Olive brown and purple brown, moderately weathered, fine grained, very thinly bedded, closely jointed, soft rock. **MUDSTONE**

1.40

NOTES

1) Refusal @ 1.40m on medium hard rock Mudstone.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : S29 37.186
Y-COORD : E26 00.676

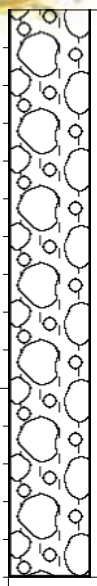
HOLE No: TP669

Zutari
Xhariep Project

HOLE No: TP670
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00

Moderately packed, moderately weathered, medium dense, angular, sandstone and mudstone GRAVEL, COBBLES and BOULDERS of up to 0.5m in a silty SAND matrix. **FILL**.

1.50

NOTES

1) Refusal @ 1.50m on boulders.
2) Sidewall slightly unstable.
3) No water seepage.
4) No samples taken.
5) DCP done.
6) Position moved as there is no access to the river.
7) Outcrop by the river level with an approximately 3m embankment.
8) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024

DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : S29 35.889
Y-COORD : E26 01.586

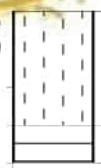
HOLE No: TP670

Zutari
Xhariep Project

HOLE No: TP 674
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, loose, intact, silty SAND with abundant angular gravel. **FILL**.

0.30 Olive brown blotched dark purple brown, moderately weathered, fine grained, very thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

0.40

NOTES

1) Refusal @ 0.40m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E25 44.325
Y-COORD : S30 09.679

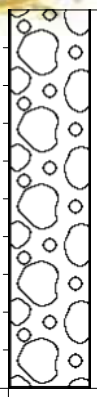
HOLE No: TP 674

Zutari
Xhariep Project

HOLE No: TP675
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Loosely packed, slightly weathered, angular, mudstone GRAVEL, COBBLES and BOULDERS up to 0.8m in a silty sand matrix. Overall consistency is loose. **FILL**

1.00

NOTES

1) Refusal @ 1.00 on Boulders.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024

DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : S29 36.350
Y-COORD : E26 01.349

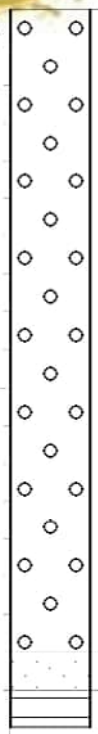
HOLE No: TP675

Zutari
Xhariep Project

HOLE No: TP678
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown speckled dark grey, medium dense, intact, gravelly SAND with subrounded and subangular dolerite and sandstone cobbles. **FILL**.

1.70 Slightly moist, orangey brown stained yellow, firm, relic jointed, sandy CLAY. **RESIDUAL MUDSTONE**.

1.80 Greenish grey, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

1.90

NOTES

1) Refusal @ 1.90m on medium hard rock Mudstone.
2) Sidewalls collapsing in the fill layer.
3) No water seepage.
4) No samples taken.
5) No DCP due to sidewalls collapsing.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : T Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 16/10/2024
DATE : 07/12/2024 15:26
TEXT : ..pelineProjectPart1.8.txt

ELEVATION :
X-COORD : E25 37.676
Y-COORD : S30 26.147

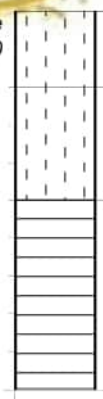
HOLE No: TP678

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP 397
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, orange brown, medium dense, intact, silty SAND with gravel , isolated boulders and roots. **FILL**.

0.20 Moist, brown streaked black and olive, firm, relic bedded, silty CLAY. **RESIDUAL SHALE**.

0.50 Pale brown blotched off white in places, highly weathered to moderately weathered, fine to medium grained, intensely thinly laminated, soft rock. **SHALE**.

1.00

NOTES

1) Refusal @ 1.00m on medium hard rock Shale.
2) Sidewalls stable.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/10/2024
DATE : 07/12/2024 14:49
TEXT : ..iepProfilesPipeline2.txt

ELEVATION :
X-COORD : E26 07.640
Y-COORD : S29 27.224

HOLE No: TP 397
FREE STATE

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP 398
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Slightly moist, brown, loose, intact, silty SAND with gravel and roots. **FILL**.

0.20 Olive brown blotched black, moderately weathered, fine grained, thinly bedded, closely jointed and spheroidal weathering, soft rock. **INDURATED MUDSTONE**.

0.30

NOTES

1) Refusal @ 0.30m on medium hard rock Indurated Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/10/2024
DATE : 07/12/2024 14:49
TEXT : ..iepProfilesPipeline2.txt

ELEVATION :
X-COORD : E26 07.861
Y-COORD : S29 27.126

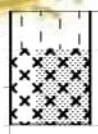
HOLE No: TP 398

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP 399
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, loose, intact, silty SAND with gravel and roots. **FILL**.

0.10 Olive brown blotched bluish, highly to moderately weathered, medium grained, very closely jointed, soft rock. **DOLERITE**.

0.30

NOTES

1) Refusal @ 0.30m on medium hard rock Dolerite.
2) Sidewalls stable.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/10/2024

DATE : 07/12/2024 14:49
TEXT : ..iepProfilesPipeline2.txt

ELEVATION :
X-COORD : E26 08.082
Y-COORD : S29 27.033

HOLE No: TP 399

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP 400
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Slightly moist, orange brown, loose, intact, silty SAND with roots and gravel. **FILL**.

0.10 Pale brown blotched orange and bluish, highly to moderately weathered, medium grained, intensely thinly laminated, soft rock. **SHALE**

0.20

NOTES

1) Refusal @ 0.20m on medium hard rock Shale.
2) Sidewalls stable.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/10/2024
DATE : 07/12/2024 14:49
TEXT : ..iepProfilesPipeline2.txt

ELEVATION :
X-COORD : E26 08.324
Y-COORD : S29 26.994

HOLE No: TP 400

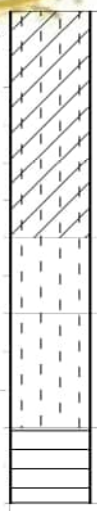
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP 401
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Moist, dark brown, firm, intact, silty CLAY. **ALLUVIUM**.
0.60	Moist, orange brown speckled off white, stiff, silty CLAY. **REWORKED RESIDUAL MUDSTONE**.
0.80	Moist, olive brown, stiff, relic bedded, silty CLAY. **RESIDUAL MUDSTONE**.
1.10	Greenish brown, moderately weathered, fine grained, closely jointed, very thinly bedded, soft rock. **MUDSTONE**.
1.30	

NOTES

1) Refusal @ 1.30m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/10/2024

DATE : 07/12/2024 14:49
TEXT : ..iepProfilesPipeline2.txt

ELEVATION :
X-COORD : S29 26.964
Y-COORD : E26 08.570

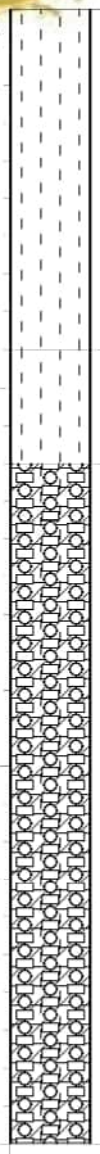
HOLE No: TP 401

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP 402
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Moist, dark brown, firm, intact, silty CLAY with roots. **COLLUVIUM**.

0.90 Moist, orange brown streaked black, firm, relic bedded, silty CLAY. **REWORKED RESIDUAL MUDSTONE**.

1.2-3.0m

1.20 Moist, pale brown blotched off white, firm to stiff, relic bedded, silty CLAY with weathered rock gravel and weathered calcrete gravel. **RESIDUAL MUDSTONE**.

3.00

NOTES

1) Terminated @ 3.00m.
2) Sidewalls stable.
3) No water seepage.
4) No refusal.
5) Bulk sample from 1.2-3.0m.
6) DCP done.
7) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/10/2024
DATE : 07/12/2024 14:49
TEXT : ..iepProfilesPipeline2.txt

ELEVATION :
X-COORD : E26 08.818
Y-COORD : S29 26.973

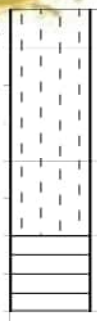
HOLE No: TP 402

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP 403
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, orange brown, medium dense, intact, silty SAND with gravel, isolated boulders and roots. **FILL**.
0.10	Moist, dark brown, firm, intact, silty CLAY. **COLLUVIUM**.
0.40	Moist, olive brown blotched black, firm, relic bedded, silty CLAY with abundant mudstone weathered rock. **RESIDUAL MUDSTONE**.
0.60	Olive brown blotched bluish, moderately weathered, fine grained, closely jointed, soft rock. **INDURATED MUDSTONE**. Notes: 1. With evidence of spheroidal weathering.
0.80	

NOTES

1) Refusal @ 0.80m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/10/2024
DATE : 07/12/2024 14:49
TEXT : ..iepProfilesPipeline2.txt

ELEVATION :
X-COORD : E26 09.066
Y-COORD : S29 26.982

HOLE No: TP 403

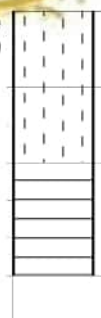
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP 404
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Moist, dark brown, firm, intact, silty CLAY. **COLLUVIUM**.
0.20	Moist, olive brown and dark brown, firm, relic bedded, silty CLAY with abundant weathered mudstone rock gravel. **RESIDUAL MUDSTONE**.
0.40	Olive brown blotched orange brown and black, moderately weathered, medium grained, very thinly bedded, closely jointed, soft rock. **INDURATED MUDSTONE**.
0.70	

NOTES

1) Refusal @ 0.70m on medium hard rock Indurated Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/10/2024
DATE : 07/12/2024 14:49
TEXT : ..iepProfilesPipeline2.txt

ELEVATION :
X-COORD : E26 09.31
Y-COORD : S29 27.009

HOLE No: TP 404

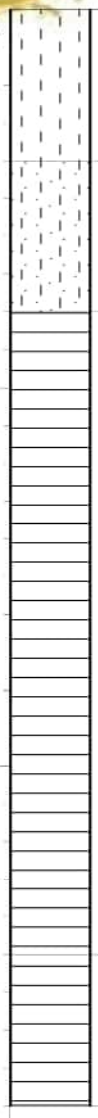
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP 405
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Moist, dark brown, firm, intact, silty CLAY with grass. **COLLUVIUM**.

0.40 Moist, brown blotched off white and olive, stiff, relic bedded, sandy silty CLAY with mudstone weathered rock gravel and weathered calcrete gravel. **RESIDUAL MUDSTONE**.

0.80 Dark purple brown interlayered with greenish brown, highly weathered, fine grained, very thinly bedded, very closely jointed, very soft rock. **MUDSTONE**.

2.50 Greenish brown blotched off white, highly weathered, fine grained, very thinly bedded, closely jointed, soft rock. **MUDSTONE**

2.90

NOTES

1) Refusal @ 2.90m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/10/2024
DATE : 07/12/2024 14:49
TEXT : ..iepProfilesPipeline2.txt

ELEVATION :
X-COORD : E26 09.559
Y-COORD : S29 27.043

HOLE No: TP 405

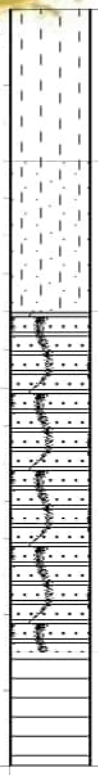
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP 406
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Moist, dark brown, firm, intact, silty CLAY with grass. **COLLUVIUM**.
0.40	Moist, brown blotched off white and olive, firm, relic bedded, sandy silty CLAY. **RESIDUAL MUDSTONE**.
0.80	Greenish blotched dark purple brown, highly weathered, very thinly bedded, closely jointed, very soft rock with sandstone pockets. **MUDSTONE**
1.70	Greenish brown, moderately weathered, fine grained, very thinly bedded, very closely jointed, soft rock. **MUDSTONE**.
2.00	

NOTES

1) Refusal @ 2.00m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/10/2024
DATE : 07/12/2024 14:49
TEXT : ..iepProfilesPipeline2.txt

ELEVATION :
X-COORD : E26 09.805
Y-COORD : S29 27.063

HOLE No: TP 406

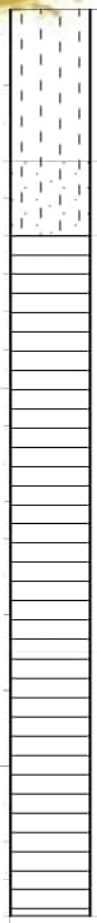
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP 407
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Moist, dark brown, firm, intact, silty CLAY with grass. **COLLUVIUM**.

0.40 Moist, brown speckled off white, stiff, relic bedded, sandy silty CLAY with weathered calcrete. **RESIDUAL MUDSTONE**.

0.60 Olive brown and greenish, highly weathered, fine grained, very thinly bedded, closely jointed, very soft to soft rock. **INDURATED MUDSTONE**.

1.70 Olive brown blotched dark brown, moderately weathered, medium grained, thinly bedded, closely jointed, soft rock. **INDURATED MUDSTONE**.

2.40

NOTES

1) Refusal @ 2.40 on medium hard Indurated Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/10/2024
DATE : 07/12/2024 14:49
TEXT : ..iepProfilesPipeline2.txt

ELEVATION :
X-COORD : E26 10.054
Y-COORD : S29 27.069

HOLE No: TP 407

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP 408
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.6-2.1m

0.00 Moist, dark brown, firm, intact, silty CLAY. **COLLUVIUM**.

0.60 Moist, pale brown blotched off white, stiff becoming firm with depth, relic bedded, sandy silty CLAY with weathered calcrete gracel. **REWORKED RESIDUAL MUDSTONE**.

2.10 Moist, olive brown blotched off white, stiff, relic bedded, sandy silty CLAY with weathered calcrete and mudstone gravel. **RESIDUAL MUDSTONE**.

3.10

NOTES

1) Terminated @ 3.10m.
2) Sidewalls stable.
3) No water seepage.
4) Bulk sample 0.6-2.1m.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/10/2024
DATE : 07/12/2024 14:49
TEXT : ..iepProfilesPipeline2.txt

ELEVATION :
X-COORD : E26 10.293
Y-COORD : S29 27.034

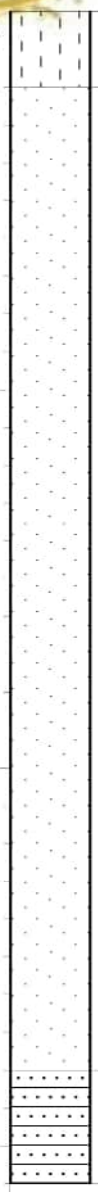
HOLE No: TP 408

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP 409
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, medium dense, intact, silty SAND with grass and gravel. **FILL**.

0.20 Moist, dark brown speckled black, firm to stiff, intact, sandy CLAY with subrounded gravel. **ALLUVIUM**.

Notes:
1. Very moist around 2.0m.

2.80 Pale olive brown, highly weathered, medium grained, thinly bedded, very soft rock. **SANDSTONE**.

3.10

NOTES

1) Terminated @ 3.10m.
2) Sidewalls stable.
3) No water seepage.
4) No sample taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/10/2024
DATE : 07/12/2024 14:49
TEXT : ..iepProfilesPipeline2.txt

ELEVATION :
X-COORD : E26 10.524
Y-COORD : S29 26.956

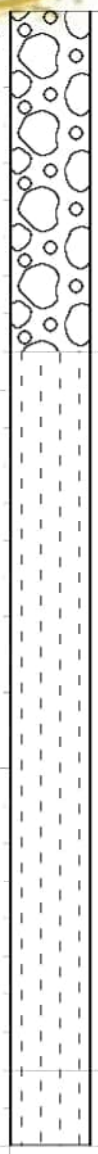
HOLE No: TP 409

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP 410
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Moderately packed, angular and subangular, highly weathered GRAVEL, COBBLES and BOULDERS (up to 0.4m) in a silty sand matrix, Overall consistency is medium dense. **FILL**.

0.90 Moist, grey brown, firm to soft with depth, intact, silty CLAY with subrounded gravel. **ALLUVIUM**.

2.80 Moist, pale brown speckled off white, firm, relic bedded, silty CLAY with abundant weathered mudstone rock. **RESIDUAL MUDSTONE**.

3.00

NOTES

1) Terminated @ 3.0m.
2) Sidewalls stable.
3) No water seepage.
4) No sample taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/10/2024
DATE : 07/12/2024 14:49
TEXT : ..iepProfilesPipeline2.txt

ELEVATION :
X-COORD : E26 10.624
Y-COORD : S29 26.928

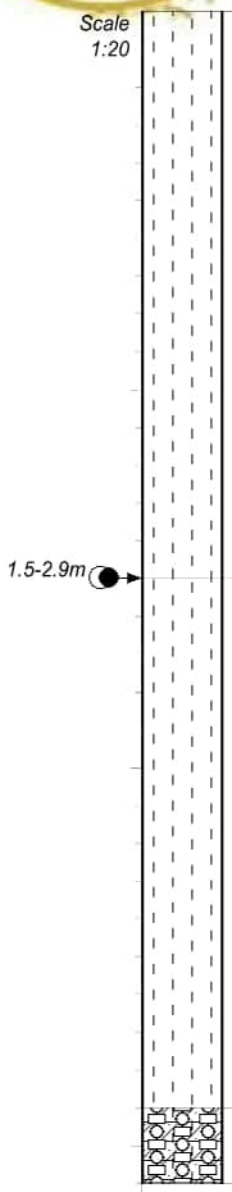
HOLE No: TP 410

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP411
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, possibly loose, intact, silty SAND with abundant gravel, cobbles and isolated boulders up to 0.6m. **FILL**.

1.50 Moist to very moist, grey brown, possibly firm, intact, silty CLAY with subrounded gravel. **ALLUVIUM**.

2.90 Moist, brown speckled off white, possibly firm, relic bedded, sandy silty CLAY with localised weathered calcrete gravel. **REWORKED RESIDUAL MUDSTONE**.

3.10

NOTES

1) Terminated @ 3.10m.
2) Sidewalls collapsing up to 1.5m
3) No water seepage but very most from 1.5-2.9m.
4) Bulk sample 1.5-2.9m.
5) No DCP.
6) Profiled from spoil due to sidewall collapsing.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/10/2024
DATE : 07/12/2024 14:49
TEXT : ..iepProfilesPipeline2.txt

ELEVATION :
X-COORD : E26 10.684
Y-COORD : S29 26.911

HOLE No: TP411

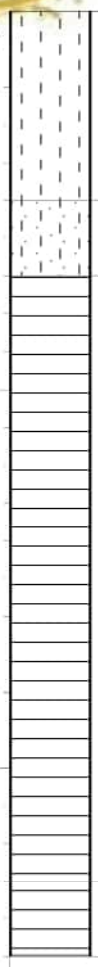
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP412
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Moist, dark brown, firm, intact, silty CLAY with roots and localised gravel. **COLLUVIUM**.

0.50 Moist, olive brown blotched off white, firm, relic bedded, sandy silty CLAY with weathered calcrete gravel. **RESIDUAL MUDSTONE**.

0.70 Greenish interlayered purple brown, highly weathered, fine grained, very thinly bedded, very closely jointed, very soft rock. **MUDSTONE**.

2.30 Olive brown, moderately weathered, fine grained, very thinly bedded, closely jointed, soft rock. **MUDSTONE**.

2.50

NOTES

1) Refusal @ 2.50m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/10/2024
DATE : 07/12/2024 14:49
TEXT : ..iepProfilesPipeline2.txt

ELEVATION :
X-COORD : E26 10.913
Y-COORD : S29 26.932

HOLE No: TP412

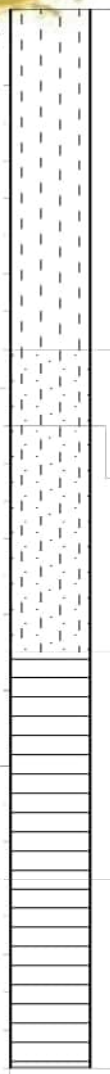
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP413
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Moist, dark brown, firm, intact, silty CLAY with roots. **COLLUVIUM**.

0.90 Moist, brown blotched off white, firm, relic bedded, sandy silty CLAY with localised weathered calcrete gravel. **REWORKED RESIDUAL MUDSTONE**.

1.10 Slightly moist, greenish blotched off white interlayered with dark purple brown, stiff, slickensided, sandy silty CLAY with localised weathered calcrete gravel. **RESIDUAL MUDSTONE**.

1.70 Dark purple brown, highly weathered, fine grained, very thinly bedded, very closely jointed, very soft rock. **MUDSTONE**.

2.30 Olive brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

2.80

NOTES

1) Refusal @ 2.80m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed Sample @ 1.4m and @1.6m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/10/2024
DATE : 07/12/2024 14:49
TEXT : ..iepProfilesPipeline2.txt

ELEVATION :
X-COORD : E26 11.111
Y-COORD : S29 27.066

HOLE No: TP413

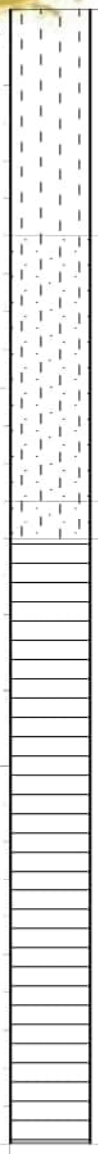
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP414
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Moist, dark brown, firm, intact, silty CLAY with grass and subrounded gravel and cobbles. **COLLUVIUM**.

0.60 Moist, brown speckled off white, firm, relic bedded, sandy silty CLAY with localised weathered calcrete gravel. **REWORKED RESIDUAL MUDSTONE**.

1.30 Slightly moist, olive brown blotched off white, stiff, relic bedded, sandy silty CLAY with localised weathered calcrete gravel. **RESIDUAL MUDSTONE**.

1.40 Olive brown blotched dark brown to black, moderately weathered, fine grained, thinly bedded, closely jointed, very soft grading to soft rock with depth. **MUDSTONE**.

3.00

NOTES

1) Terminated @ 3.0m.
2) Sidewalls stable.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/10/2024
DATE : 07/12/2024 14:49
TEXT : ..iepProfilesPipeline2.txt

ELEVATION :
X-COORD : E26 11.340
Y-COORD : S29 27.123

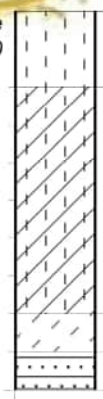
HOLE No: TP414

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP415
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, brown, loose, intact, silty SAND with angular gravel and cobbles. **FILL**.
0.20	Moist, dark brown, firm, intact, silty CLAY. **COLLUVIUM**.
0.80	Moist, orange brown speckled off white, medium dense, relic bedded, clayey SAND with sandstone rock gravel. **RESIDUAL SANDSTONE**.
0.90	Pale brown, highly weathered, medium grained, thinly bedded, closely jointed, soft rock. **SANDSTONE**.
1.00	

NOTES

1) Refusal @ 1.00 on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/10/2024
DATE : 07/12/2024 14:49
TEXT : ..iepProfilesPipeline2.txt

ELEVATION :
X-COORD : E26 11.589
Y-COORD : S29 27.136

HOLE No: TP415

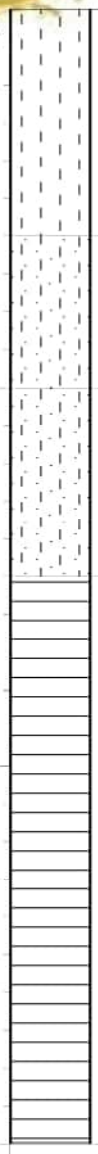
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP416
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Moist, dark brown, firm, intact, silty CLAY with subrounded gravel and grass. **COLLUVIUM**.

0.60 Moist, brown speckled off white, stiff, relic bedded, sandy silty CLAY with localised weathered calcrete gravel. **REWORKED RESIDUAL MUDSTONE**.

1.00 Slightly moist, olive brown blotched off white, stiff, relic bedded, sandy silty CLAY with abundant weathered calcrete and mudstone rock. **RESIDUAL MUDSTONE**.

1.50 Olive brown speckled orange brown, highly weathered, fine grained, very thinly bedded, closely jointed. **MUDSTONE**.

3.00

NOTES

1) Terminated @ 3.0m.
2) Sidewalls stable.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/10/2024
DATE : 07/12/2024 14:49
TEXT : ..iepProfilesPipeline2.txt

ELEVATION :
X-COORD : E26 11.835
Y-COORD : S29 27.149

HOLE No: TP416

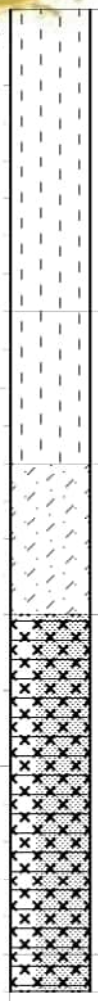
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP417
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, orange brown, medium dense, intact, silty SAND with abundant gravel cobbles and isolated boulders. **FILL**.

0.80 Moist, dark brown, firm, intact, silty CLAY. **COLLUVIUM**.

1.20 Slightly moist, pale pinkish blotched off white, stiff, relic bedded, clayey sandy SILT with abundant gravel and cobbles. **RESIDUAL MUDSTONE**.

1.60 Pinkish and olive green, moderately weathered, medium grained, closely jointed, soft rock. **MUDSTONE /DOLERITE CONTACT**.

2.50 Olive green and light grey glossy, slightly weathered, medium grained, closely jointed, soft rock. **MUDSTONE/DOLERITE**

2.60

NOTES

1) Refusal on medium hard rock @ 2.60m possible contact Mudstone/Dolerite rock.
2) Sidewalls stable.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/10/2024
DATE : 07/12/2024 14:49
TEXT : ..iepProfilesPipeline2.txt

ELEVATION :
X-COORD : E26 11.969
Y-COORD : S29 27.158

HOLE No: TP417

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP418
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Moist, dark brown, soft, intact, silty CLAY with grass. **COLLUVIUM**.

0.30 Pale brown blotched black and orange brown, highly weathered, medium grained, closely jointed, soft rock. **SANDSTONE**.

0.35

NOTES

1) Refusal @ 0.3m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/10/2024

DATE : 07/12/2024 14:49
TEXT : ..iepProfilesPipeline2.txt

ELEVATION :
X-COORD : E26 12.211
Y-COORD : S29 27.202

HOLE No: TP418

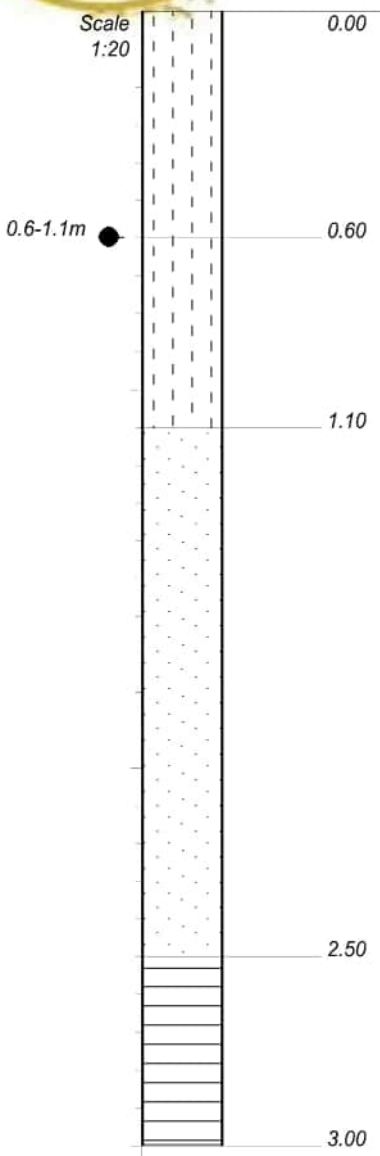
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP 419
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Moist, dark brown, firm, intact, silty CLAY. **COLLUVIUM**.

0.60 Slightly moist, pale brown, medium dense, relic bedded, silty SAND completely weathered sandstone. **RESIDUAL SANDSTONE**.

1.10 Moist, pale brown blotched off white, stiff, relic jointed, sandy CLAY. **RESIDUAL MUDSTONE**.

2.50 Dark purple brown and greenish, highly weathered, fine grained, very thinly bedded, very soft rock. **MUDSTONE**.

3.00

NOTES

1) Terminated @ 3.00m.
2) Sidewalls stable.
3) No water seepage.
4) Bulk sample 0.6-1.1m.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/10/2024
DATE : 07/12/2024 14:49
TEXT : ..iepProfilesPipeline2.txt

ELEVATION :
X-COORD : E26 12.452
Y-COORD : S29 27.243

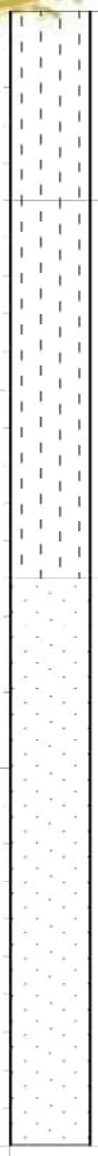
HOLE No: TP 419

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP420
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, light brown, medium dense, silty SAND with abundant tree and roots. **FILL**.

0.50 Moist, dark brown, stiff, silty CLAY with minor roots. **ALLUVIUM**.

1.50 Slightly moist, dark brown speckled orange brown, firm to stiff with depth, sandy CLAY. **COLLUVIUM**.

3.00

NOTES

1) Terminated @ 3.00m.
2) Sidewalls stable.
3) No water seepage.
4) No sample taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 19/10/2024
DATE : 07/12/2024 14:49
TEXT : ..iepProfilesPipeline2.txt

ELEVATION :
X-COORD : E26 12.689
Y-COORD : S29 27.299

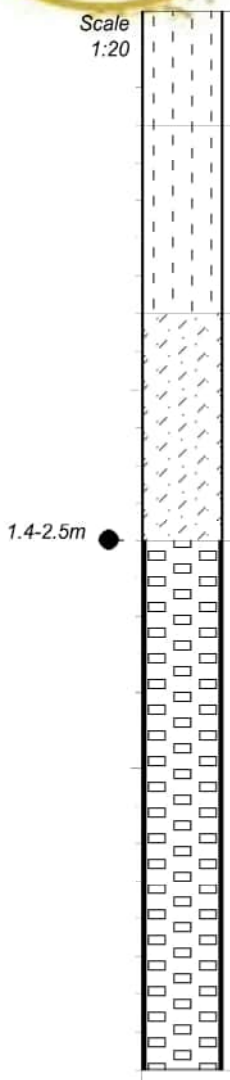
HOLE No: TP420

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP421
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, light brown, medium dense, silty SAND with abundant tree roots and gravel and boulders. **FILL**.

0.30 Moist, dark brown, stiff, silty CLAY with subrounded, dolerite cobbles. **ALLUVIUM**.

0.80 Slightly moist, red brown and olive speckled off-white, very stiff, sandy clayey SILT with subrounded calcretes. **CALCRETISED SILT**.

1.40 Weakly to well cemented calcrete, pale brown blotched off-white, soft to medium hard rock. **HARDPAN**.

2.80

NOTES

1) Refusal @ 2.80m on medium hard rock Hardpan
2) Sidewalls stable.
3) No water seepage.
4) Bulk sample from 1.4-2.5m.
5) DCP carried out.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/10/2024
DATE : 07/12/2024 14:50
TEXT : ..pProfilesPipeline2.1.txt

ELEVATION :
X-COORD : E26 12.922
Y-COORD : S29 27.335

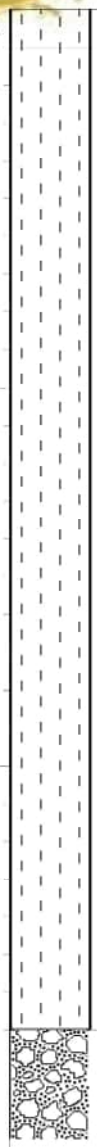
HOLE No: TP421
FREE STATE

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP422
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, medium dense, silty SAND with angular dolerite cobbles. **FILL**.

0.10 Moist, dark grey mottled light grey, soft to firm, intact, silty CLAY. **ALLUVIUM/FILL**.

2.70 **CONCRETE BLOCK?**

NOTES

1) Refusal @ 2.70m on concrete block.
2) Sidewalls stable.
3) No water seepage.
4) No sample taken.
5) Excavated near a bridge.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/10/2024
DATE : 07/12/2024 14:50
TEXT : ..pProfilesPipeline2.1.txt

ELEVATION :
X-COORD : E26 13.111
Y-COORD : S29 27.302

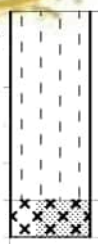
HOLE No: TP422

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP423
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, medium dense, silty SAND with gravel and roots. **COLLUVIUM**.

0.50 Dark grey blotched orange brown, highly weathered, coarse grained, closely jointed, soft rock. **DOLERITE**.

0.60

NOTES

1) Refusal @ 0.60m on medium hard rock Dolerite.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/10/2024
DATE : 07/12/2024 14:50
TEXT : ..pProfilesPipeline2.1.txt

ELEVATION :
X-COORD : E26 13.320
Y-COORD : S29 27.276

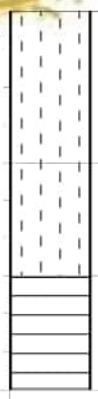
HOLE No: TP423

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP426
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Moist, dark brown, firm, silty CLAY with gravel and roots. **COLLUVIUM**.

0.40 Moist, olive brown, firm, relic bedded, silty CLAY with abundant weathered rock gravel. **RESIDUAL MUDSTONE** .

0.70 Olive grey and dark purple brown, moderately weathered, fine grained, very thinly bedded, closely jointed, soft to medium hard rock. **MUDSTONE**.

1.00

NOTES

1) Refusal @ 1.00m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/10/2024
DATE : 07/12/2024 14:50
TEXT : ..pProfilesPipeline2.1.txt

ELEVATION :
X-COORD : E26 14.061
Y-COORD : S29 27.236

HOLE No: TP426

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP432
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Moist, dark brown, firm, silty CLAY. **COLLUVIUM**.

0.70 Olive brown, blotched bluish, highly weathered, fine grained, very closely jointed, very soft rock. **INDURATED MUDSTONE** .

1.60 Olive brown, blotched bluish, moderately weathered, fine grained, very closely jointed, soft rock. **INDURATED MUDSTONE**.

1.70

NOTES

1) Refusal @ 1.70m on medium hard rock Indurated Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No sample taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/10/2024
DATE : 07/12/2024 14:50
TEXT : ..pProfilesPipeline2.1.txt

ELEVATION :
X-COORD : E26 15.551
Y-COORD : S29 26.954

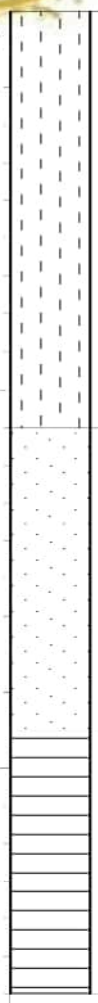
HOLE No: TP432

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP433
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Moist, dark brown blotched off white at base, firm, silty CLAY with weathered calcrete gravel. **COLLUVIUM**.

1.10 Moist, pale brown blotched yellow brown and speckled off-white, firm, sandy SILT with weathered calcrete and mudstone weathered rock gravel. **COLLUVIUM**.

1.90 Olive brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **INDURATED MUDSTONE**.

2.60

NOTES

1) Refusal @ 2.6m on medium hard rock Indurated Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No sample taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/10/2024
DATE : 07/12/2024 14:50
TEXT : ..pProfilesPipeline2.1.txt

ELEVATION :
X-COORD : E26 15.774
Y-COORD : S29 26.858

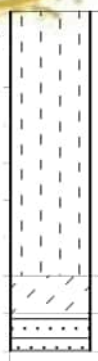
HOLE No: TP433

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP434
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown, stiff, silty CLAY with gravel and roots. **COLLUVIUM**.

0.70 Moist, greenish brown blotched off-white, stiff, clayey SILT with weathered calcrete gravel and mudstone rock gravel. **RESIDUAL MUDSTONE**.

Notes:
1. with sand pockets

0.80 Pale brown, moderately weathered, coarse grained, thinly bedded, soft rock. **SANDSTONE**.

0.90

NOTES

1) Refusal @ 0.90m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) No sample taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/10/2024
DATE : 07/12/2024 14:50
TEXT : ..pProfilesPipeline2.1.txt

ELEVATION :
X-COORD : E26 15.999
Y-COORD : S29 26.762

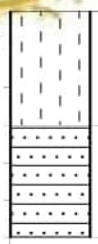
HOLE No: TP434

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP435
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown, stiff, silty CLAY with gravel and roots. **COLLUVIUM**.

0.30 Pale brown, moderately weathered, coarse grained, thinly bedded, closely jointed, soft rock. **SANDSTONE**.

0.60

NOTES

1) Refusal @ 0.60m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/10/2024
DATE : 07/12/2024 14:50
TEXT : ..pProfilesPipeline2.1.txt

ELEVATION :
X-COORD : E26 16.230
Y-COORD : S29 26.687

HOLE No: TP435

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP436
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00

Pale brown, moderately weathered, coarse grained, thinly bedded, medium hard rock. **SANDSTONE**.

0.10

NOTES

1) Refusal @ 0.1m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/10/2024

ELEVATION :
X-COORD : E26 16.455
Y-COORD : S29 26.605

HOLE No: TP436

TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

DATE : 07/12/2024 14:50
TEXT : ..pProfilesPipeline2.1.txt

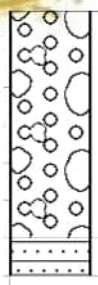
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP437
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Angular and subrounded, moderately weathered dolerite COBBLES and GRAVEL in a silty sand matrix. **COLLUVIUM**.

0.60 Pale brown, highly weathered, coarse grained, closely jointed, soft rock. **SANDSTONE**.

0.70

NOTES

1) Refusal @ 0.70m on medium hard Sandstone.
2) Sidewalls slightly unstable.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/10/2024

DATE : 07/12/2024 14:50
TEXT : ..pProfilesPipeline2.1.txt

ELEVATION :
X-COORD : E26 16.595
Y-COORD : S29 26.430

HOLE No: TP437

NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP438
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Slightly moist, grey, medium dense, clayey SAND with cobbles and boulders. **ALLUVIUM**.

1.50 Grey, highly to moderately weathered, medium grained, intensely thinly laminated, very soft rock grading into soft rock. **SHALE**.

2.70

NOTES

1) Refusal @ 2.70m on medium hard rock Shale.
2) Sidewalls stable.
3) No water seepage.
4) No sample taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/10/2024
DATE : 07/12/2024 14:50
TEXT : ..pProfilesPipeline2.1.txt

ELEVATION :
X-COORD : E26 16.734
Y-COORD : S29 26.252

HOLE No: TP438

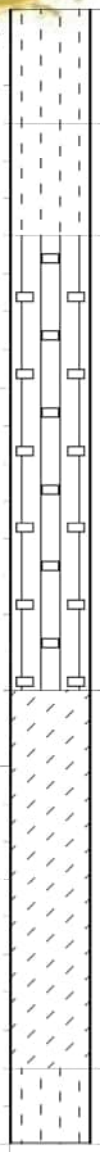
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP439
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, pale brown, dense, silty SAND with gravel and roots. **FILL**.

0.30 Slightly moist, dark brown, stiff, silty CLAY with gravel. **COLLUVIUM**

0.60 Moist, pale brown blotched off-white, calcrete nodules. **CALCRETISED SILT**

1.80 Slightly moist, brown mottled orange blotched off-white, clayey SILT with abundant calcrete nodules. **CALCRETISED SILT**

2.80 Slightly moist, yellow brown, medium dense, silty SAND with ferricrete nodules. **RESIDUAL MUDSTONE**.

NOTES:
1. Material appears Ferruginised

3.00

NOTES

1) Terminated @ 3.00m.
2) Sidewalls stable.
3) No water seepage.
4) No sample taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/10/2024
DATE : 07/12/2024 14:50
TEXT : ..pProfilesPipeline2.1.txt

ELEVATION :
X-COORD : E26 16.967
Y-COORD : S29 26.244

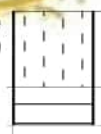
HOLE No: TP439

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP447
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, pale brown, medium dense, silty SAND with gravel , cobbles and isolated boulders. **FILL**.

0.20 Pale brown, moderately weathered, medium grained, intensely thinly laminated, soft rock. **SHALE**.

0.30

NOTES

1) Refusal @ 0.30m on medium hard rock Shale.
2) Sidewalls stable.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/10/2024

DATE : 07/12/2024 14:50
TEXT : ..pProfilesPipeline2.1.txt

ELEVATION :
X-COORD : E26 18.601
Y-COORD : S29 25.374

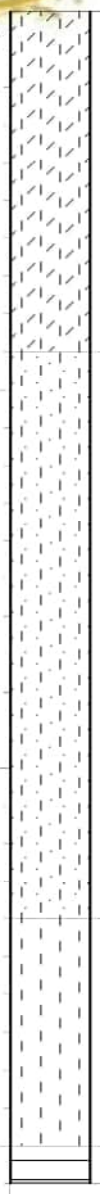
HOLE No: TP447

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP448
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, medium dense, clayey silty SAND with gravel and cobbles. **ALLUVIUM**.

0.90 Slightly moist, orange brown blotched grey speckled black, firm, sandy silty CLAY. **REWORKED RESIDUAL SHALE**.

2.40 Slightly moist, olive brown mottled orange, firm, silty CLAY with weathered calcrete gravel. **RESIDUAL SHALE**.

3.00 Olive brown blotched dark bluish, moderately weathered, fine grained, intensely thinly laminated, soft Rock. **INDURATED SHALE**

3.10

NOTES

1) Terminated@ 3.10m on Indurated Shale.
2) Sidewalls stable.
3) No water seepage.
4) No sample taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/10/2024
DATE : 07/12/2024 14:50
TEXT : ..pProfilesPipeline2.1.txt

ELEVATION :
X-COORD : E26 18.684
Y-COORD : S29 25.165

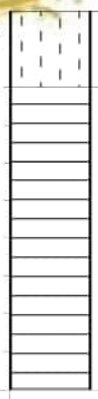
HOLE No: TP448

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP449
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, medium dense, silty SAND with gravel and cobbles and roots. **FILL**.

0.20 Pale brown blotched black, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **INDURATED MUDSTONE**.

1.00

NOTES

1) Refusal @ 1.00m on medium hard rock Indurated Mudstone.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/10/2024

DATE : 07/12/2024 14:50
TEXT : ..pProfilesPipeline2.1.txt

ELEVATION :
X-COORD : E26 18.771
Y-COORD : S29 24.959

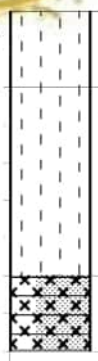
HOLE No: TP449

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP450
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, medium dense, silty SAND with gravel, cobbles and roots. **FILL**.

0.20 Moist, dark brown, firm, silty CLAY. **COLLUVIUM**.

0.70 Dark bluish and olive brown, highly to moderately weathered, medium grained, very closely jointed, soft rock. **MUDSTONE/DOLERITE CONTACT**

0.90

NOTES

1) Refusal @ 0.90m on medium hard rock Mudstone/Dolerite contact.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/10/2024
DATE : 07/12/2024 14:50
TEXT : ..pProfilesPipeline2.1.txt

ELEVATION :
X-COORD : E26 18.918
Y-COORD : S29 24.790

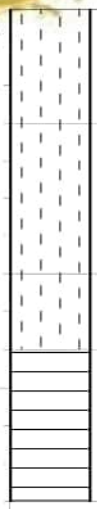
HOLE No: TP450

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP451
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, pale brown, loose, silty SAND with gravel, cobbles and roots. **FILL**.

0.30 Moist, dark brown, stiff, silty CLAY. **COLLUVIUM**.

0.70 Olive brown speckled off white, stiff, silty CLAY with highly weathered mudstone gravel. **RESIDUAL MUDSTONE**.

0.90 Olive brown, highly to moderately weathered, medium grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**

1.30

NOTES

1) Refusal @ 1.30m on medium hard rock Mudstone.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/10/2024
DATE : 07/12/2024 14:50
TEXT : ..pProfilesPipeline2.1.txt

ELEVATION :
X-COORD : E26 19.079
Y-COORD : S29 24.624

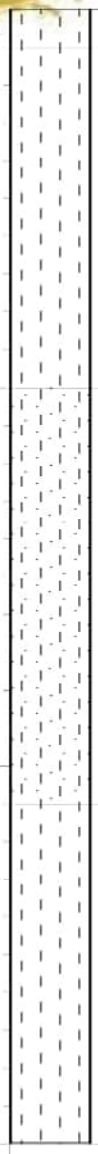
HOLE No: TP451

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP452
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, pale brown, loose, silty SAND with gravel and cobbles and roots. **FILL**.

0.10 Moist, dark brown, stiff, silty CLAY. **COLLUVIUM**.

1.00 Slightly moist, brown blotched off white, stiff, sandy silty CLAY with weathered calcrete gravel. **REWORKED RESIDUAL MUDSTONE**.

1.5

2.10 Moist, olive brown, slightly slickensided, firm, silty CLAY with abundant dolerite and mudstone gravel and cobbles. **RESIDUAL MUDSTONE**.

Note:
1. Possible contact between mudstone and dolerite

2.5m

3.00

NOTES

1) Terminated @ 3.00m.
2) Sidewall stable.
3) No water seepage.
4) Disturbed sample from 1.5 2.5m .
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/10/2024
DATE : 07/12/2024 14:50
TEXT : ..pProfilesPipeline2.1.txt

ELEVATION :
X-COORD : E26 19.487
Y-COORD : S29 24.107

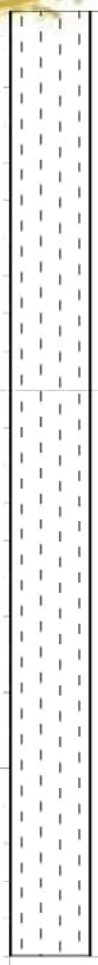
HOLE No: TP452

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP453
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, pale brown, medium dense, silty SAND with gravel and cobbles and roots. **COLLUVIUM**.

1.00 Moist, grey mottled orange brown, firm to stiff with depth, silty CLAY. **ALLUVIUM**.

2.50

NOTES

1) Refusal @ 2.50m on very stiff material.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/10/2024
DATE : 07/12/2024 14:50
TEXT : ..pProfilesPipeline2.1.txt

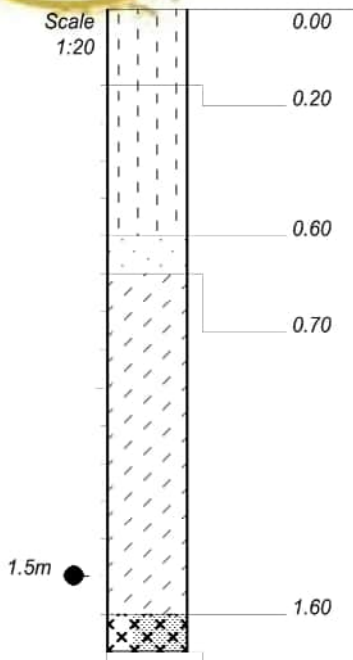
ELEVATION :
X-COORD : S29 24.292
Y-COORD : E26 19.361

HOLE No: TP453

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP454
Sheet 1 of 1

JOB NUMBER: NVG013



0.00 Slightly moist, pale brown, loose, silty SAND with gravel and cobbles and roots. **FILL**.

0.20 Moist, dark brown, stiff, silty CLAY. **COLLUVIUM**.

0.60 Moist, brown blotched off-white and orange brown, sandy CLAY with gravel. **REWORKED RESIDUAL DOLERITE**.

0.70 Moist, brown speckled black and orange brown, medium dense, thinly bedded, clayey coarse SAND with abundant highly weathered dolerite rock. **RESIDUAL DOLERITE**

1.60 Brown blotched dark bluish, moderately weathered, medium grained, closely jointed, soft rock. **DOLERITE**.

1.70

NOTES

1) Refusal @ 1.70m on medium hard rock Dolerite.
2) Sidewall stable.
3) No water seepage.
4) Disturbed sample @ 1.5m.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/10/2024
DATE : 07/12/2024 14:50
TEXT : ..pProfilesPipeline2.1.txt

ELEVATION :
X-COORD : E26 19.079
Y-COORD : S29 24.624

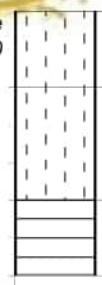
HOLE No: TP454

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP455
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, yellowish brown, loose, silty SAND with gravel and roots. **FILL**.

0.20 Moist, brown speckled orange, firm, silty CLAY with weathered rock gravel. **RESIDUAL SHALE**.

0.50 Olive brown blotched pale, moderately weathered, medium grained, intensely thinly laminated, soft rock. **SHALE**

0.70

NOTES

1) Refusal @ 0.70m on medium hard rock Shale.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/10/2024
DATE : 07/12/2024 14:50
TEXT : ..pProfilesPipeline2.1.txt

ELEVATION :
X-COORD : E26 19.607
Y-COORD : S29 23.915

HOLE No: TP455

NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP456
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00	Slightly moist, pale brown, medium dense, silty SAND with gravel and roots. **FILL**.
0.30	Moist, orange brown speckled black, stiff, silty CLAY with subrounded gravel. **COLLUVIUM**.
0.80	Moist, olive brown blotched off white and speckled black, stiff, silty CLAY with abundant weathered rock gravel. **RESIDUAL MUDSTONE**.
1.50	Olive brown blotched black, highly to moderately weathered, medium grained, very thinly bedded, soft rock. **MUDSTONE**.
2.00	

NOTES

1) Refusal @ 2.00m on medium hard rock Mudstone.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/10/2024
DATE : 07/12/2024 14:50
TEXT : ..pProfilesPipeline2.1.txt

ELEVATION :
X-COORD : E26 19.695
Y-COORD : S29 23.767

HOLE No: TP456

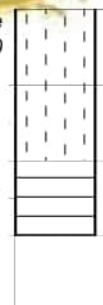
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP457
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, pale brown, medium dense, silty SAND with gravel and abundant tree roots. **FILL**.

0.20 Slightly moist, dark grey brown blotched olive brown and orange, stiff, silty CLAY with weathered rock gravel. **RESIDUAL SHALE**.

0.40 Pale brown and olive brown, highly to moderately weathered, medium grained, intensely thinly laminated, soft rock. **SHALE**.

0.60

NOTES

1) Refusal @ 0.60m on medium hard rock Shale.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/10/2024

DATE : 07/12/2024 14:50
TEXT : ..pProfilesPipeline2.1.txt

ELEVATION :
X-COORD : E26 19.809
Y-COORD : S29 23.573

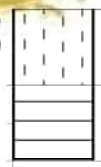
HOLE No: TP457

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP458
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, orange brown, medium dense, silty SAND with gravel roots. **FILL**.

0.20 Olive brown blotched bluish brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

0.40

NOTES

1) Refusal @ 0.40m on medium hard rock Mudstone.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/10/2024
DATE : 07/12/2024 14:50
TEXT : ..pProfilesPipeline2.1.txt

ELEVATION :
X-COORD : E26 19.911
Y-COORD : S29 23.376

HOLE No: TP458

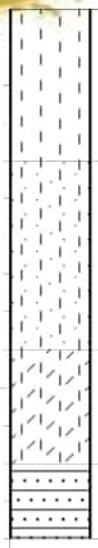
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP459
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, pale brown, medium dense, silty SAND with grass. **COLLUVIUM**.

0.40 Slightly moist, orange brown, firm, silty sandy CLAY. **REWORKED RESIDUAL SANDSTONE**.

0.90 Moist, beige brown blotched off-white, medium dense to dense, clayey silty SAND with weathered rock gravel. **RESIDUAL SANDSTONE**.

1.20 Pale brown and orange and greenish brown, highly weathered, medium grained, closely jointed, soft rock. **SANDSTONE**.

1.40

NOTES

1) Refusal @ 1.40m on medium hard rock Sandstone.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/10/2024
DATE : 07/12/2024 14:50
TEXT : ..pProfilesPipeline2.1.txt

ELEVATION :
X-COORD : E26 20.008
Y-COORD : S29 23.172

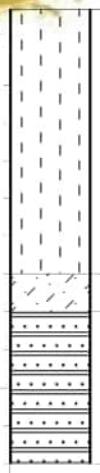
HOLE No: TP459

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP460
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Moist, dark brown speckled orange brown, slightly slickensided, silty CLAY. **COLLUVIUM**.

0.70 Moist, olive yellowish green, firm, sandy clayey SILT with abundant weathered calcrete. **CALCRETISED SILT**.

0.80 Olive yellowish green, highly weathered, medium grained, thinly bedded, soft rock with depth. **INTERBEDDED SHALE/SANDSTONE**.

1.20

NOTES

1) Refusal @ 1.20m on medium hard rock Shale/Sandstone.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/10/2024
DATE : 07/12/2024 14:50
TEXT : ..pProfilesPipeline2.1.txt

ELEVATION :
X-COORD : E26 20.140
Y-COORD : S29 22.997

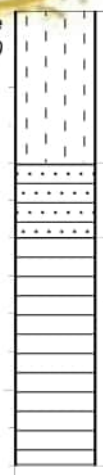
HOLE No: TP460

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP461
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Moist, dark brown speckled orange brown, firm, silty CLAY with roots. **COLLUVIUM**.

Notes:
1. With calcrete at base of layer

0.40 Off-white blotched orange brown, highly weathered, soft rock. **SANDSTONE**.

0.60 Olive brown, moderately weathered, fine grained, thinly bedded, very closely jointed, soft rock. **MUDSTONE**.

1.20

NOTES

1) Refusal @ 1.20m on medium hard rock Mudstone.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/10/2024
DATE : 07/12/2024 14:50
TEXT : ..pProfilesPipeline2.1.txt

ELEVATION :
X-COORD : E26 20.308
Y-COORD : S29 22.781

HOLE No: TP461

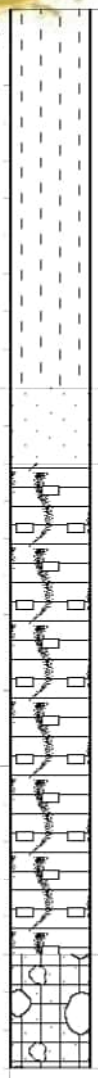
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP486
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Moist, dark brown, soft, silty CLAY with grass. **COLLUVIUM**.

1.00 Slightly moist, pale brown, stiff, sandy SILT with abundant calcrete. **CALCRELISED SILT**.

1.20 Green blotched off-white, highly weathered, fine grained, very thinly bedded, very soft rock. **MUDSTONE**.

NOTES:
1. Mudstone with pockets of calcrete nodules

2.50 Grey, slightly weathered, mudstone cobbles in a sandy silt matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

NOTES:
1. Possible contact

2.80

NOTES

1) Refusal @ 2.80m on Mudstone.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/10/2024
DATE : 07/12/2024 14:50
TEXT : ..pProfilesPipeline2.1.txt

ELEVATION :
X-COORD : E26 21.985
Y-COORD : S29 19.522

HOLE No: TP486

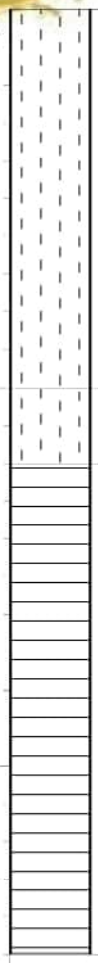
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP487
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Moist, dark brown, firm, silty CLAY with grass. **COLLUVIUM**.

1.00 Moist, brown blotched off-white, stiff, silty CLAY with abundant calcrete nodules and mudstone cobbles. **RESIDUAL MUDSTONE**.

1.20 Pale green, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

2.50

NOTES

1) Refusal @ 2.50m on medium hard rock Mudstone.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/10/2024
DATE : 07/12/2024 14:50
TEXT : ..pProfilesPipeline2.1.txt

ELEVATION :
X-COORD : E26 21.822
Y-COORD : S29 19.355

HOLE No: TP487

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP488
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Moist, dark brown blotched off-white with depth, silty CLAY with localised weathered calcrete. **COLLUVIUM**.

1.00 Moist, olive brown blotched off-white, sandy clayey SILT with weathered calcrete. **RESIDUAL MUDSTONE**.

2.30 Green, highly weathered, fine grained, very thinly bedded, <u>very soft rock.</u> **MUDSTONE**.

NOTES:
1. With zones of residual soils

2.50 Moist, olive brown blotched orange, silty CLAY with weathered rock gravel. **INTERBEDDED MUDSTONE/SANDSTONE**.

Notes:
1. with sand lenses

3.10

NOTES

1) Terminated @ 3.10m.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/10/2024
DATE : 07/12/2024 14:50
TEXT : ..pProfilesPipeline2.1.txt

ELEVATION :
X-COORD : E26 21.659
Y-COORD : S29 19.188

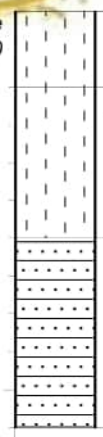
HOLE No: TP488

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP489
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, medium dense, silty SAND with abundant angular and subrounded gravel. **FILL**.

0.20 Moist, dark brown, firm, silty CLAY. **COLLUVIUM**.

0.60 Yellow brown, slightly weathered, medium grained, thinly bedded, soft rock. **SANDSTONE**.

1.10

NOTES

1) Refusal @ 1.10m on medium hard rock Sandstone.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 25/10/2024
DATE : 07/12/2024 14:50
TEXT : ..pProfilesPipeline2.1.txt

ELEVATION :
X-COORD : E26 21.499
Y-COORD : S29 19.023

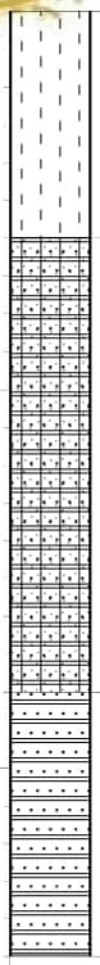
HOLE No: TP489

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP490
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Moist, dark brown, silty CLAY with calcrete nodules weathered at the base of the layer. **COLLUVIUM**.

0.60 Moist, yellow brown blotched off-white with zones of olive green, medium dense/ firm SILT/SAND with weathered rock fragments. **INTERBEDDED RESIDUAL SANDSTONE/MUDSTONE**.

1.80 Yellow brown blotched off-white and olive brown, highly weathered, medium grained, thinly bedded, very soft becoming soft with depth. **INTERBEDDED SANDSTONE/MUDSTONE**.

2.50

NOTES

1) Refusal @ 2.50m on medium hard rock Interbedded Sandstone/Mudstone.
2) Sidewall stable.
3) No water seepage.
4) Bulk statement 0.6-1.8m.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 28/10/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.2.txt

ELEVATION :
X-COORD : E26 21.336
Y-COORD : S29 18.859

HOLE No: TP490
FREE STATE

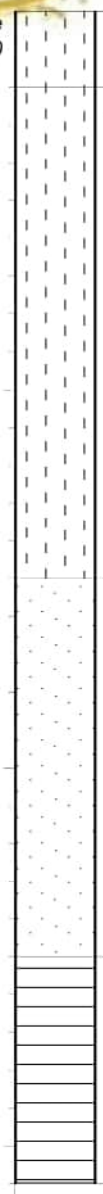
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP491
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, medium dense, silty SAND with abundant angular gravel. **FILL**.

0.20 Moist, dark brown, firm, silty CLAY. **COLLUVIUM**.

1.50 Moist, olive brown blotched off-white, sandy SILT with abundant weathered calcrete nodules. **RESIDUAL MUDSTONE**

2.50 Green blotched off-white, completely to highly weathered, very soft rock. **MUDSTONE**.

3.10

NOTES

1) Terminated @ 3.10m.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 28/10/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.2.txt

ELEVATION :
X-COORD : E26 21.175
Y-COORD : S29 18.694

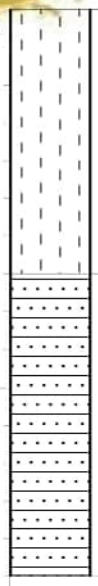
HOLE No: TP491

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP492
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Moist, dark brown, silty CLAY with calcrete nodules. **COLLUVIUM**.

0.70 Green blotched off-white, highly weathered, fine grained, thinly bedded, soft rock. **SANDSTONE**.

1.50

NOTES

1) Refusal @ 1.50m on medium hard rock Sandstone.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 28/10/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.2.txt

ELEVATION :
X-COORD : E26 21.013
Y-COORD : S29 18.531

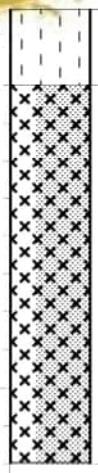
HOLE No: TP492

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP493
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, medium dense, silty SAND with angular gravel. **FILL**.

0.20 Brown mottled orange brown and black, highly weathered, medium grained, medium jointed, soft rock. **DOLERITE**.

1.20

NOTES

1) Refusal @ 1.20m on medium hard rock Dolerite.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 28/10/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.2.txt

ELEVATION :
X-COORD : E26 20.855
Y-COORD : S29 18.365

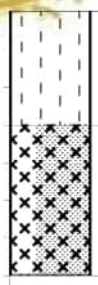
HOLE No: TP493

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP494
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, orange brown, medium dense, silty CLAY with roots. **COLLIVIUM**.

0.30 Dark grey blotched orange brown, highly weathered, coarse grained, closely jointed, very soft rock grading into soft rock with depth. **DOLERITE**.

0.70

NOTES

1) Refusal @ 0.70m on medium hard rock Dolerite.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 28/10/2024

DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.2.txt

ELEVATION :
X-COORD : E26 20.704
Y-COORD : S29 18.194

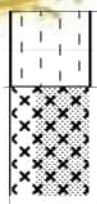
HOLE No: TP494

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP495
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, grey brown, medium dense, silty SAND with gravel and roots. **FILL**.

0.10 Slightly moist, orange brown, medium dense, silty SAND with dolerite rock gravel and cobbles. **RESIDUAL DOLERITE**.

0.20 Grey, moderately weathered, medium grained, hard rock **DOLERITE**.

NOTES

1) Refusal @ 0.20+m on medium hard rock Dolerite.
2) Sidewall stable.
3) No water seepage.
4) No sample taken.
5) No DCP carried out.
6) Dolerite outcrop.
7) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 28/10/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.2.txt

ELEVATION :
X-COORD : E26 20.557
Y-COORD : S29 18.019

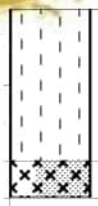
HOLE No: TP495

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP496
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Moist, dark grey, firm, silty CLAY with grass roots. **COLLUVIUM**.

0.40 Dark bluish, highly weathered, medium grained, closely jointed, spheroidal weathering, soft rock. **DOLERITE**.

0.50

NOTES

1) Refusal @ 0.50m on medium hard rock Dolerite.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 28/10/2024

DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.2.txt

ELEVATION :
X-COORD : E26 20.408
Y-COORD : S29 17.847

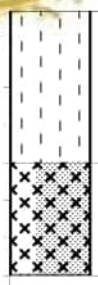
HOLE No: TP496

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP497
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Moist, dark grey, firm, silty CLAY with subrounded weathered dolerite cobbles. **COLLUVIUM**.

0.40 Dark bluish, highly weathered, medium grained, closely jointed, spheroidal weathering, soft rock. **DOLERITE**.

0.70

NOTES

1) Refusal @ 0.70m on medium hard rock Dolerite.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 28/10/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.2.txt

ELEVATION :
X-COORD : E26 20.261
Y-COORD : S29 17.675

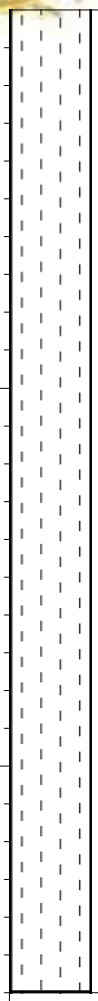
HOLE No: TP497

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP498
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00

Moist to very moist, dark grey mottled greenish grey, soft, silty CLAY with subrounded cobbles and boulders up to 0.3m. **ALLUVIUM**.

2.60

NOTES

1) Refusal on boulders.
2) Sidewall stable.
3) No water seepage but very moist.
4) No samples taken.
5) DCP done.
6) Within the Riverbed.
7) Profiled from spoil.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

INCLINATION :
DIAM : 600mm
DATE :
DATE : 28/10/2024

ELEVATION :
X-COORD : E26 20.204
Y-COORD : S29 17.606

HOLE No: TP498

TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

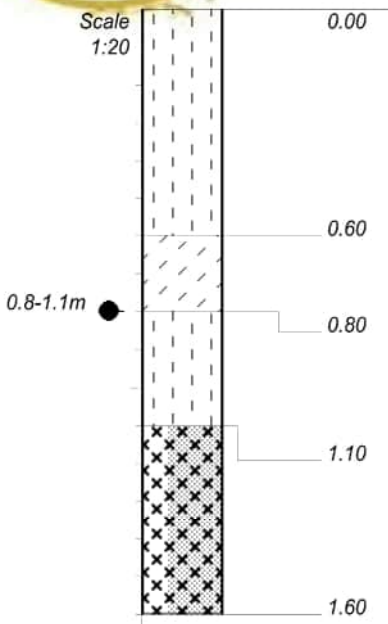
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.2.txt

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP499
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Moist, dark brown, firm, silty CLAY. **COLLUVIUM**.
0.60	Off-white, slightly moist, firm, clayey SILT with abundant calcrete nodules. **COLLUVIUM**.
0.80	Slightly moist, yellowish brown speckled black and orange, medium dense, silty SAND with abundant highly weathered rock fragments. **RESIDUAL DOLERITE** .
1.10	Dark grey blotched orange brown, highly weathered, coarse grained, closely jointed, very soft to soft rock with depth. **DOLERITE**.
1.60	

NOTES

1) Refusal @ 1.60m on medium hard rock.
2) Sidewall stable.
3) No water seepage.
4) Bulk sample from 0.8-1.1m.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 28/10/2024

DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.2.txt

ELEVATION :
X-COORD : E26 20.053
Y-COORD : S29 17.435

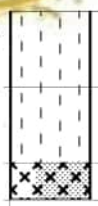
HOLE No: TP499

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP500
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, brown, loose, silty SAND abundant angular gravel. **FILL**.
0.20	Moist, red brown, medium dense, silty SAND with subrounded weathered dolerite cobbles. **COLLUVIUM**.
0.40	Dark grey, moderately weathered, medium grained, closely jointed, soft rock. **DOLERITE**.
0.50	

NOTES

1) Refused @ 0.50m on medium hard rock Dolerite.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 28/10/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.2.txt

ELEVATION :
X-COORD : E26 19.903
Y-COORD : S29 17.263

HOLE No: TP500

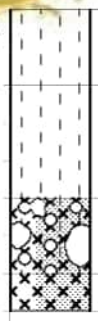
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP501
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, brown, medium dense, silty SAND with gravel and roots. **COLLUVIUM**.
0.20	Moist, orange brown, medium dense, silty SAND. **COLLUVIUM**.
0.50	Well packed, subrounded and subangular dolerite GRAVEL and COBBLES in a silty coarse SAND matrix. **RESIDUAL DOLERITE**.
0.70	Dark grey blotched orange brown, highly weathered, coarse grained, closely jointed, soft rock. **DOLERITE**.
0.80	

NOTES

1) Refusal @ 0.80m on medium hard rock Dolerite.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 28/10/2024

DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.2.txt

ELEVATION :
X-COORD : E26 19.764
Y-COORD : S29 17.081

HOLE No: TP501

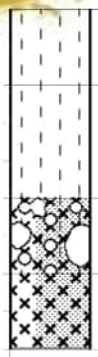
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP502
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, brown, medium dense, silty SAND with gravel and roots. **COLLUVIUM**.
0.20	Moist, orange brown, medium dense, silty SAND. **COLLUVIUM**.
0.50	Well packed, subrounded and subangular dolerite GRAVEL and COBBLES in a silty coarse SAND matrix. **RESIDUAL DOLERITE**.
0.70	Dark grey blotched orange brown, highly weathered, coarse grained, closely jointed, soft rock. **DOLERITE**.
0.90	

NOTES

1) Refusal @ 0.90m on medium hard rock Dolerite.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 28/10/2024

DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.2.txt

ELEVATION :
X-COORD : E26 19.764
Y-COORD : S29 17.081

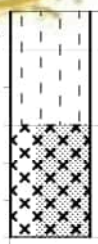
HOLE No: TP502

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP503
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, brown, medium dense, silty SAND with gravel and roots. **COLLUVIUM**.
0.10	Slightly moist, orange brown, medium dense, silty SAND. **COLLUVIUM**.
0.30	Dark grey blotched orange brown, highly weathered, coarse grained, closely jointed, soft rock. **DOLERITE**.
0.60	

NOTES

1) Refusal @ 0.60m on medium hard rock Dolerite.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 28/10/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.2.txt

ELEVATION :
X-COORD : E26 19.415
Y-COORD : S29 16.206

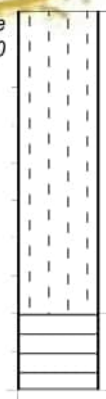
HOLE No: TP503

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP504
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, medium dense, intact, silty SAND with gravel and cobbles. **COLLUVIUM**.

0.80 Olive brown blotched dark purple, moderately weathered, medium grained, spheroidal weathering, closely jointed, soft rock. **INDURATED MUDSTONE**.

1.00

NOTES

1) Refusal @ 1.00m on medium hard rock Indurated Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 28/10/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.2.txt

ELEVATION :
X-COORD : E26 19.175
Y-COORD : S29 16.606

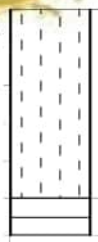
HOLE No: TP504

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP505
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, orange brown, dense, silty SAND with gravel and roots. **COLLUVIUM**.

0.50 Olive brown blotched bluish, moderately weathered, fine grained, spheroidal weathering, closely jointed. **INDURATED MUDSTONE**.

0.60

NOTES

1) Refusal @ 1.00m on medium hard rock Indurated Mudstone.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 28/10/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.2.txt

ELEVATION :
X-COORD : E26 18.982
Y-COORD : S29 16.470

HOLE No: TP505

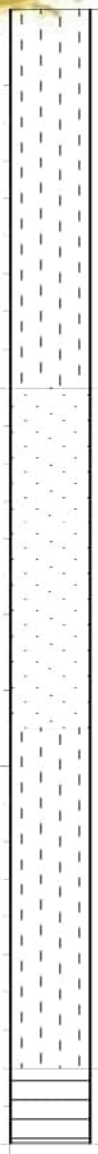
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP506
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown mottled orange, stiff, silty CLAY with grass roots. **COLLUVIUM**.

1.00 Slightly moist, pale brown blotched off-white, stiff, sandy SILT with abundant calcrete nodules. **CALCRELISED SILT**.

1.90 Moist, olive brown blotched off-white, relic bedded, stiff, silty CLAY with weathered calcrete gravel and mudstone rock gravel. **RESIDUAL MUDSTONE**.

2.80 Green, highly weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

3.00

NOTES

1) Terminated @ 3.00m.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 28/10/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.2.txt

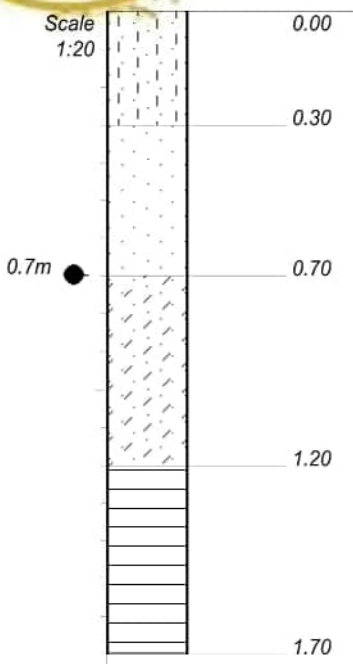
ELEVATION :
X-COORD : E26 18.785
Y-COORD : S29 16.338

HOLE No: TP506

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP507
Sheet 1 of 1

JOB NUMBER: NVG013



0.00 Slightly moist, dark brown, firm, honeycomb like dry sandy silty CLAY with grass.

0.30 Slightly moist, pale brown speckled orange blotched off-white, stiff, sandy SILT with abundant calcrete (weathered) nodules. **RESIDUAL SHALE**.

0.70 Moist, olive brown mottled orange brown and localised off-white, firm, relic bedded, sandy clayey SILT with weathered rock gravel. **RESIDUAL SHALE**.

1.20 Pale yellow brown, highly weathered, medium grained, intensely thinly laminated, soft rock. **SHALE**.

1.70

NOTES

1) Refusal @ 1.70m on medium hard rock Shale.
2) Sidewall stable.
3) No water seepage.
4) Disturbed sample @ 0.7m.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 28/10/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.2.txt

ELEVATION :
X-COORD : E26 18.587
Y-COORD : S29 16.206

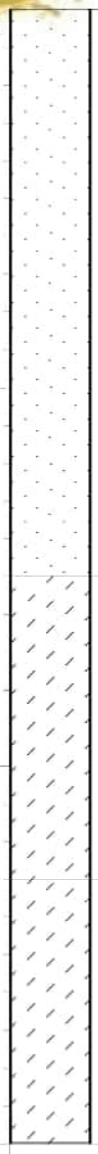
HOLE No: TP507

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP508
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, orange brown, soft, sandy SILT. **COLLUVIUM**.

1.50 Slightly moist, yellow brown speckled orange and black, soft, slickensided, clayey SILT. **RESIDUAL SHALE**.

2.30 Moist, dark purple brown blotched off-white, soft, clayey SILT with abundant weathered calcrete nodules. **RESIDUAL MUDSTONE**.

3.00

NOTES

1) Terminated @ 3.00m.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 28/10/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.2.txt

ELEVATION :
X-COORD : E26 18.388
Y-COORD : S29 16.080

HOLE No: TP508

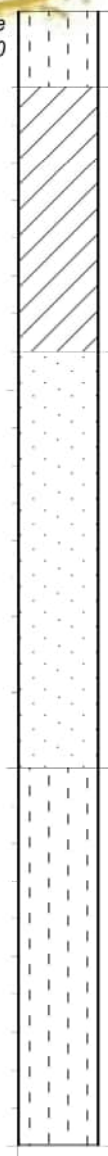
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP509
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, pale brown, medium dense, silty SAND with gravel and grass. **FILL**.

0.20 Moist, dark brown blotched orange, stiff, CLAY. **COLLUVIUM**.

0.90 Slightly moist, yellow brown speckled black, sandy SILT with subrounded gravel and weathered calcrete. **CALCRETISED SILT**.

2.00 Moist, grey blotched olive green and off white, slickensided, silty CLAY with weathered calcrete gravel. **RESIDUAL MUDSTONE**.

3.00

NOTES

1) Terminated @ 3.00m.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 28/10/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.2.txt

ELEVATION :
X-COORD : E26 18.194
Y-COORD : S29 15.945

HOLE No: TP509

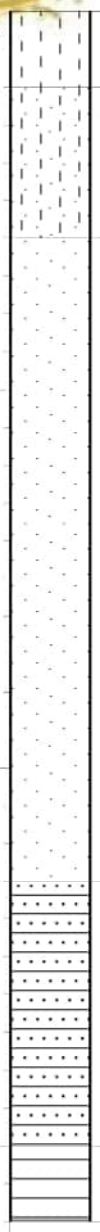
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP510
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



1.0-2.0m

0.00	Slightly moist, brown, medium dense, silty SAND with gravel and roots. **FILL**.
0.20	Moist, orange brown, firm, sandy silty CLAY with minor localised subrounded calcrete nodules. **COLLUVIUM**.
0.60	Moist, yellow brown blotched off-white and grey, stiff, sandy CLAY/SILT with abundant subrounded calcrete gravel and cobbles. **RESIDUAL SHALE**.
2.30	Yellow brown, highly weathered, medium grained, thinly bedded, very soft rock. **SANDSTONE**.
3.00	Grey, highly weathered, fine grained, intensely laminated, very soft rock. **SHALE**
3.20	

NOTES

1) Terminated @ 3.20.
2) Sidewall stable.
3) No water seepage.
4) Bulk sample from 1.0-2.0m.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 28/10/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.2.txt

ELEVATION :
X-COORD : E26 18.001
Y-COORD : S29 15.812

HOLE No: TP510

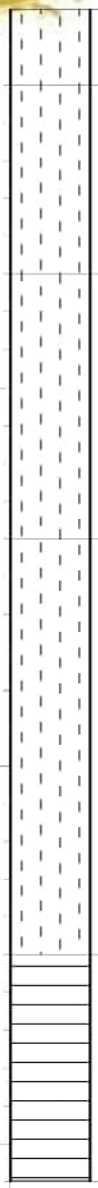
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP511
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, brown, medium dense, silty SAND. **COLLUVIUM**.
0.20	Moist, orange brown, medium dense, silty SAND. **COLLUVIUM**.
0.70	Moist, orange brown blotched dark brown, silty CLAY with minor ferricrete nodules. **COLLUVIUM**.
1.40	Moist, grey blotched orange brown and speckled black, silty CLAY with pockets of sandstone and calcrete nodules. **RESIDUAL MUDSTONE**.
2.50	Olive brown blotched bluish, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.
3.10	

NOTES

1) Terminated @ 3.10m.
2) Sidewall stable.
3) No water seepage.
4) Disturbed @ 1.5m.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 17.809
Y-COORD : S29 15.677

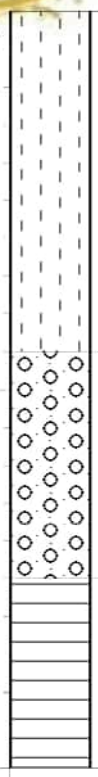
HOLE No: TP511
FREE STATE

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP512
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Moist, orange brown blotched dark grey, firm, silty CLAY. **COLLUVIUM**.

0.90 Well packed, angular, moderately weathered GRAVEL in a sandy silt matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.

1.50 Dark purple brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.

2.00

NOTES

1) Refusal @ 2.00m on medium hard rock Mudstone.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 17.615
Y-COORD : S29 15.543

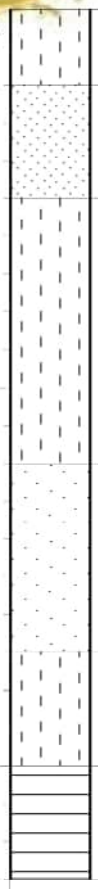
HOLE No: TP512

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP513
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, brown, medium dense, silty SAND with gravel and roots. **FILL**.
0.20	Moist, orange brown, medium dense, SAND. **COLLUVIUM**.
0.50	Moist, dark brown mottled orange brown, silty CLAY with minor ferricrete nodules. **COLLUVIUM**.
1.20	Moist, yellow brown blotched off-white, stiff, sandy SILT with calcrete nodules. **CALCRETISED SILT**.
1.70	Moist, olive and purple brown blotched off-white, slickensided, silty CLAY with localised weathered calcrete and abundant angular mudstone gravel. **RESIDUAL MUDSTONE**.
2.00	Pale purple brown, moderately weathered, fine grained, thinly bedded, closely jointed, medium hard rock. **MUDSTONE**.
2.30	

NOTES

1) Refusal @ 2.30m on medium hard rock Mudstone.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024

DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 17.423
Y-COORD : S29 15.409

HOLE No: TP513

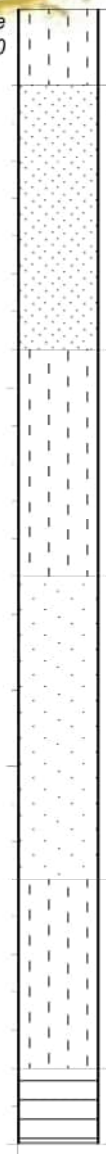
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP514
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, medium dense, silty SAND with angular, slightly weathered gravel. **FILL**.

0.20 Moist, orange brown, medium dense, SAND. **COLLUVIUM**.

0.90 Moist, dark brown blotched orange, silty CLAY with minor ferricrete nodules. **COLLUVIUM**.

1.50 Slightly moist, yellow brown blotched off-white and orange, stiff, sandy SILT with calcrete nodules. **CALCRETISED SILT**

2.30 Moist, olive brown and orange brown, firm, silty CLAY with weathered calcrete and mudstone rock gravel. **RESIDUAL MUDSTONE**.

2.80 Pale olive brown, highly weathered, fine grained, thinly bedded, closely jointed, very soft rock. **MUDSTONE**

3.00

NOTES

1) Terminated @ 3.00m.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 17.229
Y-COORD : S29 15.277

HOLE No: TP514

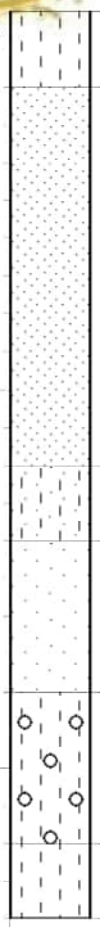
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP515
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, brown, medium dense, silty SAND with abundant angular gravel. **FILL**.
0.20	Moist, orange brown, medium dense, SAND. **COLLUVIUM**.
1.20	Moist, orange brown and dark brown, firm, sandy silty CLAY with minor ferricrete nodules. **COLLUVIUM**.
1.40	Slightly moist, yellow brown blotched off-white, sandy SILT with weathered calcrete nodules with weakly cemented nodules at the base. **CALCRETISED SILT**.
1.80	Slightly moist, orange brown blotched bluish, medium dense, silty gravelly SAND. **RESIDUAL DOLERITE**.
2.20	Well packed, highly weathered angular dolerite cobbles and gravel in a silty sand matrix. Overall consistency is very dense. **DOLERITE**.
2.40	

NOTES

1) Refusal on Dolerite Cobbles.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 17.041
Y-COORD : S29 15.140

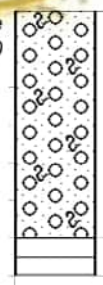
HOLE No: TP515

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP516
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, orange brown, medium dense, SAND with gravel and roots. **COLLUVIUM**.

0.60 Pale brown blotched dark brown, highly weathered, medium grained, intensely thinly laminated, soft rock. **INDURATED SHALE**.

0.70

NOTES

1) Refusal @ 0.70m on medium hard rock Indurated Shale.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024

DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 16.851
Y-COORD : S29 15.001

HOLE No: TP516

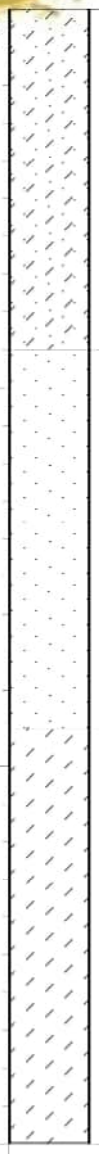
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP517
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Moist, brown, soft, sandy clayey SILT with gravel and roots. **FILL**.

0.90 Moist, pale brown speckled off-white, stiff, sandy SILT with calcrete nodules. **CALCRETISED SILT**.

1.90 Well packed, highly weathered, fine grained, angular, very soft mudstone rock GRAVEL in a clayey SILT matrix. Overall consistency is medium dense. **RESIDUAL MUDSTONE**.

3.00

NOTES

1) Terminated @ 3.00m.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 16.661
Y-COORD : S29 14.864

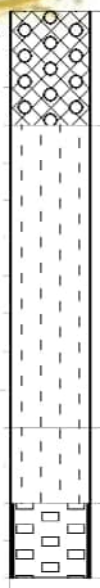
HOLE No: TP517

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP518
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Pale brown, weathered rock gravel. **FILL**.

0.30 Slightly moist, orange brown, medium dense, silty SAND. **COLLUVIUM**.

1.10 Moist, brown blotched orange, silty CLAY with minor ferricrete nodules. **COLLUVIUM**.

1.30 Well cemented, pale brown speckled black and orange, calcrete nodules, medium hard rock. **HARDPAN CALCRETE**.

1.50

NOTES

1) Refusal @ 1.50m on medium hard rock Hardpan Calcrete.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 16.468
Y-COORD : S29 14.727

HOLE No: TP518

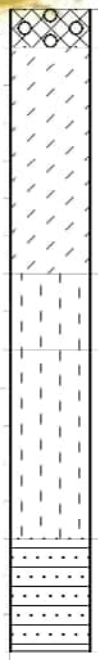
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP519
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Pale brown, weathered rock gravel. **FILL**.
0.10	Moist, orange brown, dense, clayey SAND with ferricrete nodules. **COLLUVIUM**.
0.70	Moist, dark grey blotched orange brown, stiff, silty CLAY. **COLLUVIUM**.
0.90	Slightly moist, pale brown blotched off-white, dense, silty SAND with weathered calcrete nodules. **RESIDUAL SANDSTONE**.
1.40	Pale brown, highly weathered, medium grained, thinly bedded, soft rock. **SANDSTONE**.
1.70	

NOTES

1) Refusal @ 1.70m on medium hard rock Sandstone.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024

DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 16.279
Y-COORD : S29 14.592

HOLE No: TP519

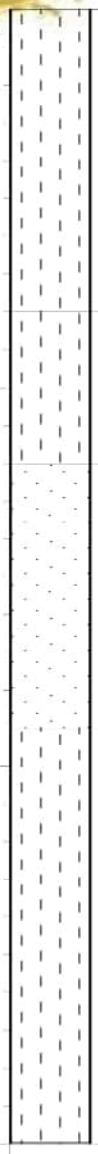
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP520
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, orange brown, medium dense, silty SAND with gravel. **COLLUVIUM**.
0.80	Moist, dark brown, firm, silty CLAY with ferricrete nodules. **COLLUVIUM**.
1.20	Moist, yellow brown and off-white, firm, sandy SILT with weathered calcrete nodules. **CALCRETISED SILT**.
1.90	Moist, olive brown blotched off-white, firm, slickensided, silty CLAY, with weathered mudstone rock gravel. **RESIDUAL MUDSTONE**.
3.00	

NOTES

1) Terminated @ 3.00m.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 16.086
Y-COORD : S29 14.459

HOLE No: TP520

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP521
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Weathered pale brown GRAVEL silty sand matrix. **FILL**.

0.20 Slightly moist, orange brown, dense, clayey silty SAND with gravel. **COLLUVIUM**.

0.70 Moist, orange brown mottled orange, stiff, silty CLAY with ferricrete nodules. **COLLUVIUM**.

1.30 Slightly moist, pale brown mottled orange blotched off-white, firm to stiff, sandy SILT with weathered rock gravel and calcrete nodules. **RESIDUAL MUDSTONE**.

2.60 Olive green blotched bluish, moderately weathered, fine to medium grained, closely jointed, soft rock. **MUDSTONE**.

3.10

NOTES

1) Terminated @ 3.10m.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 15.893
Y-COORD : S29 14.324

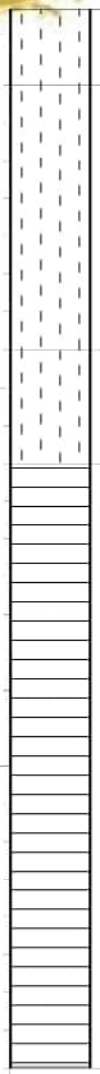
HOLE No: TP521

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP522
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Pale grey, loose, silty SAND with gravel of weathered rock. **FILL**.

0.20 Moist, dark brown, firm, silty CLAY. **ALLUVIUM**.

0.90 Moist, olive green, stiff, slickensided, silty CLAY. **RESIDUAL MUDSTONE**.

Notes:
1. Completely weathered rock.

1.20 Olive green, highly weathered, fine grained, thinly bedded, closely jointed, very soft grading to better soft rock with depth. **MUDSTONE**

2.80

NOTES

1) Refusal @ 2.80m on medium hard rock Mudstone.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 15.701
Y-COORD : S29 14.188

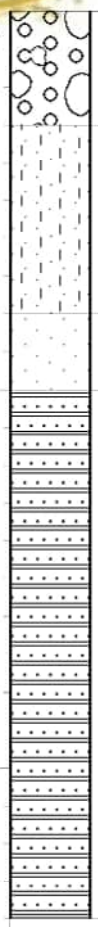
HOLE No: TP522

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP523
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Weathered rock, gravel and cobbles. **FILL**.

0.30 Slightly moist, dark brown blotched orange, stiff, sandy silty CLAY. **COLLUVIUM**.

0.80 Slightly moist, pale brown mottled off-white, sandy SILT with abundant calcrete, mudstone and sandstone, gravel. **INTERBEDDED RESIDUAL MUDSTONE/SANDSTONE**.

1.00 Pale brown and olive brown blotched off-white and bluish, moderately weathered, fine to medium grained, very closely jointed, soft rock. **INTERBEDDED MUDSTONE/ SANDSTONE**.

2.40

NOTES

1) Refusal @ 2.40m on medium hard rock Mudstone.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 15.507
Y-COORD : S29 14.056

HOLE No: TP523

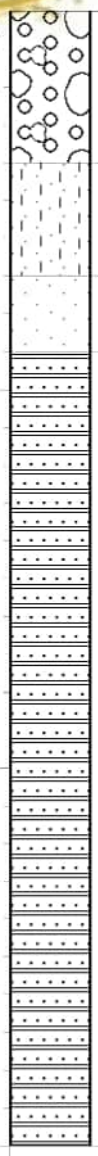
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP524
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Weathered rock, gravel and cobbles. **FILL**.
0.40	Slightly moist, dark brown blotched orange, stiff, sandy silty CLAY. **COLLUVIUM**.
0.70	Slightly moist, pale brown mottled off-white, sandy SILT with abundant calcrete, mudstone and sandstone gravel. **INTERBEDDED RESIDUAL MUDSTONE/SANDSTONE**.
0.90	Pale brown and olive brown blotched off-white and bluish, moderately weathered, fine to medium grained, very closely jointed, soft rock. **INTEREBEDDED MUDSTONE/SANDSTONE**.
3.00	

NOTES

1) Terminated @ 3.00.
2) Sidewall stable.
3) No water seepage.
4) Bulk sample from 1.6-2.0m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 15.313
Y-COORD : S29 13.923

HOLE No: TP524

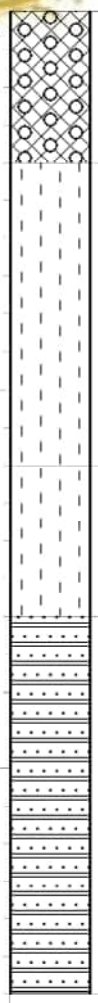
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP525
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Pale brown, weathered rock angular gravel. **FILL**.
0.40	Slightly moist, orange brown, dense, silty SAND. **COLLUVIUM**.
1.20	Moist, dark brown blotched orange, stiff, silty CLAY with ferricrete nodules. **COLLUVIUM**.
1.60	Olive brown blotched bluish, moderately weathered, fine grained, closely jointed, soft rock. **MUDSTONE**.
2.60	

Notes:
1. With zones of residual soils and sandstone rock

NOTES

1) Refusal on medium hard rock Mudstone.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 15.104
Y-COORD : S29 13.809

HOLE No: TP525

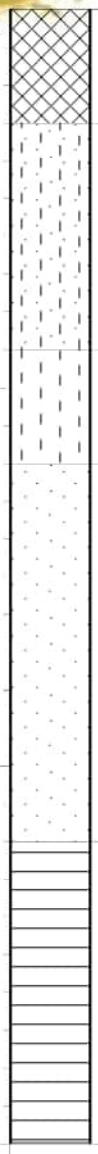
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP526
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Pale brown, weathered rock. **FILL**.
0.30	Moist, orange brown, dense, sandy silty SAND. **COLLUVIUM**.
0.90	Moist, dark brown and blotched orange, stiff, silty CLAY. **COLLUVIUM**.
1.20	Slightly moist, pale brown blotched off-white, firm, sandy SILT with weathered calcrete nodules. **RESIDUAL MUDSTONE**.
2.20	Olive brown blotched bluish, highly to moderately weathered, fine grained, closely jointed, very soft to soft rock. **MUDSTONE**.
3.00	

NOTES

1) Terminated @ 3.00m.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 14.893
Y-COORD : S29 13.700

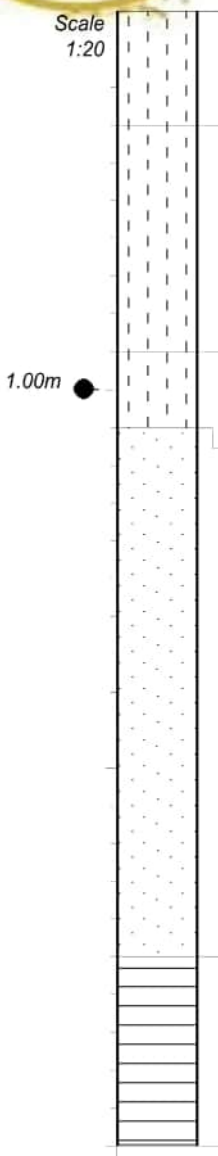
HOLE No: TP526

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP527
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Angular weathered rock gravel in a silty SAND matrix. Overall consistency is medium dense. **FILL**.
0.30	Slightly moist, orange brown, medium dense, silty SAND. **COLLUVIUM**.
0.90	Moist, dark brown mottled orange brown, stiff, silty CLAY with localised ferricrete nodules. **COLLUVIUM**.
1.10	Slightly moist, pale brown blotched off-white, stiff, sandy SILT with abundant calcrete nodules and weathered mudstone rock gravel. **RESIDUAL MUDSTONE**.
2.50	Olive brown, moderately weathered, fine grained, thinly bedded, closely jointed, soft rock. **MUDSTONE**.
3.00	

NOTES

1) Terminated @ 3.00m.
2) Sidewall stable.
3) No water seepage.
4) Disturbed sample @ 1.00m.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 14.681
Y-COORD : S29 13.589

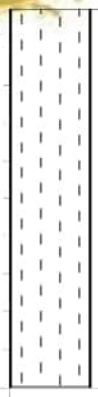
HOLE No: TP527

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP528
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, loose, silty SAND with abundant angular mudstone gravel. **FILL**.

1.00 **PIPELINE BACKFILL MATERIAL**.

NOTES

1) Terminated due to possible pipeline.
2) Sidewall stable.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 14.469
Y-COORD : S29 13.479

HOLE No: TP528

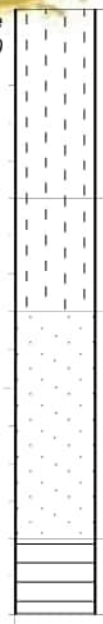
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP529
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Moist, orange brown, medium dense, silty SAND. **COLLUVIUM**.
0.50	Moist, dark brown mottled orange, firm, silty CLAY with ferricrete nodules. **COLLUVIUM**.
0.80	Angular weathered mudstone gravel in a sandy SILT matrix. Overall consistency is dense. **RESIDUAL MUDSTONE**.
1.40	Olive grey, moderately weathered, fine grained, thinly bedded, closely joined, soft rock. **MUDSTONE**.
1.60	

NOTES

1) Refusal @ 1.60m on medium hard rock mudstone.
2) Sidewall stable.
3) No water seepage.
4) No sample taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 14.281
Y-COORD : S29 13.431

HOLE No: TP529

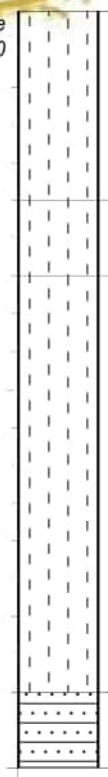
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP530
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, orange brown, medium dense, silty SAND. **COLLUVIUM**.
0.50	Moist, dark brown mottled orange, firm, silty CLAY. **COLLUVIUM**.
0.70	Slightly moist, pale brown blotched off-white, dense, silty SAND with sandstone gravel and calcrete nodules. **RESIDUAL SANDSTONE**.
1.80	Pale brown speckled black, highly weathered, medium grained, thinly bedded, closely jointed, soft rock. **SANDSTONE**.
2.00	

NOTES

1) Refusal @ 2.00m on medium hard rock Sandstone.
2) Sidewall stable.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024

DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 14.064
Y-COORD : S29 13.330

HOLE No: TP530

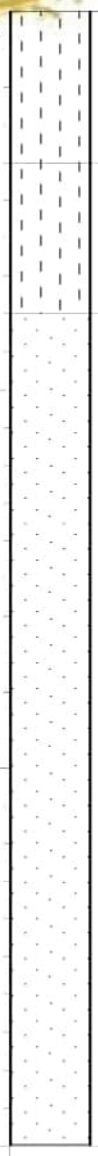
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP531
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, orange brown, medium dense, silty SAND. **COLLUVIUM**.

0.40 Moist, dark brown mottled orange brown, stiff, silty CLAY. **COLLUVIUM**.

0.80 Slightly moist, pale olive brown interlayered dark purple brown and blotched off white, firm, sandy SILT with abundant weathered calcrete nodules. **RESIDUAL MUDSTONE**.

3.00

NOTES

1) Terminated @ 3.00m.
2) Sidewall stable.
3) No water seepage.
4) No sample taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 13.845
Y-COORD : S29 13.230

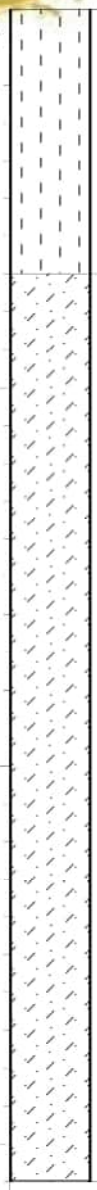
HOLE No: TP531

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP532
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Moist, dark brown, stiff, silty CLAY. **COLLUVIUM**.

0.70 Slightly moist, olive brown mottled off-white and dark purple brown, stiff, clayey sandy SILT with abundant weathered mudstone gravel and calcrete nodules. **RESIDUAL MUDSTONE**.

Notes:
1. Completely weathered rock

3.10

NOTES

1) Terminated @ 3.10m.
2) Sidewall stable.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 13.633
Y-COORD : S29 13.121

HOLE No: TP532

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP533
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Slightly moist, dark brown, medium dense, clayey SAND with angular gravel. **FILL**.

0.50 Moist, dark brown, stiff, silty CLAY with minor gravel. **COLLUVIUM**.

0.70 Slightly moist, olive brown, stiff, silty CLAY with weathered rock gravel. **RESIDUAL MUDSTONE**.

1.10 Olive brown blotched bluish, stiff, highly to moderately weathered, fine grained, very thinly bedded, soft rock. **MUDSTONE**.

Notes:
1. Weathered along the joints

1.40

NOTES

1) Refusal @ 1.40 medium hard rock Mudstone.
2) Sidewall stable.
3) No water seepage.
4) No sample taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 13.422
Y-COORD : S29 13.009

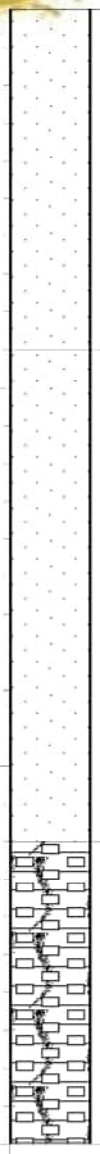
HOLE No: TP533

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP534
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown, stiff, sandy CLAY. **COLLUVIUM**.

0.90

1.00m ● Slightly moist, olive brown blotched off-white, stiff, sandy SILT with localised ferricrete nodules. **COLLUVIUM**.

2.20 Olive brown, moderately weathered, fine grained, closely jointed, soft rock. **MUDSTONE**.

Notes:
1. With calcrete pockets

3.00

NOTES

1) Terminated @ 3.00m.
2) Sidewall stable.
3) No water seepage.
4) Disturbed sample @ 1.00m.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 13.394
Y-COORD : S29 12.959

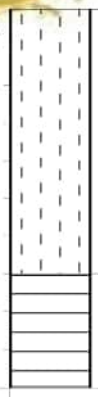
HOLE No: TP534

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP535
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, orange brown, medium dense, silty SAND. **COLLUVIUM**.

0.70 Light grey blotched bluish and orange, moderately weathered, medium grained, closely jointed, soft rock. **INDURATED MUDSTONE**.

1.00

NOTES

1) Refusal @ 1.00m on medium hard rock Indurated Mudstone.
2) Sidewall stable.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 13.410
Y-COORD : S29 12.928

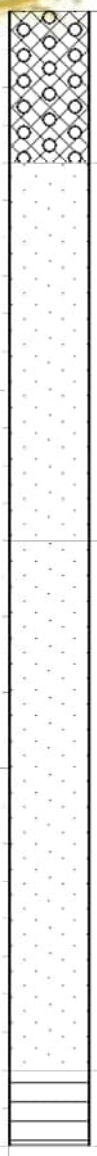
HOLE No: TP535

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP536
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Pale brown, weathered rock gravel. **FILL**.

0.40 Moist, orange brown, firm, sandy CLAY. **COLLUVIUM**.

1.40 Slightly moist, pale brown and olive brown blotched off-white, stiff, sandy SILT with weathered calcrete and weathered rock. **RESIDUAL MUDSTONE**.

2.80 Olive brown, highly weathered, fine grained, very thinly bedded, closely jointed, very soft rock. **MUDSTONE**.

3.00

NOTES

1) Terminated @ 3.00m.
2) Sidewall stable.
3) No water seepage.
4) No sample taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 13.195
Y-COORD : S29 12.822

HOLE No: TP536

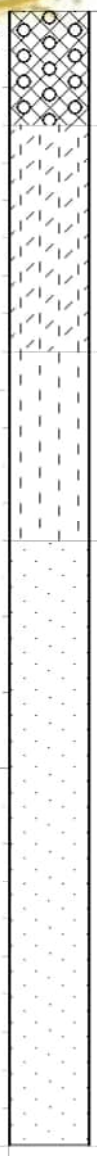
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP537
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Pale brown, weathered rock gravel. **FILL**.
0.30	Slightly moist, orange brown, medium dense, clayey silty SAND. **COLLUVIUM**.
0.90	Moist, brown speckled orange brown, firm, silty CLAY. **COLLUVIUM**.
1.40	Slightly moist, pale brown and olive brown blotched off-white, stiff, sandy SILT with weathered calcrete and weathered rock. **RESIDUAL MUDSTONE**.
3.00	

NOTES

1) Terminated @ 3.00m.
2) Sidewall stable.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 12.982
Y-COORD : S29 12.715

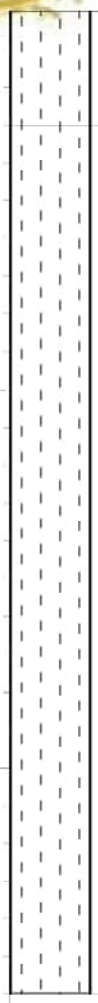
HOLE No: TP537

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP538
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Moist, brown, medium dense, silty SAND with abundant gravel, cobbles and boulders. **FILL**.

0.30 Moist, pale brown blotched off-white, silty CLAY with weathered calcrete, cobbles and boulders. **COLLUVIUM**.

2.60

NOTES

1) Refusal @ 2.60 on boulders.
2) Sidewall stable.
3) No water seepage.
4) No sample taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 12.831
Y-COORD : S29 12.638

HOLE No: TP538

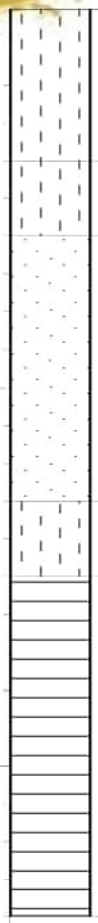
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP539
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00	Slightly moist, brown, medium dense, silty SAND with abundant gravel and cobbles. **FILL**.
0.40	Slightly moist, orange brown, medium dense, silty SAND. **COLLUVIUM**.
0.60	Moist, dark brown blotched orange, firm to soft, sandy CLAY. **COLLUVIUM**.
1.30	Moist, olive brown, soft, silty CLAY with weathered rock gravel. **RESIDUAL MUDSTONE**.
1.50	Olive brown blotched bluish, moderately weathered, fine grained, very thinly bedded, very closely jointed, soft rock. **INDURATED MUDSTONE**.
2.40	

NOTES

1) Refusal @ 2.40m on medium hard rock Indurated Mudstone.
2) Sidewall stable.
3) Seepage @ 1.5m.
4) No sample taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024

DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 12.616
Y-COORD : S29 12.529

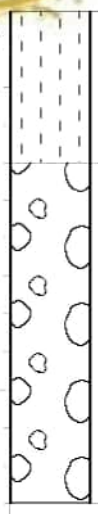
HOLE No: TP539

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP540
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, orange brown, medium dense, silty SAND with gravel and roots. **COLLUVIUM**.

0.40 Well packed, subangular GRAVEL. COBBLES and BOILDERS in clayey sand matrix. Overall consistency is dense. **RESIDUAL DOLERITE**.

1.30

NOTES

1) Refusal @ 1.30m on Dolerite Boulders.
2) Sidewall stable.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 12.542
Y-COORD : S29 12.491

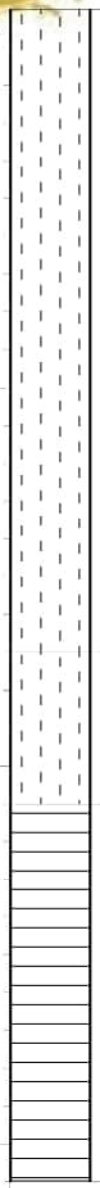
HOLE No: TP540

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP541
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Moist, orange brown, firm, silty CLAY with localised gravel. **ALLUVIUM**.

1.70 Moist, olive brown, stiff, silty CLAY with weathered rock. **RESIDUAL SHALE**.

2.10 Olive brown and green, highly weathered, medium grained, very intensely laminated, very closely jointed, very soft rock. **SHALE**.

3.10

NOTES

1) Terminated @ 3.10m.
2) Sidewall stable.
3) No water seepage.
4) Disturbed sample @ 1.0m.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 12.501
Y-COORD : S29 12.424

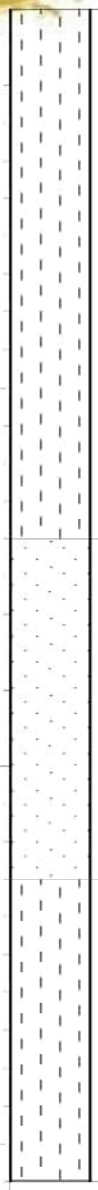
HOLE No: TP541

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP542
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Moist, dark brown blotched orange, firm, silty CLAY. **COLLUVIUM**.

1.40 Moist, pale brown blotched off-white, firm, sandy SILT with abundant weathered calcrete nodules and localised ferricrete nodules. **CALCRETISED SILT**.

2.30 Moist, olive brown, slickensided, stiff, silty CLAY with weathered rock. **RESIDUAL MUDSTONE**.

3.10

NOTES

1) Terminated @ 3.10m.
2) Sidewall stable.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 12.384
Y-COORD : S29 12.234

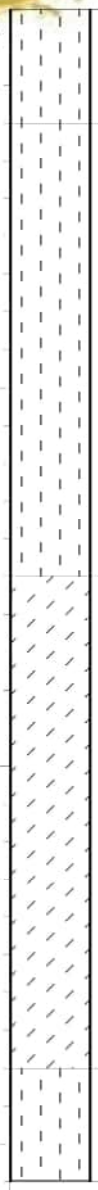
HOLE No: TP542

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP543
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, medium dense, silty SAND with abundant gravel. **FILL**.

0.30 Moist, orange brown, stiff, silty CLAY with subrounded ferricrete gravel. **COLLUVIUM**

1.50 Moist, dark purple brown and pale brown blotched off-white, firm, clayey SILT with pockets of sand. **REWORKED RESIDUAL MUDSTONE**.

2.80 Slightly moist, olive brown, stiff, silty CLAY with highly weathered mudstone rock. **RESIDUAL MUDSTONE**.

3.10

NOTES

1) Terminated @ 3.10m.
2) Sidewall stable.
3) No water seepage.
4) No sample taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 12.264
Y-COORD : S29 12.044

HOLE No: TP543

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP544
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00 Grey and brown, dense, weathered mudstone and dolerite rock gravel. **FILL**.

0.70 Moist, yellow brown, firm, sandy silty CLAY with dolerite rock gravel and cobbles. **RESIDUAL DOLERITE**.

1.80 **CONCRETE, PIPELINE JACKED BELOW A ROAD**.

NOTES

1) Terminated @ 1.80m due to existing pipe.
2) Sidewall stable.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Excavated @ a dump site
7) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 12.180
Y-COORD : S29 11.906

HOLE No: TP544

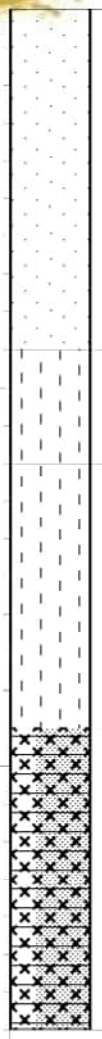
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP545
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00		Moist, orange brown, firm. sandy CLAY. **COLLUVIUM**.
0.90		Moist, yellow brown blotched olive and off-white, firm, silty CLAY with abundant dolerite cobbles. **RESIDUAL MUDSTONE**.
	1.2m	
1.20		Moist, olive brown, firm, silty CLAY with abundant mudstone rock gravel. **RESIDUAL MUDSTONE**.
1.90		Olive brown blotched bluish, moderately weathered, fine grained, closely jointed, soft to soft rock. **MUDSTONE**. Notes: 1. Possible contact with dolerite
2.70		

NOTES

1) Refusal @ 2.70m on medium hard rock Mudstone.
2) Sidewall stable.
3) No water seepage.
4) Disturbed sample @ 1.2m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 12.061
Y-COORD : S29 11.716

HOLE No: TP545

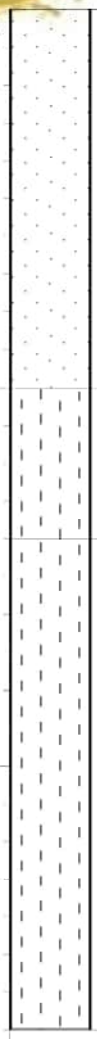
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP546
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark purple brown, very stiff, sandy CLAY. Completely Weathered Rock. **FILL**.

1.00 Slightly moist, yellow brown, dense, silty SAND with highly weathered rock gravel. **RESIDUAL SANDSTONE**.

1.40 Slightly moist, dark olive brown, very stiff, silty CLAY with pockets of sand and calcrete. **RESIDUAL MUDSTONE**.

2.70

NOTES

1) Near refusal on very stiff Mudstone.
2) Sidewall stable.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 11.943
Y-COORD : S29 11.526

HOLE No: TP546

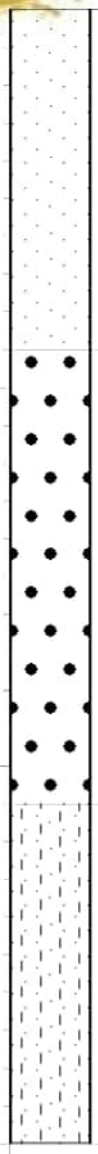
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP547
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown, stiff, sandy CLAY. **COLLUVIUM**.

0.90 Slightly moist, pale brown blotched grey brown, stiff, with ferricrete nodules. **ALLUVIUM**.

2.10 Slightly moist, grey blotched red brown speckled black, sandy silty CLAY with ferricrete nodules becoming cemented with depth. **NODULAR FERRICERTE**.

3.00

NOTES

1) Terminated @ 3.00m.
2) Sidewall stable.
3) No water seepage.
4) No sample taken.
5) DCP done.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 11.871
Y-COORD : S29 11.408

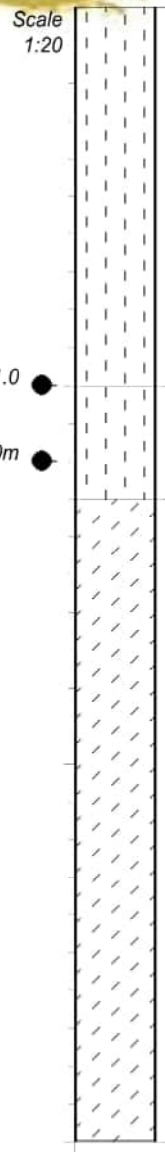
HOLE No: TP547

NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP548
Sheet 1 of 1

JOB NUMBER: NVG013



0.00 Moist, dark brown, firm, silty CLAY. **ALLUVIUM**.

1.00 Moist, orange brown, medium dense, silty SAND. **COLLUVIUM**.

1.30 Moist, pale olive brown blotched off-white, clayey SILT with pockets of sand, mottled orange and ferricrete nodules. **NODULAR FERRICRETE**.

3.00

NOTES

1) Terminated @ 3.00m.
2) Sidewall stable.
3) No water seepage.
4) Disturbed sample @ 1.0 and 1.20m.
5) DCP done.
6) Excavated near a gulley.
7) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 11.753
Y-COORD : S29 11.343

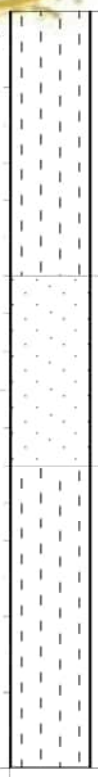
HOLE No: TP548

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP549
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown, stiff, silty CLAY. **COLLUVIUM**.

0.70 Slightly moist, orange brown, stiff, sandy CLAY. **COLLUVIUM**.

1.20 Slightly moist, pale brown blotched off-white, very stiff, silty CLAY with weathered calcrete and ferricrete nodules. **CALCRETISED CLAY**.

Notes:
1. Tyre marks

2.00

NOTES

1) Refusal @ 2.00m in very stiff clay.
2) Sidewall stable.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 11.923
Y-COORD : S29 11.201

HOLE No: TP549

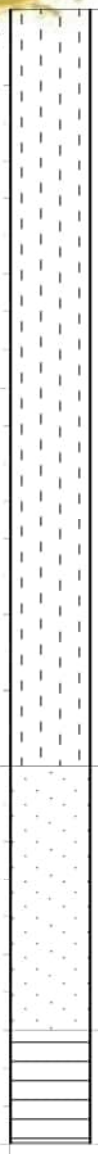
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP550
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, orange brown, loose to medium dense, silty SAND with abundant angular slightly weathered gravel. **FILL**.

2.00 Slightly moist, pale brown, possibly firm, sandy SILT with gravel. **RESIDUAL MUDSTONE**.

2.70 Olive green blotched bluish, moderately weathered, fine grained, closely jointed, soft rock. **INDURATED MUDSTONE**.

3.00

NOTES

1) Terminated @ 3.00m.
2) Sidewall slightly unstable.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Profiled from spoil.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 12.089
Y-COORD : S29 11.060

HOLE No: TP550

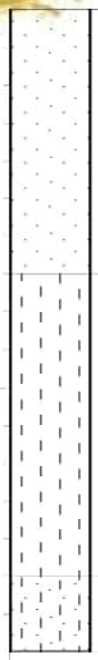
NATUREVHUDI GROUP (PTY) LTD

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP551
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown, stiff, sandy CLAY with gravel and cobbles. **COLLUVIUM**.

0.70 Moist, orange brown, medium dense, silty SAND with gravel. **COLLUVIUM**.

1.50 Moist, yellow brown mottled orange, dense, sandy silty CLAY with abundant angular dolerite GRAVEL,COBBLES and BOULDERS up to 0.3m. **RESIDUAL MUDSTONE**.

1.70

NOTES

1) Refusal @ 1.70m on boulders.
2) Sidewall stable.
3) No water seepage.
4) No sample taken.
5) DCP done.
6) Near a dump site.
7) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 12.003
Y-COORD : S29 10.947

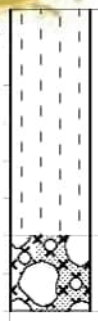
HOLE No: TP551

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP552
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, brown, medium dense, silty SAND with abundant gravel, cobbles and boulders. **FILL**.

0.60 Moist, yellow brown speckled orange, medium dense, GRAVEL,COBBLES and BOULDERS of dolerite. **RESIDUAL DOLERITE**.

0.80

NOTES

1) Refusal @ 0.80m on boulders.
2) Sidewall slightly collapsing.
3) No water seepage.
4) No sample taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe
TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024
DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 11.914
Y-COORD : S29 10.827

HOLE No: TP552

Zutari
Xhariep Pipeline Project Part 2

HOLE No: TP554
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20

0.00

SANDSTONE OUTCROP.

0.00

NOTES

1) Sandstone outcrop.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : Sam
PROFILED BY : W Muofhe

TYPE SET BY : W Muofhe
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 01/11/2024

DATE : 07/12/2024 14:52
TEXT : ..pProfilesPipeline2.3.txt

ELEVATION :
X-COORD : E26 11.925
Y-COORD : S29 10.654

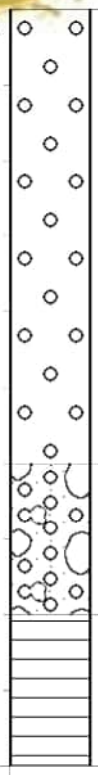
HOLE No: TP554

ZUTARI
Xhariep Pipeline Project

HOLE No: TP01
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:10



0.00 Slightly moist, yellowish brown speckled dark grey banded greenish grey, loose to medium dense, intact, gravelly SAND with occasional subangular dolerite cobbles and boulders. **FILL**.

0.60 Slightly moist, reddish brown speckled grey, soft to firm, shattered, sandy CLAY with occasional weathered mudstone rock gravel and cobbles. **RESIDUAL MUDSTONE**.

0.80 Pale olive green stained reddish brown , highly to moderately weathered, thinly bedded, very closely jointed, soft to medium hard rock. **MUDSTONE**.

1.00

NOTES

1) Refusal @ 1.0m on medium hard rock Mudstone.
2) Sidewalls collapsing on fill.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : SAM
PROFILED BY : Wendy Muofhe
TYPE SET BY : Thabang Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 9/11/2024
DATE : 06/12/2024 01:07
TEXT : ..reProfilesStructures.txt

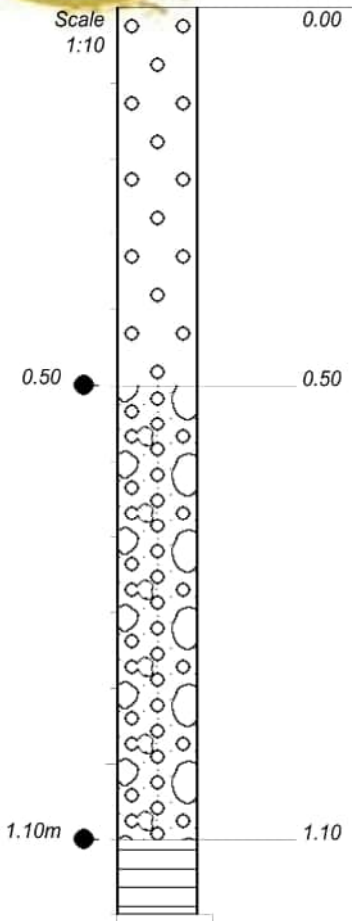
ELEVATION :
X-COORD : S30 37.497
Y-COORD : E25 29.171

HOLE No: TP01
FREE STATE

ZUTARI
Xhariep Pipeline Project

HOLE No: TP02
Sheet 1 of 1

JOB NUMBER: NVG013



0.00 Slightly moist, yellowish brown speckled dark grey, loose to medium dense, intact gravelly SAND with occasional subangular dolerite cobbles and boulders. **FILL**.

0.50 Slightly moist, reddish brown, soft to firm, shattered, sandy CLAY with occasional weathered mudstone rock gravel and cobbles. **RESIDUAL MUDSTONE**.

1.10 Pale olive green stained reddish brown, highly to moderately weathered, thinly bedded, very closely jointed, soft to medium hard rock. **MUDSTONE**.

1.20

NOTES

1) Refusal @ 1.2m on medium hard rock Mudstone.
2) Sidewalls collapsing on fill.
3) No water seepage.
4) Disturbed samples from 0.50 - 1.10m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : SAM
PROFILED BY : Wendy Muofhe
TYPE SET BY : Thabang Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 9/11/2024
DATE : 06/12/2024 01:07
TEXT : ..reProfilesStructures.txt

ELEVATION :
X-COORD : S30 37.459
Y-COORD : E25 29.095

HOLE No: TP02

ZUTARI
Xhariep Pipeline Project

HOLE No: TP03
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:10

0.00 Dark grey stained reddish brown, moderately weathered, medium grained, very closely jointed, hard rock, **DOLERITE**.

0.10

NOTES

1) Dolerite rock outcrop.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : SAM
PROFILED BY : Wendy Muofhe

TYPE SET BY : Thabang Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 9/11/2024

DATE : 06/12/2024 01:07
TEXT : ..reProfilesStructures.txt

ELEVATION :
X-COORD : S30 37.493
Y-COORD : E25 29.061

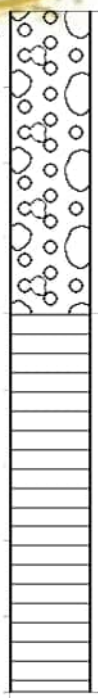
HOLE No: TP03

ZUTARI
Xhariep Pipeline Project

HOLE No: TP04
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:10



0.00 Well packed angular, highly weathered, mudstone gravel and cobbleS. Overall consistency is medium dense. **RESIDUAL MUDSTONE**.

0.40 Pale olive green stained reddish brown, highly to moderately weathered, thinly bedded, very closely jointed, soft to medium hard rock. **MUDSTONE**.

0.90

NOTES

1) Refusal @ 0.90m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : SAM
PROFILED BY : Wendy Muofhe
TYPE SET BY : Thabang Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 9/11/2024
DATE : 06/12/2024 01:07
TEXT : ..reProfilesStructures.txt

ELEVATION :
X-COORD : S30 37.538
Y-COORD : E25 29.138

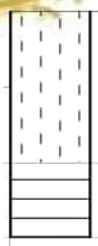
HOLE No: TP04

ZUTARI
Xhariep Pipeline Project

HOLE No: TP06
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:10



0.00 Slightly moist, dark brown speckled grey, loose, intact, silty SAND. **COLLUVIUM**.

0.20 Pale olive green stained reddish brown, highly to moderately weathered, fine grained, thinly bedded, very closely jointed, medium hard rock. **MUDSTONE**.

0.30

NOTES

1) Refusal @ 0.3m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : SAM
PROFILED BY : Wendy Muofhe
TYPE SET BY : Thabang Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 9/11/2024
DATE : 06/12/2024 01:07
TEXT : ..reProfilesStructures.txt

ELEVATION :
X-COORD : S30 37.538
Y-COORD : E25 29.138

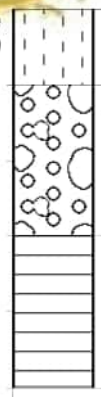
HOLE No: TP06

ZUTARI
Xhariep Pipeline Project

HOLE No: TP07
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:10



0.00 Slightly moist, dark brown speckled grey, loose, intact, silty SAND. **COLLUVIUM**.

0.10 Well packed angular, highly weathered, mudstone gravel and cobbleS. Overall consistency is medium dense. **RESIDUAL MUDSTONE**.

0.30 Pale olive green stained reddish brown, highly to moderately weathered, fine grained, thinly bedded, very closely jointed, soft to medium hard rock. **MUDSTONE**.

0.50

NOTES

1) Refusal @ 0.5m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : SAM
PROFILED BY : Wendy Muofhe
TYPE SET BY : Thabang Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 9/11/2024
DATE : 06/12/2024 01:07
TEXT : ..reProfilesStructures.txt

ELEVATION :
X-COORD : S30 32.741
Y-COORD : E25 30.664

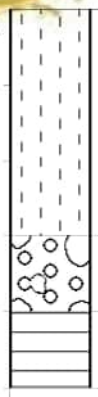
HOLE No: TP07

ZUTARI
Xhariep Pipeline Project

HOLE No: TP08
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:10



0.00 Slightly moist, dark brown speckled grey, loose to medium dense, intact, silty SAND. **COLLUVIUM**.

0.30 Well packed angular, highly weathered, mudstone gravel and cobbleS. Overall consistency is dense. **RESIDUAL MUDSTONE**.

0.40 Pale olive green stained reddish brown, highly to moderately weathered, fine grained, thinly bedded, very closely jointed, soft to medium hard rock. **MUDSTONE**.

0.50

NOTES

1) Refusal @ 0.5m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Profiled in-situ.
5) No samples taken.
6) No DCP.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : SAM
PROFILED BY : Wendy Muofhe
TYPE SET BY : Thabang Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 9/11/2024
DATE : 06/12/2024 01:07
TEXT : ..reProfilesStructures.txt

ELEVATION :
X-COORD : S30 32.741
Y-COORD : E25 30.664

HOLE No: TP08

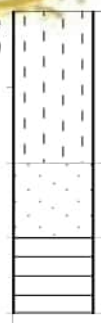
ZUTARI
Xhariep Pipeline Project

HOLE No: TP09
Sheet 1 of 1

JOB NUMBER: NVG013

0.0-0.2m

Scale 1:10



0.00 Slightly moist, dark brown speckled grey, loose, intact, silty SAND. **COLLUVIUM**.

0.20 Slightly moist, dark brown speckled pale olive green, firm to stiff, shattered, slightly sandy CLAY with occasional weathered mudstone rock cobbles. **RESIDUAL MUDSTONE**.

0.30 Pale olive green stained reddish brown, highly to moderately weathered, fine grained, thinly bedded, very closely jointed, soft to medium hard rock. MUDSTONE.

0.40

NOTES

1) Refusal @ 0.4m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Profiled in-situ.
5) Disturbed samples from 0.0-0.2m.
6) No DCP.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : SAM
PROFILED BY : Wendy Muofhe
TYPE SET BY : Thabang Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 9/11/2024
DATE : 06/12/2024 01:07
TEXT : ..reProfilesStructures.txt

ELEVATION :
X-COORD : S30 32.743
Y-COORD : E25 30.553

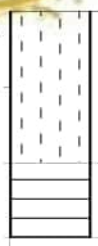
HOLE No: TP09

ZUTARI
Xhariep Pipeline Project

HOLE No: TP10
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:10



0.00 Slightly moist, dark brown speckled grey, medium dense, intact, silty SAND. **COLLUVIUM**.

0.20 Pale olive green stained reddish brown, highly to moderately weathered, fine grained, thinly bedded, very closely jointed, soft to medium hard rock. **MUDSTONE**.

0.30

NOTES

1) Refusal @ 0.30m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : SAM
PROFILED BY : Wendy Muofhe
TYPE SET BY : Thabang Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 9/11/2024
DATE : 06/12/2024 01:07
TEXT : ..reProfilesStructures.txt

ELEVATION :
X-COORD : S30 32.855
Y-COORD : E25 30.482

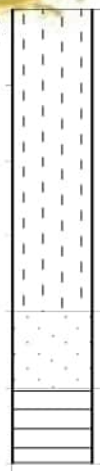
HOLE No: TP10

ZUTARI
Xhariep Pipeline Project

HOLE No: TP11
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:10



0.00 Slightly moist, dark brown speckled grey, loose to medium dense, intact, silty SAND. **COLLUVIUM**.

0.40 Slightly moist, dark brown speckled pale olive green, firm to stiff, shattered, slightly sandy CLAY with occasional weathered mudstone rock cobbles. **RESIDUAL MUDSTONE**.

0.50 Pale olive green, highly to moderately weathered, fine grained, thinly bedded, very closely jointed, soft to medium hard rock. **MUDSTONE**.

0.60

NOTES

1) Refusal @ 0.60m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : SAM
PROFILED BY : Wendy Muofhe
TYPE SET BY : Thabang Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 9/11/2024
DATE : 06/12/2024 01:07
TEXT : ..reProfilesStructures.txt

ELEVATION :
X-COORD : S30 32.881
Y-COORD : E25 30.345

HOLE No: TP11

ZUTARI
Xhariep Pipeline Project

HOLE No: TP12
Sheet 1 of 1

JOB NUMBER: NVG013

0.0-0.3m

Scale 1:10

0.00 Slightly moist, dark brown speckled grey, medium dense, intact, silty SAND. **COLLUVIUM**.

0.30 Pale olive green stained reddish brown, highly to moderately weathered, fine grained, thinly bedded, very closely jointed, soft to medium hard rock. **MUDSTONE**.

0.40

NOTES

1) Refusal @ 0.4m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed samples from 0.0-0.3m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : SAM
PROFILED BY : Wendy Muofhe
TYPE SET BY : Thabang Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 9/11/2024
DATE : 06/12/2024 01:07
TEXT : ..reProfilesStructures.txt

ELEVATION :
X-COORD : S30 32.794
Y-COORD : E25 30.34

HOLE No: TP12

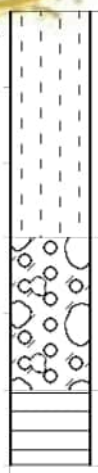
ZUTARI
Xhariep Pipeline Project

HOLE No: TP13
Sheet 1 of 1

JOB NUMBER: NVG013

0.0-0.3m

Scale 1:10



0.00 Slightly moist, dark brown speckled grey, medium dense, intact, silty SAND. **COLLUVIUM**.

0.30 Moderately packed, angular, highly weathered mudstone gravel and cobbleS in a clayey sand matrix. Overall consistency is medium dense to dense. **RESIDUAL MUDSTONE**.

0.50 Pale olive green stained reddish brown, highly to moderately weathered, fine grained, thinly bedded, very closely jointed, soft to medium hard rock. **MUDSTONE**.

0.60

NOTES

1) Refusal @ 0.6m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed samples from 0.0-0.3m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : SAM
PROFILED BY : Wendy Muofhe
TYPE SET BY : Thabang Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 9/11/2024
DATE : 06/12/2024 01:07
TEXT : ..reProfilesStructures.txt

ELEVATION :
X-COORD : S30 32.73
Y-COORD : E25 30.444

HOLE No: TP13

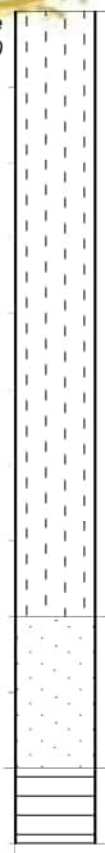
ZUTARI
Xhariep Pipeline Project

HOLE No: TP14
Sheet 1 of 1

JOB NUMBER: NVG013

0.0-0.8m

Scale 1:10



0.00 Slightly moist, dark brown speckled grey, loose to medium dense, intact, silty SAND. **COLLUVIUM**.

0.80 Slightly moist, dark brown speckled pale olive green, firm to stiff, shattered, slightly sandy CLAY with occasional weathered mudstone rock cobbles. **RESIDUAL MUDSTONE**.

1.00 Pale olive green, highly to moderately weathered, fine grained, thinly bedded, very closely jointed, soft to medium hard rock. **MUDSTONE**.

1.10

NOTES

1) Refusal @ 1.10m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) Disturbed samples from 0.0-0.8m.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : SAM
PROFILED BY : Wendy Muofhe
TYPE SET BY : Thabang Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 9/11/2024
DATE : 06/12/2024 01:07
TEXT : ..reProfilesStructures.txt

ELEVATION :
X-COORD : S30 32.876
Y-COORD : E25 30.414

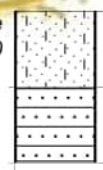
HOLE No: TP14

ZUTARI
Xhariep Pipeline Project

HOLE No: TP15
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:10



0.00 Slightly moist, dark brown speckled grey, loose, intact, silty SAND. **COLLUVIUM**.

0.10 Pale olive green stained reddish brown, highly to moderately weathered, fine grained, thinly bedded, very closely jointed, soft to medium hard rock. **SANDSTONE**.

0.20

NOTES

1) Refusal @ 0.2m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : SAM
PROFILED BY : Wendy Muofhe
TYPE SET BY : Thabang Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 9/11/2024
DATE : 06/12/2024 01:07
TEXT : ..reProfilesStructures.txt

ELEVATION :
X-COORD : S30 32.815
Y-COORD : E25 30.513

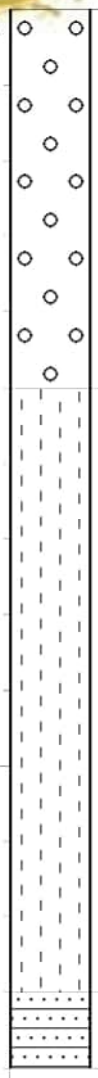
HOLE No: TP15

ZUTARI
Xhariep Pipeline Project

HOLE No: TP16
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:10



0.00 Slightly moist, dark brown speckled grey, loose to medium dense, intact, slightly gravelly SAND with subangular dolerite cobbles. **COLLUVIUM**.

0.50 Slightly moist, orangey brown speckled grey, dense to very dense, intact, silty SAND with occasional cobbles. **COLLUVIUM**.

1.30 Light grey, slightly to moderately weathered, medium grained, thinly bedded, very closely jointed, medium hard rock. **SANDSTONE**.

1.40

NOTES

1) Refusal @ 1.40m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : SAM
PROFILED BY : Wendy Muofhe
TYPE SET BY : Thabang Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 9/11/2024
DATE : 06/12/2024 01:07
TEXT : ..reProfilesStructures.txt

ELEVATION :
X-COORD : S30 15.010
Y-COORD : E25 44.234

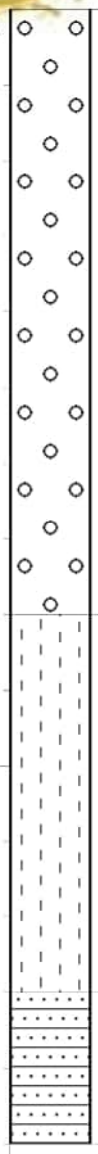
HOLE No: TP16

ZUTARI
Xhariep Pipeline Project

HOLE No: TP17
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:10



0.00 Slightly moist, dark brown speckled grey, loose to medium dense, intact, slightly gravelly SAND with subangular dolerite cobbles. **COLLUVIUM**.

0.80 Slightly moist, orangey brown speckled grey, dense to very dense, intact, silty SAND with occasional cobbles. **RESIDUAL SANDSTONE**.

1.30 Light grey, slightly to moderately weathered, medium grained, very closely jointed, hard to medium hard rock. **SANDSTONE**.

1.50

NOTES

1) Refusal @ 1.50m on medium hard rock Sandstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : SAM
PROFILED BY : Wendy Muofhe
TYPE SET BY : Thabang Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 9/11/2024
DATE : 06/12/2024 01:07
TEXT : ..reProfilesStructures.txt

ELEVATION :
X-COORD : S30 14.982
Y-COORD : E25 44.323

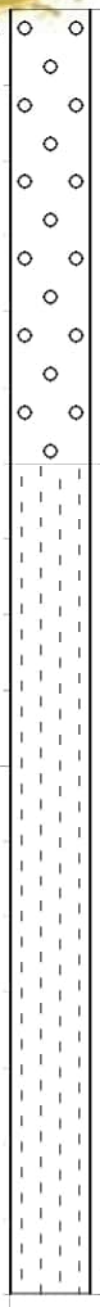
HOLE No: TP17

ZUTARI
Xhariep Pipeline Project

HOLE No: TP18
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:10



0.00 Slightly moist, dark brown speckled grey, loose to medium dense, intact, slightly gravelly SAND with subangular dolerite cobbles. **COLLUVIUM**.

0.60 Slightly moist, orangey brown speckled grey, dense to very dense, intact, silty SAND with occasional cobbles. **RESIDUAL SANDSTONE**.

1.70

NOTES

1) Refusal @ 1.70m on very dense sand.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : SAM
PROFILED BY : Wendy Muofhe
TYPE SET BY : Thabang Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 9/11/2024
DATE : 06/12/2024 01:07
TEXT : ..reProfilesStructures.txt

ELEVATION :
X-COORD : S30 15.079
Y-COORD : E25 44.266

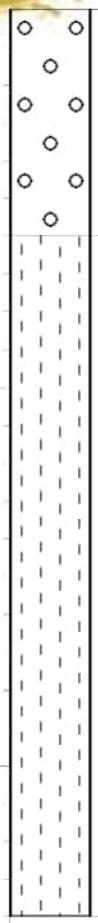
HOLE No: TP18

ZUTARI
Xhariep Pipeline Project

HOLE No: TP19
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:20



0.00 Slightly moist, dark brown speckled grey, loose to medium dense, intact, slightly gravelly SAND with subangular dolerite cobbles. **COLLUVIUM**.

0.60 Slightly moist, orangey brown speckled grey, dense to very dense, intact, silty SAND with occasional cobbles. **RESIDUAL SANDSTONE**.

2.40

NOTES

1) Refusal @ 2.4m on very dense sand.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : SAM
PROFILED BY : Wendy Muofhe
TYPE SET BY : Thabang Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 9/11/2024
DATE : 06/12/2024 01:09
TEXT : ..s\wendy\Downloads\19.txt

ELEVATION :
X-COORD : S30 15.053
Y-COORD : E25 44.352

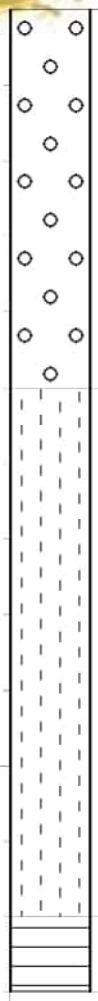
HOLE No: TP19

ZUTARI
Xhariep Pipeline Project

HOLE No: TP20
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:10



0.00 Slightly moist, dark brown speckled grey, loose to medium dense, intact, slightly gravelly SAND with subangular dolerite cobbles. **COLLUVIUM**.

0.50 Slightly moist, orangey brown speckled grey, dense to very dense, intact, silty Clayey SAND with occasional cobbles. **INTERBEDDED RISIDUAL SANDSTONE/MUDSTONE**.

1.20 Pale olive green stained reddish brown, highly to moderately weathered, thinly bedded, very closely jointed , soft to medium hard rock. **MUDSTONE**.

1.30

NOTES

1) Refusal @ 1.3m on medium hard rock Mudstone.
2) Sidewalls stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : SAM
PROFILED BY : Wendy Muofhe
TYPE SET BY : Thabang Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 9/11/2024
DATE : 06/12/2024 01:07
TEXT : ..reProfilesStructures.txt

ELEVATION :
X-COORD : S30 15.031
Y-COORD : E25 44.298

HOLE No: TP20

ZUTARI
Xhariep Pipeline Project

HOLE No: TP21
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:10

0.00 Pale brown, moderately weathered, medium grained, very thinly bedded, medium hard rock. **INTERBEDDED SHALE/SANDSTONE**.

0.10

NOTES

1) Refusal @ 0.1m on medium hard rock Mudstone.
2) Sidewall stable.
3) No water seepage.
4) Profiled in-situ.
5) No samples taken.
6) No DCP.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : SAM
PROFILED BY : Wendy Muofhe
TYPE SET BY : Thabang Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 9/11/2024
DATE : 06/12/2024 01:07
TEXT : ..reProfilesStructures.txt

ELEVATION :
X-COORD : S29 31.008
Y-COORD : E26 05.241

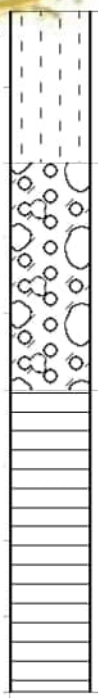
HOLE No: TP21

ZUTARI
Xhariep Pipeline Project

HOLE No: TP22
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:10



0.00 Slightly moist, brown, medium dense, intact, silty SAND with gravel and roots. **COLLUVIUM**.

0.20 Moderately packed, angular, highly weathered mudstone gravel and cobbles in a clayey SAND matrix. Overall consistency is medium dense **RESIDUAL MUDSTONE**.

0.50 Pale olive green, moderately weathered, fine grained, very thinly bedded, very closely jointed, soft to medium hard rock. **MUDSTONE**

0.90

NOTES

1) Refusal @ 0.90m on medium hard rock Mudstone.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : SAM
PROFILED BY : Wendy Muofhe
TYPE SET BY : Thabang Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 9/11/2024
DATE : 06/12/2024 01:07
TEXT : ..reProfilesStructures.txt

ELEVATION :
X-COORD : S29 30.987
Y-COORD : E26 05.156

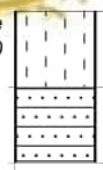
HOLE No: TP22

ZUTARI
Xhariep Pipeline Project

HOLE No: TP23
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:10



0.00 Slightly moist, brown, medium dense, , intact, silty SAND with abundant gravel and roots. **COLLUVIUM**.

0.10 Pale brown, moderately weathered, coarse grained, thinly bedded, very closely jointed, medium hard rock. **SANDSTONE**

0.20

NOTES

1) Refusal @ 0.20m on medium hard rock Sandstone.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : SAM
PROFILED BY : Wendy Muofhe
TYPE SET BY : Thabang Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 9/11/2024
DATE : 06/12/2024 01:07
TEXT : ..reProfilesStructures.txt

ELEVATION :
X-COORD : S29 30.830
Y-COORD : E26 05.218

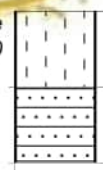
HOLE No: TP23

ZUTARI
Xhariep Pipeline Project

HOLE No: TP24
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:10



0.00 Slightly moist, brown, medium dense, intact, silty SAND with abundant gravel and roots. **COLLUVIUM** .

0.10 Pale brown, moderately weathered, coarse grained, thinly bedded, medium hard rock. **SANDSTONE**

0.20

NOTES

1) Refusal @ 0.20m on medium hard rock Sandstone.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : SAM
PROFILED BY : Wendy Muofhe
TYPE SET BY : Thabang Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 9/11/2024
DATE : 06/12/2024 01:07
TEXT : ..reProfilesStructures.txt

ELEVATION :
X-COORD : S29 30.853
Y-COORD : E26 05.303

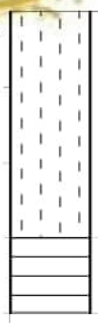
HOLE No: TP24

ZUTARI
Xhariep Pipeline Project

HOLE No: TP25
Sheet 1 of 1

JOB NUMBER: NVG013

Scale 1:10



0.00 Slightly moist, brown, medium dense, intact, silty SAND with gravel and roots. **COLLUVIUM**.

0.30 Pale brown blotched black, highly weathered, medium grained, intensely laminated, medium hard rock. **SHALE**

0.40

NOTES

1) Refusal @ 0.40m on medium hard rock Shale.
2) Sidewall stable.
3) No water seepage.
4) No samples taken.
5) No DCP.
6) Profiled in-situ.

CONTRACTOR : Mukona Geotechnics (pty) ltd
MACHINE : TLB
DRILLED BY : SAM
PROFILED BY : Wendy Muofhe
TYPE SET BY : Thabang Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 600mm
DATE :
DATE : 9/11/2024
DATE : 06/12/2024 01:07
TEXT : ..reProfilesStructures.txt

ELEVATION :
X-COORD : S29 30.913
Y-COORD : E26 05.187

HOLE No: TP25

ZUTARI
Xhariep Pipeline Project

LEGEND
Sheet 1 of 1

JOB NUMBER: NVG013

GRAVEL	{SA02}
GRAVELLY	{SA03}
SAND	{SA04}
SANDY	{SA05}
SILTY	{SA07}
CLAYEY	{SA09}
SANDSTONE	{SA11}
MUDSTONE/shale	{SA12}
DOLERITE	{SA18}{SA42}
DISTURBED SAMPLE	{SA38}
COBBLES	{SA58}

Name ●

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY :

TYPE SET BY : Thabang Mashiane
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE :

DATE : 06/12/2024 01:07
TEXT : ..reProfilesStructures.txt

ELEVATION :
X-COORD :
Y-COORD :

LEGEND
SUMMARY OF SYMBOLS

Appendix C - Test Pit Photographs

Pipeline Section 1

TP01

TP02

TP03

TP04

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Kosmosdal.
0157

Pipeline Section 1

TP05

TP06

TP07

TP08

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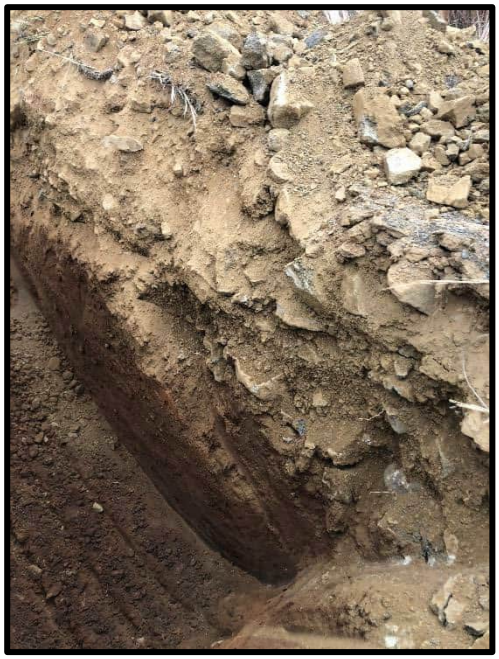
2466 Valley View Estate.
Kosmosdal.
0157

Pipeline Section 1

TP09

TP10

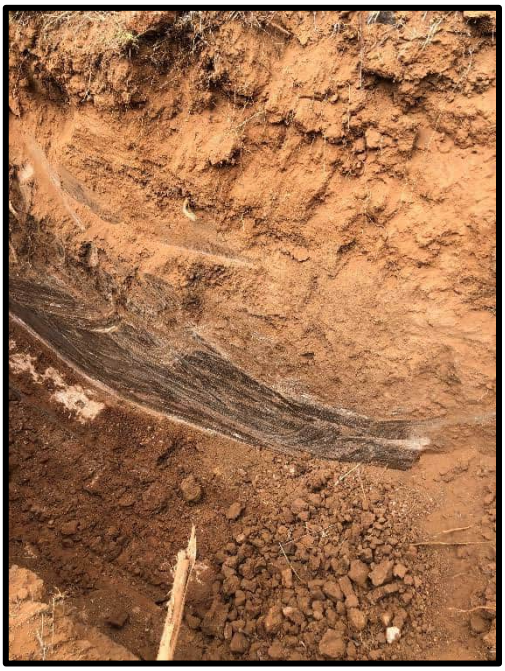


TP11

TP12

Pipeline Section 1

TP13



TP14

TP15

TP16

Pipeline Section 1

TP17

TP18

TP19

TP20

Pipeline Section 1

TP21

TP22

TP23

TP24

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Pipeline Section 1

TP25

TP26

TP27

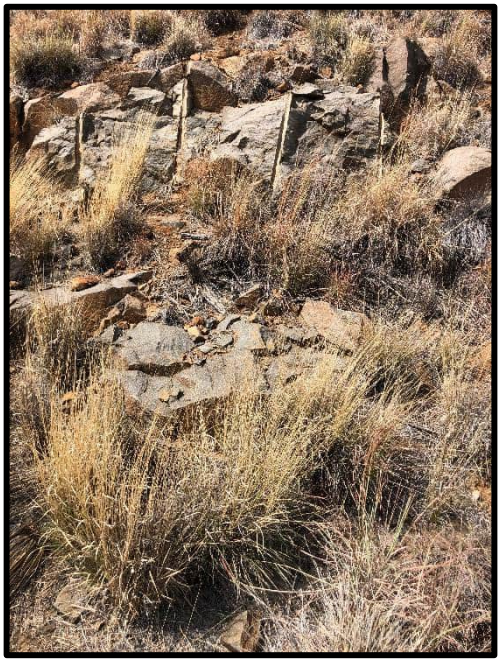
TP28

Pipeline Section 1

TP29

TP30

TP31



TP32

Pipeline Section 1

TP33

TP34

TP35

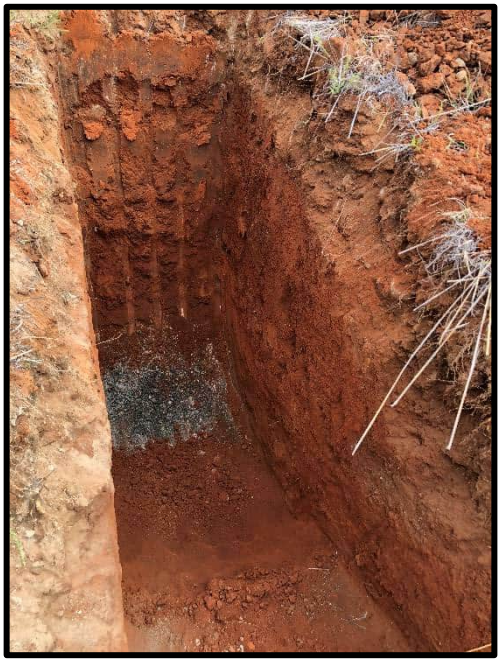
TP36

Pipeline Section 1

TP37

TP38

TP39



TP40

Pipeline Section 1

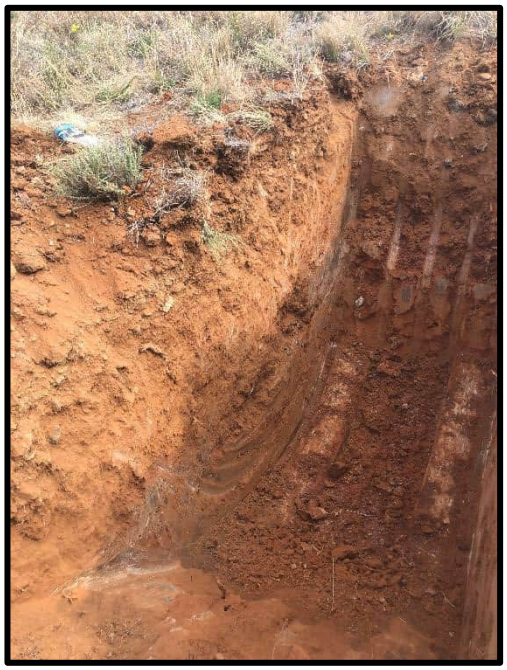
TP41

TP42

TP43

TP44

Pipeline Section 1



TP45

TP46

TP47

TP48

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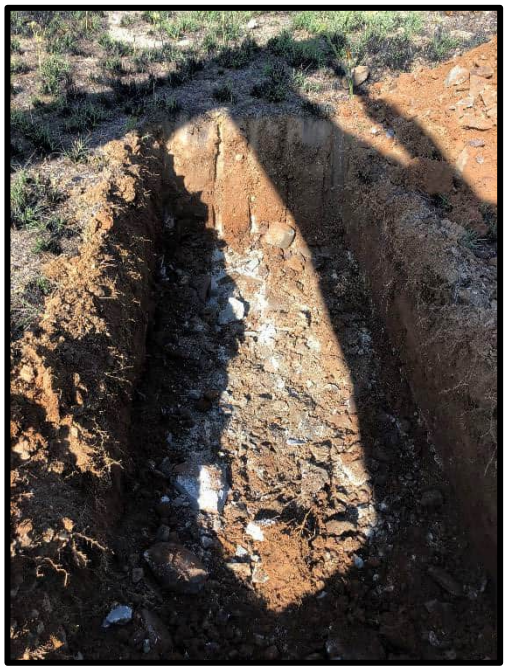
Pipeline Section 1



TP49

TP50

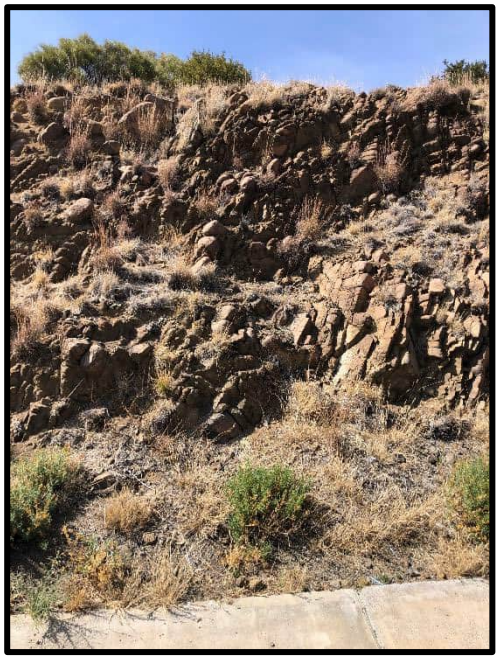
TP51

TP52

Pipeline Section 1

TP53

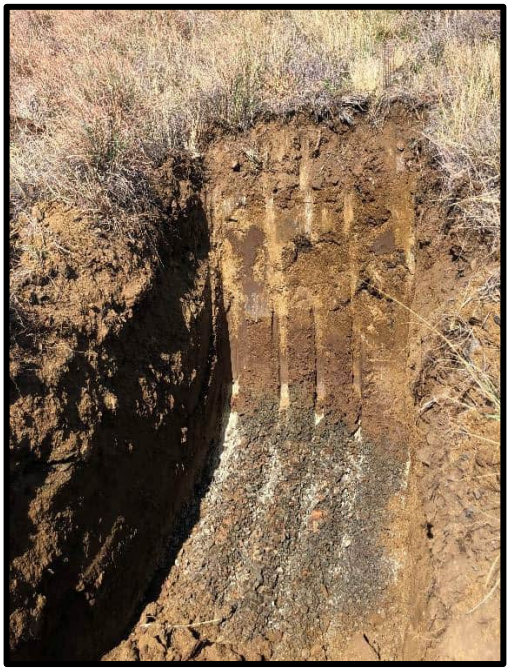
TP54



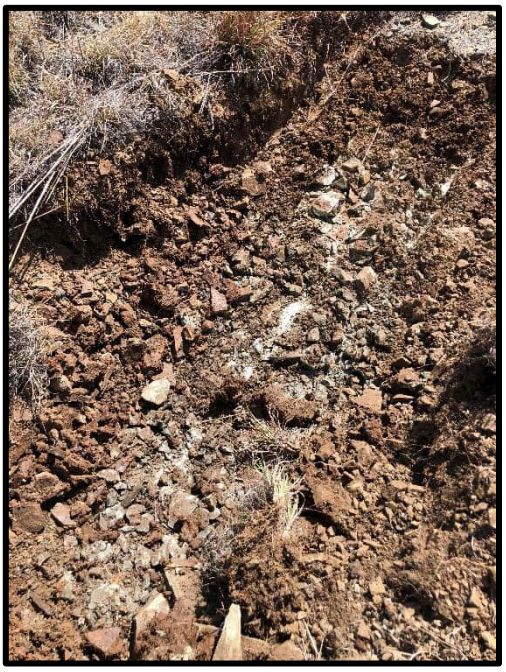
TP55

TP56

Pipeline Section 1



TP57



TP58

TP59

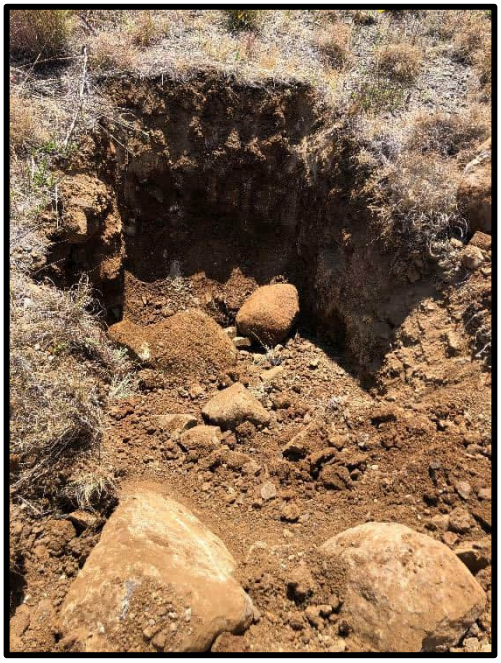
TP60

Pipeline Section 1

TP61

TP62

TP63

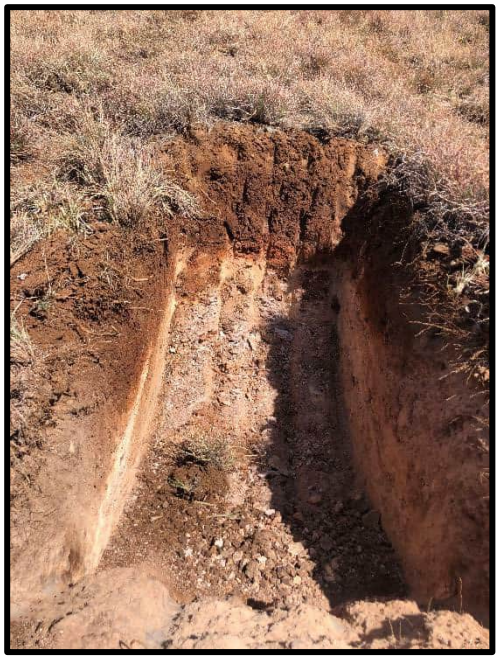


TP64

Pipeline Section 1

TP65

TP66



TP67

TP68

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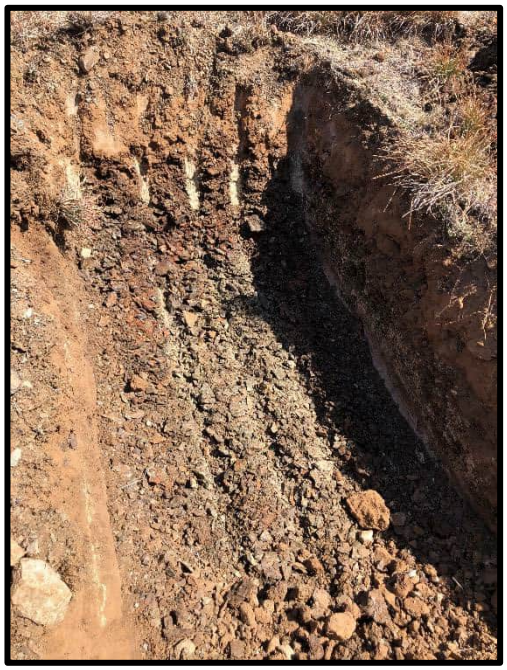
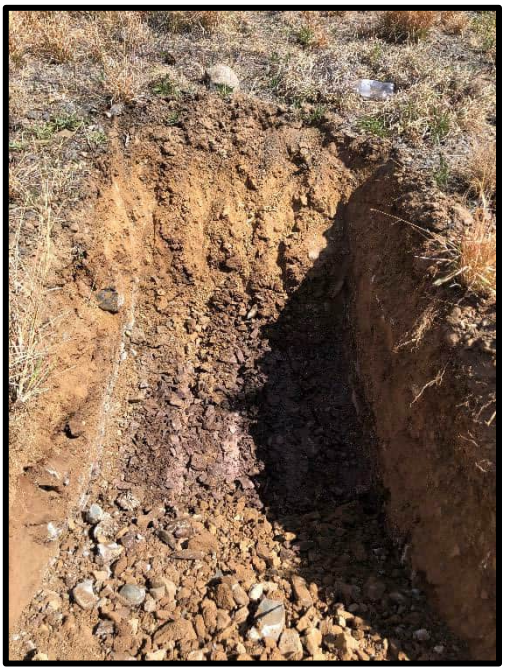
Pipeline Section 1



TP69



TP70

TP71

TP72

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Pipeline Section 1

TP73

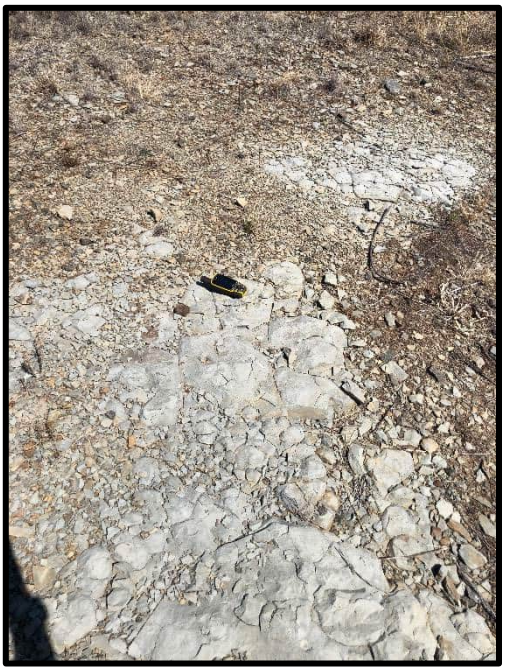
TP74

TP75

TP76

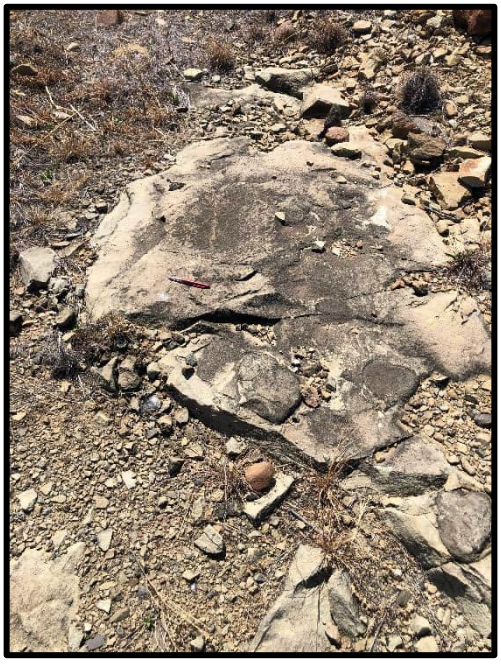
Pipeline Section 1

TP77



TP78

TP79



TP80

Pipeline Section 1

TP81

TP82

TP83

TP84

Pipeline Section 1

TP85

TP86

TP87

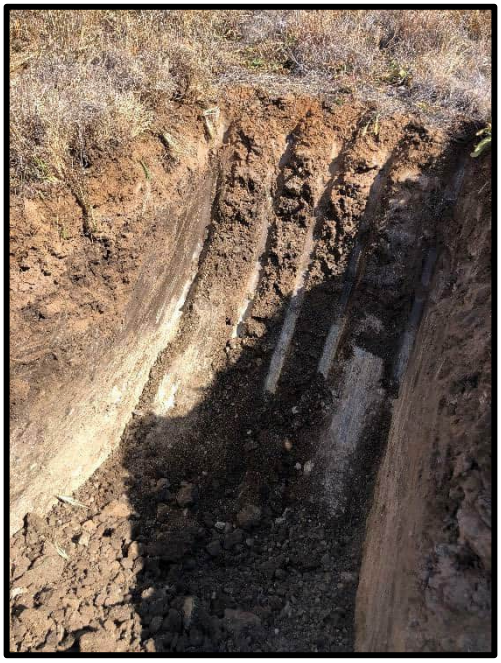
TP88

Pipeline Section 1

TP89

TP90

TP91



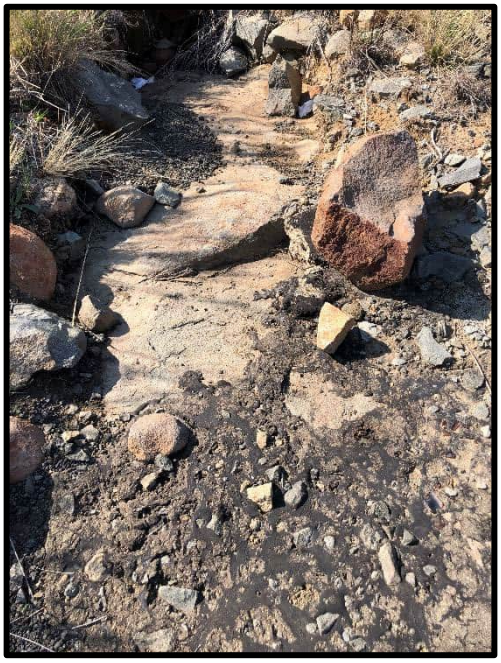
TP92

Pipeline Section 1

TP93

TP94

TP95



TP96

Pipeline Section 1

TP97

TP98

TP99

TP100

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Pipeline Section 1

TP101

TP102

TP103

TP104

Pipeline Section 1

TP105

TP106

TP107

TP108

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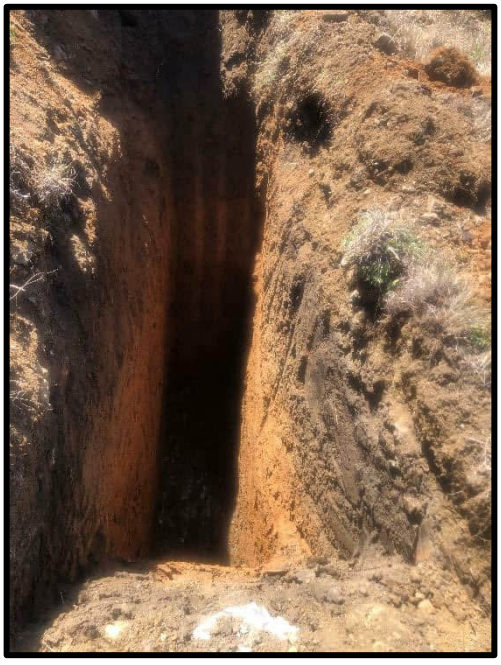
Pipeline Section 1

TP109

TP110

TP111

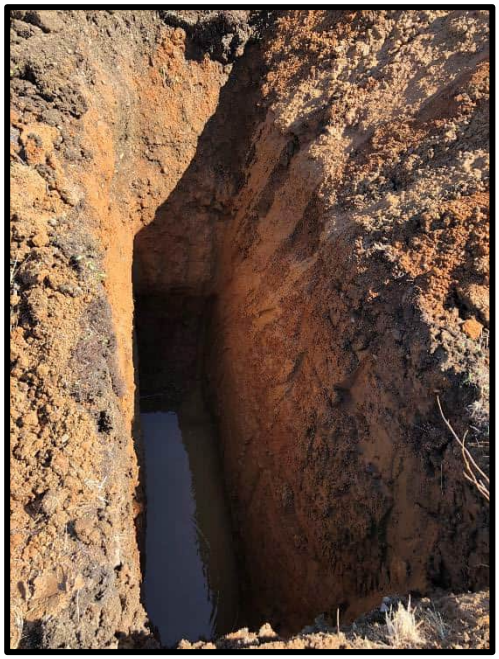


TP112

Pipeline Section 1

TP113

TP114



TP115

TP116

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Pipeline Section 1

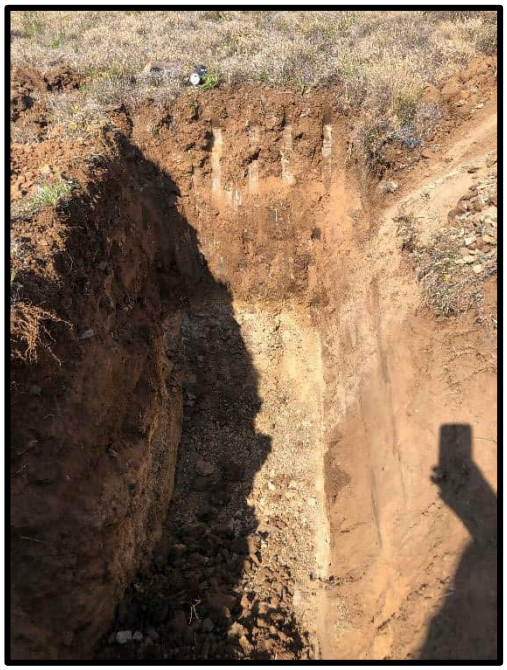
TP117

TP118

TP119

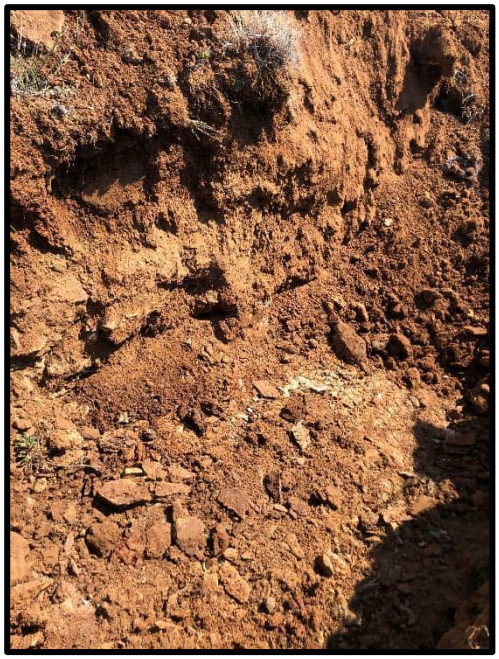
TP120

Pipeline Section 1



TP121

TP122

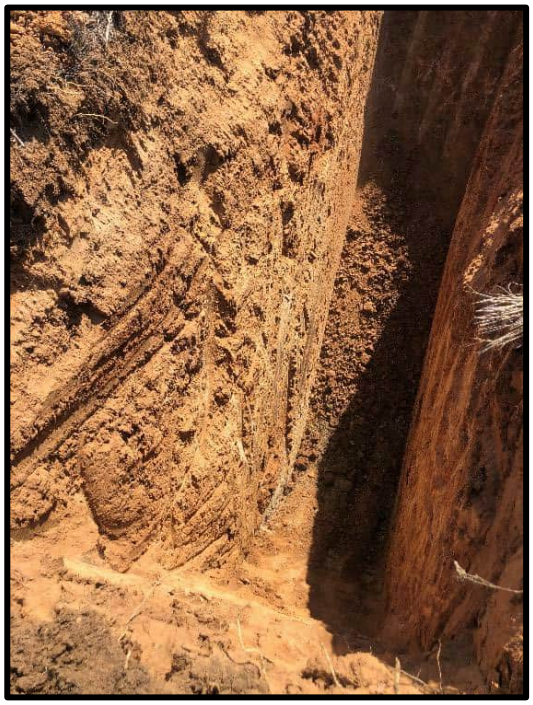


TP123

TP124

Pipeline Section 1

TP125



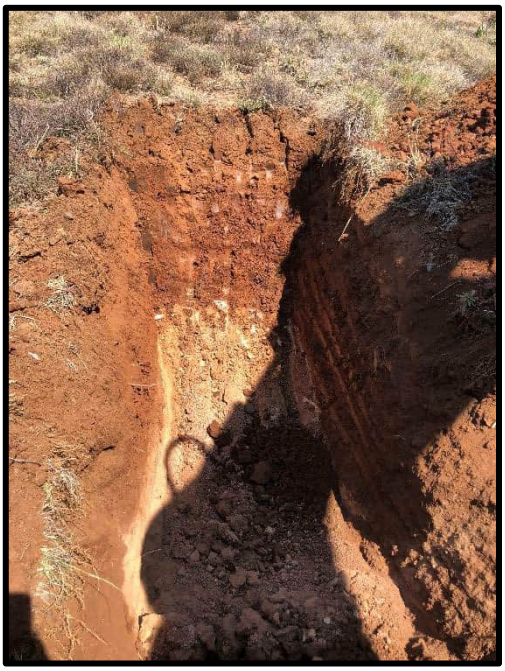
TP126

TP127

TP128

Pipeline Section 1

TP129

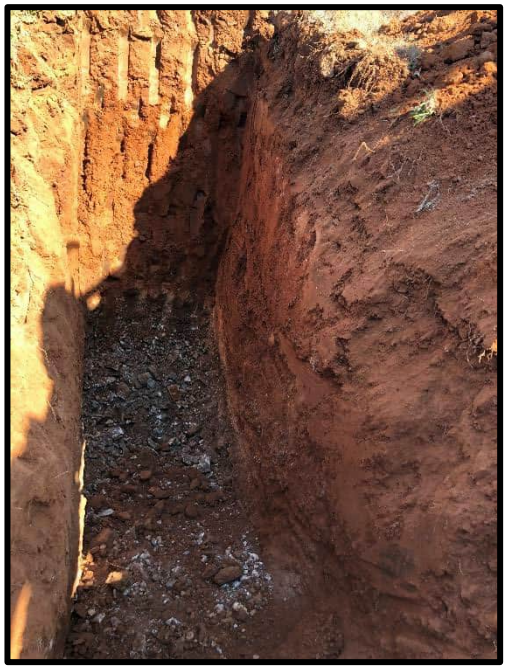


TP130

TP131

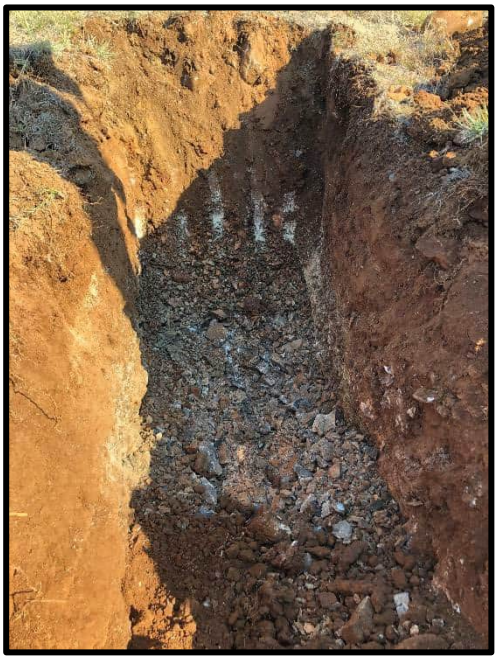
TP132

Pipeline Section 1



TP133

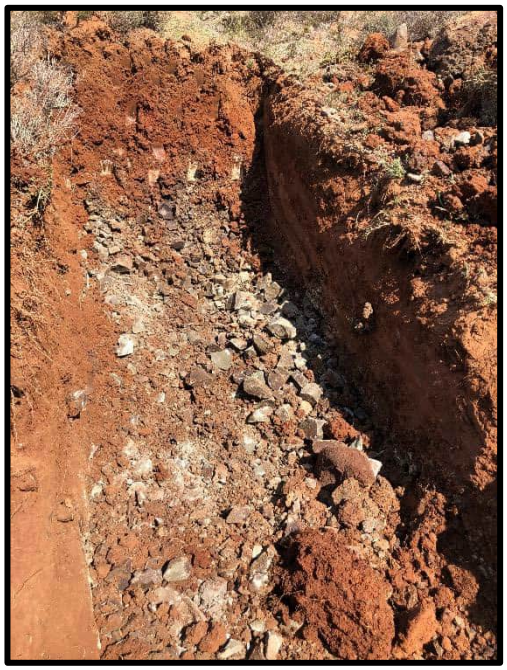
TP134



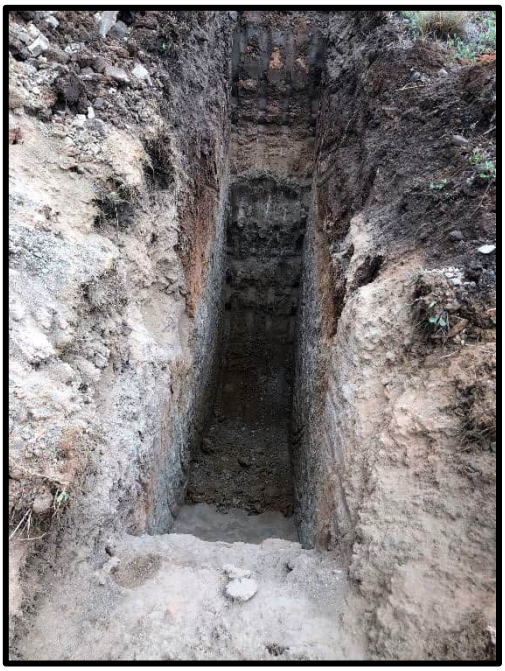
TP135

TP136

Pipeline Section 1



TP137

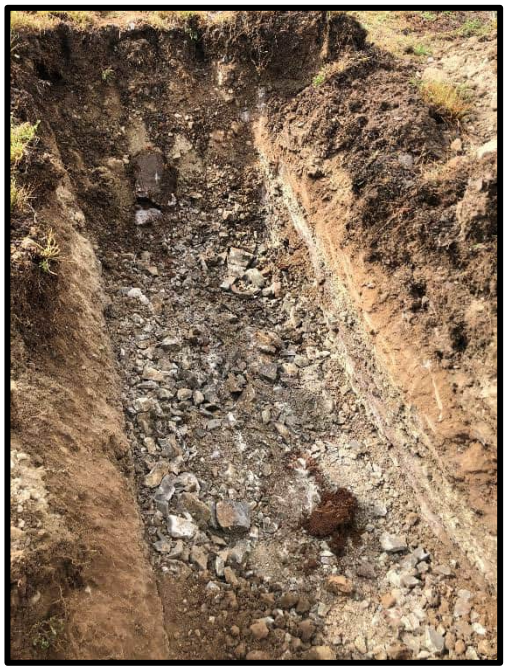


TP138

TP139

TP140

Pipeline Section 1



TP141

TP142

TP143

TP144

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TP147

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Pipeline Section 1

TP153

TP154

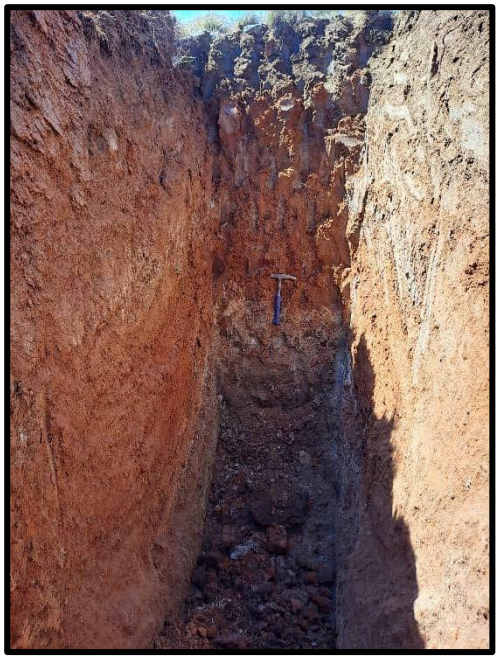
TP155

TP156

Pipeline Section 1

TP157

TP158



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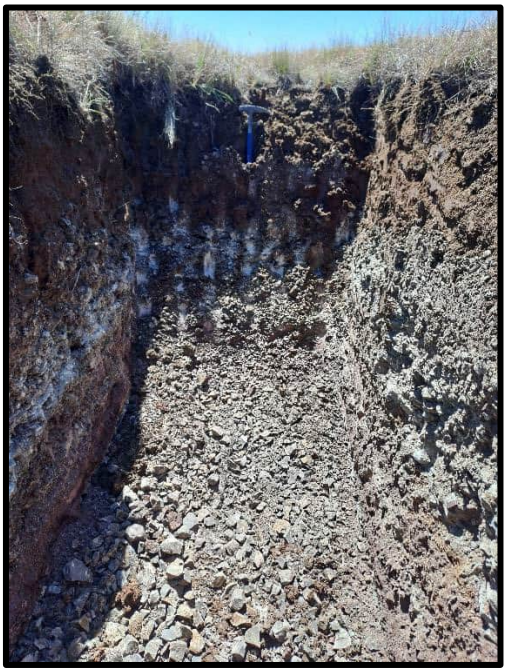
TP160

Pipeline Section 1

TP161



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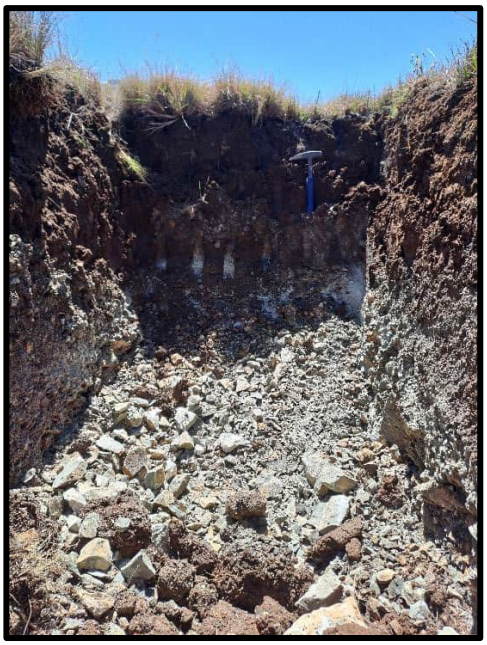

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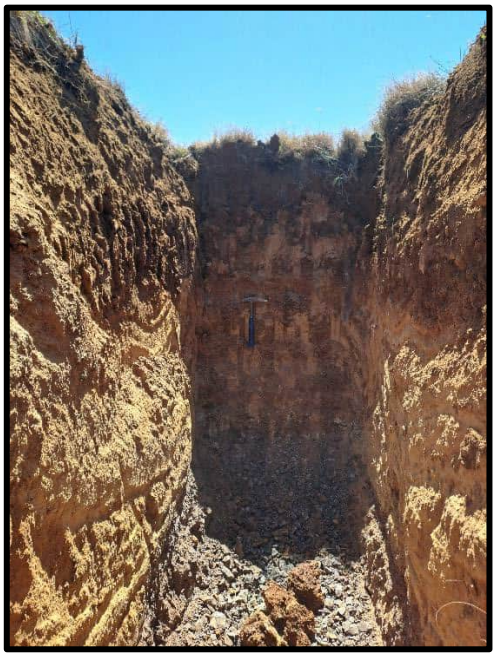

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Pipeline Section 1

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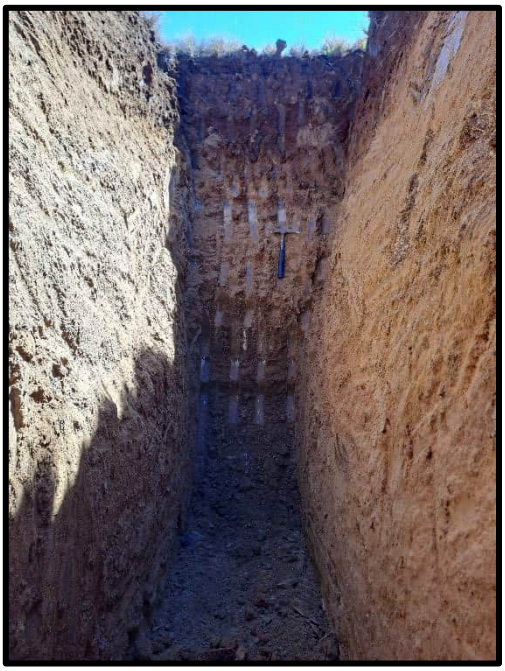

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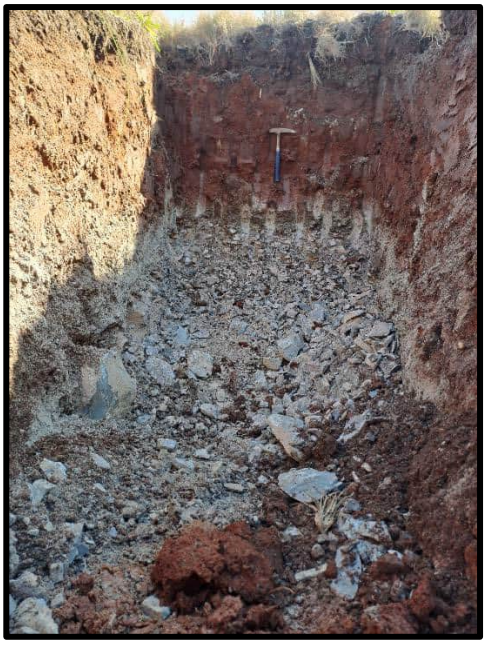

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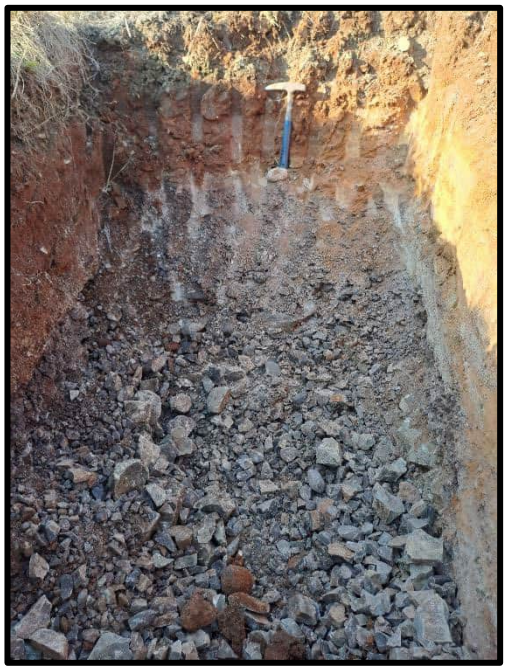

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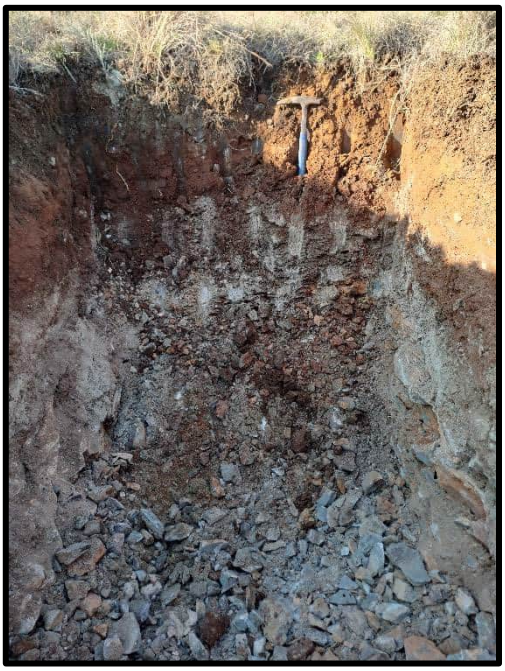

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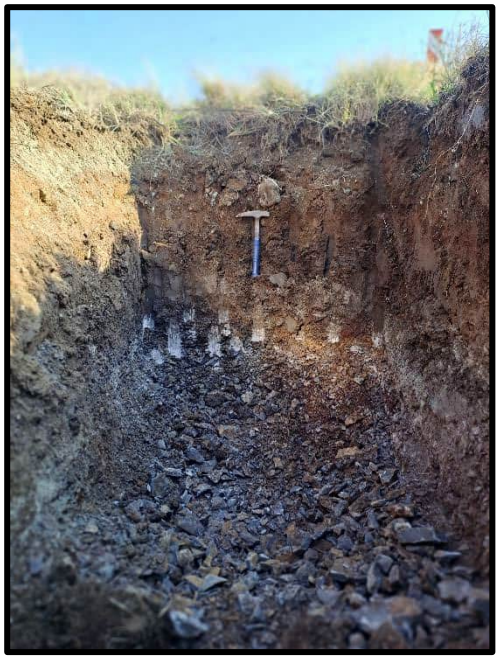

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TP173

TP174

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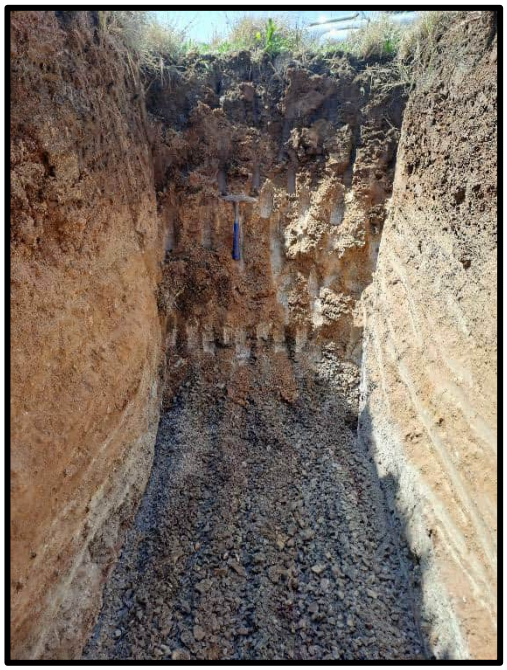

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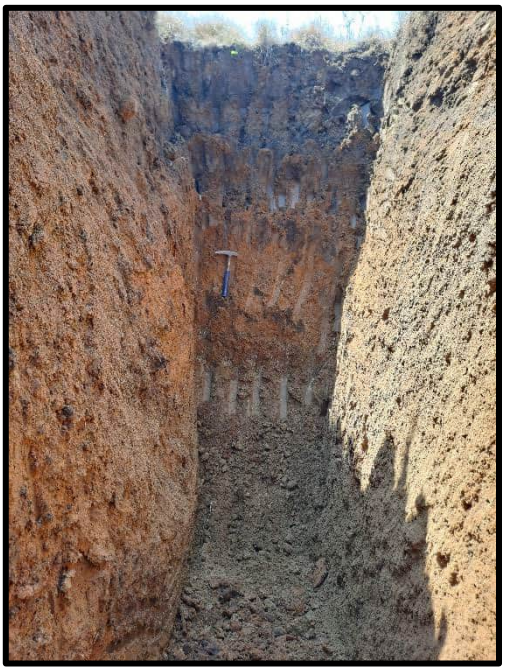

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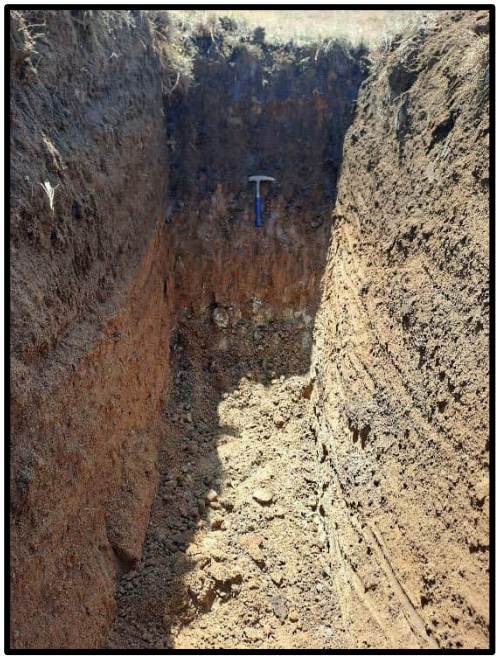

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Pipeline Section 1

TP185

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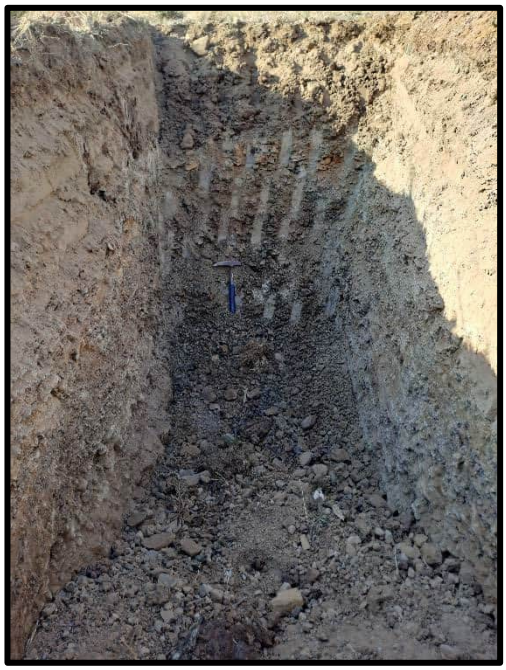
TP188

Pipeline Section 1



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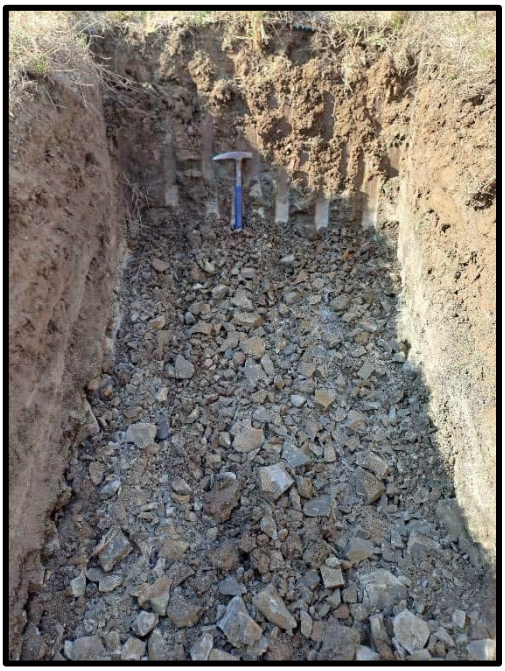

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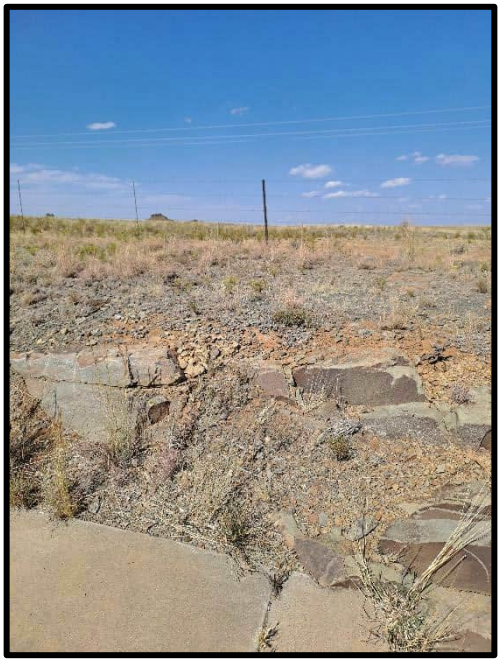

TP192

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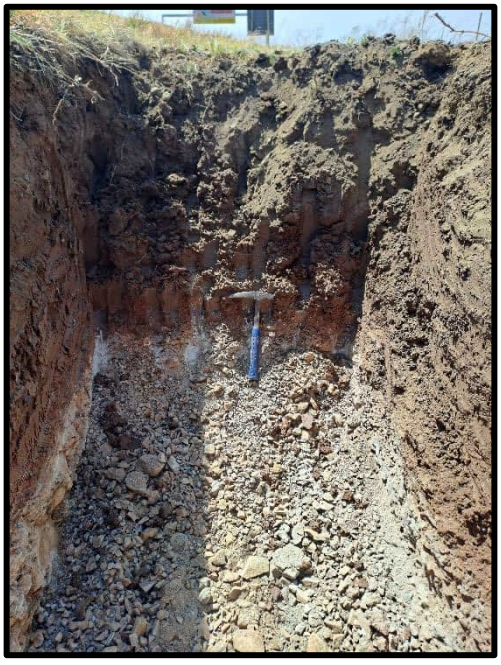

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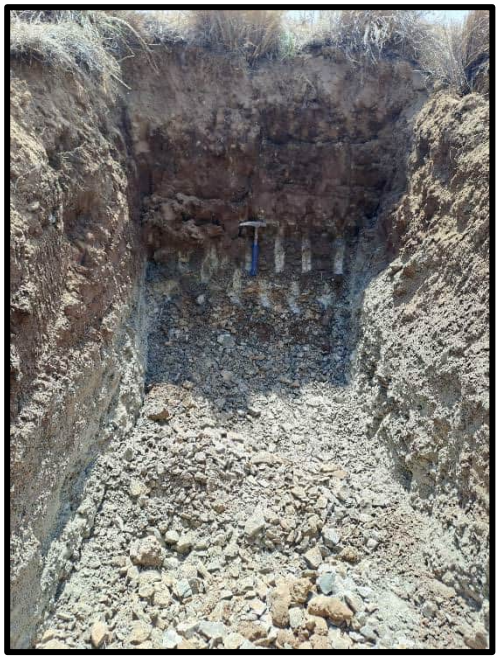

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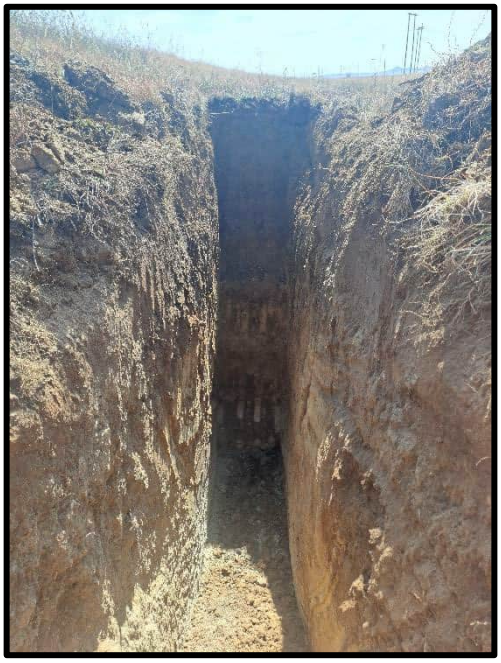

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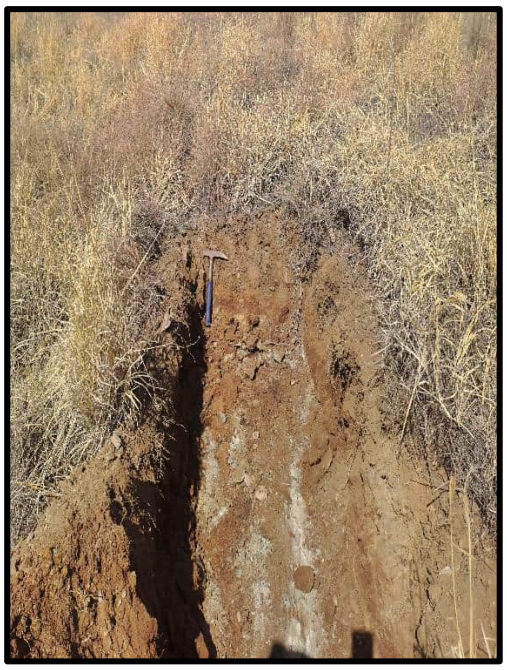

TP201

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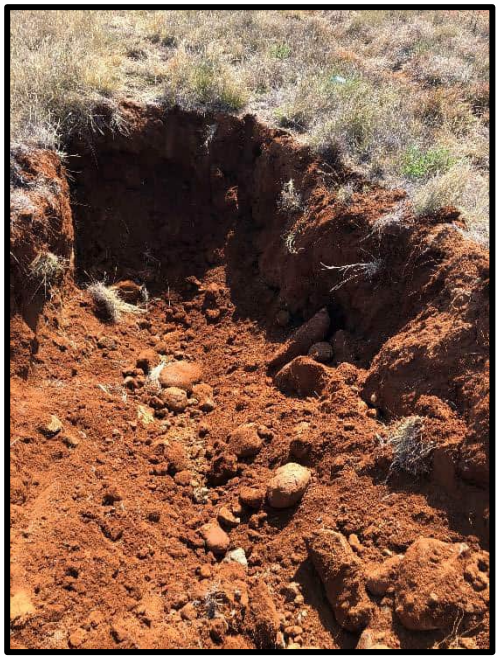
TP210



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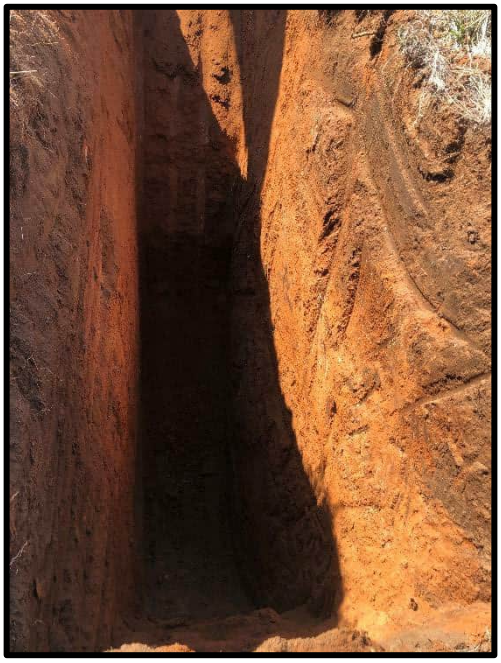

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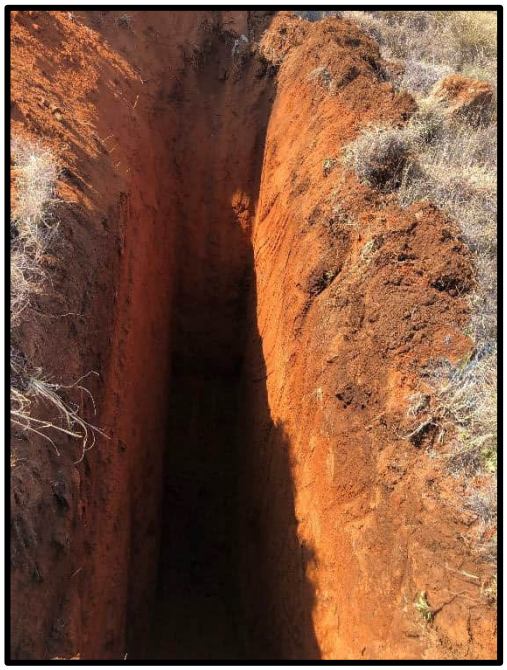

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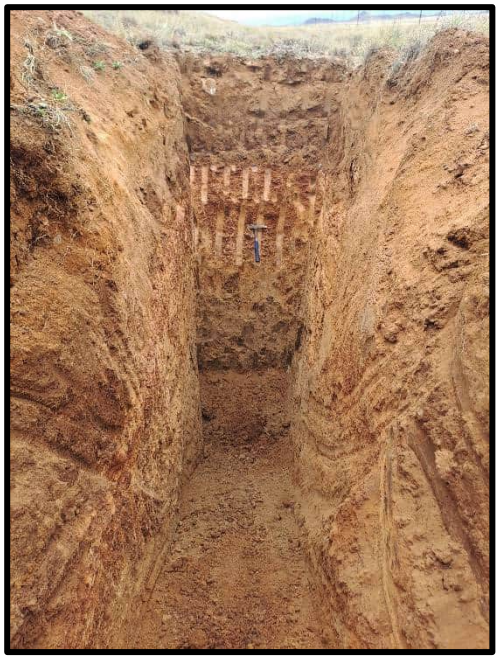

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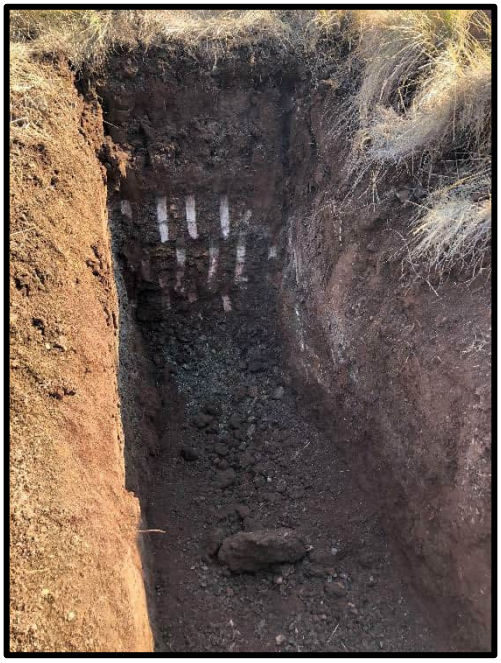

TP224

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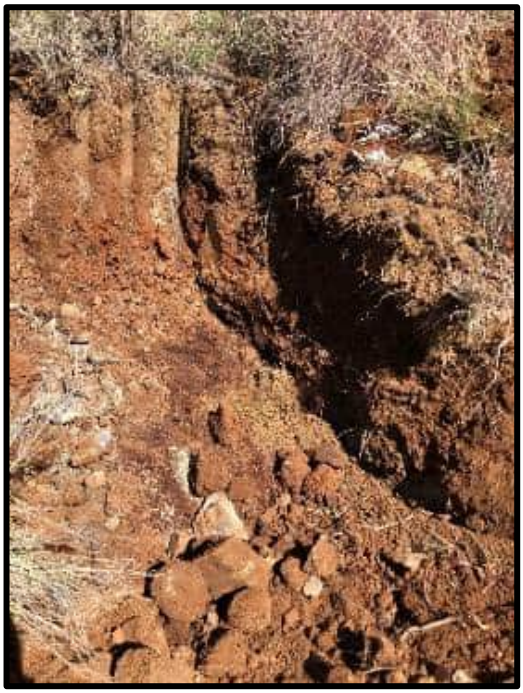

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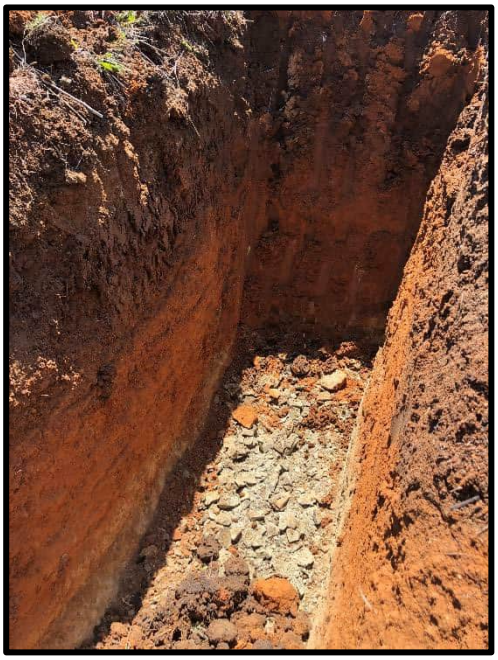

TP239

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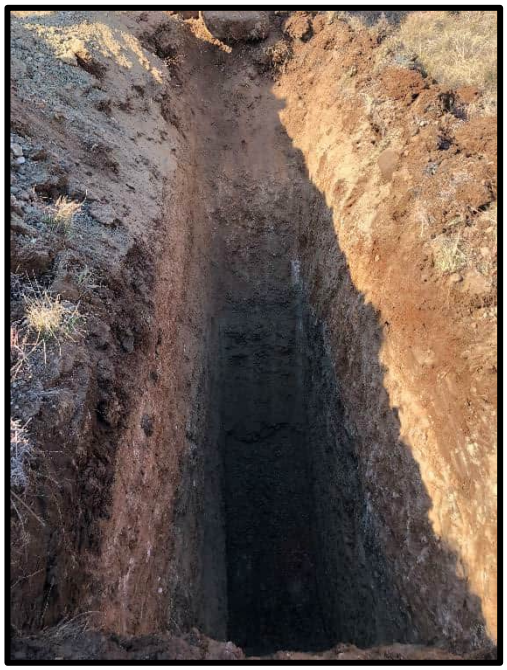

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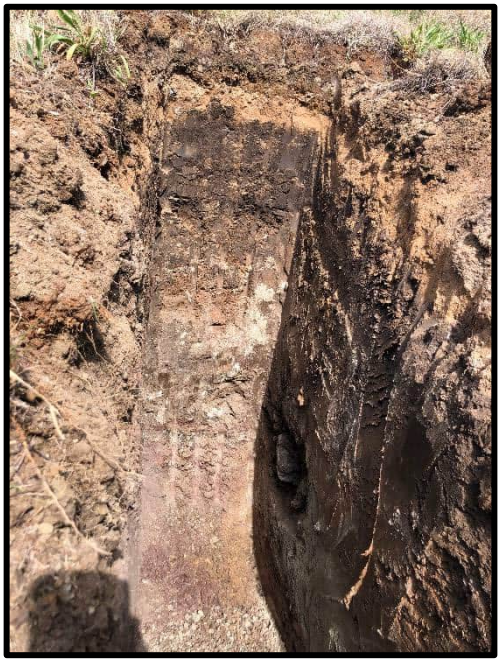

TP256

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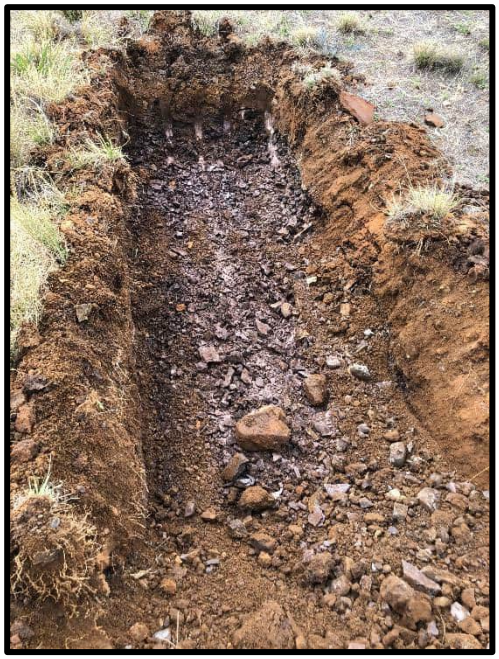
TP262



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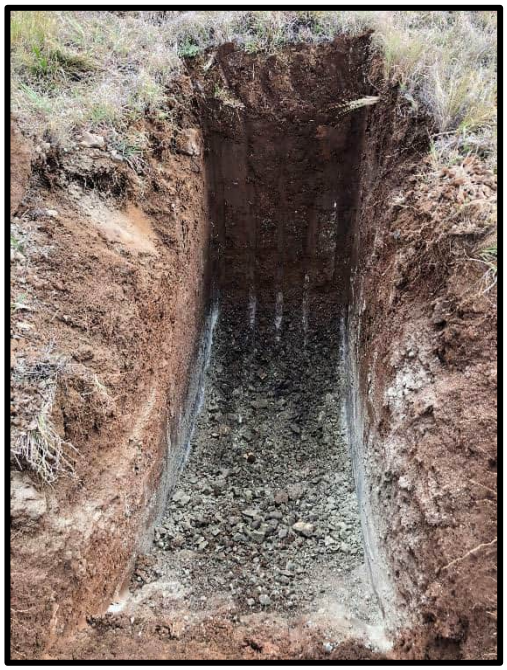

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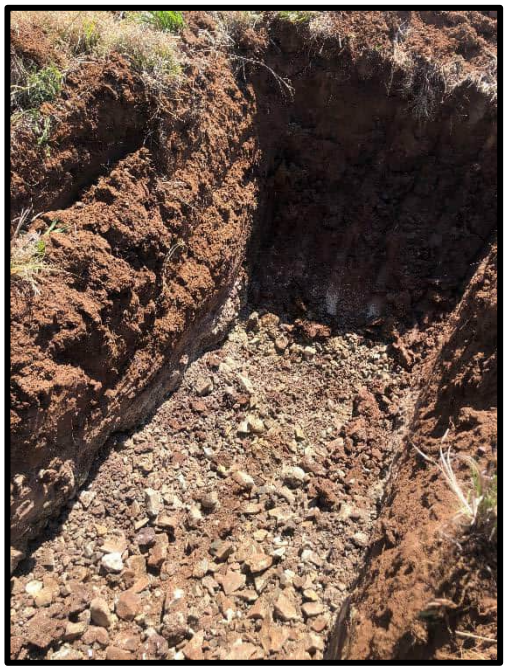
Pipeline Section 1



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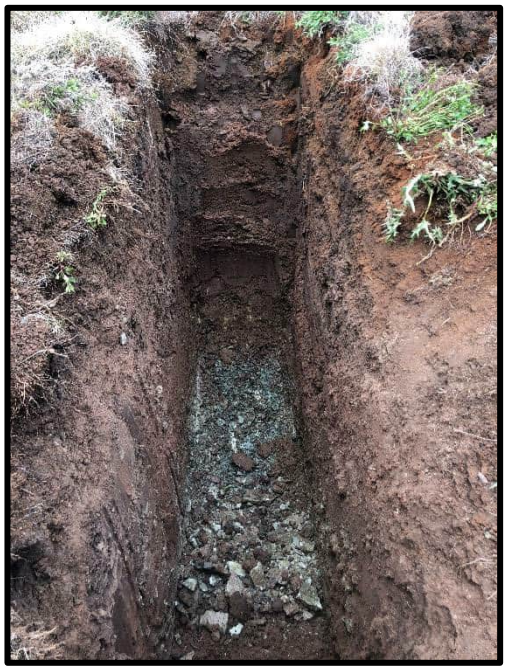

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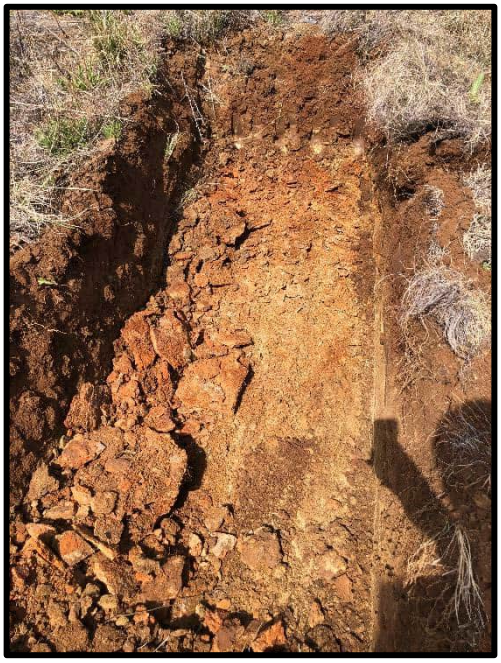

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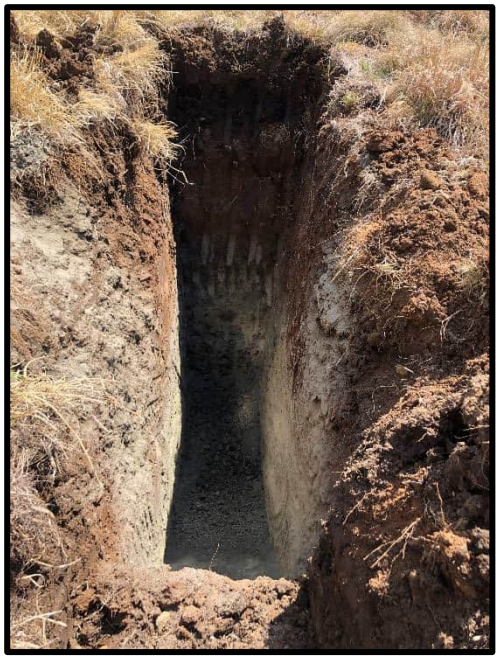

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TP308

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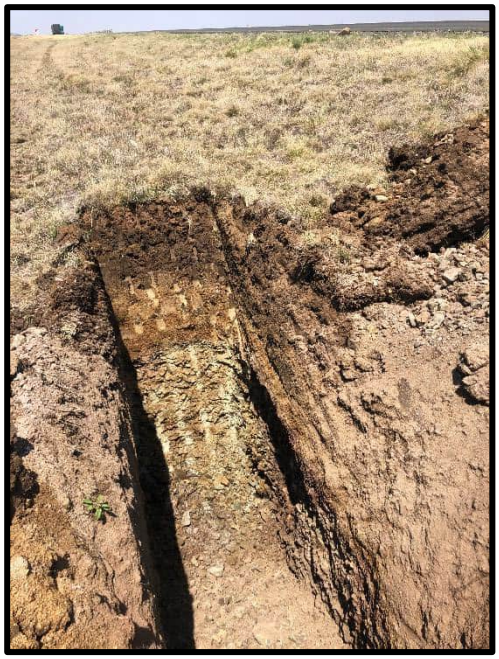

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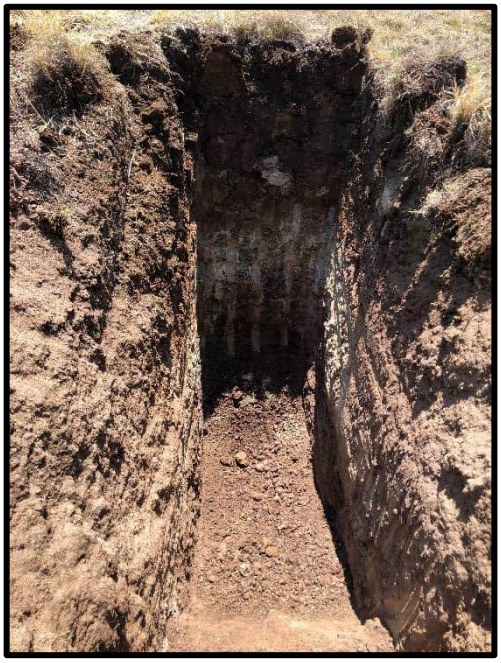

TP312

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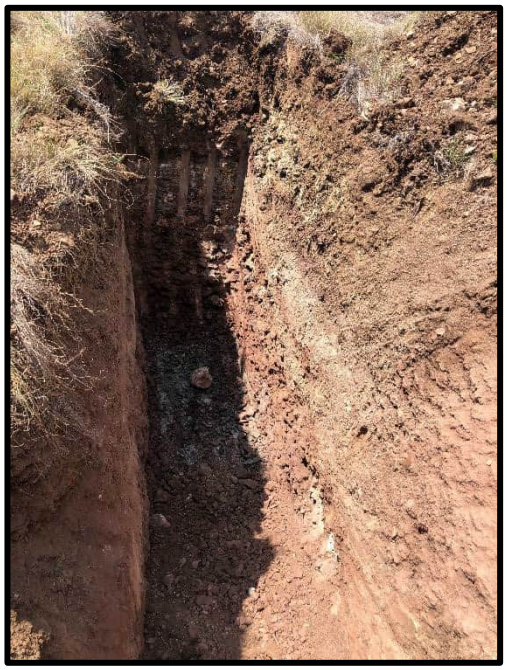

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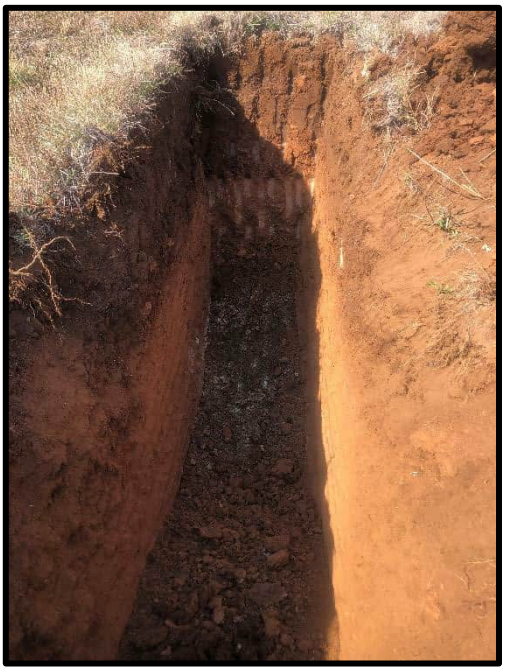

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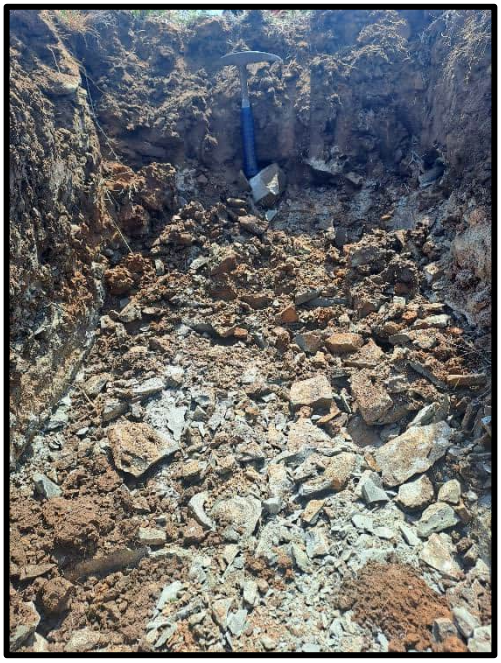
TP335



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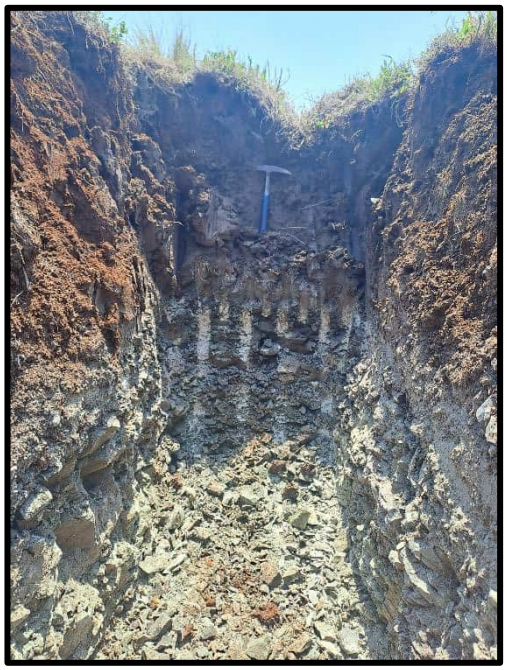

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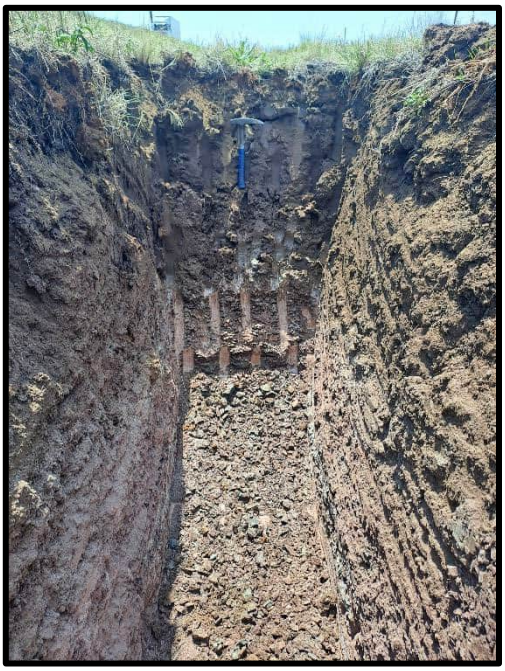

TP338

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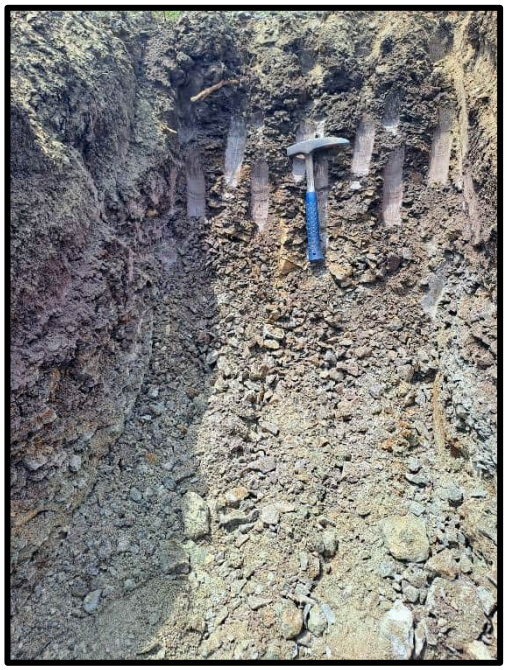

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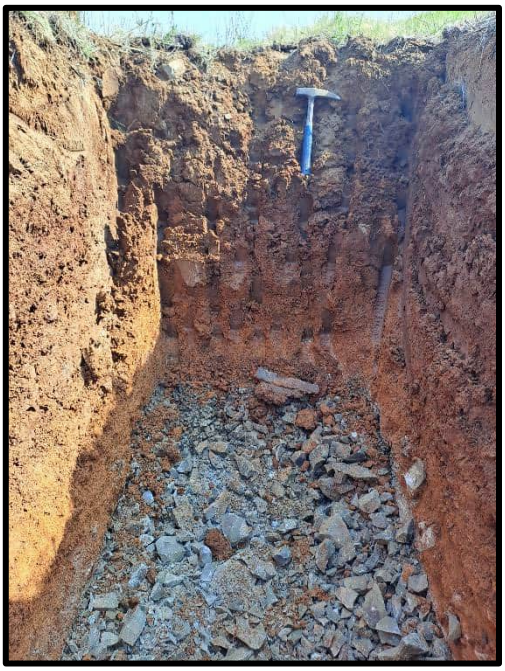
Pipeline Section 1

TP345



TP346

TP347

TP348

Naturevhudi Group PTY LTD
2466 Valley View Estate.
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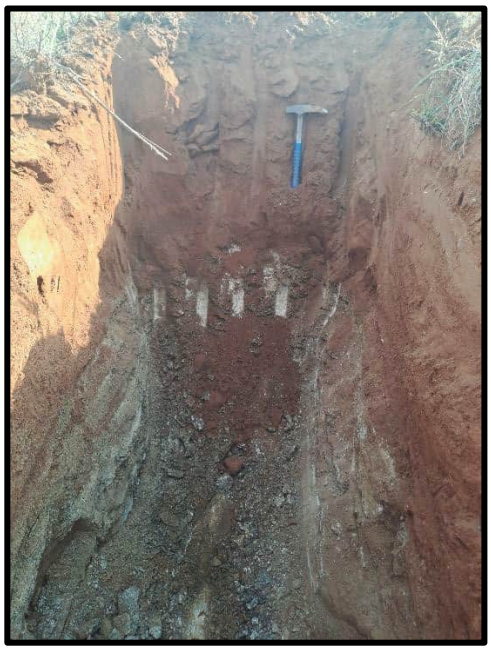
Pipeline Section 1



TP349

TP350

TP351

TP352

Pipeline Section 1

TP353

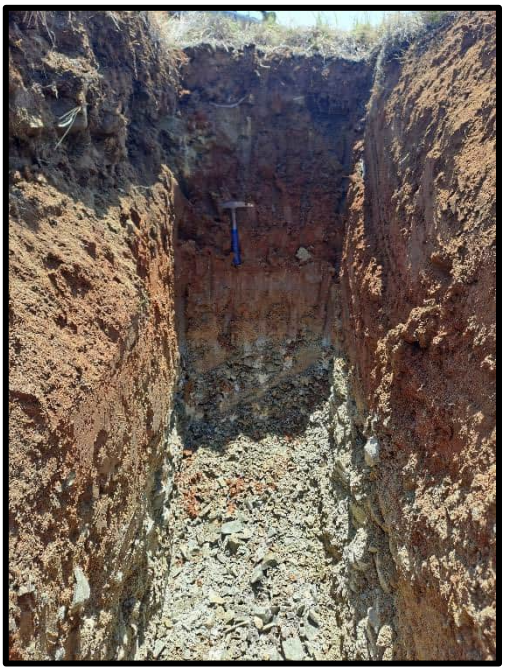
TP354

TP355

TP356

Pipeline Section 1

TP357



TP358

TP359

TP360

Pipeline Section 1

TP361

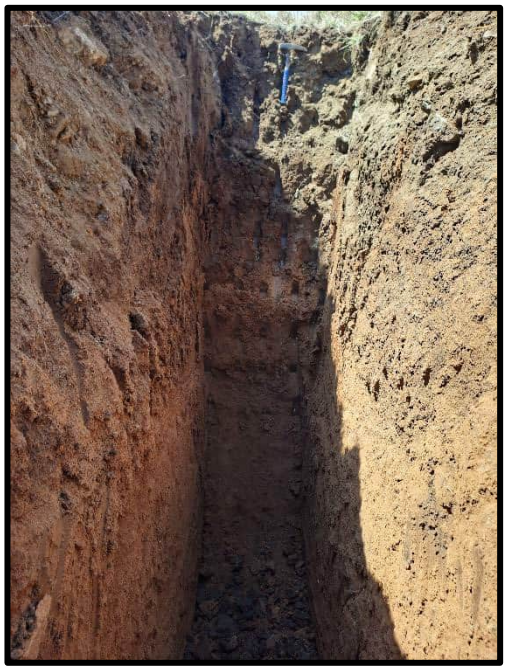
TP362

TP363

TP364

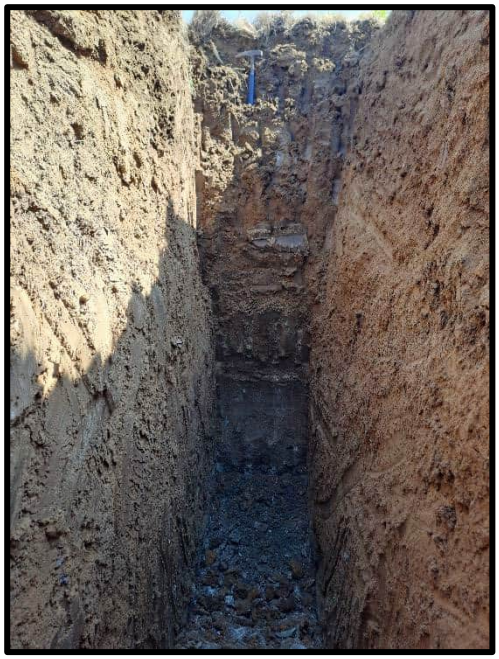
Naturevhudi Group PTY LTD
2466 Valley View Estate.
Kosmosdal.
0157

Pipeline Section 1



TP365

TP366



TP367

TP368

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Pipeline Section 1

TP369

TP370

TP371

TP372

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Pipeline Section 1

TP373

TP374

TP375

TP376

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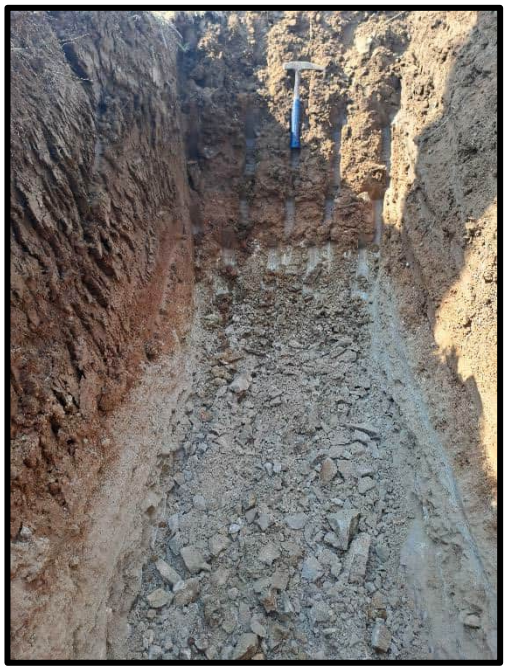
Pipeline Section 1



TP377

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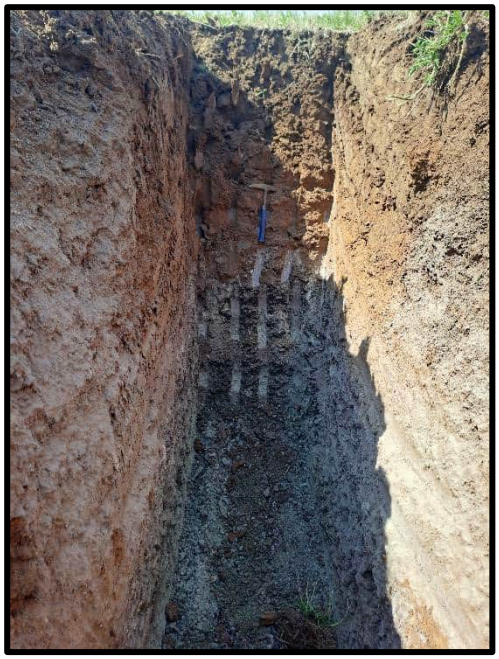

TP379

TP380

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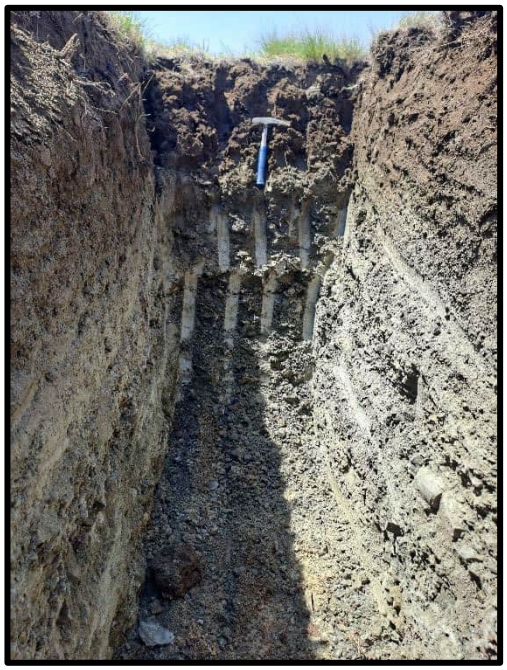
Pipeline Section 1



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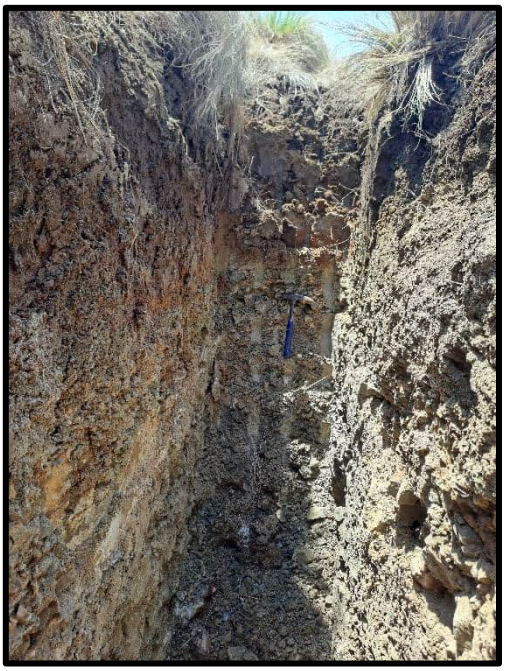


TP382

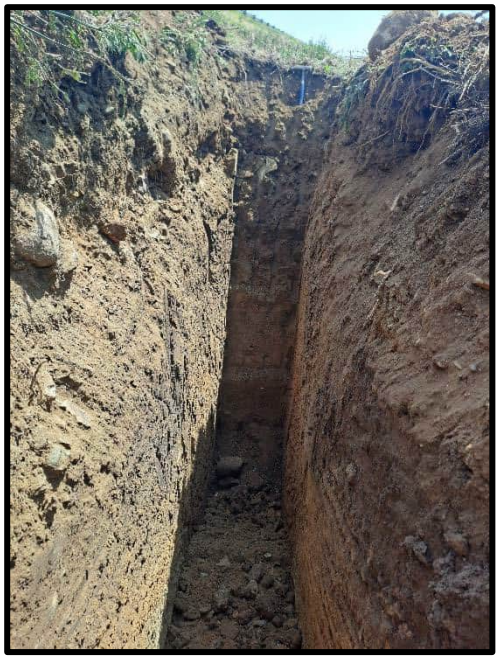
TP383

TP384

Pipeline Section 1

TP385

TP386



TP387

TP388

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Pipeline Section 1

TP389

TP390

TP391

TP392

Pipeline Section 1

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TP395

TP396

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Pipeline Section 1

TP655

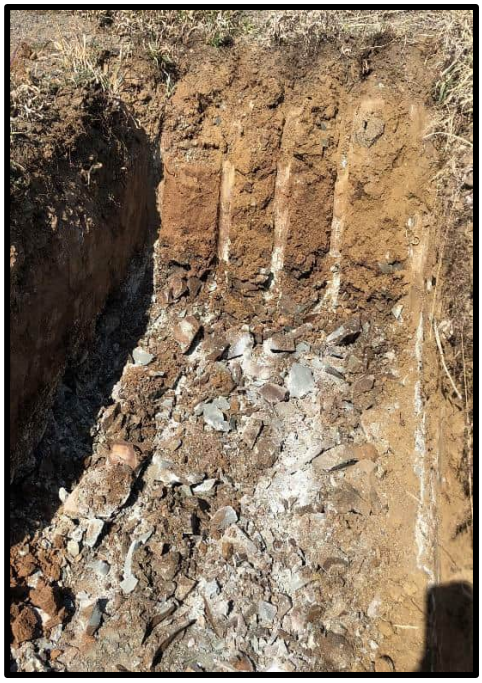
TP656

TP658

TP659

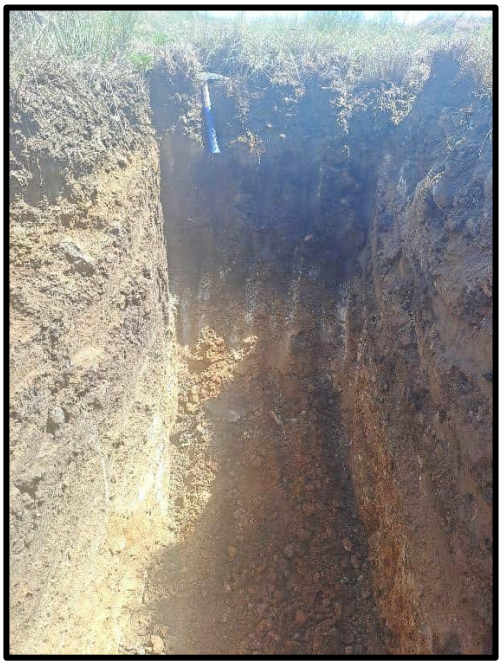
Pipeline Section 1

TP660



TP661

TP662

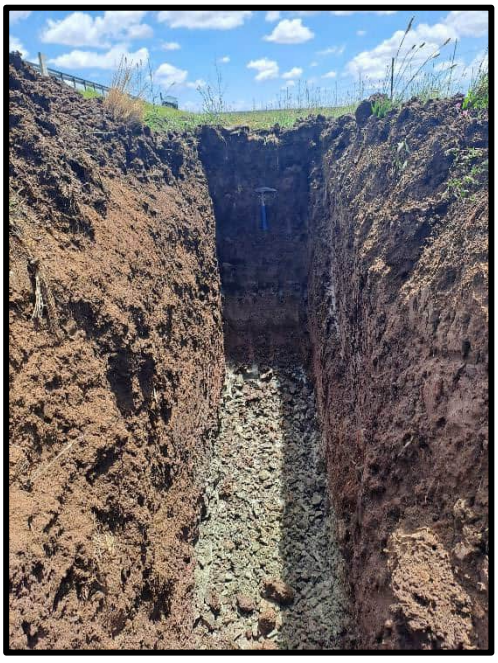


TP663

Pipeline Section 1

TP664

TP665



TP666

TP667

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Kosmosdal.
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Pipeline Section 1

TP668

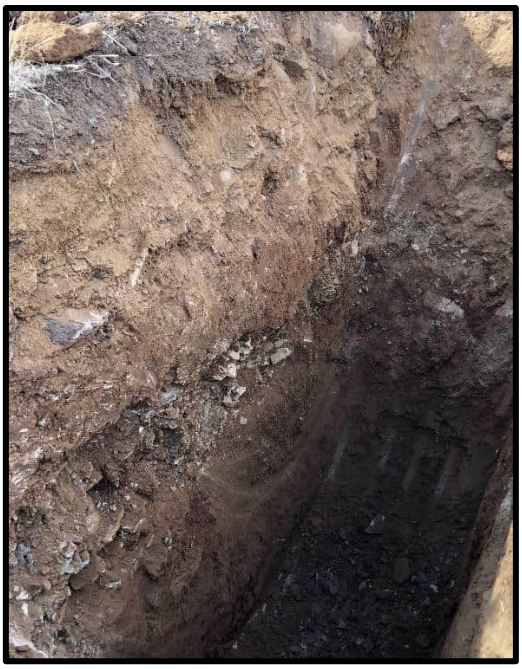
TP669

TP670

TP674

Pipeline Section 1

TP675



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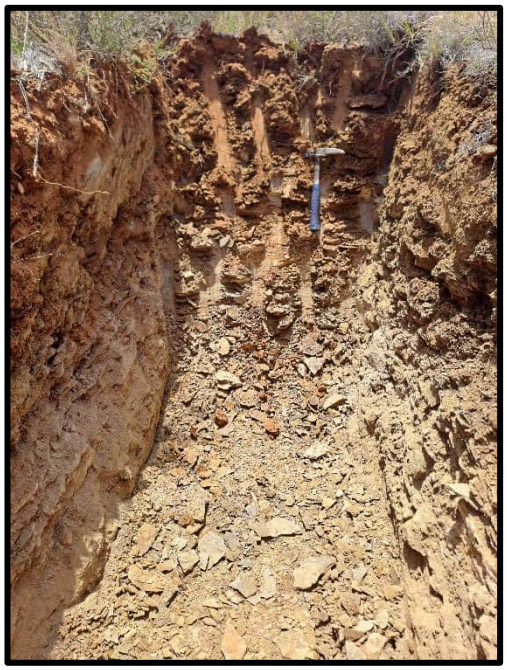
Pipeline Section 2



TP397

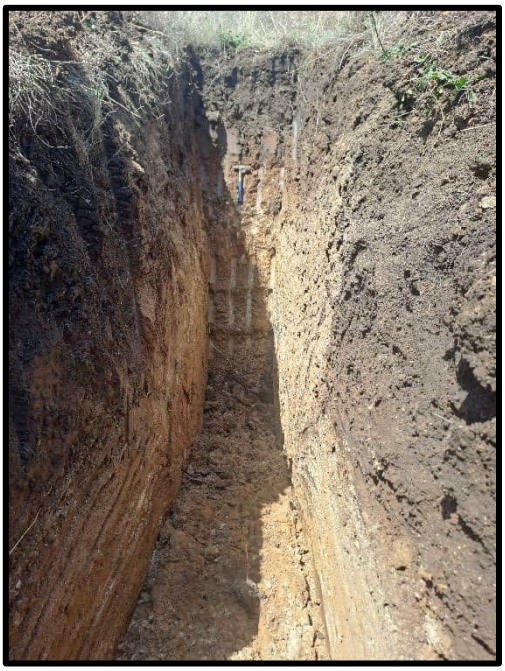
TP398

TP399

TP400

Pipeline Section 2

TP401



TP402

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TP404

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2466 Valley View Estate.
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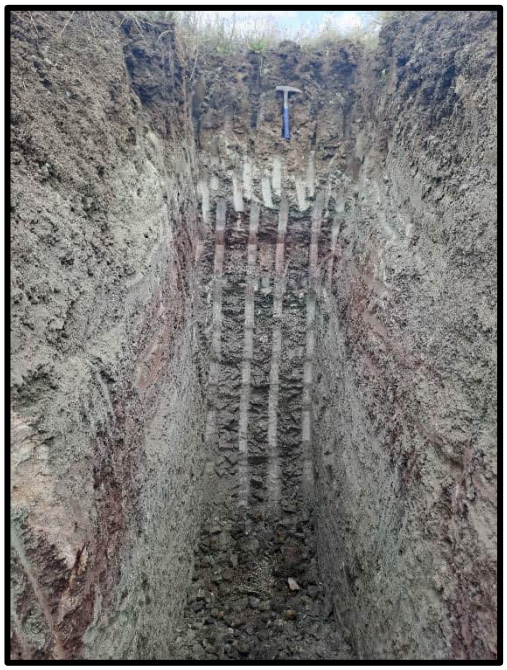
0157

Pipeline Section 2



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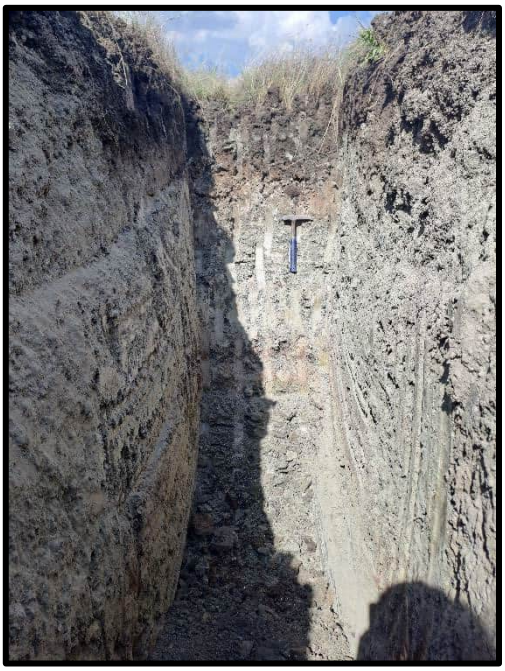

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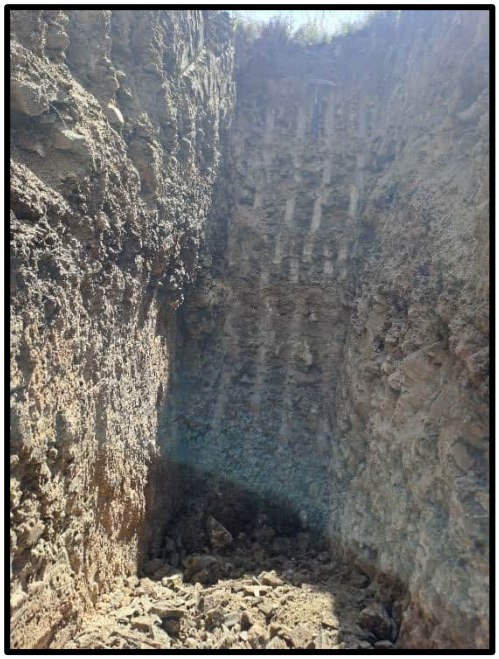

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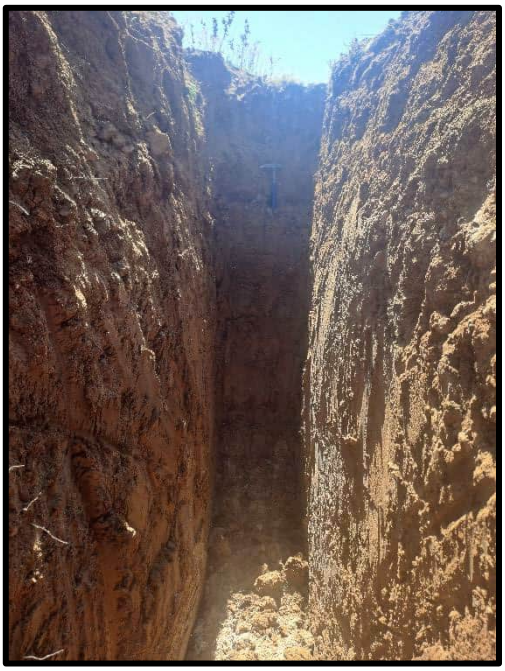
TP408

Pipeline Section 2

TP409



TP410

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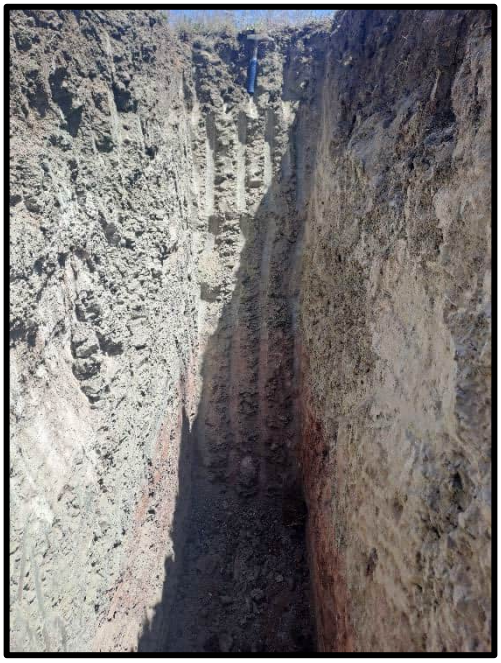

TP412

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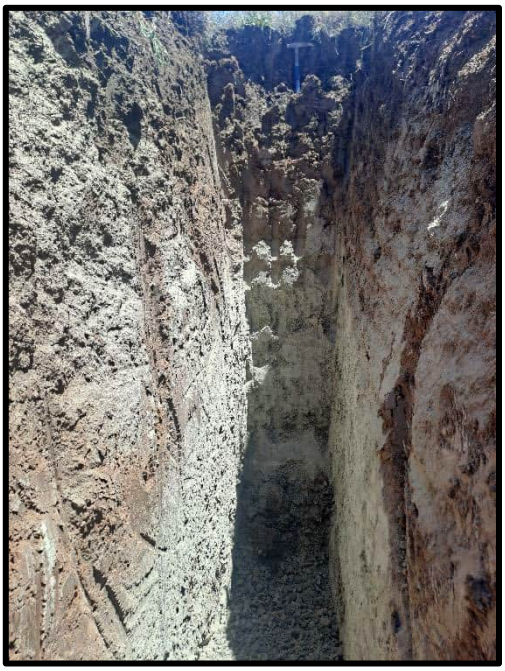
Pipeline Section 2

TP413



TP414

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Kosmosdal.
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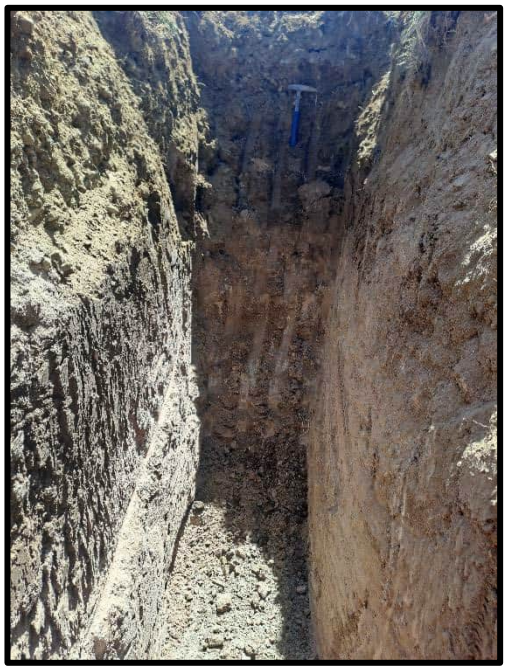
Pipeline Section 2



TP417

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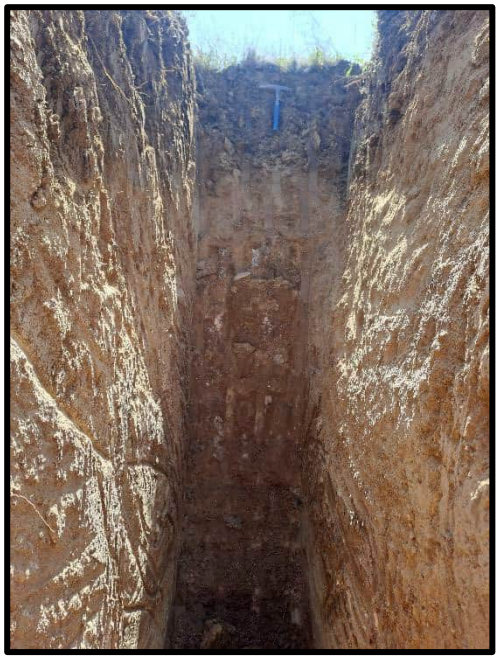

TP419

TP420

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Pipeline Section 2

TP421

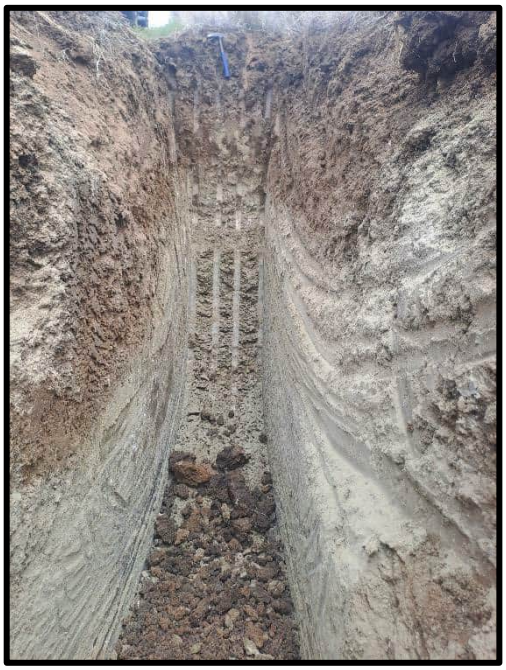
TP422

TP423

TP426

Pipeline Section 2

TP432



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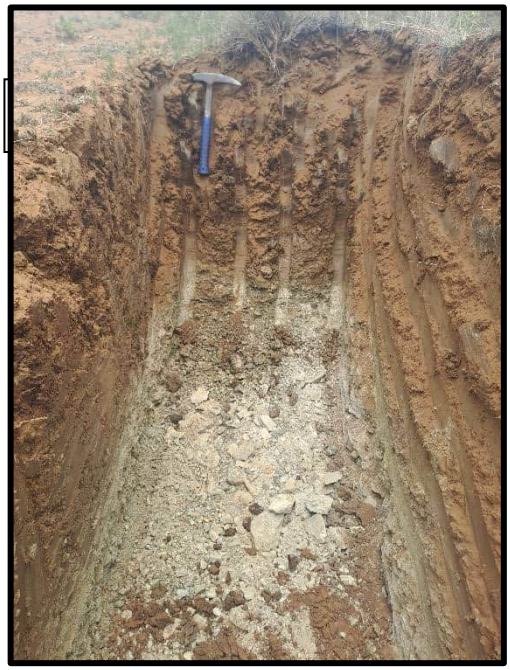

TP434

TP435

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2466 Valley View Estate.
Kosmosdal.
0157

Pipeline Section 2

TP436

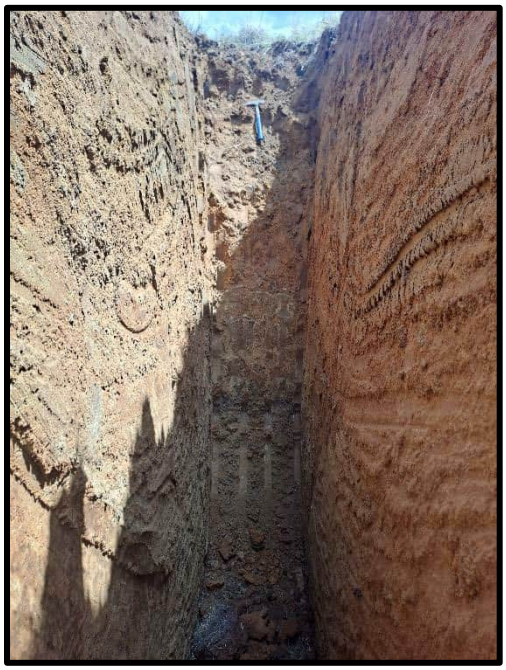
TP437

TP438

TP439

Pipeline Section 2

TP447



TP448

TP449

TP450

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2466 Valley View Estate.
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Pipeline Section 2

TP451

TP452

TP453

TP454

Pipeline Section 2

TP455

TP456

TP457

TP458

Pipeline Section 2

TP459

TP460

TP461

No access from

TP 462 to TP485

Naturevhudi Group PTY LTD
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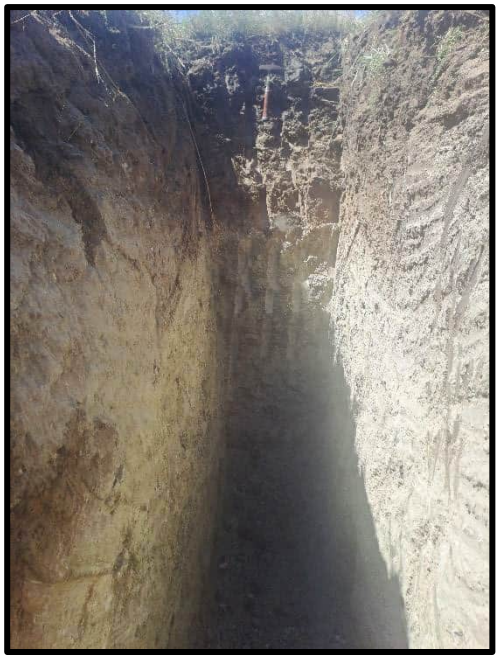
Pipeline Section 2



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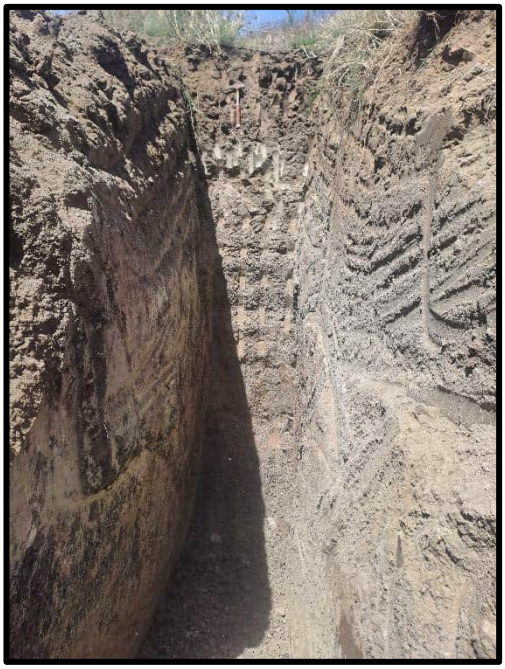

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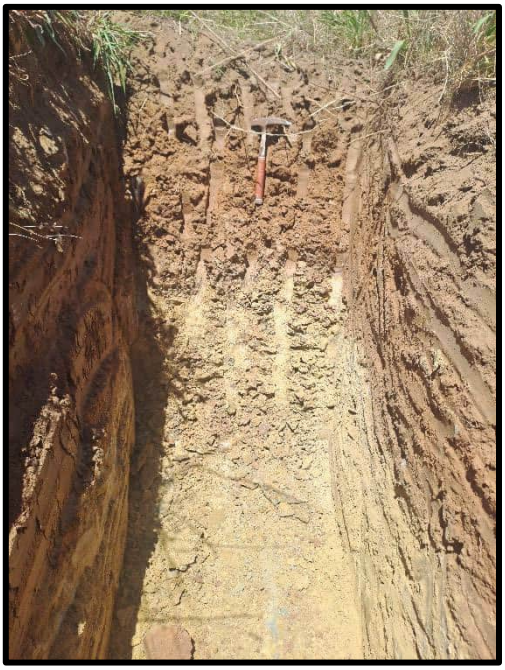

TP489

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2466 Valley View Estate.
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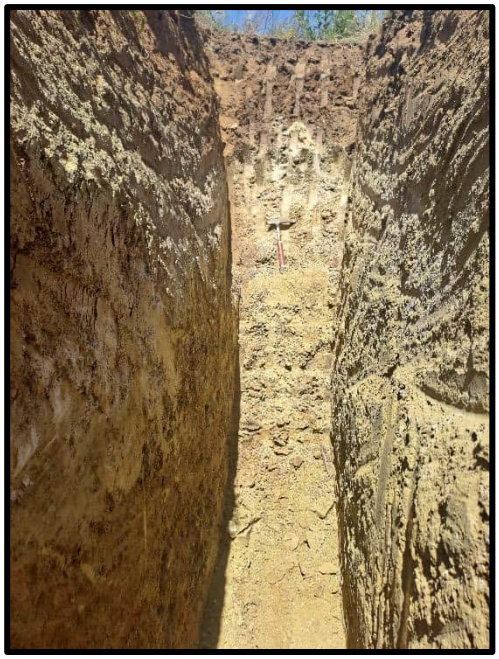
0157

Pipeline Section 2



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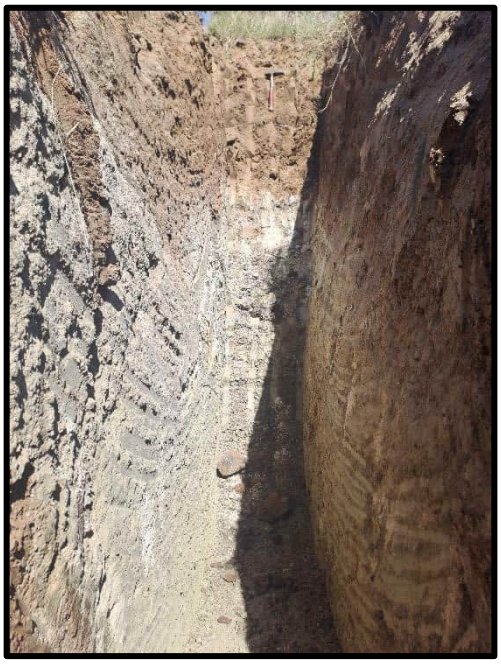

TP491

TP492

TP493

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2466 Valley View Estate.
Kosmosdal.
0157

Pipeline Section 2

TP494

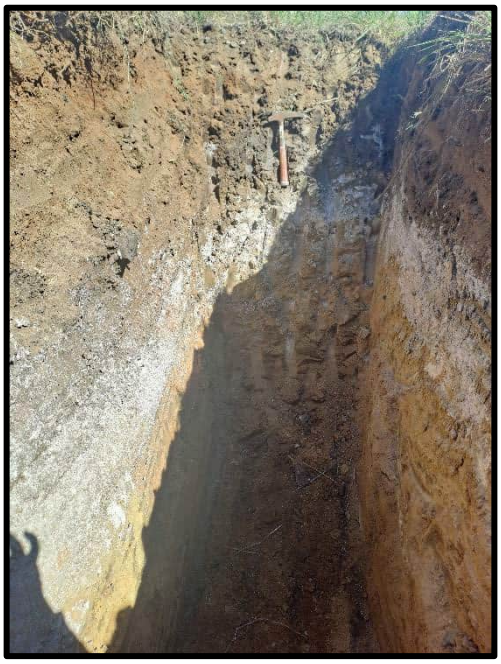
TP495

TP496

TP497

Pipeline Section 2

TP498



TP499

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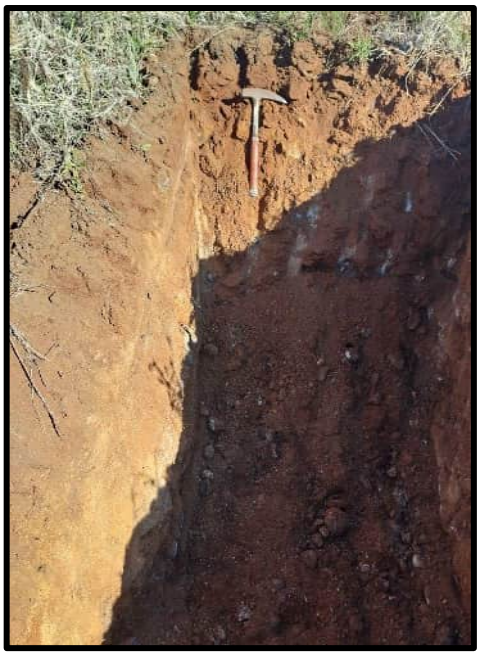
2466 Valley View Estate.
Kosmosdal.
0157

Pipeline Section 2

TP502



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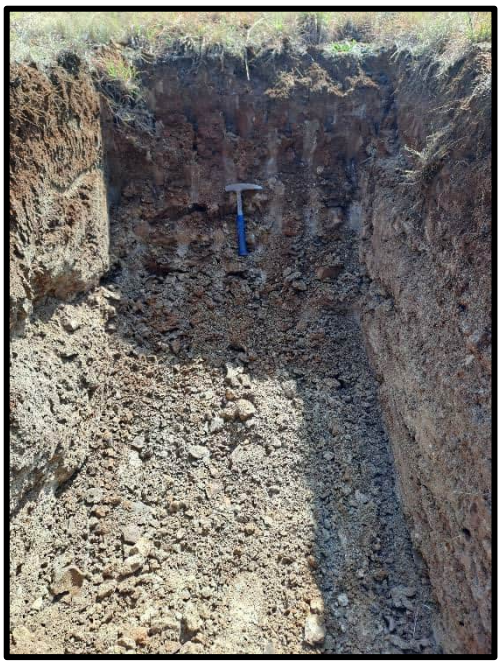
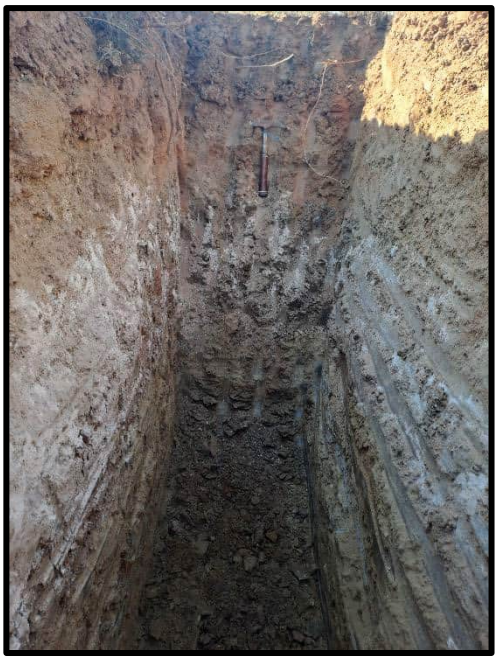


TP504

TP505

Pipeline Section 2

TP506



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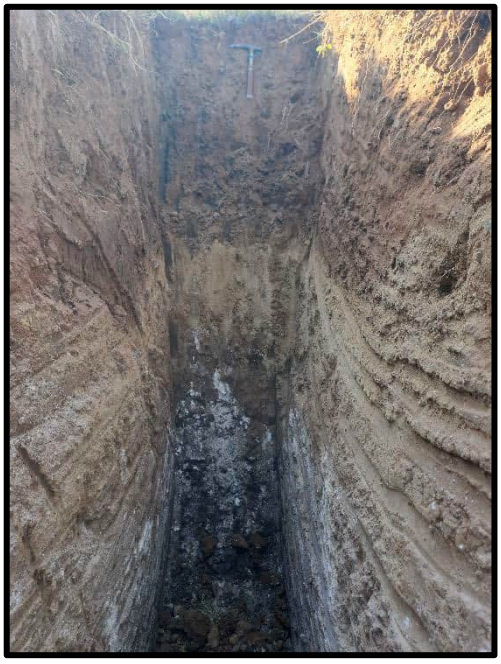

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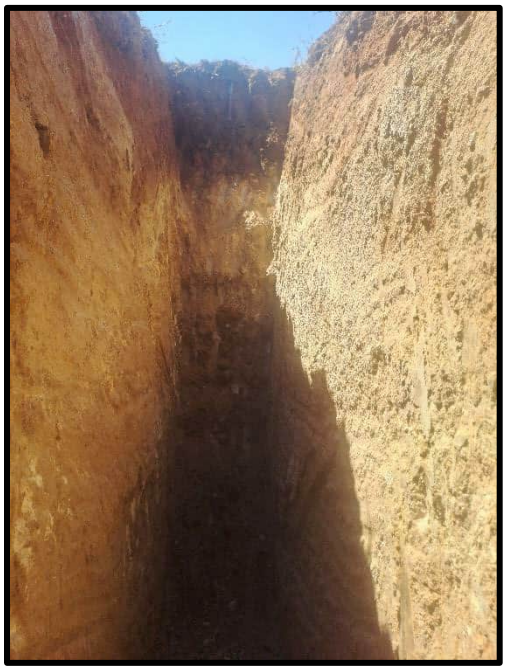

TP509

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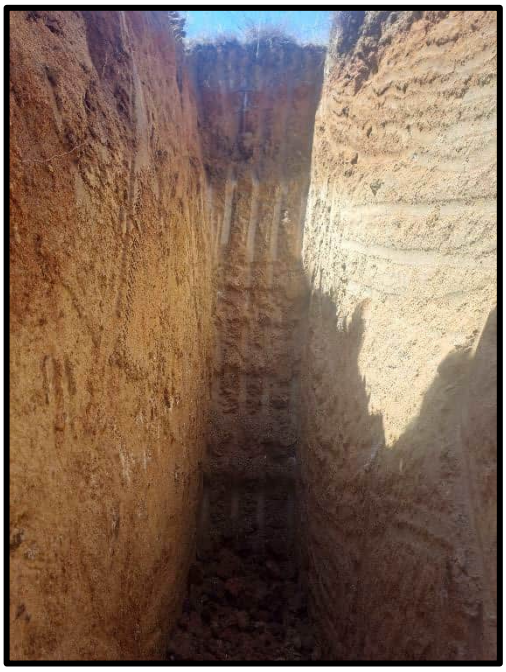
Pipeline Section 2



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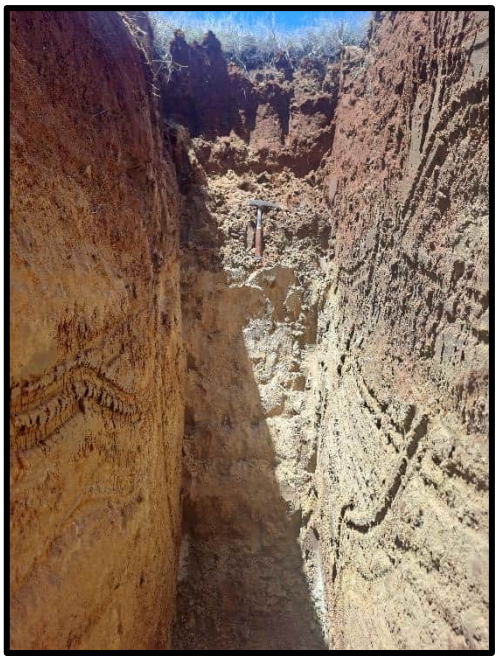

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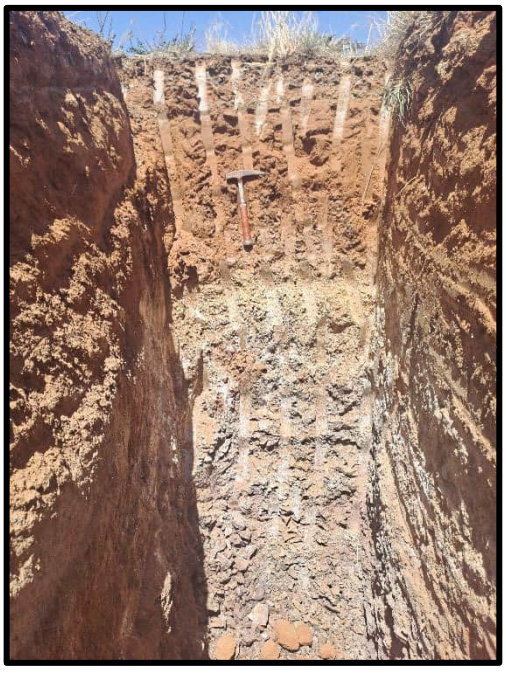

TP513

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Kosmosdal.
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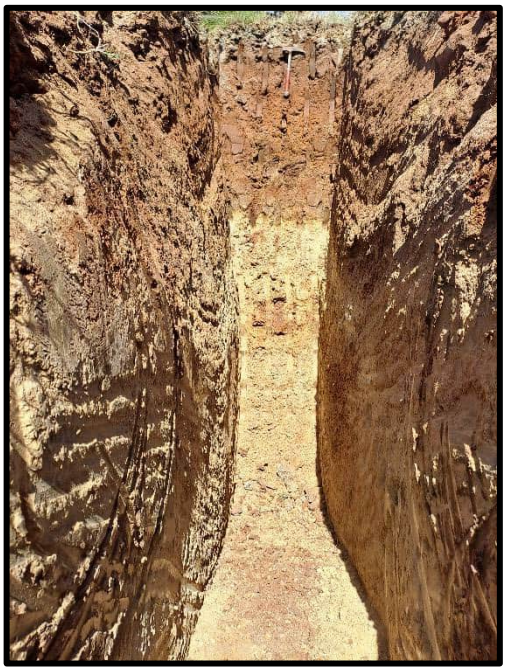
Pipeline Section 2



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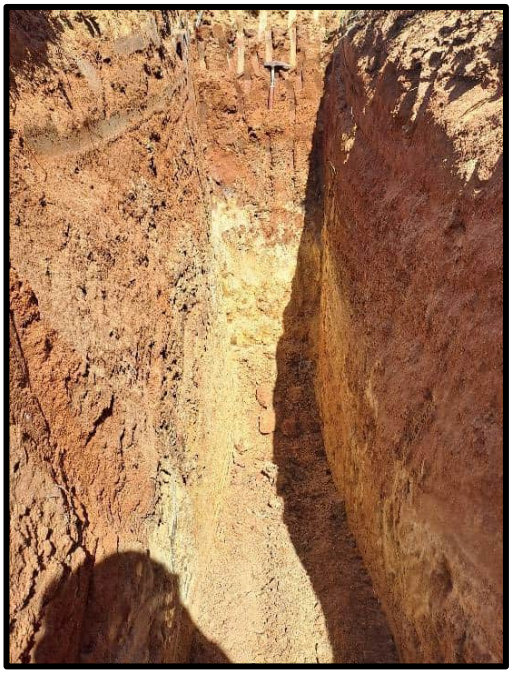
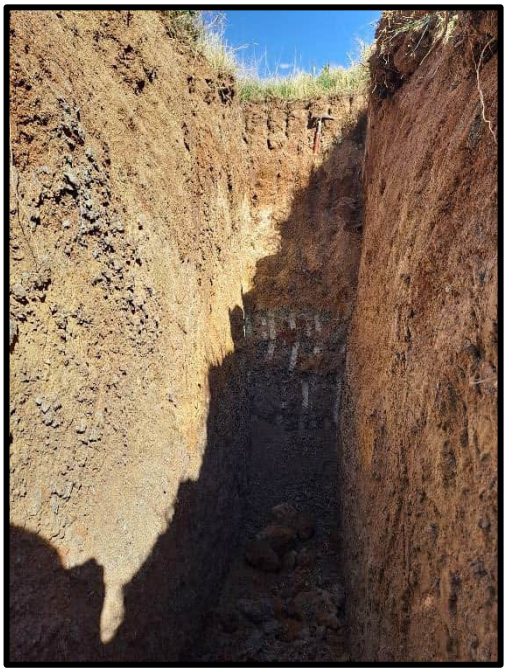


TP515

TP516



TP517

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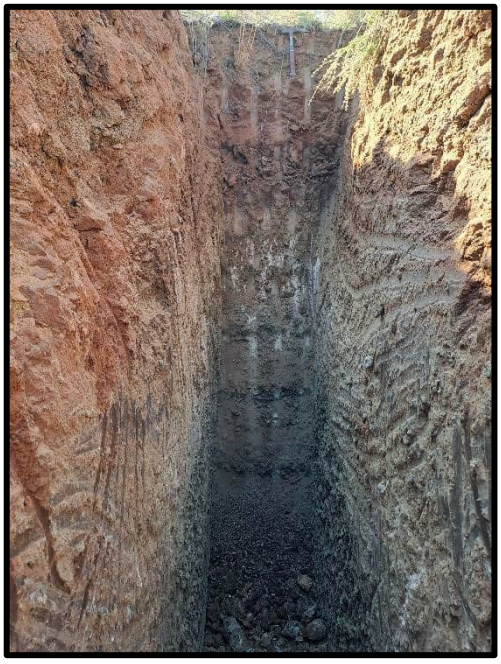
TP518

TP519



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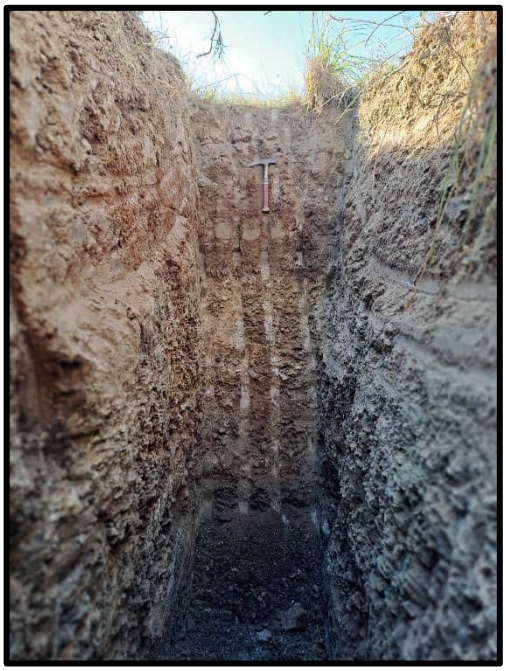
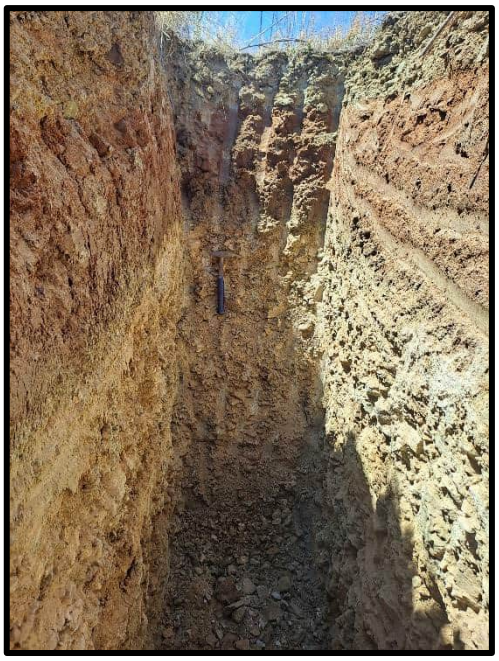
0157

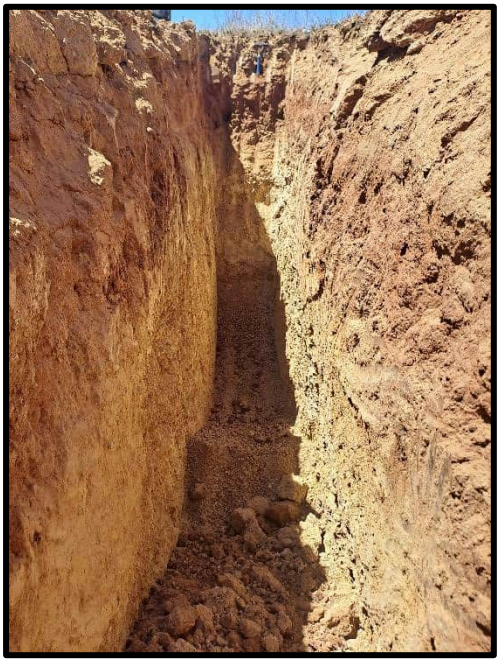
Pipeline Section 2



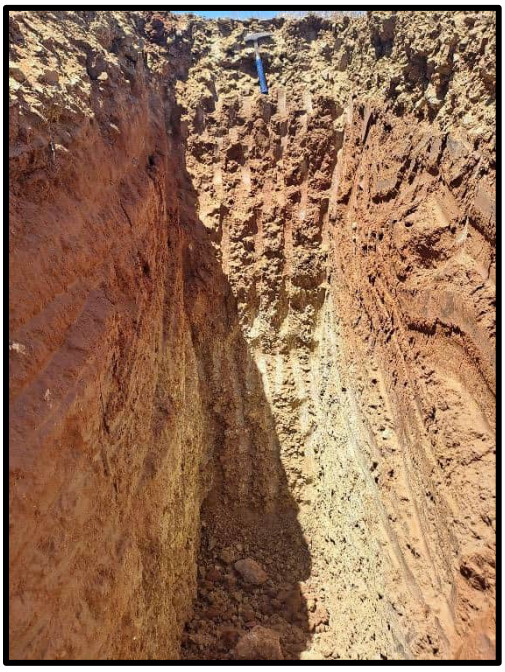
TP522



TP523



TP524



TP525

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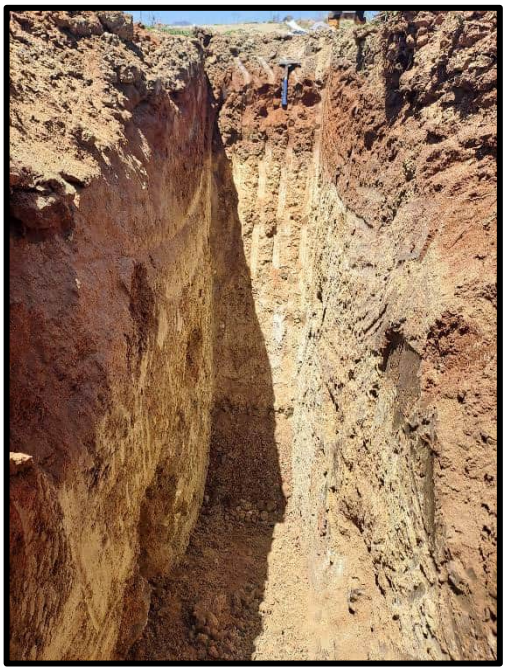
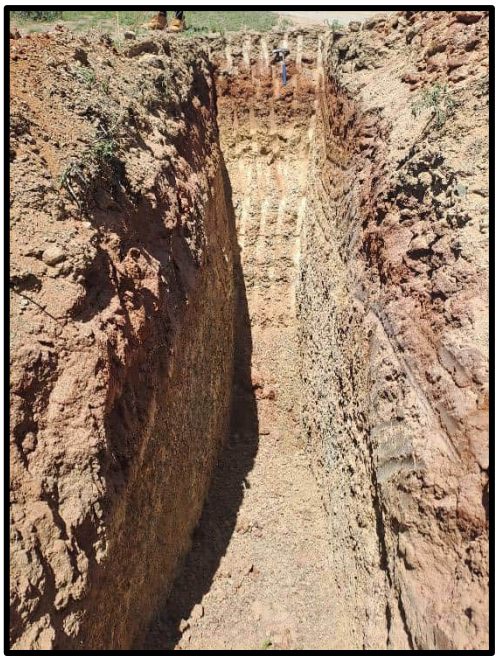
0157

Pipeline Section 2

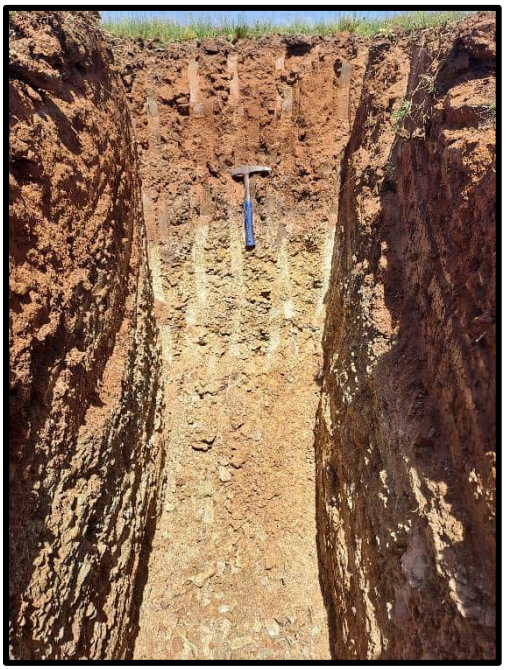


TP526



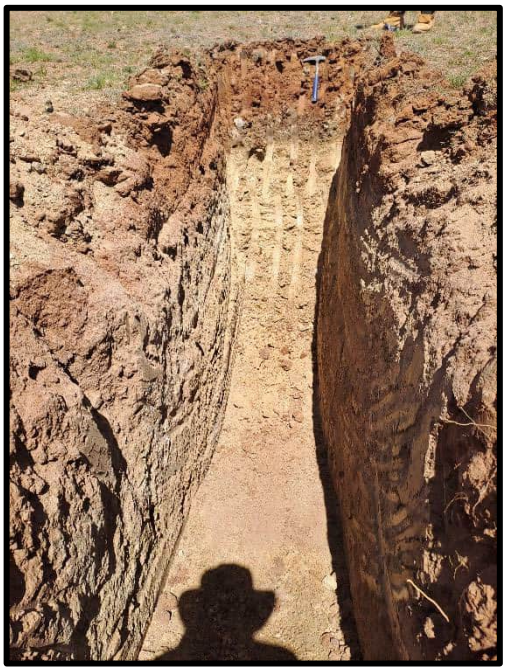
TP527

TP528

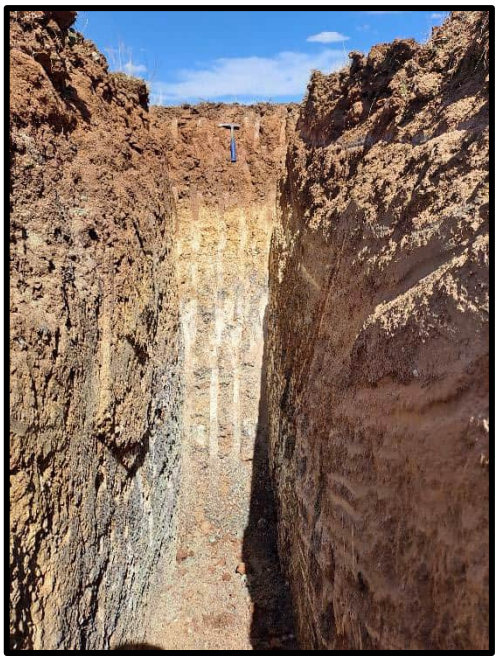


TP529

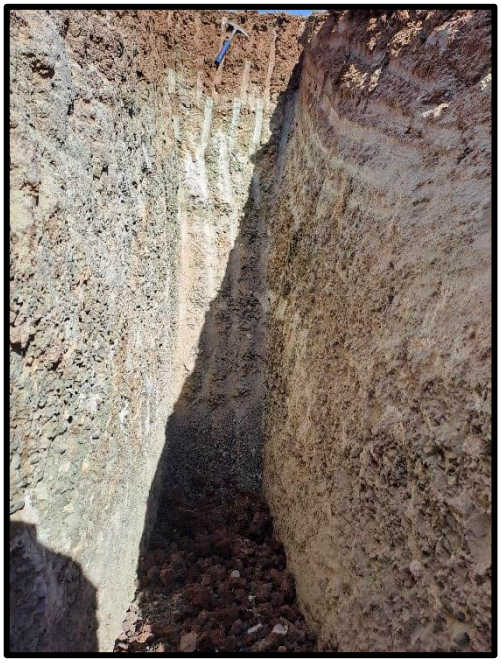
Pipeline Section 2



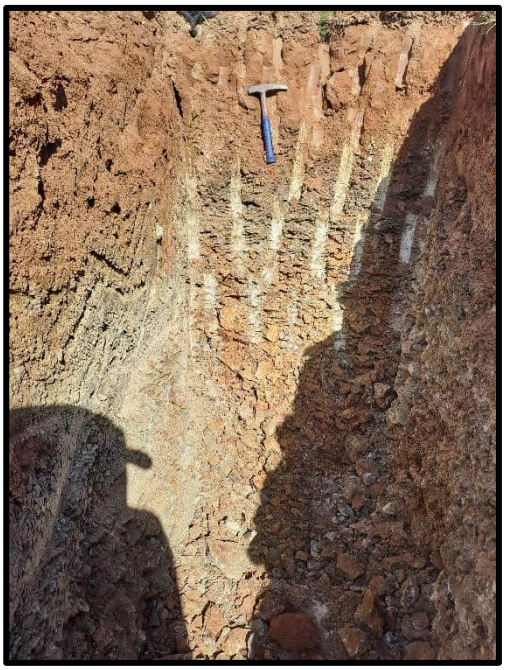
TP530



TP531



TP532

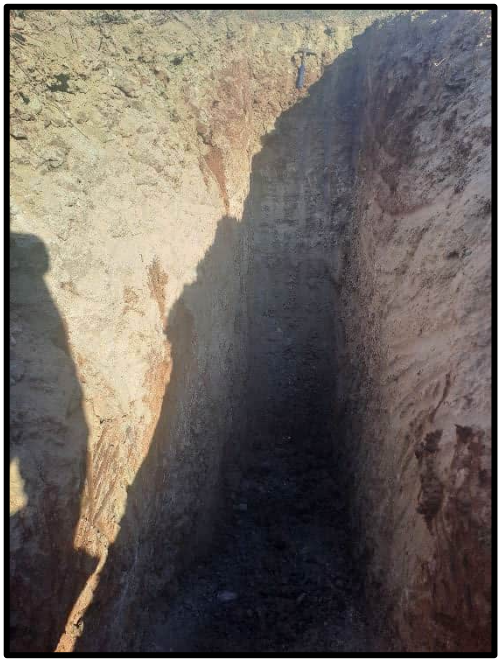


TP533

Pipeline Section 2

TP534

TP535

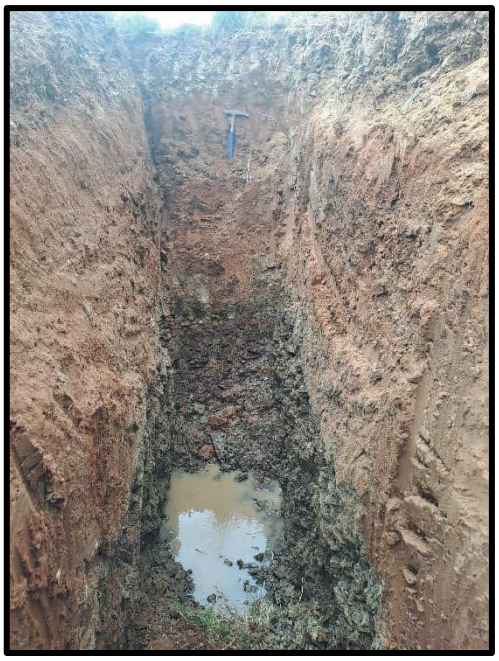


TP536

TP537

Pipeline Section 2

TP538



TP539

TP540

TP541

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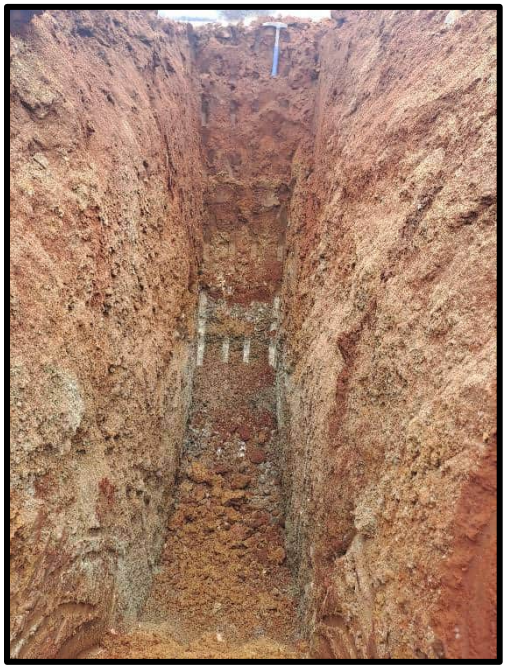
Pipeline Section 2

TP542

TP543

TP544



TP545

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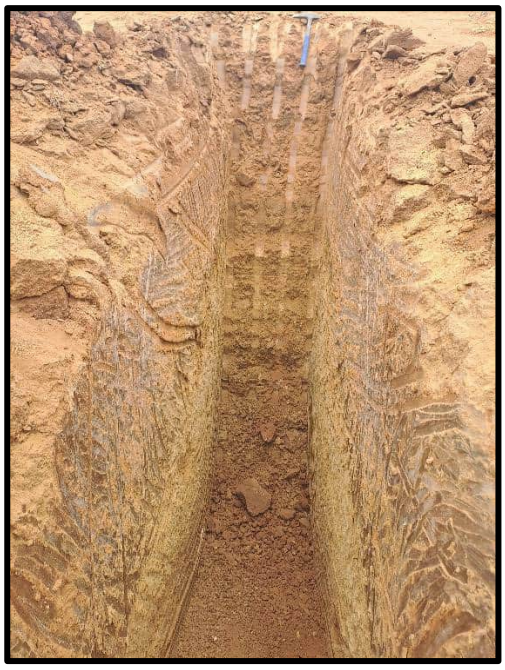
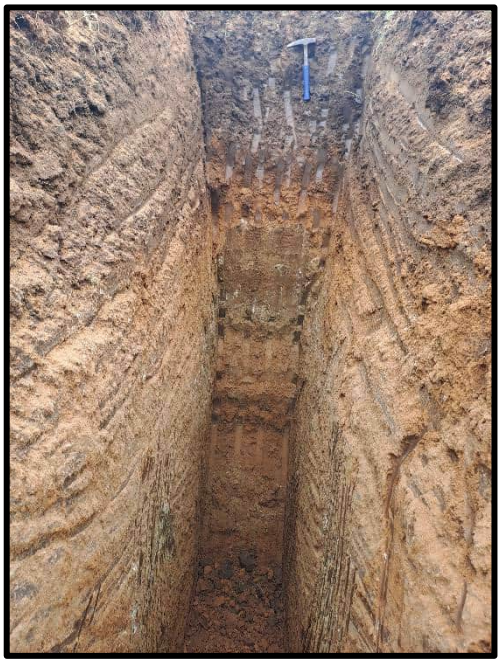
Pipeline Section 2

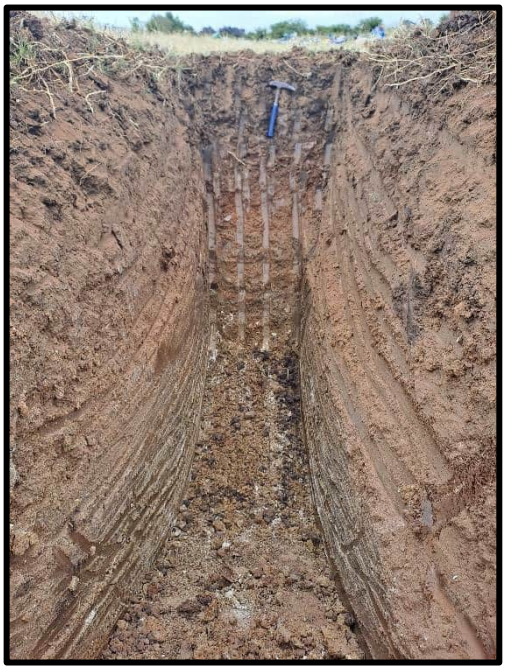


TP546

TP547



TP548



T549

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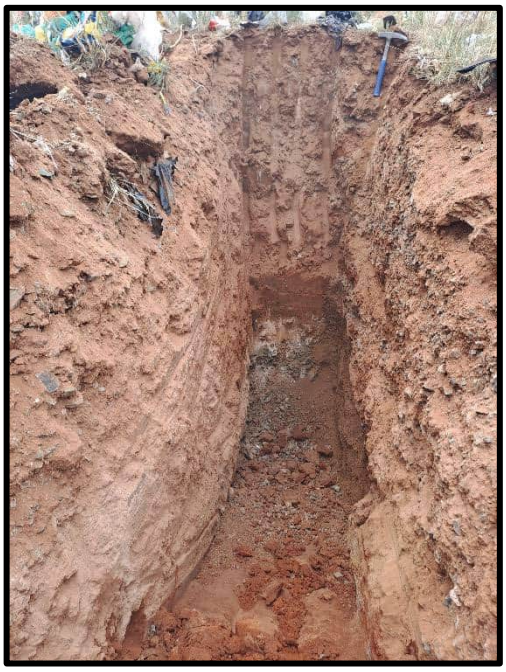
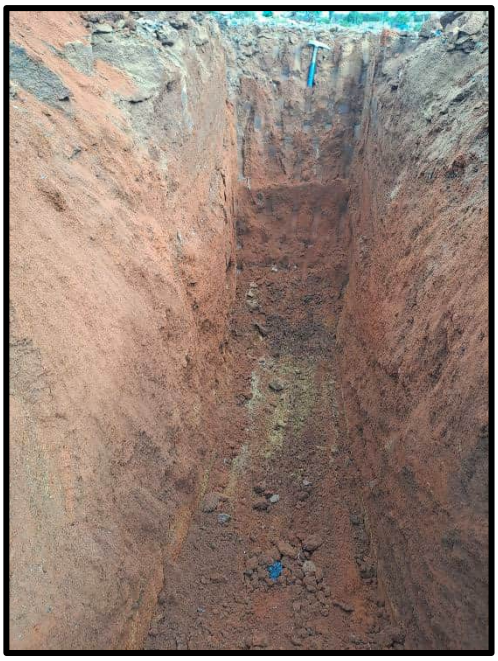
Kosmosdal.
0157

Pipeline Section 2

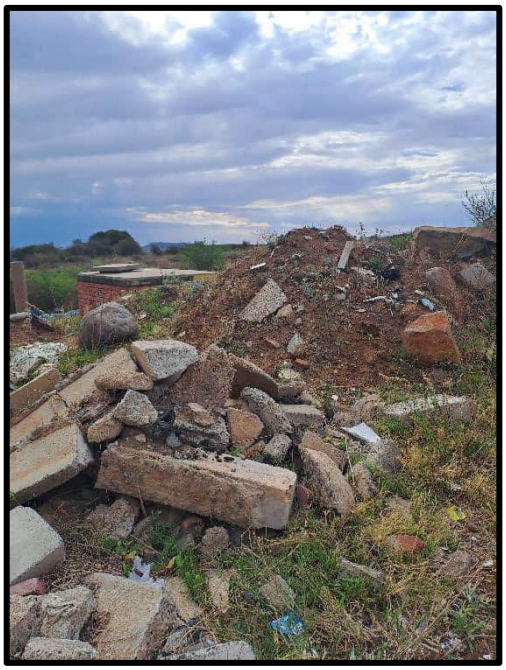


TP550



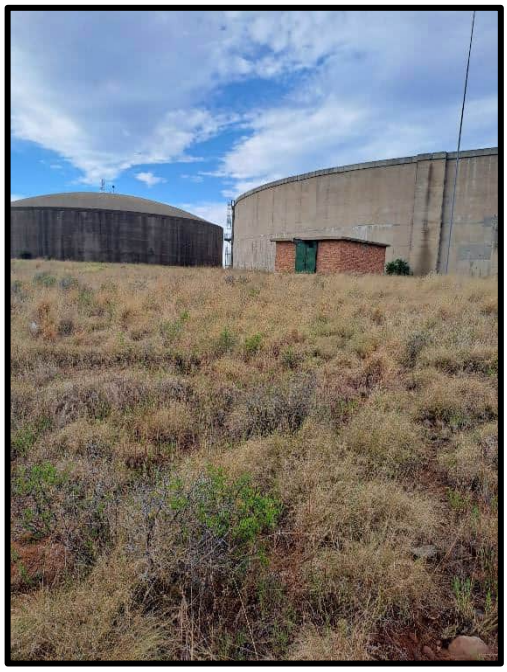
TP551

TP552



TP553

Pipeline Section 2

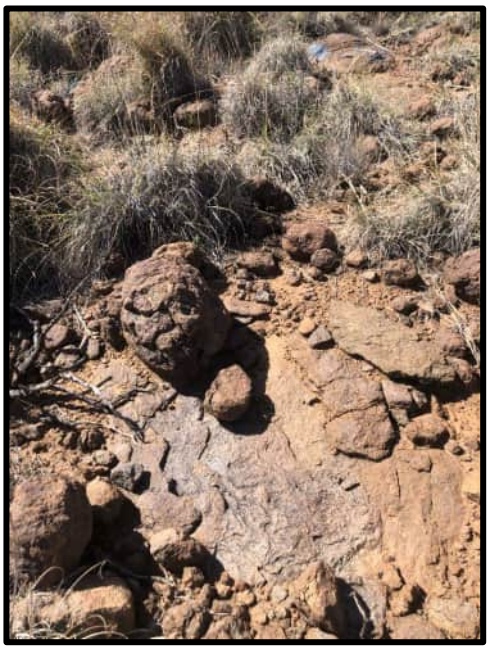


TP554

Low Lift Pump Station

TP01

TP02



TP03

TP04

WTW & High Lift Pump Station

TP06

TP07

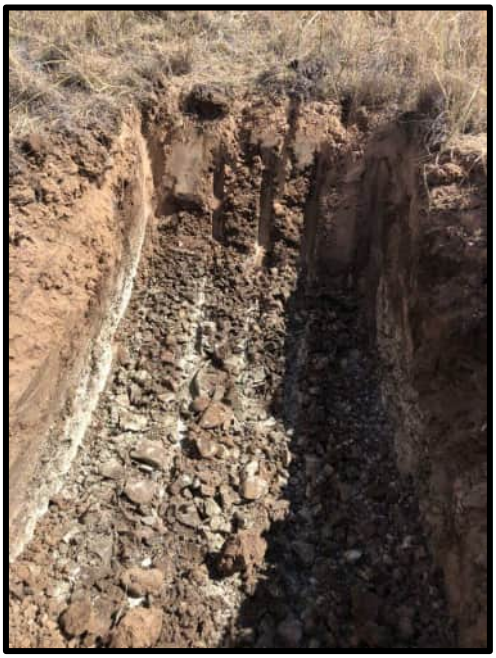
TP08

TP09

TP10

TP11

TP12



TP13

TP14

TP15

Reservoir No.1

TP16

TP17

TP18

TP19

TP20

Reservoir No.2 and Booster PS

TP21

TP22

TP23

TP24

TP25

Appendix D - DCP Test Results

DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	18/09/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	18/09/2024
TEST POSITION:	DCP 40	**STARTING DEPTH:**	10mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

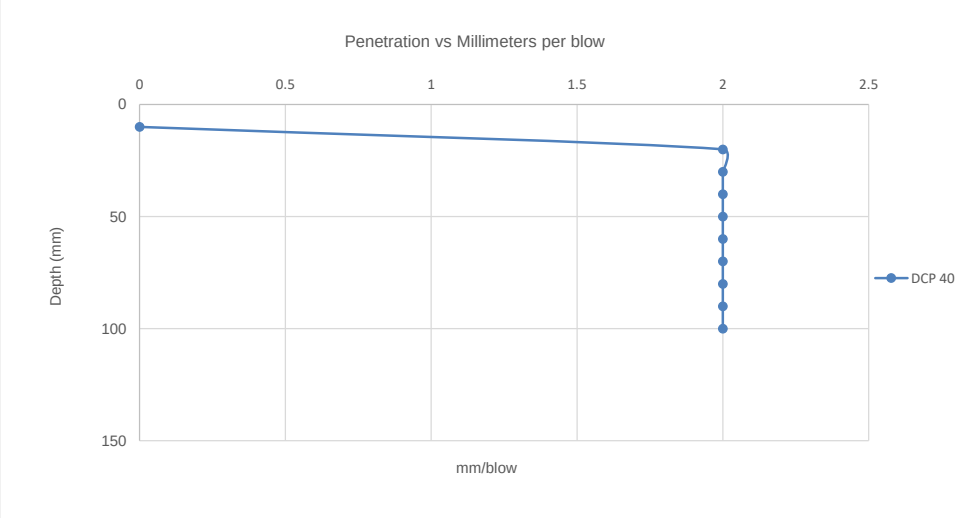
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	10	10mm	0	0				
5	20	20mm	10	2.0	Very Dense	170	>110	1362
10	30	30mm	10	2.0	Very Dense	170	>110	1362
15	40	40mm	10	2.0	Very Dense	170	>110	1362
20	50	50mm	10	2.0	Very Dense	170	>110	1362
25	60	60mm	10	2.0	Very Dense	170	>110	1362
30	70	70mm	10	2.0	Very Dense	170	>110	1362
35	80	80mm	10	2.0	Very Dense	170	>110	1362
40	90	90mm	10	2.0	Very Dense	170	>110	1362
45	100	100mm	10	2.0	Very Dense	170	>110	1362

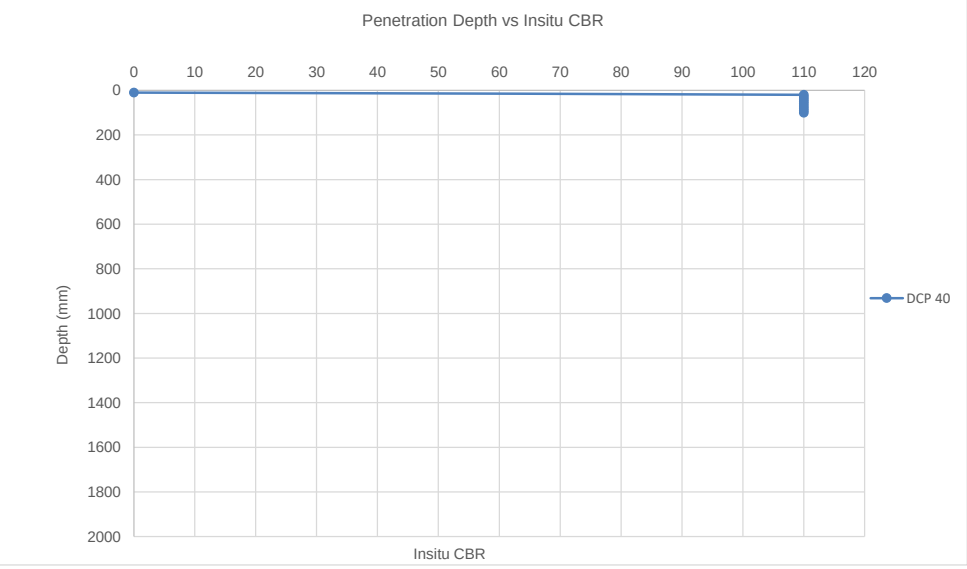
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 40
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 18/09/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 10mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	18/09/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	18/09/2024
TEST POSITION:	DCP 130	**STARTING DEPTH:**	10mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

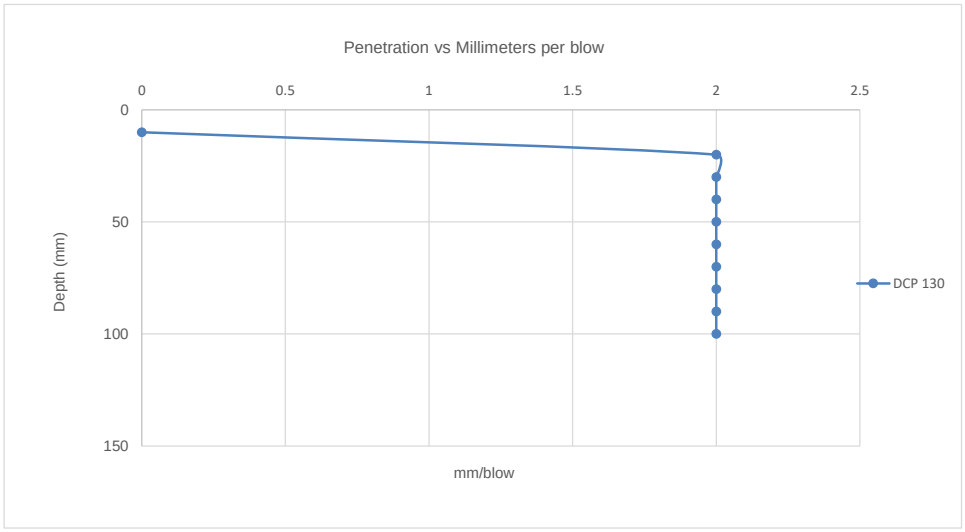
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	10	10mm	0	0				
5	20	20mm	10	2.0	Very Dense	170	>110	1362
10	30	30mm	10	2.0	Very Dense	170	>110	1362
15	40	40mm	10	2.0	Very Dense	170	>110	1362
20	50	50mm	10	2.0	Very Dense	170	>110	1362
25	60	60mm	10	2.0	Very Dense	170	>110	1362
30	70	70mm	10	2.0	Very Dense	170	>110	1362
35	80	80mm	10	2.0	Very Dense	170	>110	1362
40	90	90mm	10	2.0	Very Dense	170	>110	1362
43	100	100mm	10	2.0	Very Dense	170	>110	1362

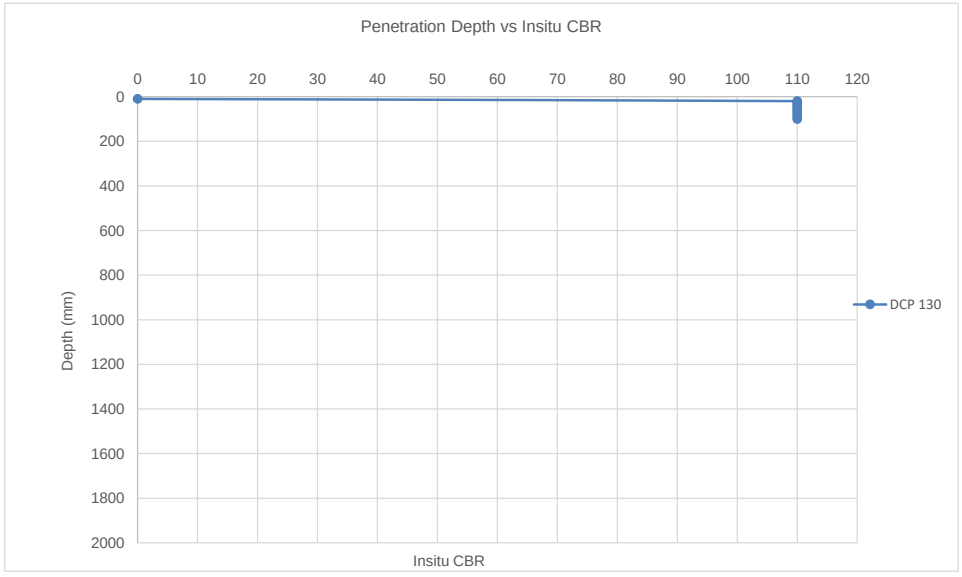
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 130
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 18/09/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 10mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	18/09/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	18/09/2024
TEST POSITION:	DCP 138	**STARTING DEPTH:**	10mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

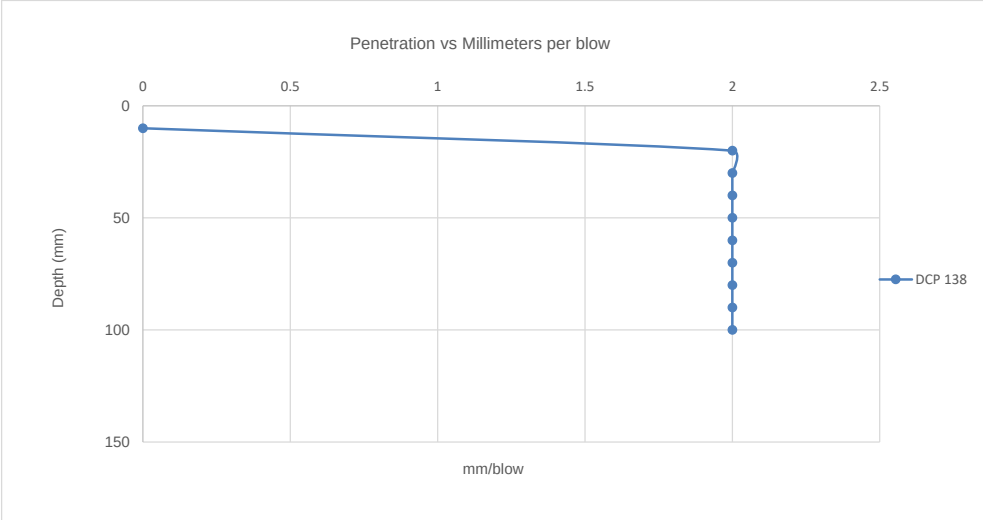
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
1	10	10mm	0	0				
5	20	20mm	10	2.0	Very Dense	170	>110	1362
10	30	30mm	10	2.0	Very Dense	170	>110	1362
15	40	40mm	10	2.0	Very Dense	170	>110	1362
20	50	50mm	10	2.0	Very Dense	170	>110	1362
25	60	60mm	10	2.0	Very Dense	170	>110	1362
30	70	70mm	10	2.0	Very Dense	170	>110	1362
35	80	80mm	10	2.0	Very Dense	170	>110	1362
40	90	90mm	10	2.0	Very Dense	170	>110	1362
45	100	100mm	10	2.0	Very Dense	170	>110	1362

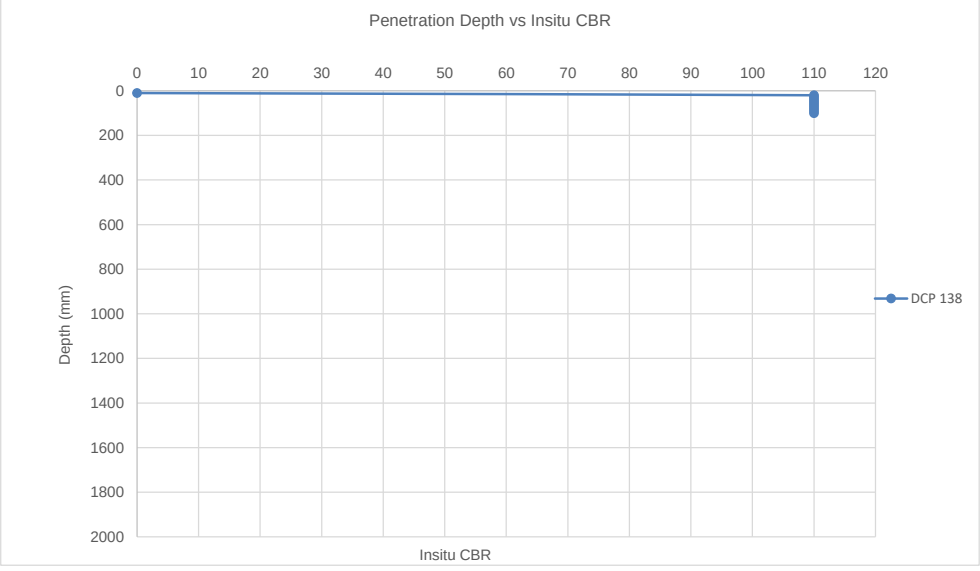
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 138
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 18/09/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 10mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	18/09/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	18/09/2024
TEST POSITION:	DCP 155	**STARTING DEPTH:**	10mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

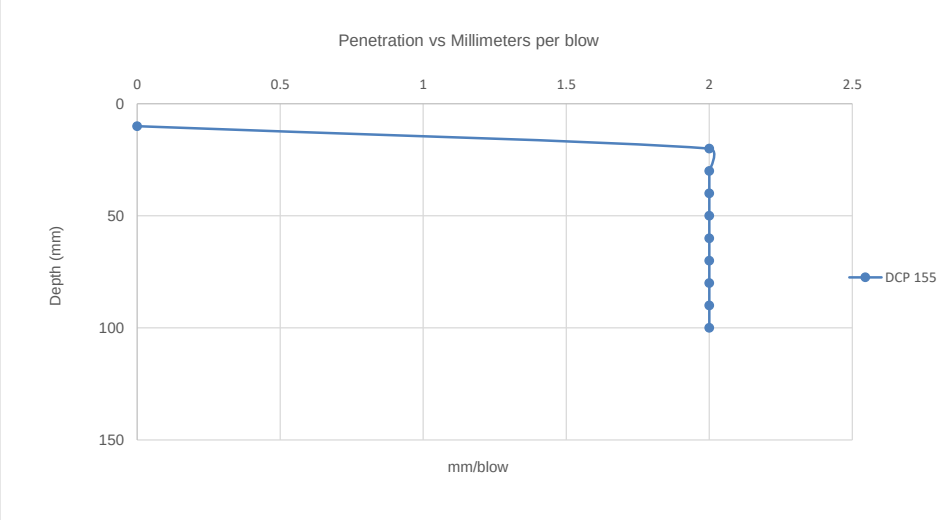
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	10	10mm	0	0				
5	20	20mm	10	2.0	Very Dense	170	>110	1362
10	30	30mm	10	2.0	Very Dense	170	>110	1362
15	40	40mm	10	2.0	Very Dense	170	>110	1362
20	50	50mm	10	2.0	Very Dense	170	>110	1362
25	60	60mm	10	2.0	Very Dense	170	>110	1362
30	70	70mm	10	2.0	Very Dense	170	>110	1362
35	80	80mm	10	2.0	Very Dense	170	>110	1362
40	90	90mm	10	2.0	Very Dense	170	>110	1362
45	100	100mm	10	2.0	Very Dense	170	>110	1362

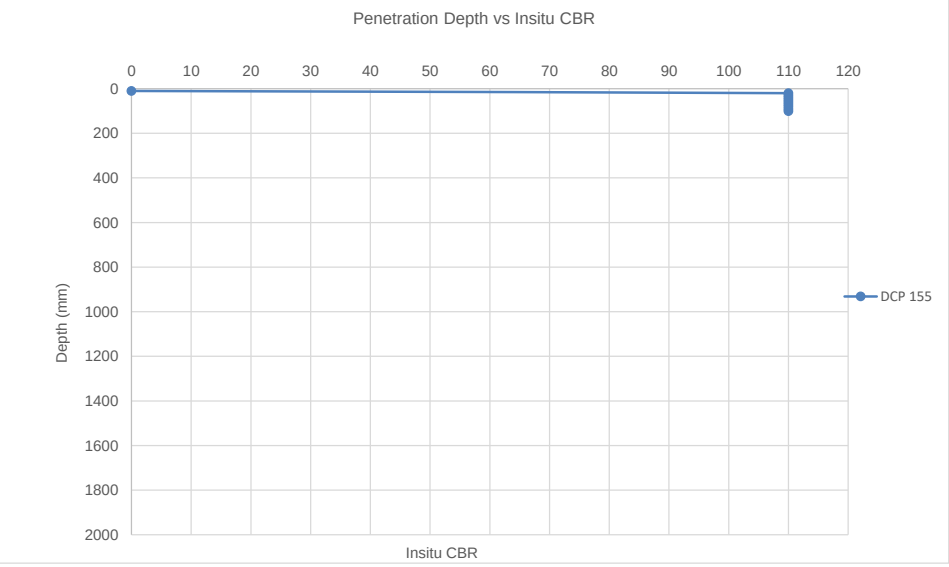
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 155
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 18/09/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 10mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	18/09/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	18/09/2024
TEST POSITION:	DCP 160	**STARTING DEPTH:**	22mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

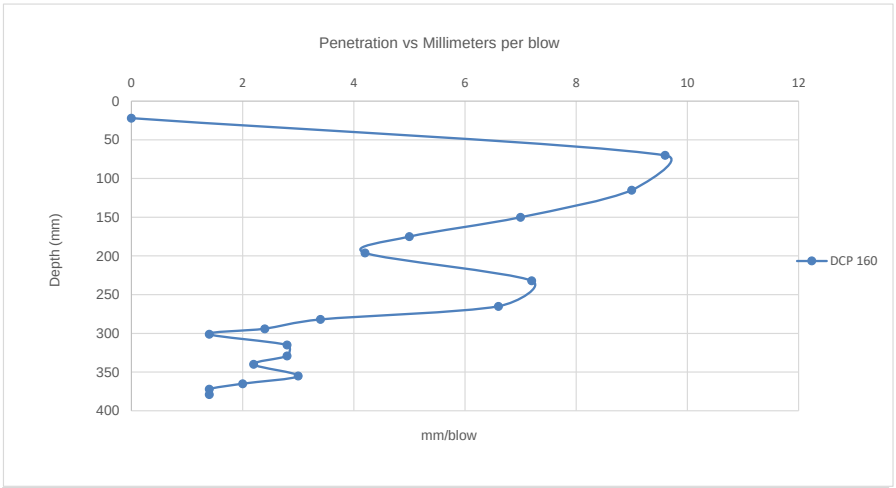
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	22	22mm	0	0				
5	70	70mm	48	9.6	Dense	23	24	246
10	115	115mm	45	9.0	Dense	25	26	264
15	150	150mm	35	7.0	Dense	35	36	348
20	175	175mm	25	5.0	Very Dense	53	56	502
25	196	196mm	21	4.2	Very Dense	66	70	607
30	232	232mm	36	7.2	Dense	33	35	337
35	265	265mm	33	6.6	Dense	37	39	371
40	282	282mm	17	3.4	Very Dense	87	92	764
45	294	294mm	12	2.4	Very Dense	135	>110	1117
50	301	301mm	7	1.4	Very Dense	232	>110	2010
55	315	315mm	14	2.8	Very Dense	111	>110	944
60	329	329mm	14	2.8	Very Dense	111	>110	944
65	340	340mm	11	2.2	Very Dense	151	>110	1228
70	355	355mm	15	3.0	Very Dense	102	108	876
75	365	365mm	10	2.0	Very Dense	170	>110	1362
80	372	372mm	7	1.4	Very Dense	232	>110	2010
85	379	379mm	7	1.4	Very Dense	232	>110	2010

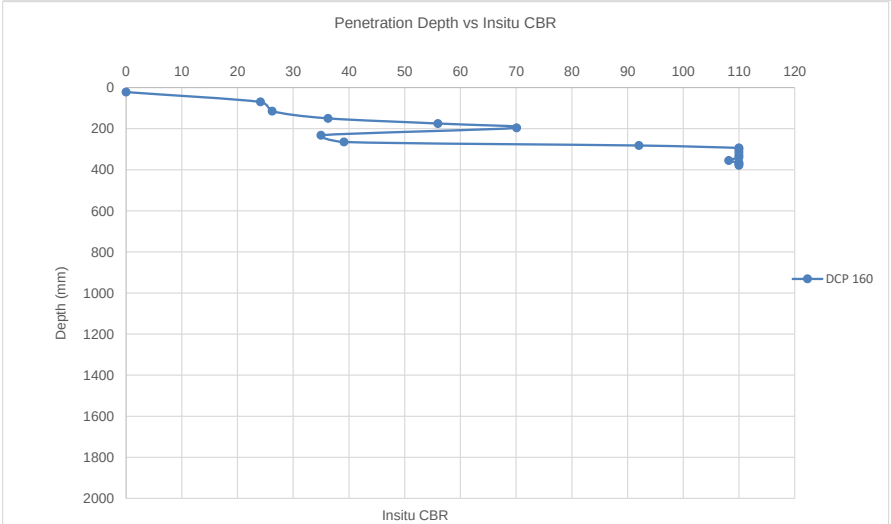
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 160
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 18/09/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 22mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	18/09/2024	
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013	
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	18/09/2024	
TEST POSITION:	DCP 180	**STARTING DEPTH:**	55mm	
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP	
CONSTRUCTION TYPE:	Road Construction	**NOTE:**		

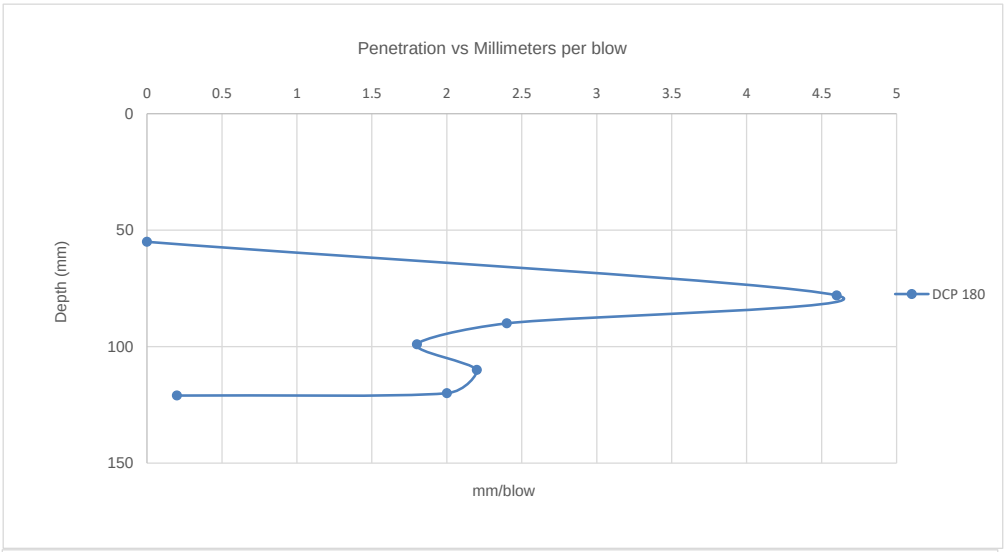
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
5	55	55mm	0	0				
10	78	78mm	23	4.6	Very Dense	59	62	550
15	90	90mm	12	2.4	Very Dense	135	>110	1117
20	99	99mm	9	1.8	Very Dense	185	>110	1528
25	110	110mm	11	2.2	Very Dense	151	>110	1228
30	120	120mm	10	2.0	Very Dense	170	>110	1362
Refusal	121	121mm	1	0.2	Very Dense	500	>110	16760

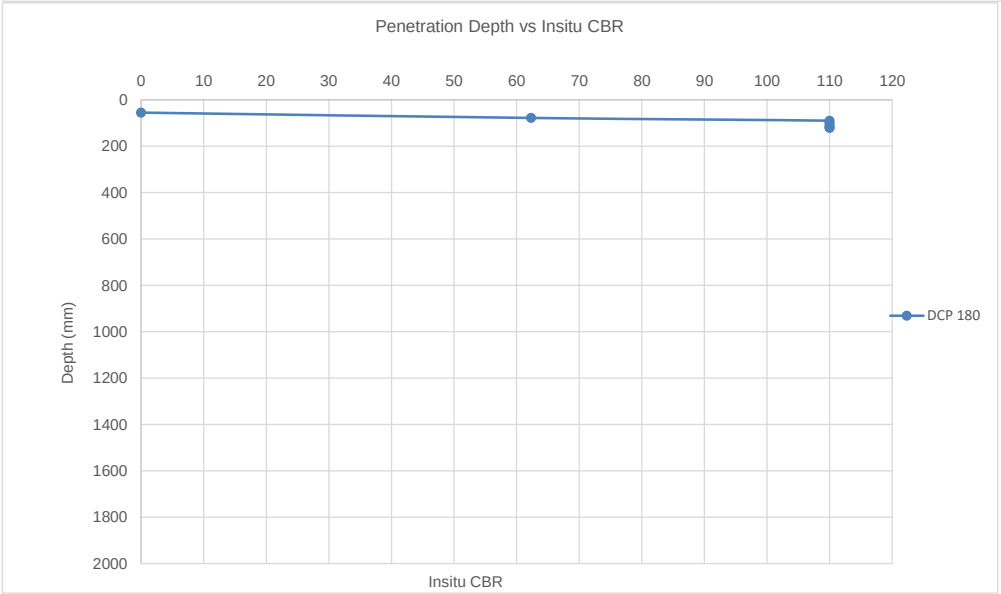
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 180
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 18/09/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 55mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	19/09/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	19/09/2024
TEST POSITION:	DCP 215	**STARTING DEPTH:**	10mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

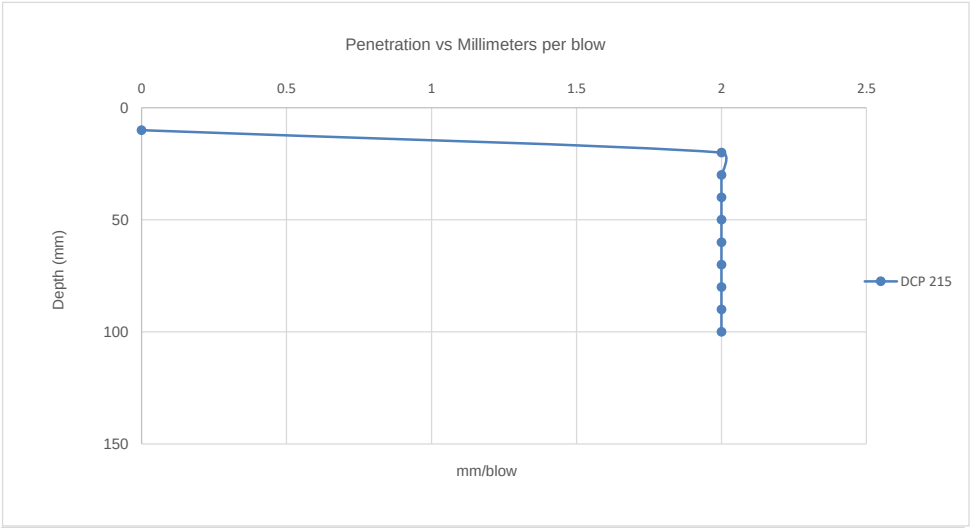
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	10	10mm	0	0				
5	20	20mm	10	2.0	Very Dense	170	>110	1362
7	30	30mm	10	2.0	Very Dense	170	>110	1362
5	40	40mm	10	2.0	Very Dense	170	>110	1362
8	50	50mm	10	2.0	Very Dense	170	>110	1362
6	60	60mm	10	2.0	Very Dense	170	>110	1362
7	70	70mm	10	2.0	Very Dense	170	>110	1362
8	80	80mm	10	2.0	Very Dense	170	>110	1362
9	90	90mm	10	2.0	Very Dense	170	>110	1362
10	100	100mm	10	2.0	Very Dense	170	>110	1362

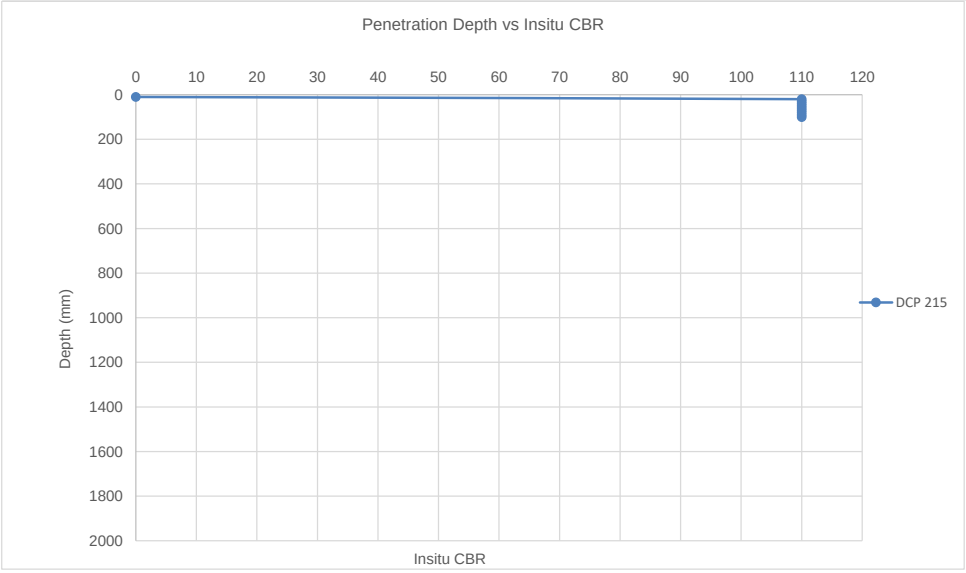
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 215
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 19/09/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 10mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	19/09/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	19/09/2024
TEST POSITION:	DCP 217	**STARTING DEPTH:**	10mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

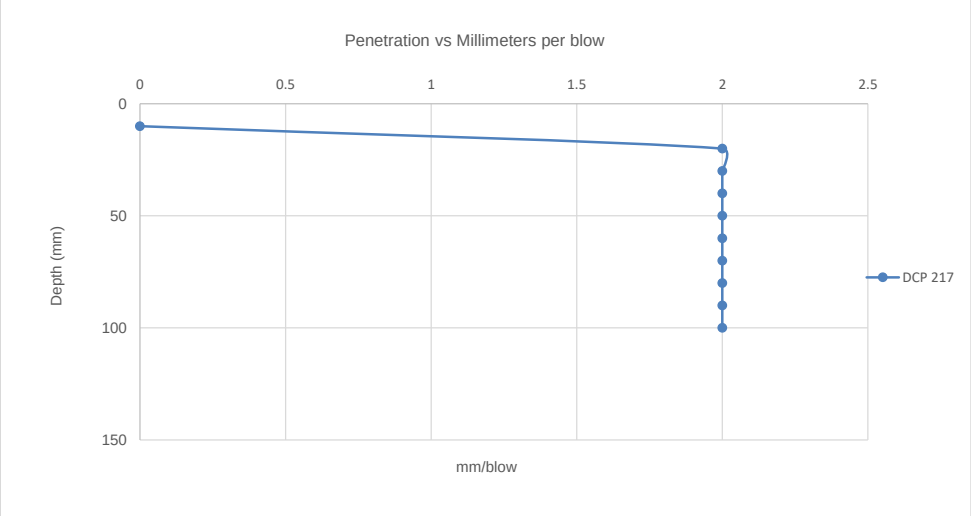
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x $(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x $(dn)^{-1.09}$
0	10	10mm	0	0				
5	20	20mm	10	2.0	Very Dense	170	>110	1362
10	30	30mm	10	2.0	Very Dense	170	>110	1362
15	40	40mm	10	2.0	Very Dense	170	>110	1362
20	50	50mm	10	2.0	Very Dense	170	>110	1362
25	60	60mm	10	2.0	Very Dense	170	>110	1362
30	70	70mm	10	2.0	Very Dense	170	>110	1362
35	80	80mm	10	2.0	Very Dense	170	>110	1362
40	90	90mm	10	2.0	Very Dense	170	>110	1362
45	100	100mm	10	2.0	Very Dense	170	>110	1362

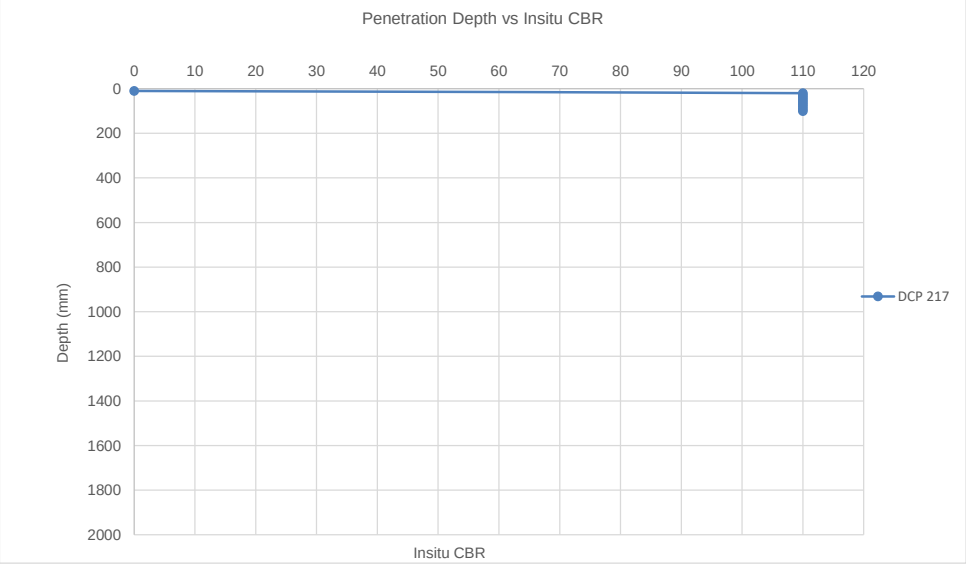
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 217
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 19/09/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 10mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	18/09/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	18/09/2024
TEST POSITION:	DCP 218	**STARTING DEPTH:**	30mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

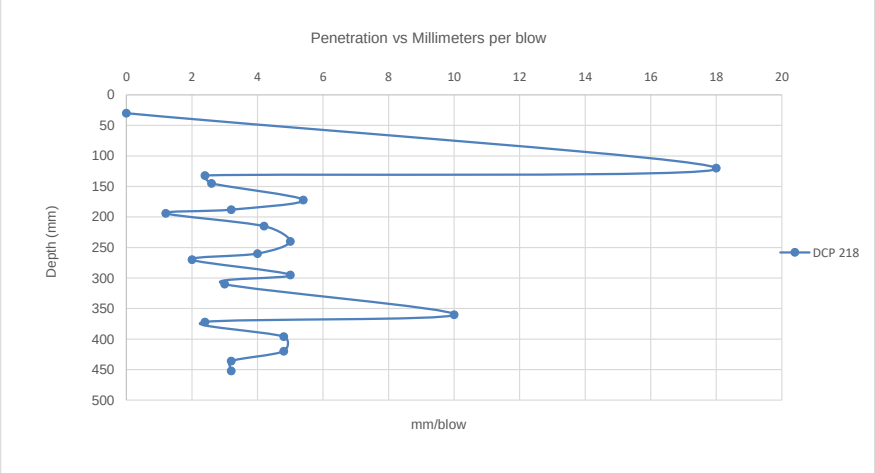
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x $(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x $(dn)^{-1.09}$
0	30	30mm	0	0				
5	120	120mm	90	18.0	Medium Dense	10	11	124
10	132	132mm	12	2.4	Very Dense	135	>110	1117
15	145	145mm	13	2.6	Very Dense	122	>110	1023
20	172	172mm	27	5.4	Dense	48	51	461
25	188	188mm	16	3.2	Very Dense	94	100	816
30	194	194mm	6	1.2	Very Dense	263	>110	2377
35	215	215mm	21	4.2	Very Dense	66	70	607
40	240	240mm	25	5.0	Very Dense	53	56	502
45	260	260mm	20	4.0	Very Dense	70	75	640
50	270	270mm	10	2.0	Very Dense	170	>110	1362
55	295	295mm	25	5.0	Very Dense	53	56	502
60	310	310mm	15	3.0	Very Dense	102	108	876
65	360	360mm	50	10.0	Dense	22	23	236
70	372	372mm	12	2.4	Very Dense	135	>110	1117
75	396	396mm	24	4.8	Very Dense	56	59	525
80	420	420mm	24	4.8	Very Dense	56	59	525
85	436	436mm	16	3.2	Very Dense	94	100	816
90	452	452mm	16	3.2	Very Dense	94	100	816

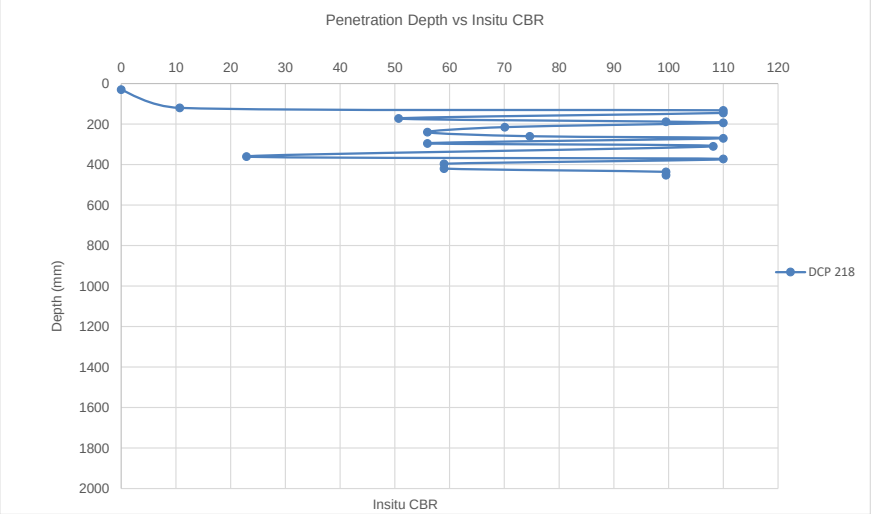
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 218
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 18/09/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 30mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	20/09/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	20/09/2024
TEST POSITION:	DCP 219	**STARTING DEPTH:**	60mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

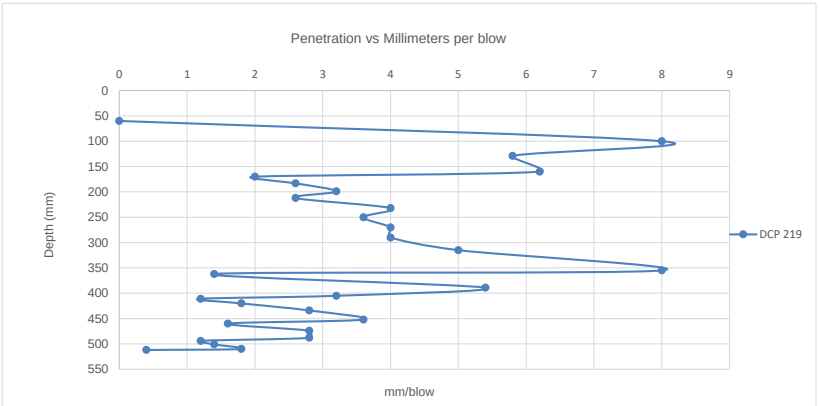
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	60	60mm	0	0				
5	100	100mm	40	8.0	Dense	29	31	301
10	129	129mm	29	5.8	Dense	44	46	427
15	160	160mm	31	6.2	Dense	40	42	397
20	170	170mm	10	2.0	Very Dense	170	>110	1362
25	183	183mm	13	2.6	Very Dense	122	>110	1023
30	199	199mm	16	3.2	Very Dense	94	100	816
35	212	212mm	13	2.6	Very Dense	122	>110	1023
40	232	232mm	20	4.0	Very Dense	70	75	640
45	250	250mm	18	3.6	Very Dense	81	86	718
50	270	270mm	20	4.0	Very Dense	70	75	640
55	290	290mm	20	4.0	Very Dense	70	75	640
60	315	315mm	25	5.0	Very Dense	53	56	502
65	355	355mm	40	8.0	Dense	29	31	301
70	362	362mm	7	1.4	Very Dense	232	>110	2010
75	389	389mm	27	5.4	Dense	48	51	461
80	405	405mm	16	3.2	Very Dense	94	100	816
85	411	411mm	6	1.2	Very Dense	263	>110	2377
90	420	420mm	9	1.8	Very Dense	185	>110	1528
95	434	434mm	14	2.8	Very Dense	111	>110	944
100	452	452mm	18	3.6	Very Dense	81	86	718
105	460	460mm	8	1.6	Very Dense	206	>110	1737
110	474	474mm	14	2.8	Very Dense	111	>110	944
115	488	488mm	14	2.8	Very Dense	111	>110	944
120	494	494mm	6	1.2	Very Dense	263	>110	2377
125	501	501mm	7	1.4	Very Dense	232	>110	2010
130	510	510mm	9	1.8	Very Dense	185	>110	1528
135	512	512mm	2	0.4	Very Dense	442	>110	7873

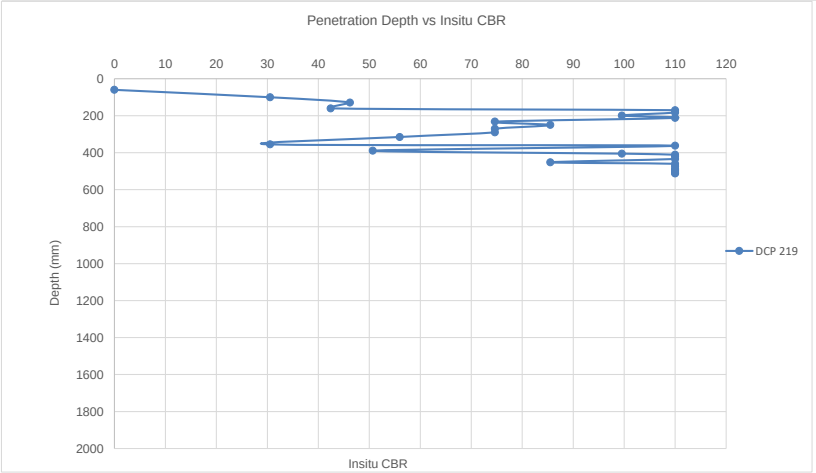
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 219
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 20/09/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 60mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	20/09/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	20/09/2024
TEST POSITION:	DCP 220	**STARTING DEPTH:**	25mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

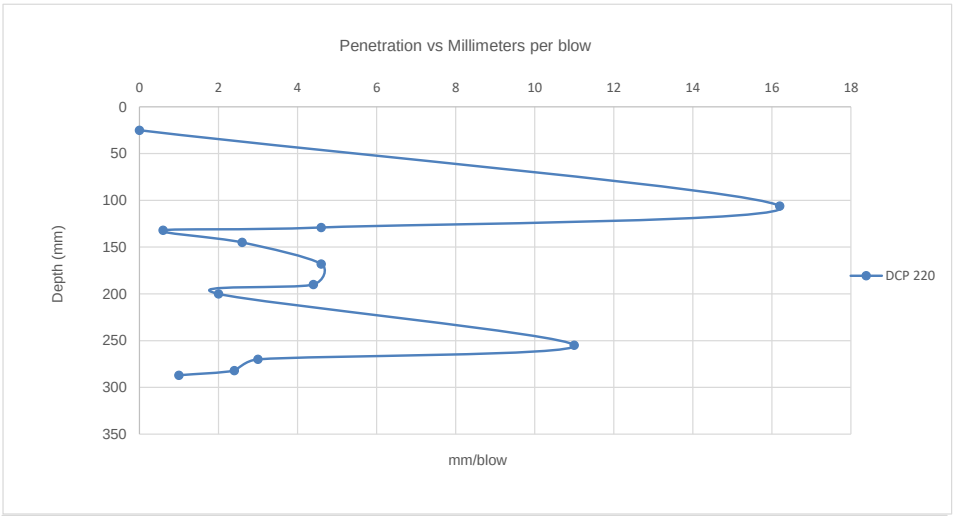
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\ (dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\ (dn)^{-1.09}$
0	25	25mm	0	0				
5	106	106mm	81	16.2	Medium Dense	12	12	139
10	129	129mm	23	4.6	Very Dense	59	62	550
15	132	132mm	3	0.6	Very Dense	389	>110	5061
20	145	145mm	13	2.6	Very Dense	122	>110	1023
25	168	168mm	23	4.6	Very Dense	59	62	550
30	190	190mm	22	4.4	Very Dense	62	66	577
35	200	200mm	10	2.0	Very Dense	170	>110	1362
40	255	255mm	55	11.0	Dense	20	20	212
45	270	270mm	15	3.0	Very Dense	102	108	876
50	282	282mm	12	2.4	Very Dense	135	>110	1117
55	287	287mm	5	1.0	Very Dense	300	>110	2900

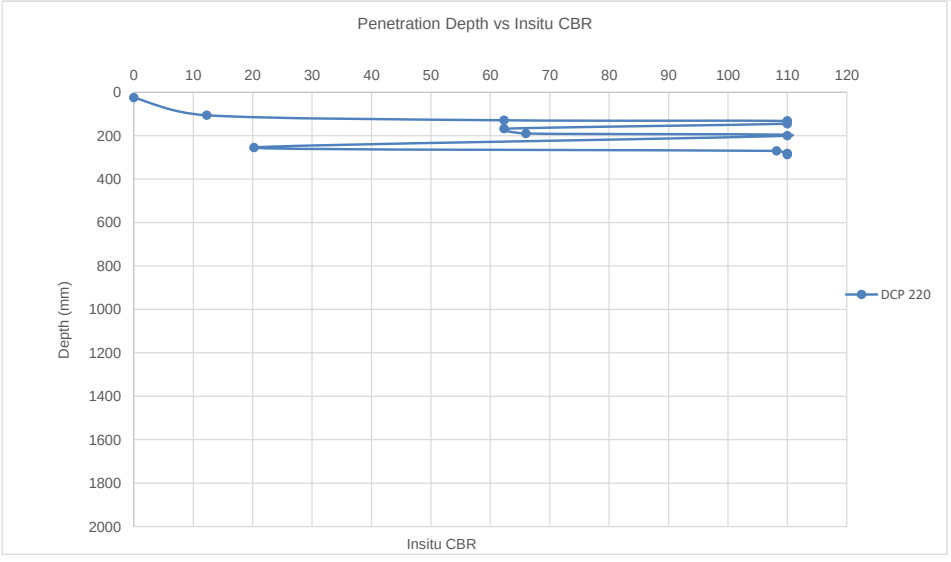
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 220
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 20/09/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 25mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	20/09/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	20/09/2024
TEST POSITION:	DCP 246	**STARTING DEPTH:**	10mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

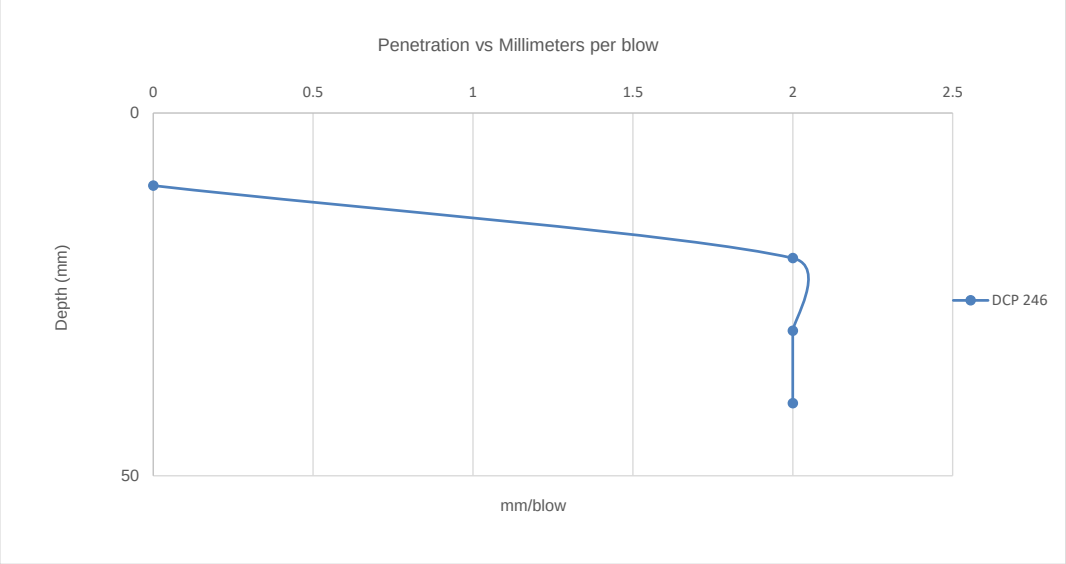
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\ (dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\ (dn)^{-1.09}$
0	10	10mm	0	0				
5	20	20mm	10	2.0	Very Dense	170	>110	1362
10	30	30mm	10	2.0	Very Dense	170	>110	1362
15	40	40mm	10	2.0	Very Dense	170	>110	1362

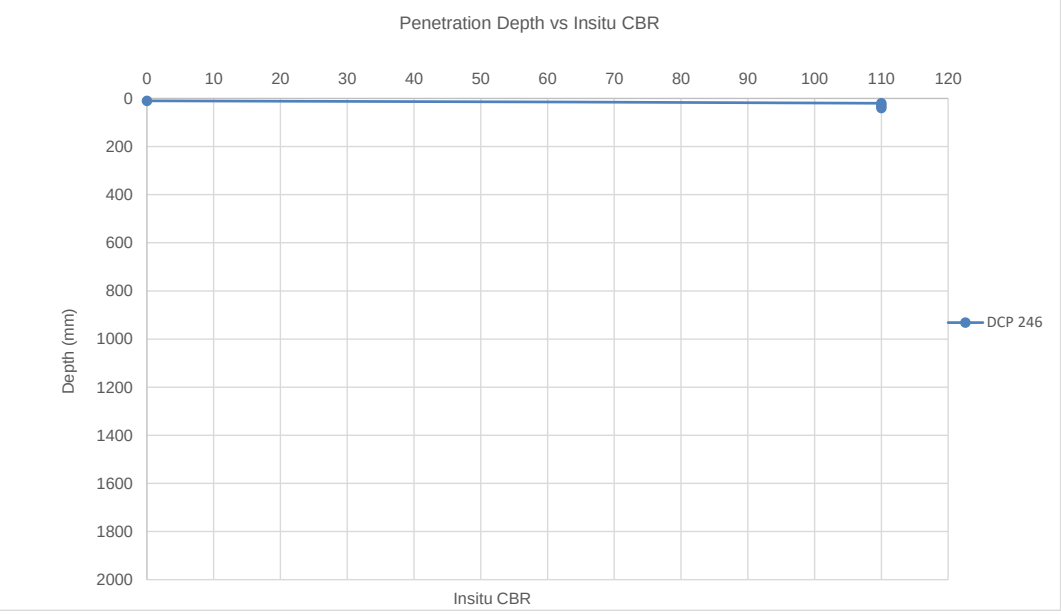
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 246
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 20/09/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 10mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	20/09/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	20/09/2024
TEST POSITION:	DCP 256	**STARTING DEPTH:**	15mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

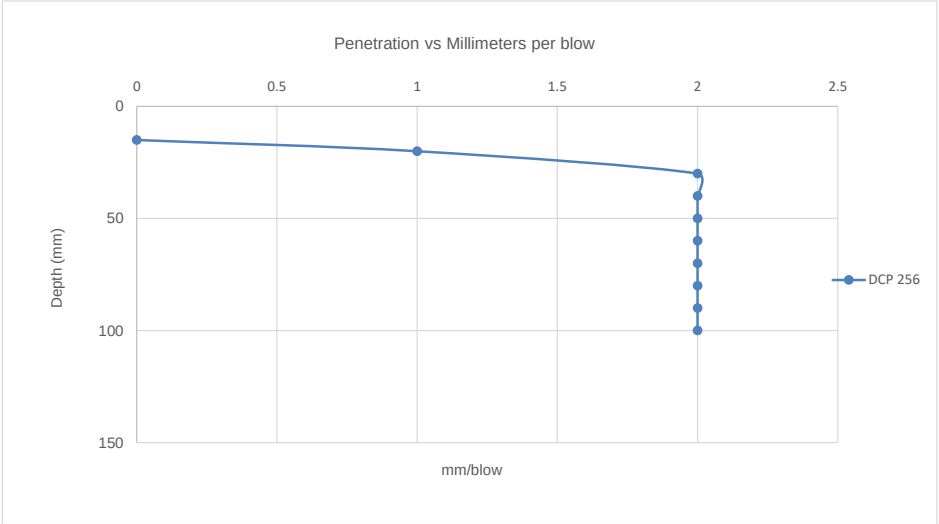
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
1	15	15mm	0	0				
5	20	20mm	5	1.0	Very Dense	300	>110	2900
10	30	30mm	10	2.0	Very Dense	170	>110	1362
15	40	40mm	10	2.0	Very Dense	170	>110	1362
20	50	50mm	10	2.0	Very Dense	170	>110	1362
25	60	60mm	10	2.0	Very Dense	170	>110	1362
30	70	70mm	10	2.0	Very Dense	170	>110	1362
35	80	80mm	10	2.0	Very Dense	170	>110	1362
40	90	90mm	10	2.0	Very Dense	170	>110	1362
45	100	100mm	10	2.0	Very Dense	170	>110	1362

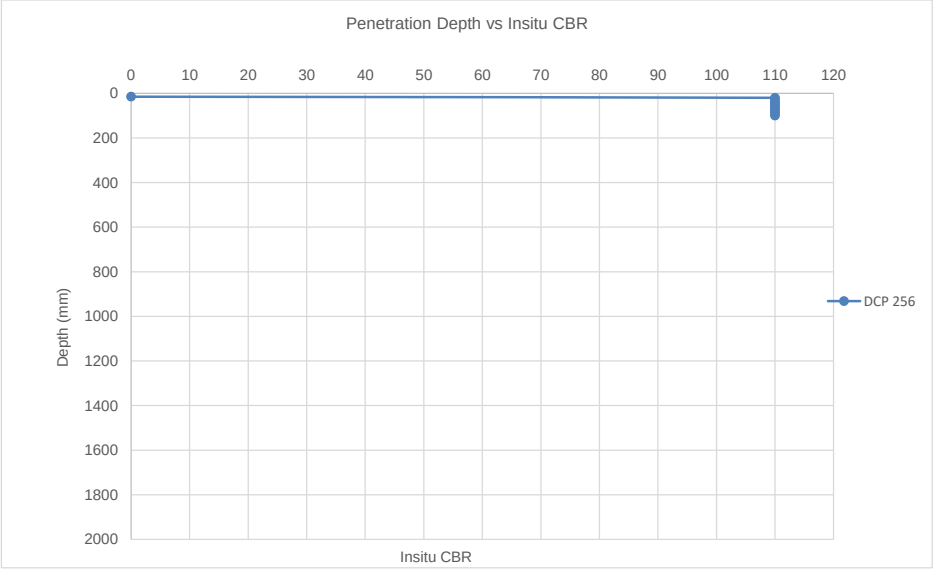
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 256
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 20/09/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 15mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	20/09/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	20/09/2024
TEST POSITION:	DCP 271	**STARTING DEPTH:**	15mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

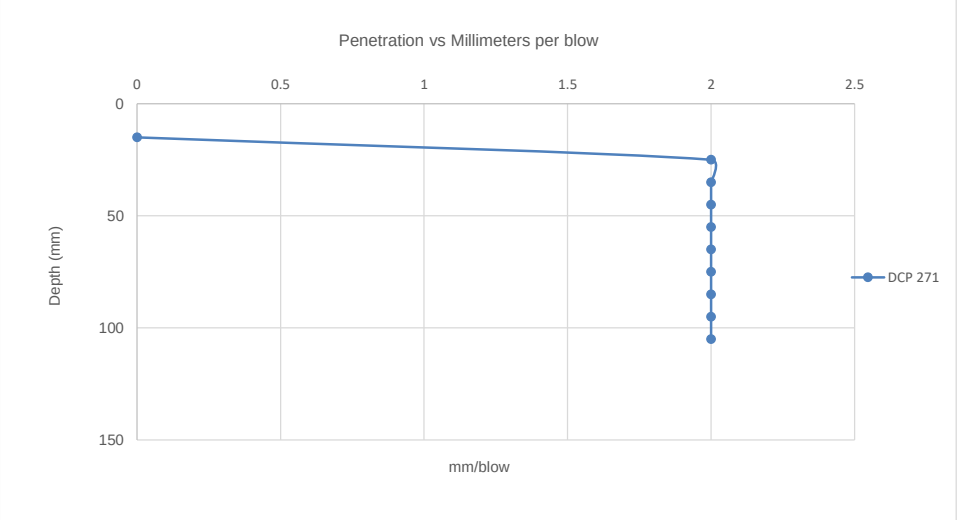
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	10	15mm	0	0				
5	20	25mm	10	2.0	Very Dense	170	>110	1362
10	30	35mm	10	2.0	Very Dense	170	>110	1362
15	40	45mm	10	2.0	Very Dense	170	>110	1362
20	50	55mm	10	2.0	Very Dense	170	>110	1362
25	60	65mm	10	2.0	Very Dense	170	>110	1362
30	70	75mm	10	2.0	Very Dense	170	>110	1362
35	80	85mm	10	2.0	Very Dense	170	>110	1362
40	90	95mm	10	2.0	Very Dense	170	>110	1362
45	100	105mm	10	2.0	Very Dense	170	>110	1362

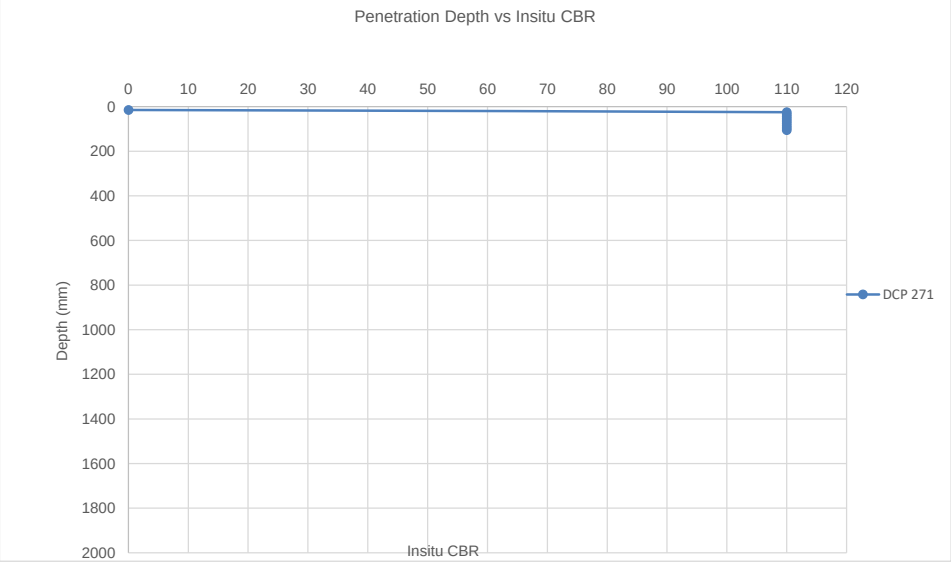
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 271
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 20/09/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 15mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	20/09/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	20/09/2024
TEST POSITION:	DCP 278	**STARTING DEPTH:**	30mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

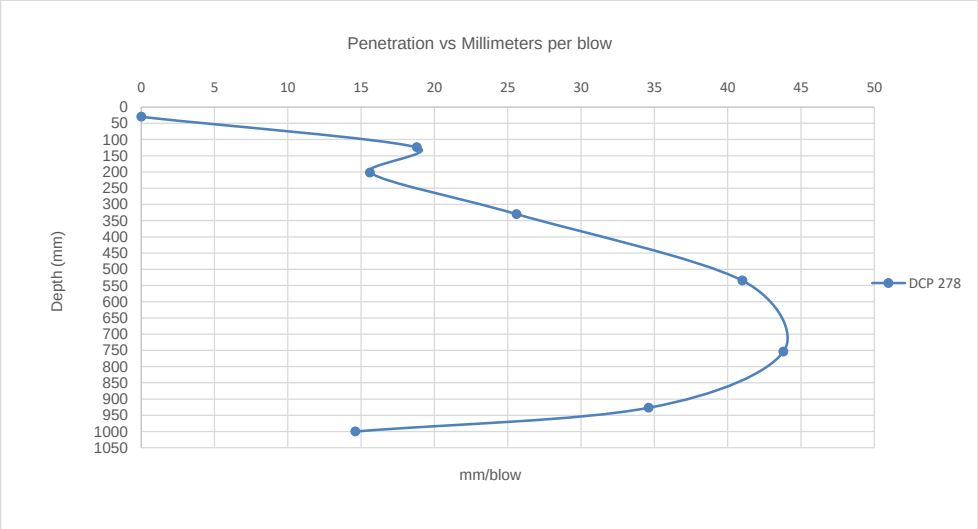
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	30	30mm	0	0				
5	124	124mm	94	18.8	Medium Dense	10	10	118
10	202	202mm	78	15.6	Medium Dense	13	13	145
15	330	330mm	128	25.6	Medium Dense	7	7	85
20	535	535mm	205	41.0	Loose	4	4	51
25	754	754mm	219	43.8	Loose	3	3	47
30	927	927mm	173	34.6	Loose	5	5	61
35	1000	1000mm	73	14.6	Medium Dense	14	14	156

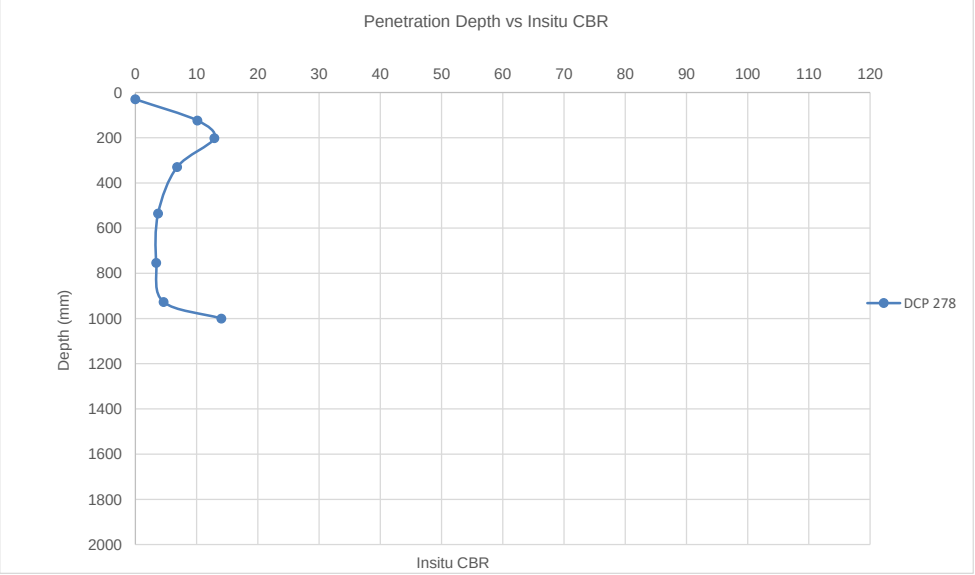
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 278
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 20/09/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 30mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	20/09/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	20/09/2024
TEST POSITION:	DCP 284	**STARTING DEPTH:**	40mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

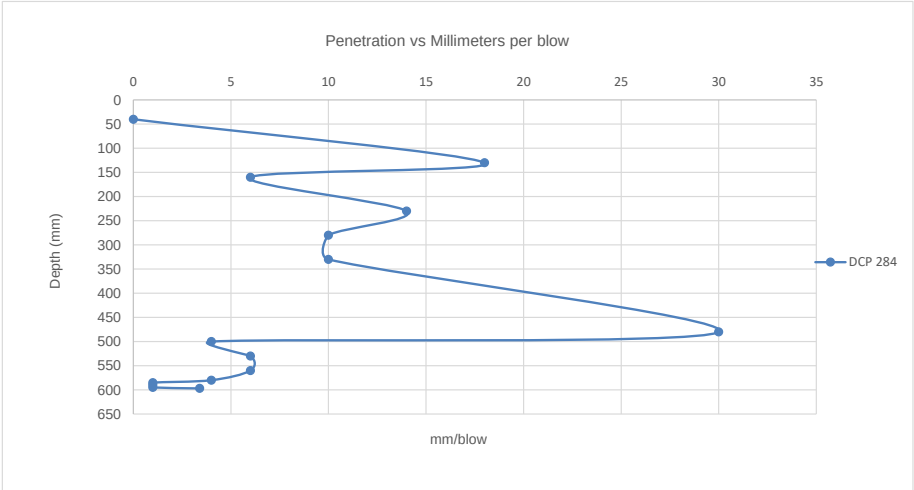
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	40	40mm	0	0				
5	130	130mm	90	18.0	Medium Dense	10	11	124
10	160	160mm	30	6.0	Dense	42	44	411
15	230	230mm	70	14.0	Medium Dense	14	15	163
25	280	280mm	50	10.0	Dense	22	23	236
30	330	330mm	50	10.0	Dense	22	23	236
35	480	480mm	150	30.0	Medium Dense	5	6	71
40	500	500mm	20	4.0	Very Dense	70	75	640
45	530	530mm	30	6.0	Dense	42	44	411
50	560	560mm	30	6.0	Dense	42	44	411
55	580	580mm	20	4.0	Very Dense	70	75	640
60	585	585mm	5	1.0	Very Dense	300	>110	2900
65	590	590mm	5	1.0	Very Dense	300	>110	2900
70	595	595mm	5	1.0	Very Dense	300	>110	2900
75	597	597mm	17	3.4	Very Dense	87	92	764

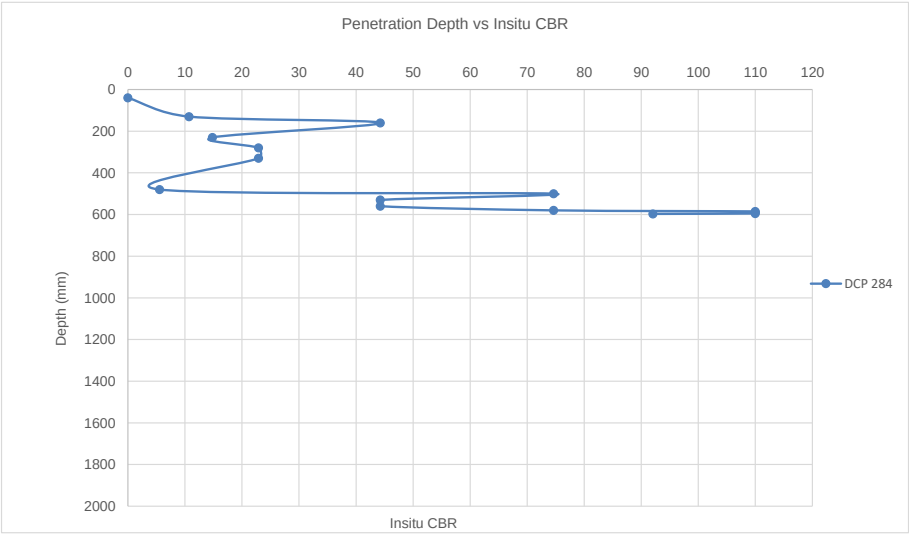
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 284
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 20/09/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 40mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	20/09/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	20/09/2024
TEST POSITION:	DCP 288	**STARTING DEPTH:**	30mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

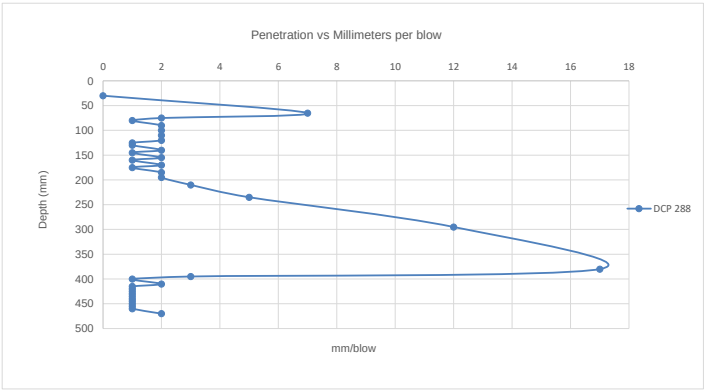
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	30	30mm	0	0				
5	65	65mm	35	7.0	Dense	35	36	348
10	75	75mm	10	2.0	Very Dense	170	>110	1362
15	80	80mm	5	1.0	Very Dense	300	>110	2900
20	90	90mm	10	2.0	Very Dense	170	>110	1362
25	100	100mm	10	2.0	Very Dense	170	>110	1362
30	110	110mm	10	2.0	Very Dense	170	>110	1362
35	120	120mm	10	2.0	Very Dense	170	>110	1362
40	125	125mm	5	1.0	Very Dense	300	>110	2900
45	130	130mm	5	1.0	Very Dense	300	>110	2900
50	140	140mm	10	2.0	Very Dense	170	>110	1362
55	145	145mm	5	1.0	Very Dense	300	>110	2900
60	155	155mm	10	2.0	Very Dense	170	>110	1362
65	160	160mm	5	1.0	Very Dense	300	>110	2900
70	170	170mm	10	2.0	Very Dense	170	>110	1362
75	175	175mm	5	1.0	Very Dense	300	>110	2900
80	185	185mm	10	2.0	Very Dense	170	>110	1362
85	195	195mm	10	2.0	Very Dense	170	>110	1362
90	210	210mm	15	3.0	Very Dense	102	108	876
95	235	235mm	25	5.0	Very Dense	53	56	502
100	295	295mm	60	12.0	Dense	17	18	193
105	380	380mm	85	17.0	Medium Dense	11	12	132
110	395	395mm	15	3.0	Very Dense	102	108	876
115	400	400mm	5	1.0	Very Dense	300	>110	2900
120	410	410mm	10	2.0	Very Dense	170	>110	1362
125	415	415mm	5	1.0	Very Dense	300	>110	2900
130	420	420mm	5	1.0	Very Dense	300	>110	2900
135	425	425mm	5	1.0	Very Dense	300	>110	2900
140	430	430mm	5	1.0	Very Dense	300	>110	2900
145	435	435mm	5	1.0	Very Dense	300	>110	2900
150	440	440mm	5	1.0	Very Dense	300	>110	2900
155	445	445mm	5	1.0	Very Dense	300	>110	2900
160	450	450mm	5	1.0	Very Dense	300	>110	2900
165	455	455mm	5	1.0	Very Dense	300	>110	2900
170	460	460mm	5	1.0	Very Dense	300	>110	2900
175	470	470mm	10	2.0	Very Dense	170	>110	1362

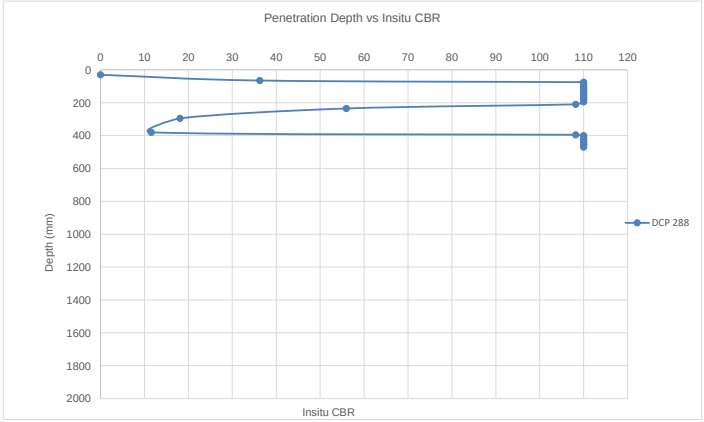
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 288
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 20/09/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 30mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	20/09/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	20/09/2024
TEST POSITION:	DCP 292A	**STARTING DEPTH:**	30mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

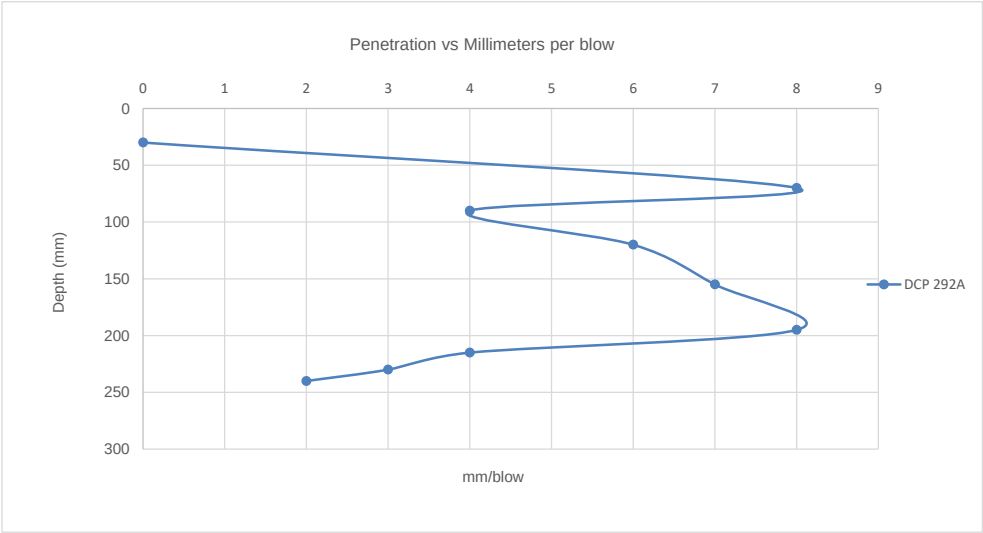
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	30	30mm	0	0				
5	70	70mm	40	8.0	Dense	29	31	301
10	90	90mm	20	4.0	Very Dense	70	75	640
15	120	120mm	30	6.0	Dense	42	44	411
20	155	155mm	35	7.0	Dense	35	36	348
25	195	195mm	40	8.0	Dense	29	31	301
30	215	215mm	20	4.0	Very Dense	70	75	640
35	230	230mm	15	3.0	Very Dense	102	108	876
40	240	240mm	10	2.0	Very Dense	170	>110	1362

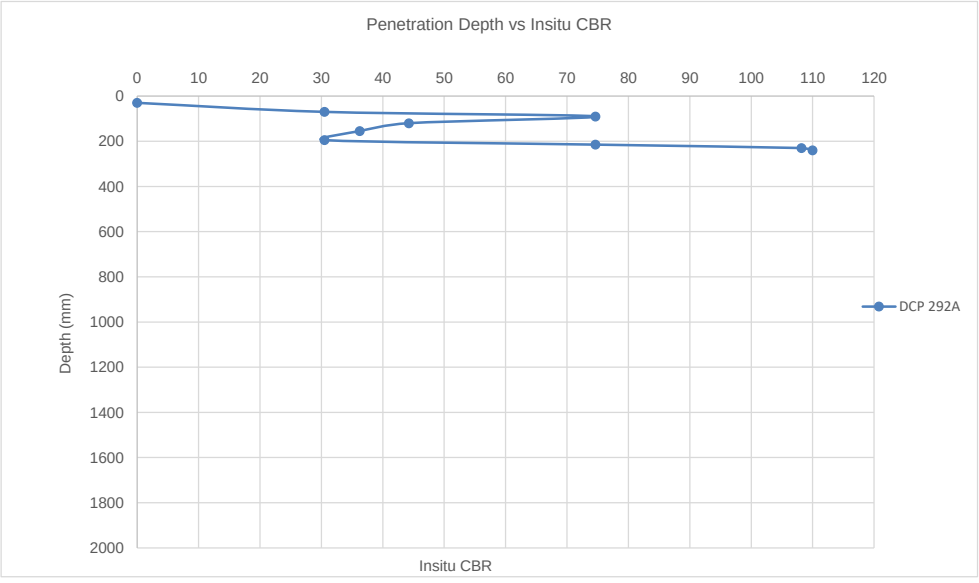
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 292A
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 20/09/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 30mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	20/09/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	20/09/2024
TEST POSITION:	DCP 292B	**STARTING DEPTH:**	40mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

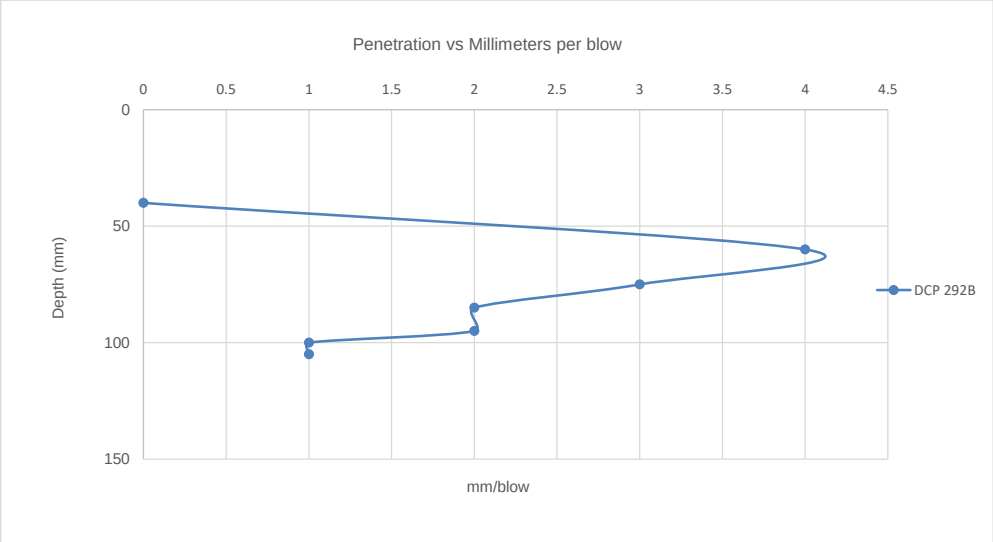
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	40	40mm	0	0				
5	60	60mm	20	4.0	Very Dense	70	75	640
10	75	75mm	15	3.0	Very Dense	102	108	876
15	85	85mm	10	2.0	Very Dense	170	>110	1362
20	95	95mm	10	2.0	Very Dense	170	>110	1362
25	100	100mm	5	1.0	Very Dense	300	>110	2900
30	105	105mm	5	1.0	Very Dense	300	>110	2900

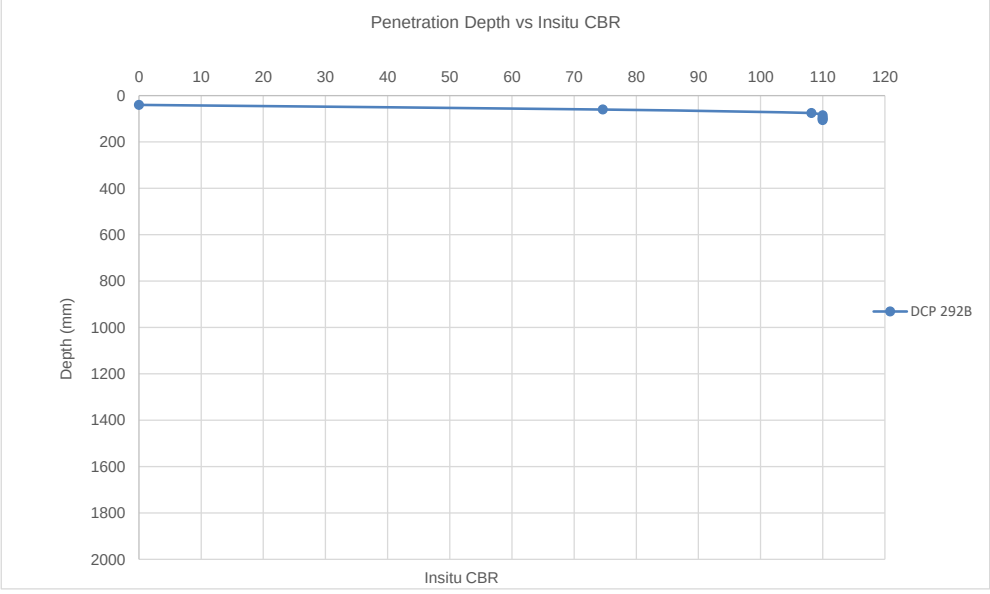
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 292B
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 20/09/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 40mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	20/09/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	20/09/2024
TEST POSITION:	DCP 294	**STARTING DEPTH:**	0mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

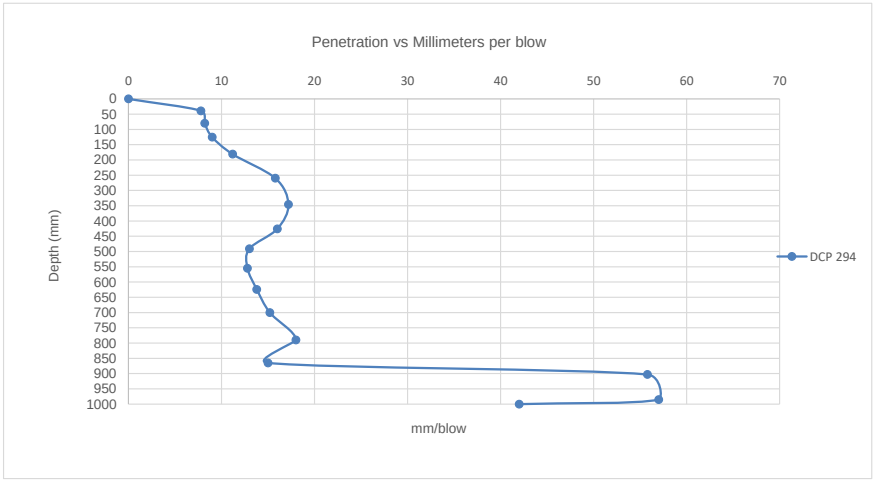
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	0	0mm	0	0				
5	39	39mm	39	7.8	Dense	30	32	309
10	80	80mm	41	8.2	Dense	28	30	293
15	125	125mm	45	9.0	Dense	25	26	264
20	181	181mm	56	11.2	Dense	19	20	208
25	260	260mm	79	15.8	Medium Dense	12	13	143
30	346	346mm	86	17.2	Medium Dense	11	11	131
35	426	426mm	80	16.0	Medium Dense	12	12	141
40	491	491mm	65	13.0	Medium Dense	16	16	177
45	555	555mm	64	12.8	Medium Dense	16	17	180
50	624	624mm	69	13.8	Medium Dense	15	15	166
55	700	700mm	76	15.2	Medium Dense	13	13	149
60	790	790mm	90	18.0	Medium Dense	10	11	124
65	865	865mm	75	15.0	Medium Dense	13	14	152
70	903	903mm	279	55.8	Loose	2	2	36
75	985	985mm	285	57.0	Loose	2	2	35
80	1000	1000mm	210	42.0	Loose	4	4	49

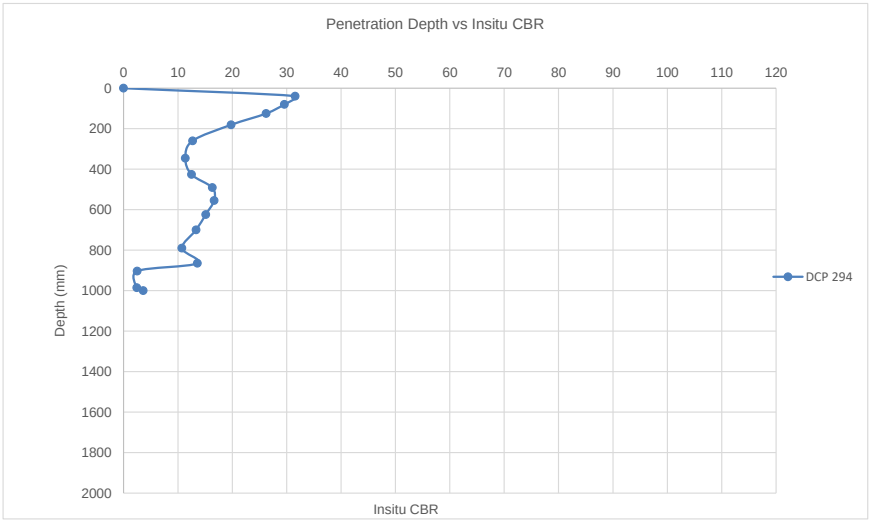
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 294
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 20/09/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 0mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	20/09/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	20/09/2024
TEST POSITION:	DCP 294	**STARTING DEPTH:**	15mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

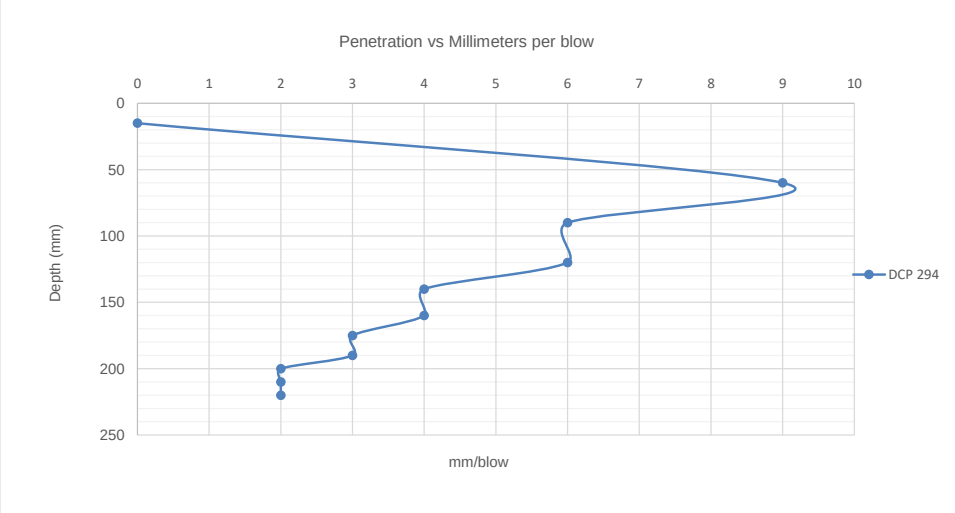
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x $(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x $(dn)^{-1.09}$
0	15	15mm	0	0				
5	60	60mm	45	9.0	Dense	25	26	264
10	90	90mm	30	6.0	Dense	42	44	411
15	120	120mm	30	6.0	Dense	42	44	411
20	140	140mm	20	4.0	Very Dense	70	75	640
25	160	160mm	20	4.0	Very Dense	70	75	640
30	175	175mm	15	3.0	Very Dense	102	108	876
35	190	190mm	15	3.0	Very Dense	102	108	876
40	200	200mm	10	2.0	Very Dense	170	>110	1362
45	210	210mm	10	2.0	Very Dense	170	>110	1362
50	220	220mm	10	2.0	Very Dense	170	>110	1362

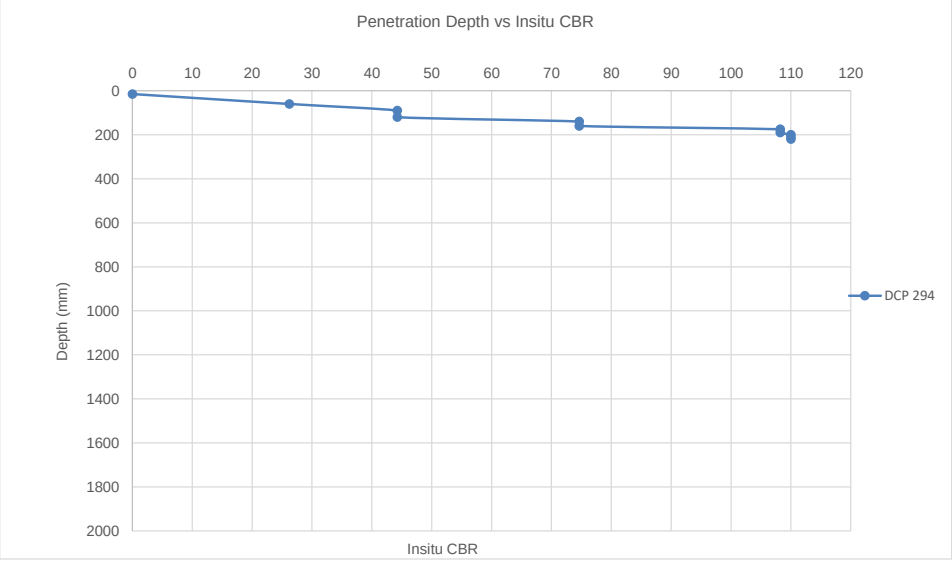
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 294
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 20/09/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 15mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	20/09/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	20/09/2024
TEST POSITION:	DCP 296B	**STARTING DEPTH:**	40mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

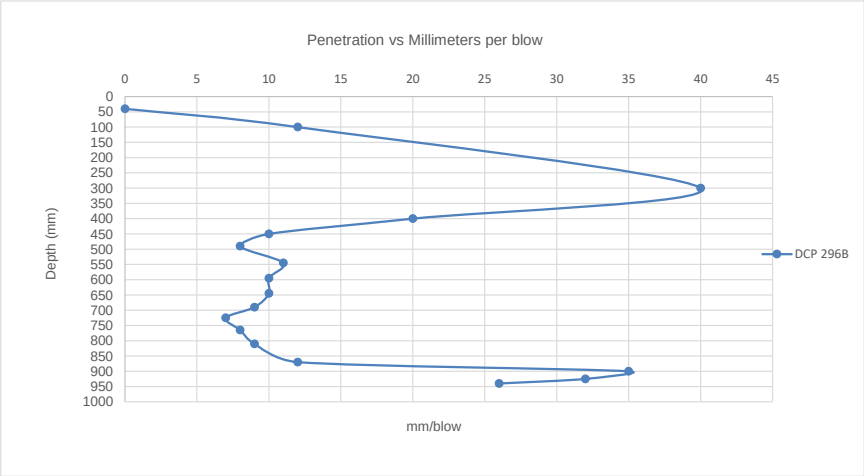
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	40	40mm	0	0				
10	100	100mm	60	12.0	Dense	17	18	193
15	300	300mm	200	40.0	Loose	4	4	52
20	400	400mm	100	20.0	Medium Dense	9	9	111
25	450	450mm	50	10.0	Dense	22	23	236
30	490	490mm	40	8.0	Dense	29	31	301
35	545	545mm	55	11.0	Dense	20	20	212
40	595	595mm	50	10.0	Dense	22	23	236
45	645	645mm	50	10.0	Dense	22	23	236
50	690	690mm	45	9.0	Dense	25	26	264
55	725	725mm	35	7.0	Dense	35	36	348
60	765	765mm	40	8.0	Dense	29	31	301
65	810	810mm	45	9.0	Dense	25	26	264
70	870	870mm	60	12.0	Dense	17	18	193
75	900	900mm	175	35.0	Loose	4	5	60
80	925	925mm	160	32.0	Loose	5	5	66
85	940	940mm	130	26.0	Medium Dense	7	7	83

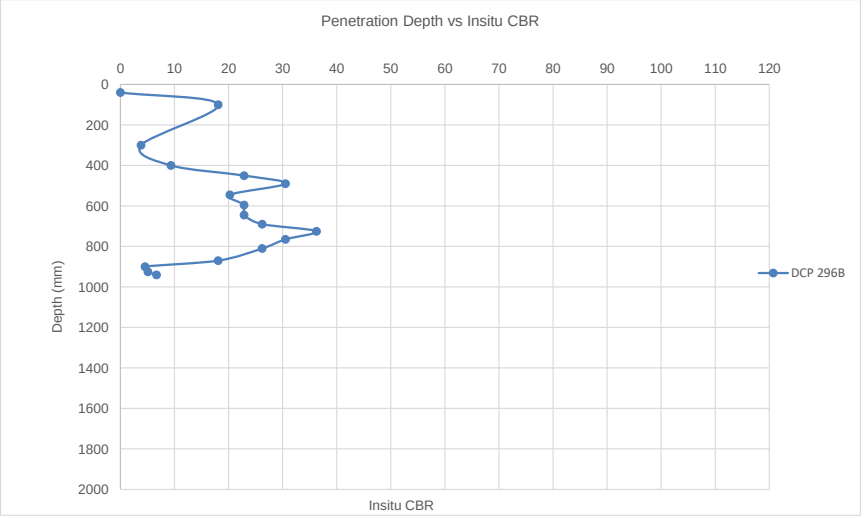
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 296B
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 20/09/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 40mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	13/09/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	13/09/2024
TEST POSITION:	DCP 300	**STARTING DEPTH:**	50mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

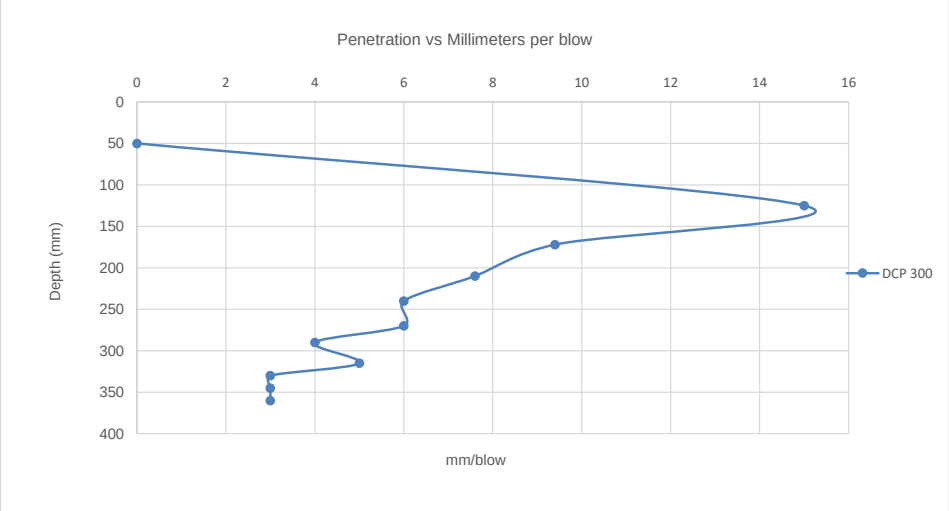
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	50	50mm	0	0				
5	125	125mm	75	15.0	Medium Dense	13	14	152
10	172	172mm	47	9.4	Dense	24	25	252
15	210	210mm	38	7.6	Dense	31	33	318
20	240	240mm	30	6.0	Dense	42	44	411
25	270	270mm	30	6.0	Dense	42	44	411
30	290	290mm	20	4.0	Very Dense	70	75	640
35	315	315mm	25	5.0	Very Dense	53	56	502
40	330	330mm	15	3.0	Very Dense	102	108	876
45	345	345mm	15	3.0	Very Dense	102	108	876
50	360	360mm	15	3.0	Very Dense	102	108	876

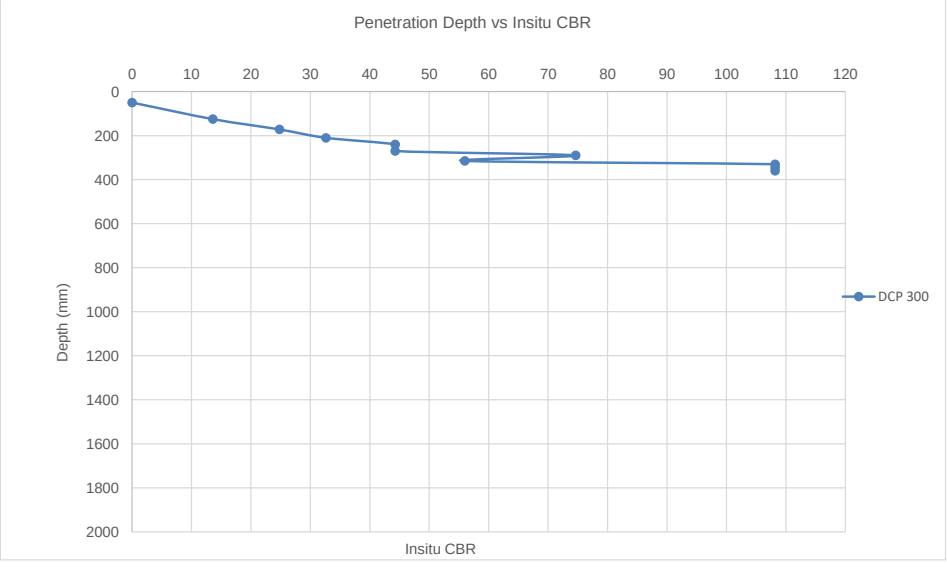
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 300
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 13/09/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 50mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	20/09/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	20/09/2024
TEST POSITION:	DCP 300B	**STARTING DEPTH:**	30mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

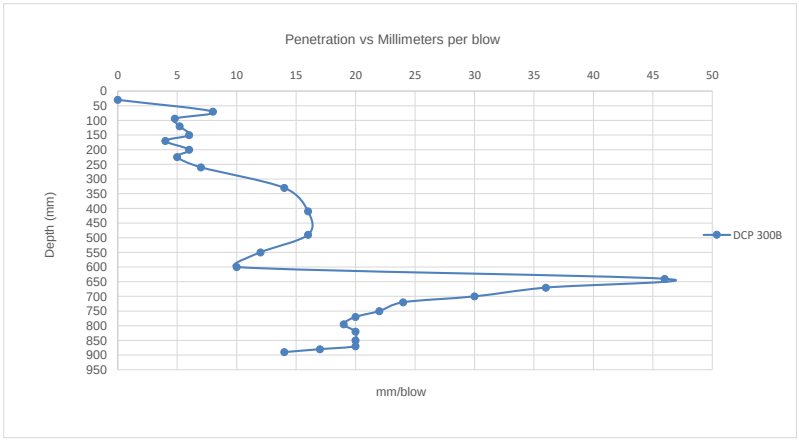
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	30	30mm	0	0				
5	70	70mm	40	8.0	Dense	29	31	301
10	94	94mm	24	4.8	Very Dense	56	59	525
15	120	120mm	26	5.2	Dense	51	53	481
20	150	150mm	30	6.0	Dense	42	44	411
25	170	170mm	20	4.0	Very Dense	70	75	640
30	200	200mm	30	6.0	Dense	42	44	411
35	225	225mm	25	5.0	Very Dense	53	56	502
40	260	260mm	35	7.0	Dense	35	36	348
45	330	330mm	70	14.0	Medium Dense	14	15	163
50	410	410mm	80	16.0	Medium Dense	12	12	141
55	490	490mm	80	16.0	Medium Dense	12	12	141
60	550	550mm	60	12.0	Dense	17	18	193
65	600	600mm	50	10.0	Dense	22	23	236
70	640	640mm	230	46.0	Loose	3	3	45
75	670	670mm	180	36.0	Loose	4	4	58
80	700	700mm	150	30.0	Medium Dense	5	6	71
85	720	720mm	120	24.0	Medium Dense	7	7	91
90	750	750mm	110	22.0	Medium Dense	8	8	100
95	770	770mm	100	20.0	Medium Dense	9	9	111
100	795	795mm	95	19.0	Medium Dense	10	10	117
105	820	820mm	100	20.0	Medium Dense	9	9	111
110	850	850mm	100	20.0	Medium Dense	9	9	111
115	870	870mm	100	20.0	Medium Dense	9	9	111
120	880	880mm	85	17.0	Medium Dense	11	12	132
125	890	890mm	70	14.0	Medium Dense	14	15	163

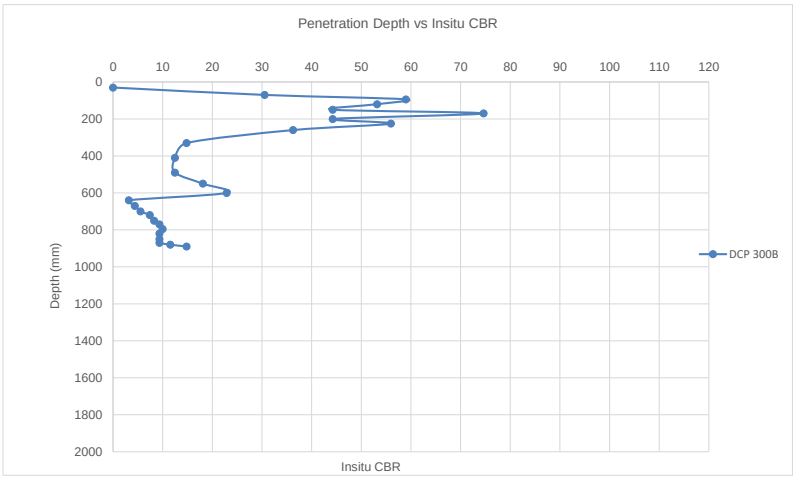
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 300B
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 20/09/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 30mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	13/09/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	13/09/2024
TEST POSITION:	DCP 302	**STARTING DEPTH:**	12mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

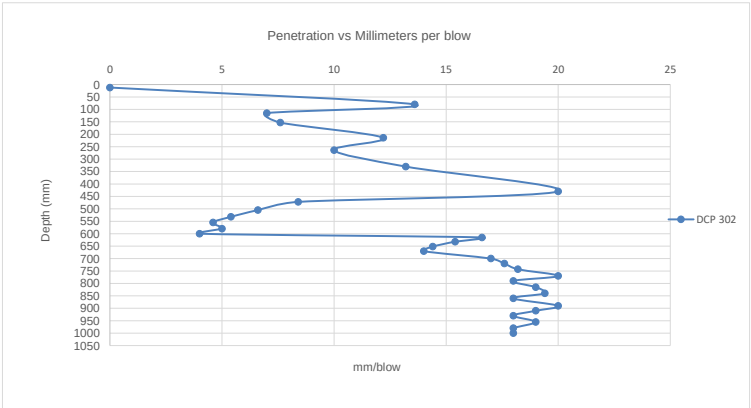
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x $(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x $(dn)^{-1.09}$
0	12	12mm	0	0				
5	80	80mm	68	13.6	Medium Dense	15	15	169
10	115	115mm	35	7.0	Dense	35	36	348
15	153	153mm	38	7.6	Dense	31	33	318
20	214	214mm	61	12.2	Dense	17	18	190
25	264	264mm	50	10.0	Dense	22	23	236
30	330	330mm	66	13.2	Medium Dense	15	16	174
35	430	430mm	100	20.0	Medium Dense	9	9	111
40	472	472mm	42	8.4	Dense	27	29	285
45	505	505mm	33	6.6	Dense	37	39	371
50	532	532mm	27	5.4	Dense	48	51	461
55	555	555mm	23	4.6	Very Dense	59	62	550
60	580	580mm	25	5.0	Very Dense	53	56	502
65	600	600mm	20	4.0	Very Dense	70	75	640
70	615	615mm	83	16.6	Medium Dense	12	12	136
75	632	632mm	77	15.4	Medium Dense	13	13	147
80	652	652mm	72	14.4	Medium Dense	14	14	158
85	670	670mm	70	14.0	Medium Dense	14	15	163
90	700	700mm	85	17.0	Medium Dense	11	12	132
95	720	720mm	88	17.6	Medium Dense	11	11	127
100	743	743mm	91	18.2	Medium Dense	10	11	123
105	770	770mm	100	20.0	Medium Dense	9	9	111
110	790	790mm	90	18.0	Medium Dense	10	11	124
115	815	815mm	95	19.0	Medium Dense	10	10	117
120	840	840mm	97	19.4	Medium Dense	9	10	114
125	860	860mm	90	18.0	Medium Dense	10	11	124
130	890	890mm	100	20.0	Medium Dense	9	9	111
135	910	910mm	95	19.0	Medium Dense	10	10	117
140	930	930mm	90	18.0	Medium Dense	10	11	124
145	955	955mm	95	19.0	Medium Dense	10	10	117
150	980	980mm	90	18.0	Medium Dense	10	11	124
155	1000	1000mm	90	18.0	Medium Dense	10	11	124

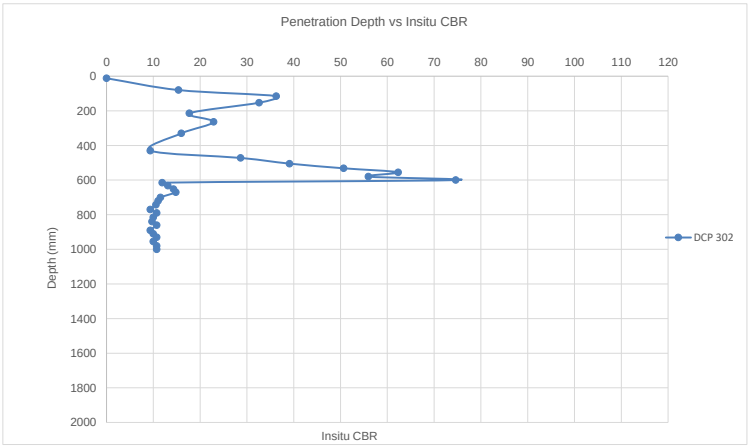
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 302
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 13/09/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 12mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	10/11/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	10/11/2024
TEST POSITION:	DCP 306	**STARTING DEPTH:**	30mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

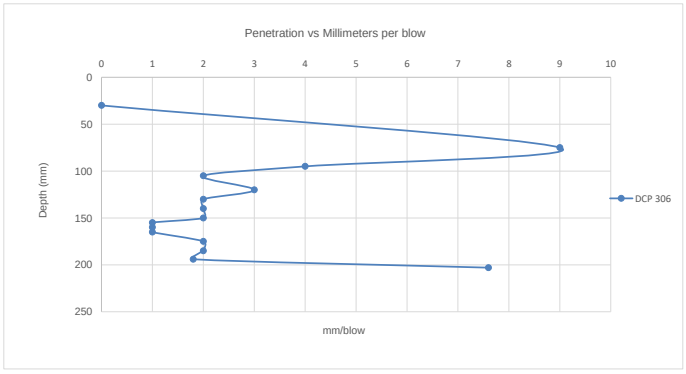
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	30	30mm	0	0				
5	75	75mm	45	9.0	Dense	25	26	264
10	95	95mm	20	4.0	Very Dense	70	75	640
15	105	105mm	10	2.0	Very Dense	170	>110	1362
20	120	120mm	15	3.0	Very Dense	102	108	876
25	130	130mm	10	2.0	Very Dense	170	>110	1362
30	140	140mm	10	2.0	Very Dense	170	>110	1362
35	150	150mm	10	2.0	Very Dense	170	>110	1362
40	155	155mm	5	1.0	Very Dense	300	>110	2900
45	160	160mm	5	1.0	Very Dense	300	>110	2900
50	165	165mm	5	1.0	Very Dense	300	>110	2900
55	175	175mm	10	2.0	Very Dense	170	>110	1362
60	185	185mm	10	2.0	Very Dense	170	>110	1362
65	194	194mm	9	1.8	Very Dense	185	>110	1528
70	203	203mm	38	7.6	Dense	31	33	318
75	220	220mm	45	9.0	Dense	25	26	264
80	235	235mm	50	10.0	Dense	22	23	236
85	350	350mm	156	31.2	Loose	5	5	68
90	270	270mm	67	13.4	Medium Dense	15	16	171
95	300	300mm	80	16.0	Medium Dense	12	12	141
100	340	340mm	105	21.0	Medium Dense	9	9	105
105	380	380mm	30	6.0	Dense	42	44	411
110	420	420mm	150	30.0	Medium Dense	5	6	71
115	460	460mm	160	32.0	Loose	5	5	66
120	510	510mm	170	34.0	Loose	5	5	62
125	540	540mm	160	32.0	Loose	5	5	66
130	580	580mm	160	32.0	Loose	5	5	66
135	610	610mm	150	30.0	Medium Dense	5	6	71
140	640	640mm	130	26.0	Medium Dense	7	7	83
145	660	660mm	120	24.0	Medium Dense	7	7	91
150	685	685mm	105	21.0	Medium Dense	9	9	105
155	720	720mm	110	22.0	Medium Dense	8	8	100
160	750	750mm	110	22.0	Medium Dense	8	8	100
165	780	780mm	120	24.0	Medium Dense	7	7	91
170	805	805mm	120	24.0	Medium Dense	7	7	91
175	840	840mm	120	24.0	Medium Dense	7	7	91
180	870	870mm	120	24.0	Medium Dense	7	7	91
185	890	890mm	110	22.0	Medium Dense	8	8	100
190	910	910mm	105	21.0	Medium Dense	9	9	105
195	950	950mm	110	22.0	Medium Dense	8	8	100
200	970	970mm	100	20.0	Medium Dense	9	9	66
205	1000	1000mm	110	22.0	Medium Dense	8	8	100

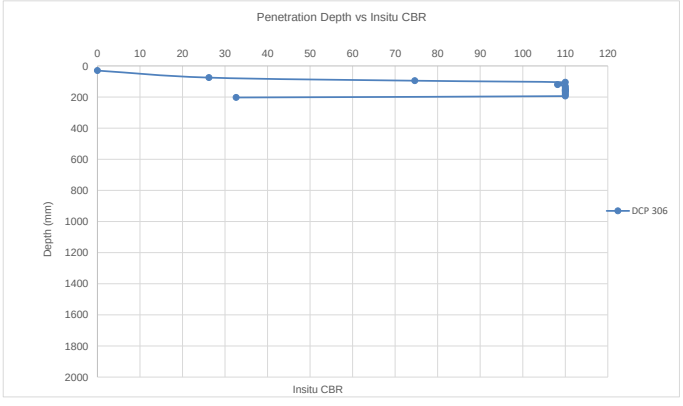
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 306
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 10/11/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 30mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	01/10/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	01/10/2024
TEST POSITION:	DCP 307	**STARTING DEPTH:**	10mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

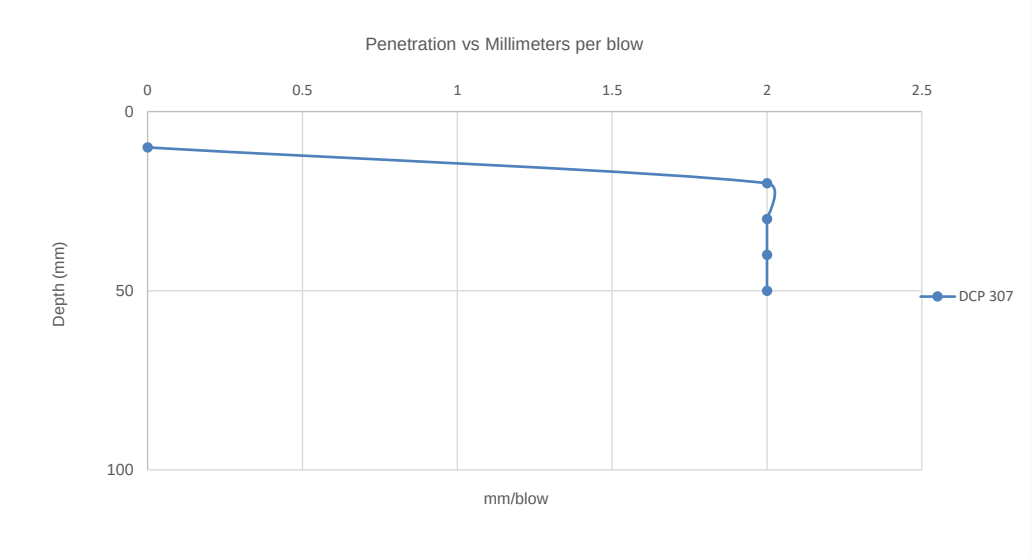
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\ (dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\ (dn)^{-1.09}$
0	10	10mm	0	0				
5	20	20mm	10	2.0	Very Dense	170	>110	1362
10	30	30mm	10	2.0	Very Dense	170	>110	1362
15	40	40mm	10	2.0	Very Dense	170	>110	1362
20	50	50mm	10	2.0	Very Dense	170	>110	1362

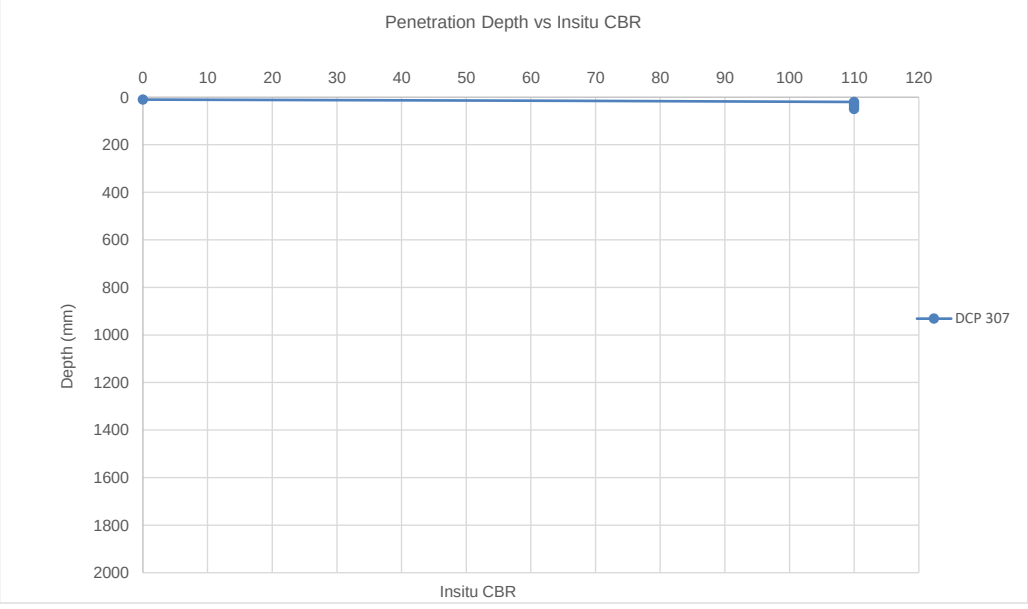
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 307
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 01/10/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 10mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	01/10/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Sam	**DATE TESTED:**	01/10/2024
TEST POSITION:	DCP 311	**STARTING DEPTH:**	10mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

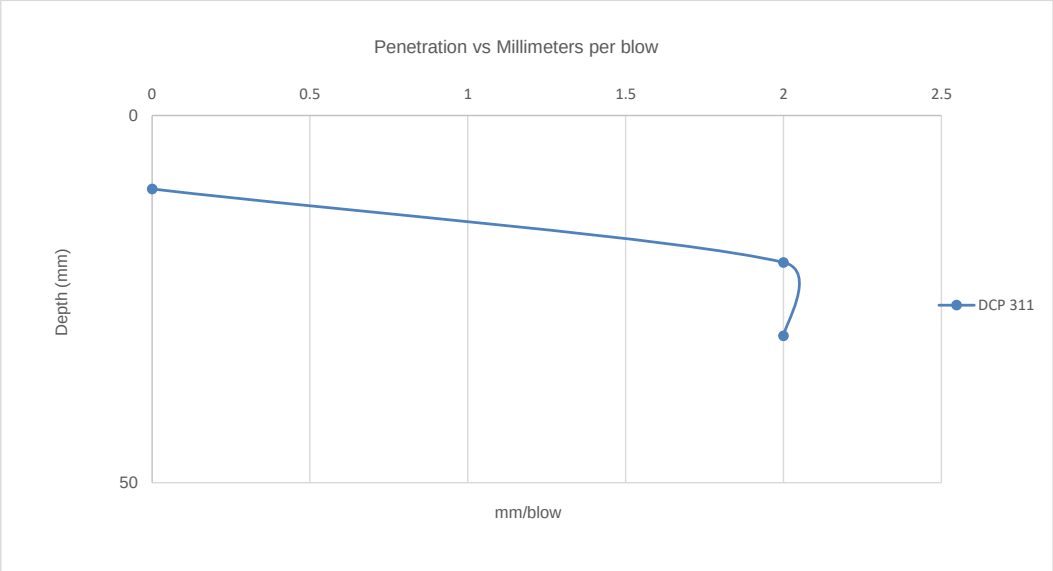
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	10	10mm	0	0				
5	20	20mm	10	2.0	Very Dense	170	>110	1362
10	30	30mm	10	2.0	Very Dense	170	>110	1362

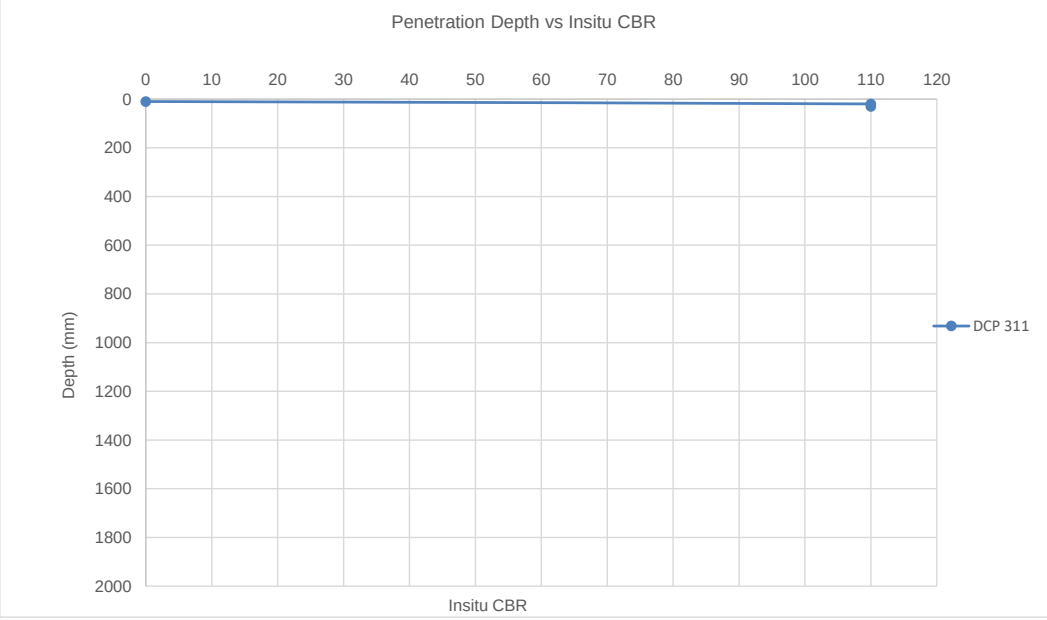
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 311
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 01/10/2024
OPERATOR: Sam
STARTING DEPTH: 10mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	01/10/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	01/10/2024
TEST POSITION:	DCP 315	**STARTING DEPTH:**	10mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

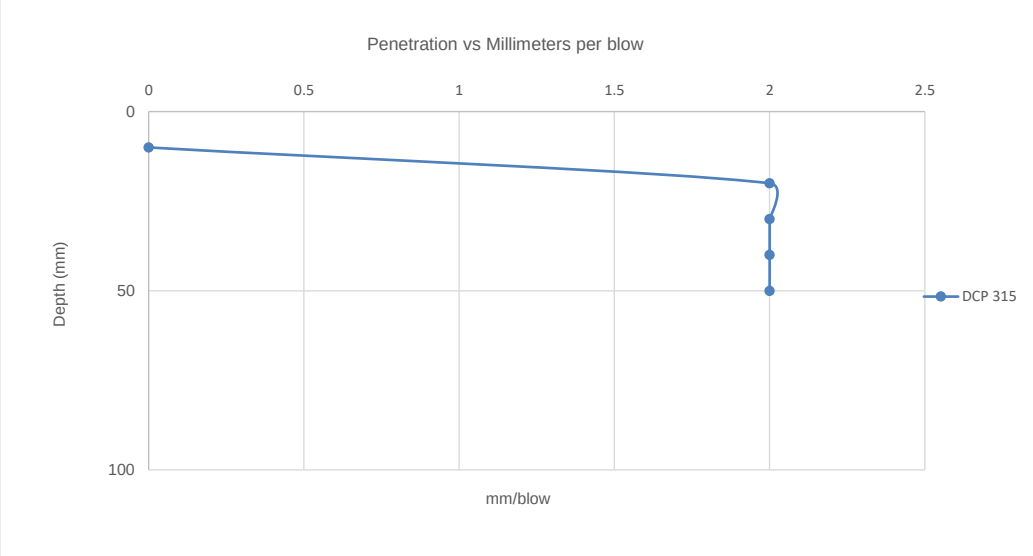
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	10	10mm	0	0				
5	20	20mm	10	2.0	Very Dense	170	>110	1362
10	30	30mm	10	2.0	Very Dense	170	>110	1362
15	40	40mm	10	2.0	Very Dense	170	>110	1362
20	50	50mm	10	2.0	Very Dense	170	>110	1362

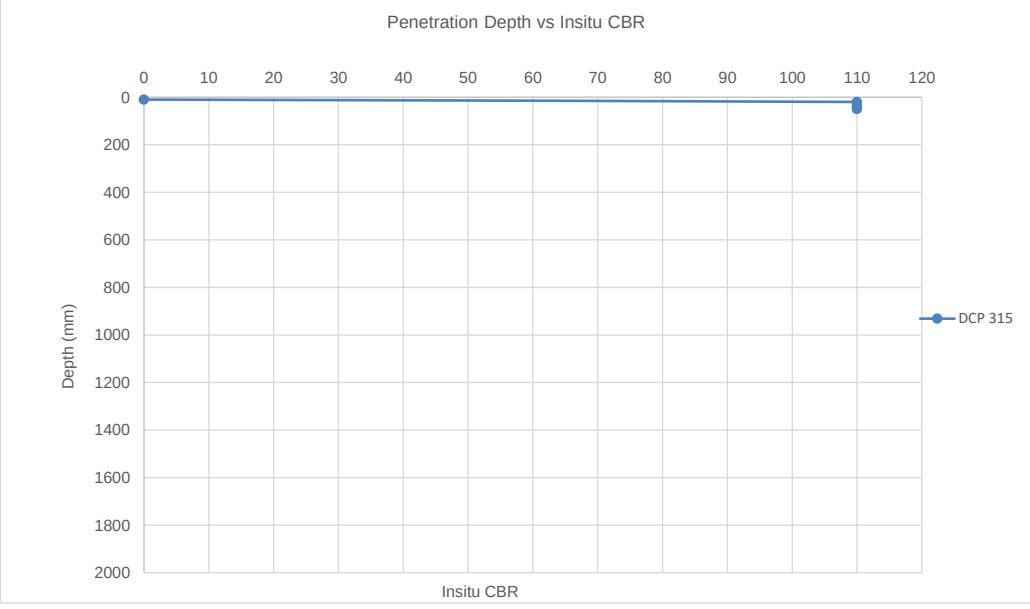
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 315
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 01/10/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 10mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	20/09/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	20/09/2024
TEST POSITION:	DCP 316	**STARTING DEPTH:**	30mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

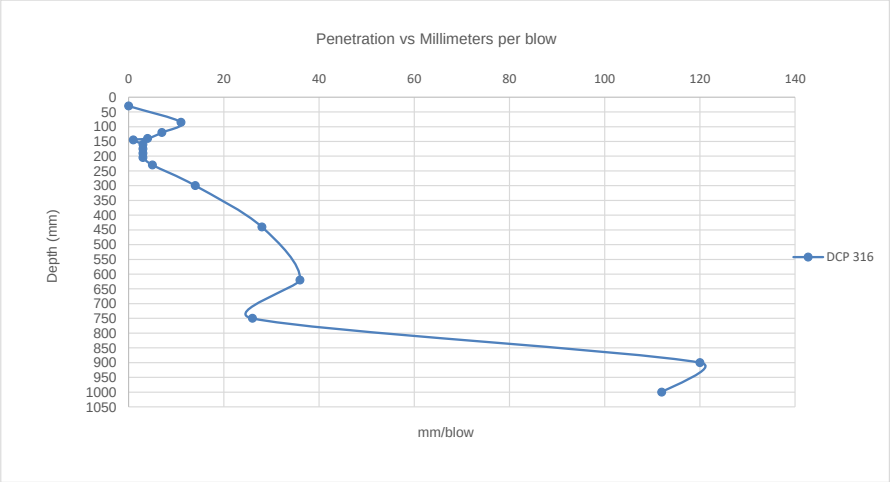
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	30	30mm	0	0				
5	85	85mm	55	11.0	Dense	20	20	212
10	120	120mm	35	7.0	Dense	35	36	348
15	140	140mm	20	4.0	Very Dense	70	75	640
20	145	145mm	5	1.0	Very Dense	300	>110	2900
25	160	160mm	15	3.0	Very Dense	102	108	876
30	175	175mm	15	3.0	Very Dense	102	108	876
35	190	190mm	15	3.0	Very Dense	102	108	876
40	205	205mm	15	3.0	Very Dense	102	108	876
45	230	230mm	25	5.0	Very Dense	53	56	502
50	300	300mm	70	14.0	Medium Dense	14	15	163
55	440	440mm	140	28.0	Medium Dense	6	6	77
60	620	620mm	180	36.0	Loose	4	4	58
65	750	750mm	130	26.0	Medium Dense	7	7	83
70	900	900mm	600	120.0	Very Loose	1	1	16
75	1000	1000mm	560	112.0	Very Loose	1	1	17

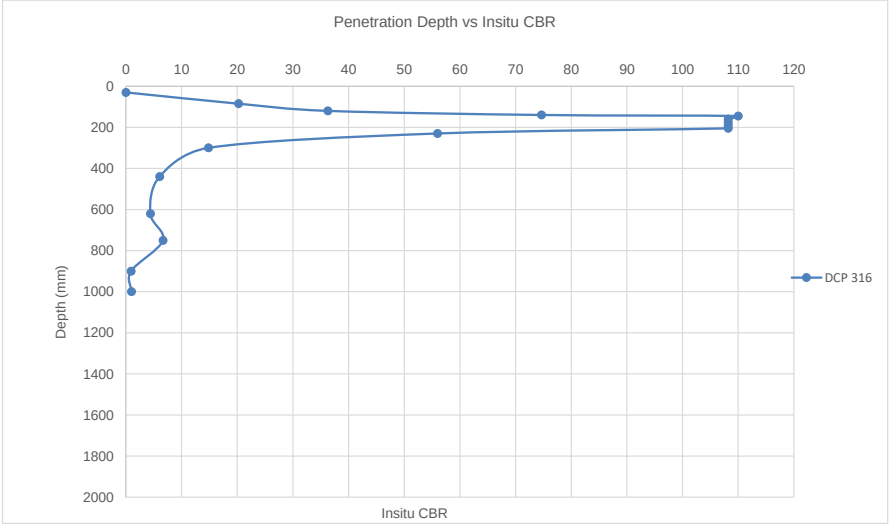
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 316
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 20/09/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 30mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	01/10/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	01/10/2024
TEST POSITION:	DCP 329	**STARTING DEPTH:**	10mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

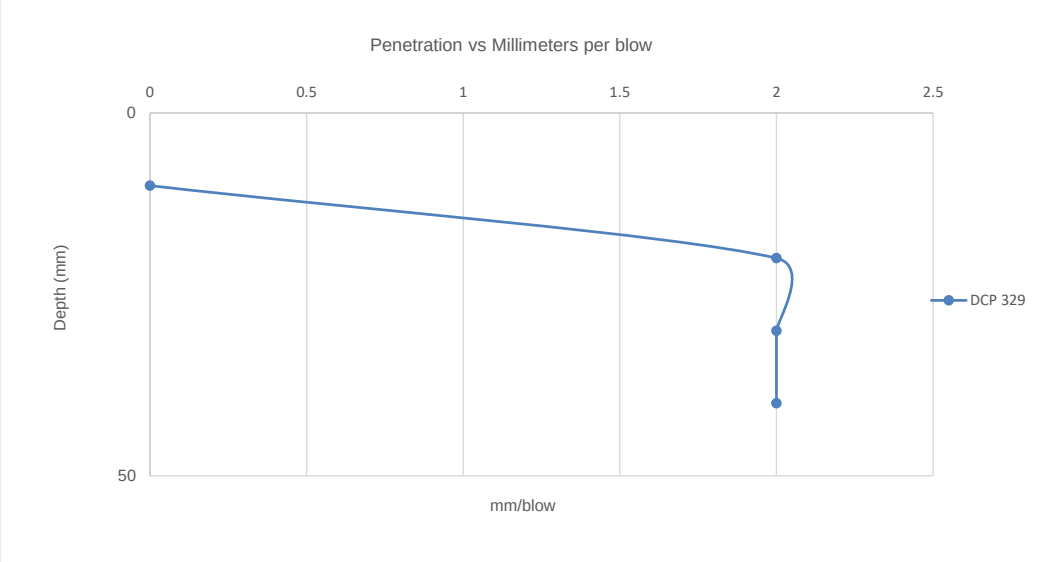
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	10	10mm	0	0				
5	20	20mm	10	2.0	Very Dense	170	>110	1362
10	30	30mm	10	2.0	Very Dense	170	>110	1362
15	40	40mm	10	2.0	Very Dense	170	>110	1362

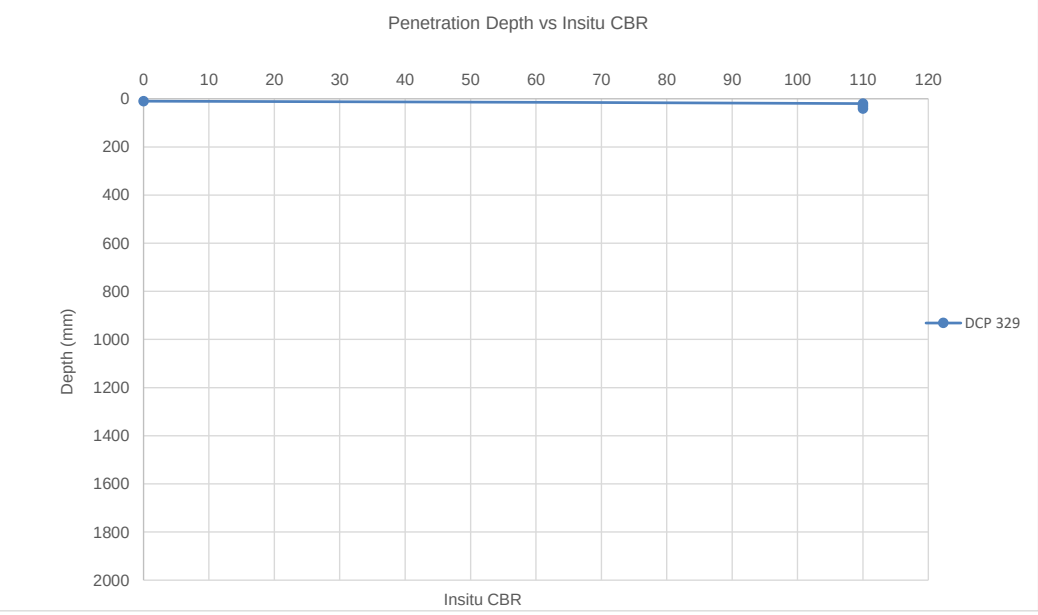
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 329
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 01/10/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 10mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	15/10/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	15/10/2024
TEST POSITION:	DCP 365	**STARTING DEPTH:**	60mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

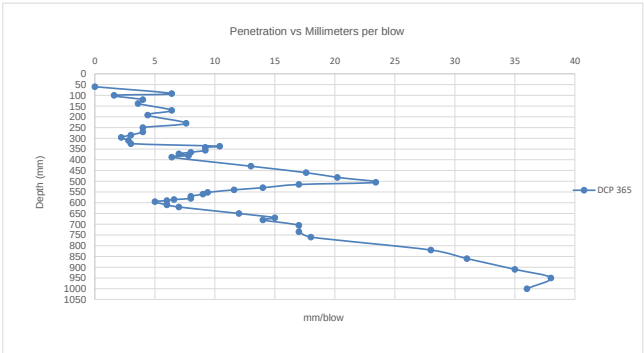
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.00}$
0	60	60mm	0	0				
5	92	92mm	32	6.4	Dense	39	41	383
10	100	100mm	8	1.6	Very Dense	206	>110	1737
15	120	120mm	20	4.0	Very Dense	70	75	640
20	138	138mm	18	3.6	Very Dense	81	86	718
25	170	170mm	32	6.4	Dense	39	41	383
30	192	192mm	22	4.4	Very Dense	62	66	577
35	230	230mm	38	7.6	Dense	31	33	318
40	250	250mm	20	4.0	Very Dense	70	75	640
45	270	270mm	20	4.0	Very Dense	70	75	640
50	285	285mm	15	3.0	Very Dense	102	108	876
55	296	296mm	11	2.2	Very Dense	151	>110	1228
60	310	310mm	14	2.8	Very Dense	111	>110	944
65	325	325mm	15	3.0	Very Dense	102	108	876
70	337	337mm	52	10.4	Dense	21	22	226
75	342	342mm	46	9.2	Dense	24	25	258
80	356	356mm	46	9.2	Dense	24	25	258
85	365	365mm	40	8.0	Dense	29	31	301
90	372	372mm	35	7.0	Dense	35	36	348
95	381	381mm	39	7.8	Dense	30	32	309
100	388	388mm	32	6.4	Dense	39	41	383
105	430	430mm	65	13.0	Medium Dense	16	16	177
110	460	460mm	88	17.6	Medium Dense	11	11	127
115	482	482mm	101	20.2	Medium Dense	9	9	110
120	505	505mm	117	23.4	Medium Dense	7	8	93
125	515	515mm	85	17.0	Medium Dense	11	12	132
130	530	530mm	70	14.0	Medium Dense	14	15	163
135	540	540mm	58	11.6	Dense	18	19	201
140	552	552mm	47	9.4	Dense	24	25	252
145	560	560mm	45	9.0	Dense	25	26	264
150	570	570mm	40	8.0	Dense	29	31	301
155	580	580mm	40	8.0	Dense	29	31	301
160	585	585mm	33	6.6	Dense	37	39	371
165	590	590mm	30	6.0	Dense	42	44	411
170	595	595mm	25	5.0	Very Dense	53	56	502
175	610	610mm	30	6.0	Dense	42	44	411
180	620	620mm	35	7.0	Dense	35	36	348
185	650	650mm	60	12.0	Dense	17	18	193
190	670	670mm	75	15.0	Medium Dense	13	14	152
195	680	680mm	70	14.0	Medium Dense	14	15	163
200	705	705mm	85	17.0	Medium Dense	11	12	66
205	735	735mm	85	17.0	Medium Dense	11	12	132
210	760	760mm	90	18.0	Medium Dense	10	11	124
215	820	820mm	140	28.0	Medium Dense	6	6	77
220	860	860mm	155	31.0	Loose	5	5	69
225	910	910mm	175	35.0	Loose	4	5	60
230	950	950mm	190	38.0	Loose	4	4	55
235	1000	1000mm	180	36.0	Loose	4	4	58

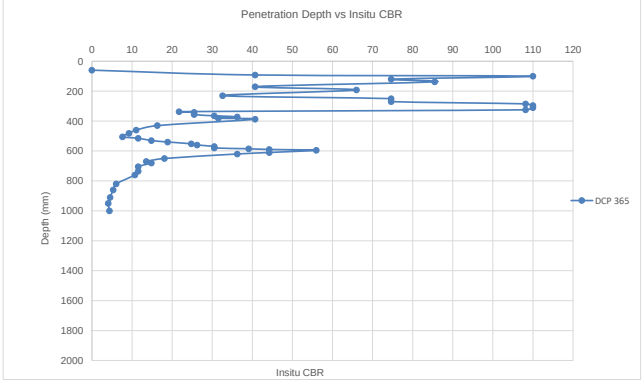
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 365
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 15/10/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 60mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	15/10/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	15/10/2024
TEST POSITION:	DCP 366	**STARTING DEPTH:**	70mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

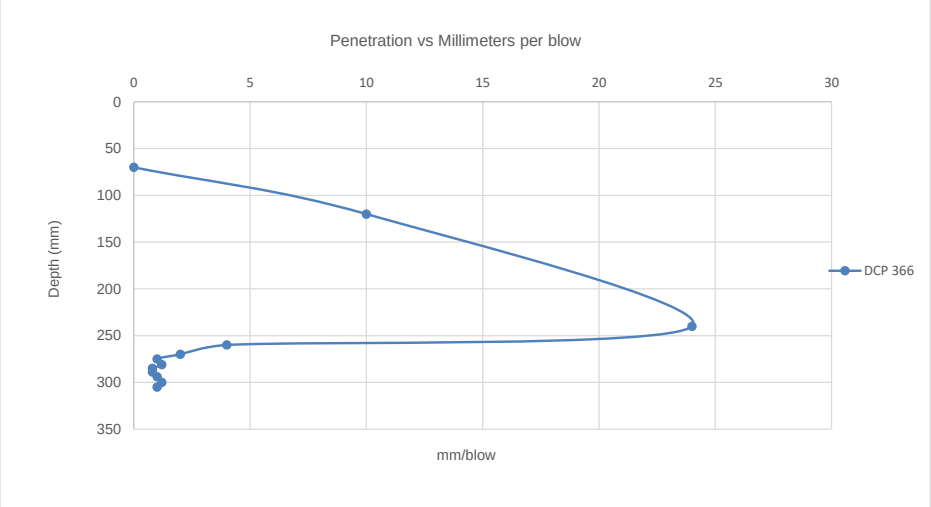
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x $(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x $(dn)^{-1.09}$
0	70	70mm	0	0				
5	120	120mm	50	10.0	Dense	22	23	236
10	240	240mm	120	24.0	Medium Dense	7	7	91
15	260	260mm	20	4.0	Very Dense	70	75	640
20	270	270mm	10	2.0	Very Dense	170	>110	1362
25	275	275mm	5	1.0	Very Dense	300	>110	2900
30	281	281mm	6	1.2	Very Dense	263	>110	2377
35	285	285mm	4	0.8	Very Dense	342	>110	3699
40	289	289mm	4	0.8	Very Dense	342	>110	3699
45	294	294mm	5	1.0	Very Dense	300	>110	2900
50	300	300mm	6	1.2	Very Dense	263	>110	2377
55	305	305mm	5	1.0	Very Dense	300	>110	2900

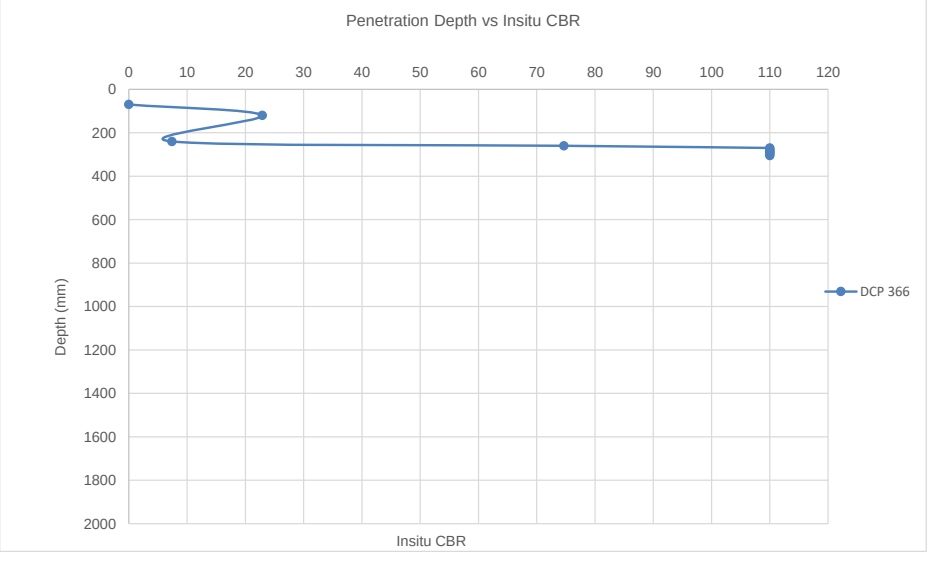
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 366
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 15/10/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 70mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	15/10/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	15/10/2024
TEST POSITION:	DCP 367	**STARTING DEPTH:**	68mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

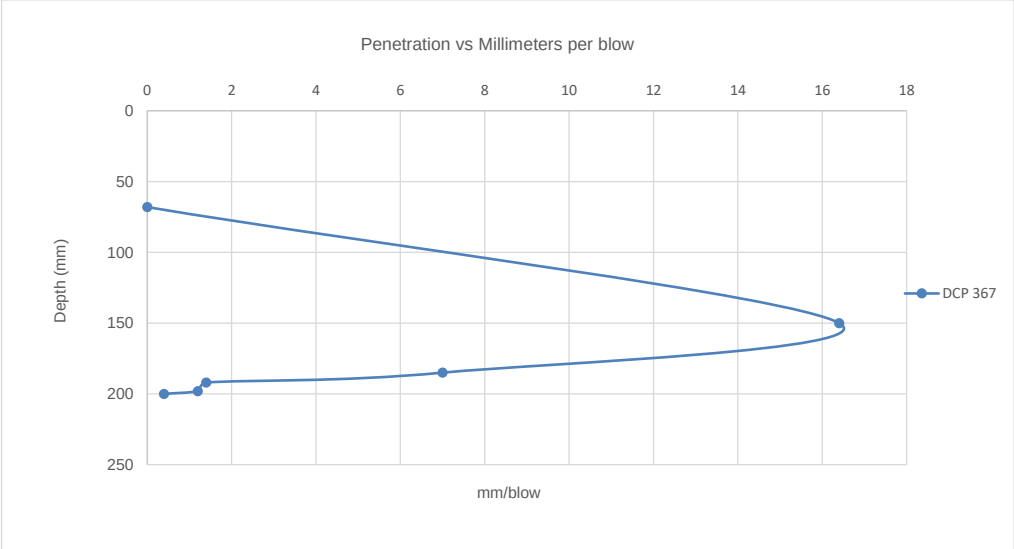
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	68	68mm	0	0				
5	150	150mm	82	16.4	Medium Dense	12	12	137
10	185	185mm	35	7.0	Dense	35	36	348
15	192	192mm	7	1.4	Very Dense	232	>110	2010
20	198	198mm	6	1.2	Very Dense	263	>110	2377
25	200	200mm	2	0.4	Very Dense	442	>110	7873

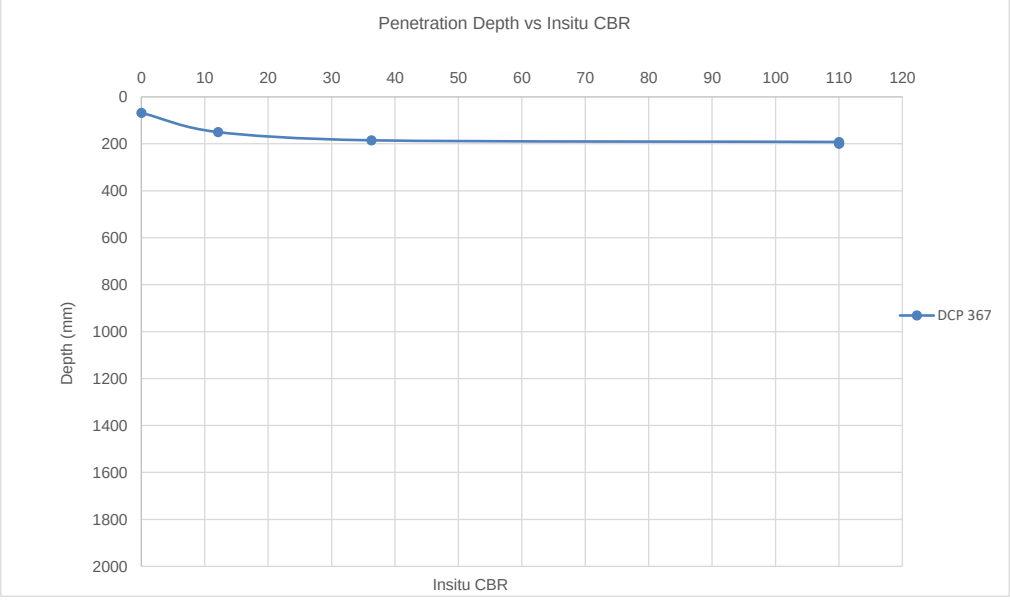
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 367
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 15/10/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 68mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	15/10/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	15/10/2024
TEST POSITION:	DCP 370	**STARTING DEPTH:**	50mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

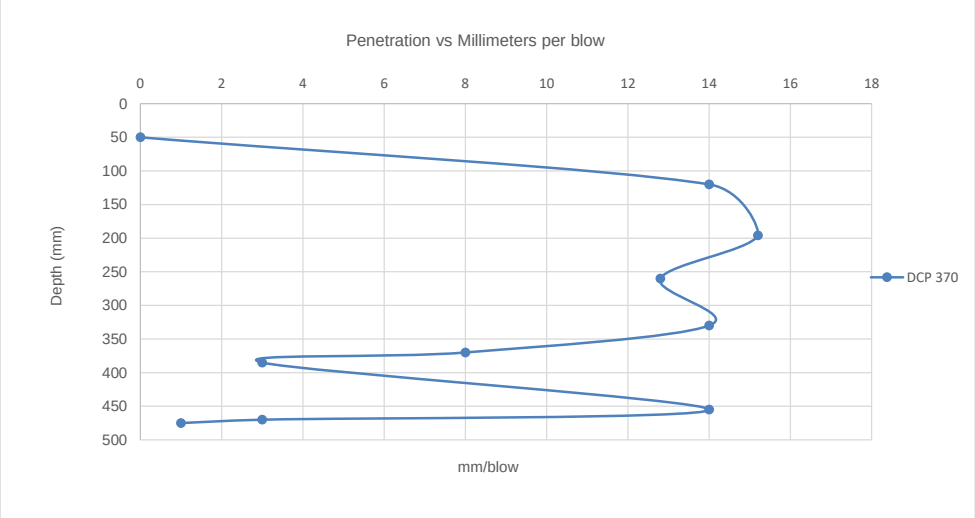
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	50	50mm	0	0				
5	120	120mm	70	14.0	Medium Dense	14	15	163
10	196	196mm	76	15.2	Medium Dense	13	13	149
15	260	260mm	64	12.8	Medium Dense	16	17	180
20	330	330mm	70	14.0	Medium Dense	14	15	163
25	370	370mm	40	8.0	Dense	29	31	301
30	385	385mm	15	3.0	Very Dense	102	108	876
35	455	455mm	70	14.0	Medium Dense	14	15	163
40	470	470mm	15	3.0	Very Dense	102	108	876
45	475	475mm	5	1.0	Very Dense	300	>110	2900

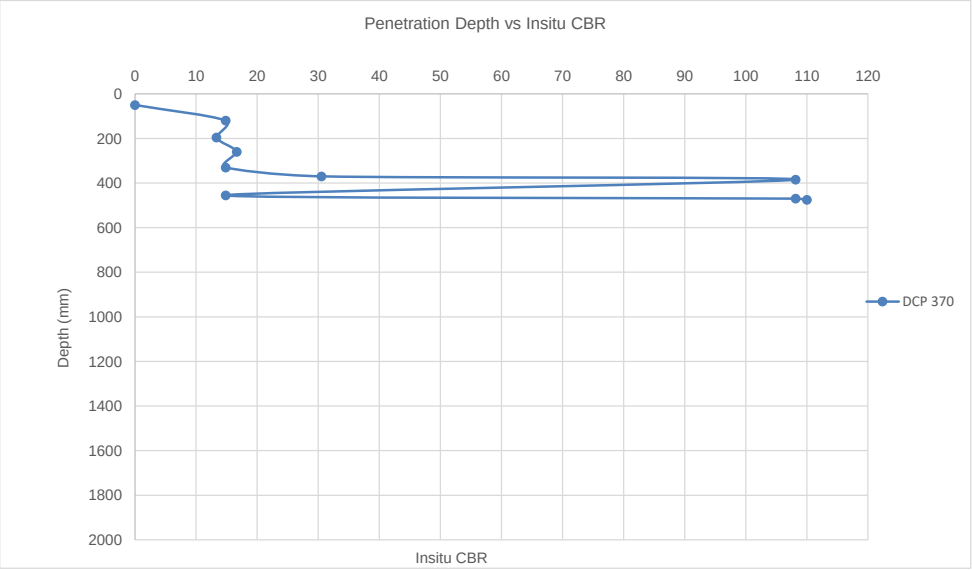
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 370
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 15/10/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 50mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	29/10/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	29/10/2024
TEST POSITION:	DCP 387	**STARTING DEPTH:**	90mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

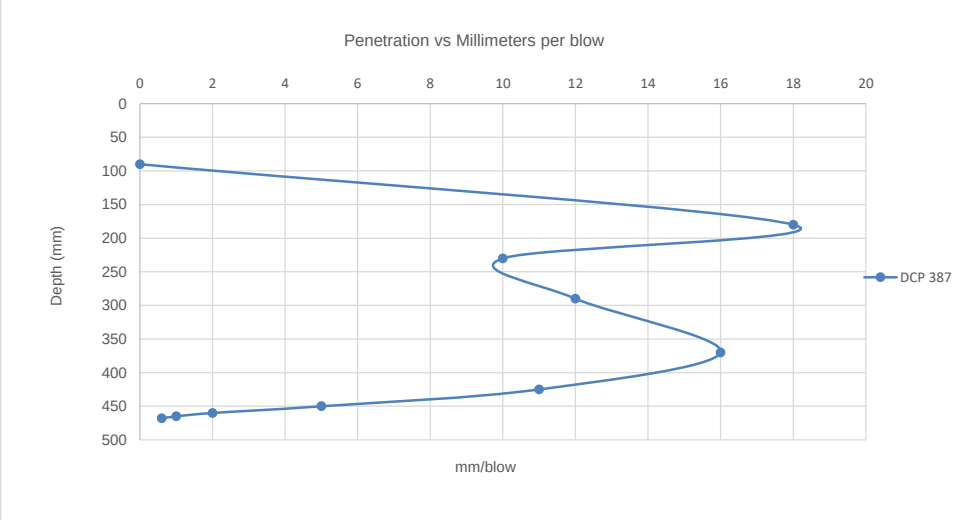
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	90	90mm	0	0				
5	180	180mm	90	18.0	Medium Dense	10	11	124
10	230	230mm	50	10.0	Dense	22	23	236
15	290	290mm	60	12.0	Dense	17	18	193
20	370	370mm	80	16.0	Medium Dense	12	12	141
25	425	425mm	55	11.0	Dense	20	20	212
30	450	450mm	25	5.0	Very Dense	53	56	502
35	460	460mm	10	2.0	Very Dense	170	>110	1362
40	465	465mm	5	1.0	Very Dense	300	>110	2900
45	468	468mm	3	0.6	Very Dense	389	>110	5061

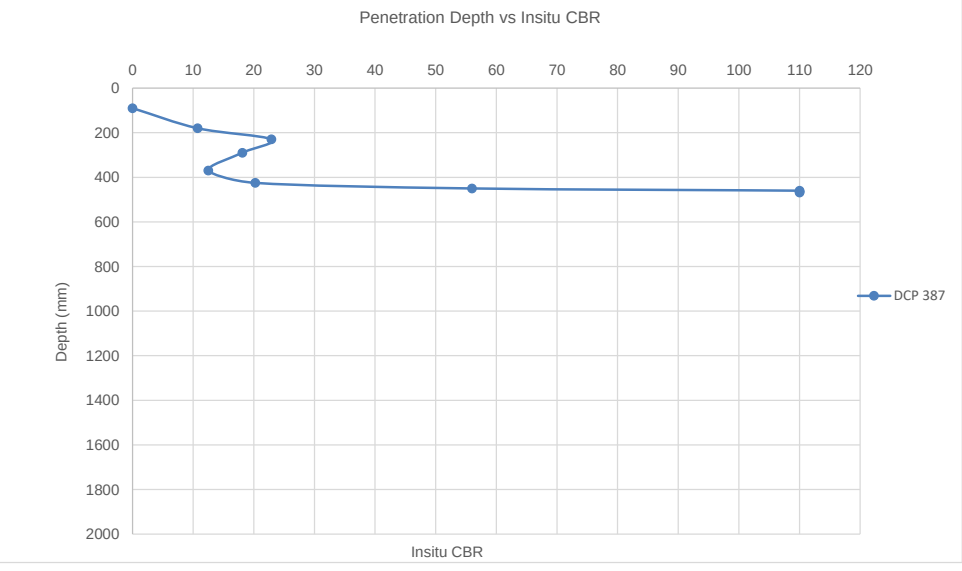
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 387
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 29/10/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 90mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	20/09/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	20/09/2024
TEST POSITION:	DCP 665	**STARTING DEPTH:**	29mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

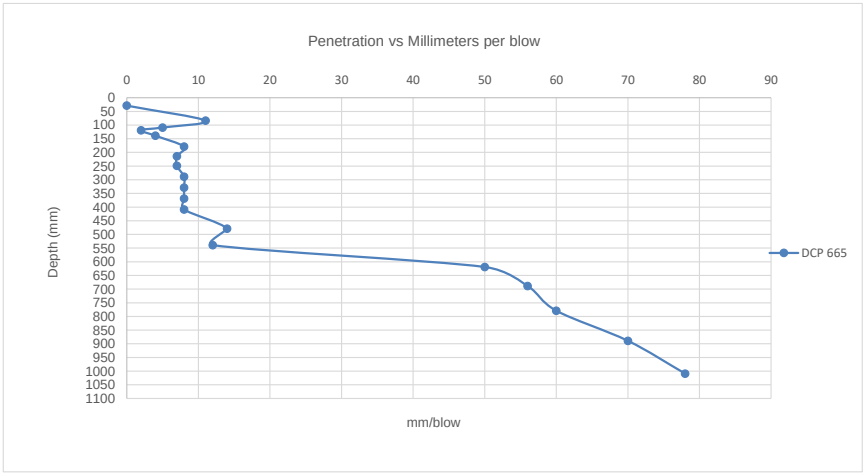
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	20	29mm	0	0				
5	75	84mm	55	11.0	Dense	20	20	212
10	100	109mm	25	5.0	Very Dense	53	56	502
15	110	119mm	10	2.0	Very Dense	170	>110	1362
20	130	139mm	20	4.0	Very Dense	70	75	640
25	170	179mm	40	8.0	Dense	29	31	301
30	205	214mm	35	7.0	Dense	35	36	348
35	240	249mm	35	7.0	Dense	35	36	348
40	280	289mm	40	8.0	Dense	29	31	301
45	320	329mm	40	8.0	Dense	29	31	301
50	360	369mm	40	8.0	Dense	29	31	301
55	400	409mm	40	8.0	Dense	29	31	301
60	470	479mm	70	14.0	Medium Dense	14	15	163
65	530	539mm	60	12.0	Dense	17	18	193
70	610	619mm	250	50.0	Loose	3	3	41
75	680	689mm	280	56.0	Loose	2	2	36
80	770	779mm	300	60.0	Loose	2	2	33
85	880	889mm	350	70.0	Loose	2	2	28
90	1000	1009mm	390	78.0	Very Loose	2	2	25

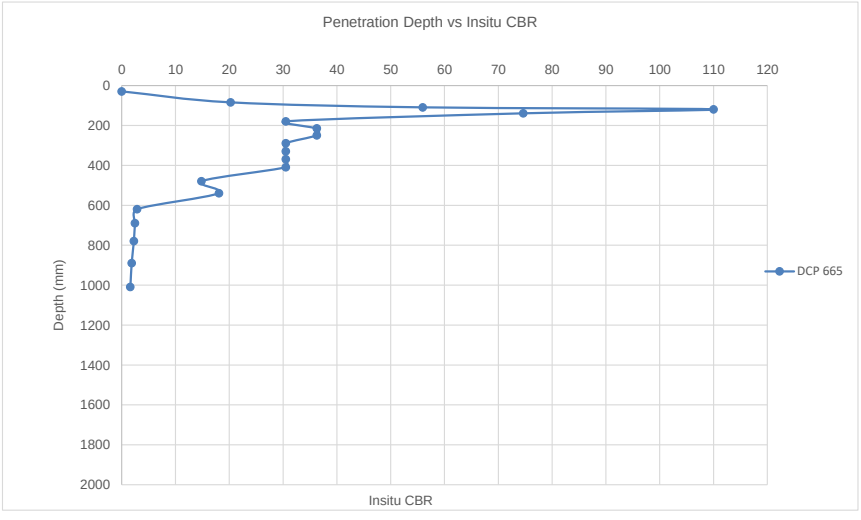
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 665
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 20/09/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 29mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	09/11/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	09/11/2024
TEST POSITION:	DCP 669	**STARTING DEPTH:**	40mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

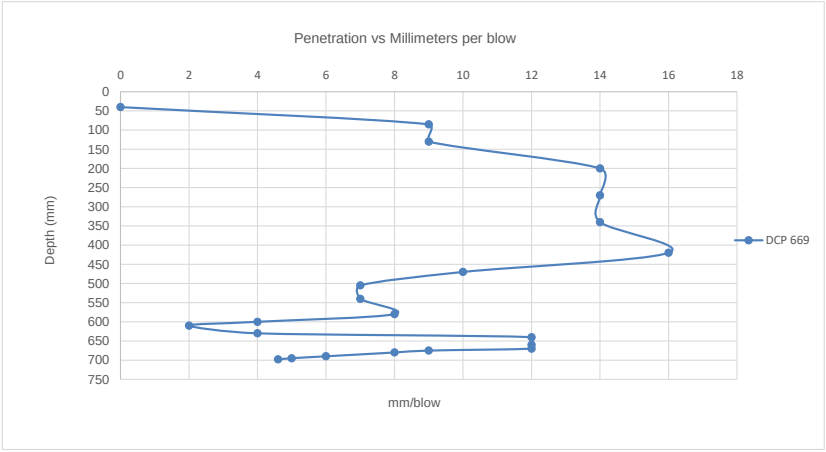
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	40	40mm	0	0				
5	85	85mm	45	9.0	Dense	25	26	264
10	130	130mm	45	9.0	Dense	25	26	264
15	200	200mm	70	14.0	Medium Dense	14	15	163
20	270	270mm	70	14.0	Medium Dense	14	15	163
25	340	340mm	70	14.0	Medium Dense	14	15	163
30	420	420mm	80	16.0	Medium Dense	12	12	141
35	470	470mm	50	10.0	Dense	22	23	236
40	505	505mm	35	7.0	Dense	35	36	348
45	540	540mm	35	7.0	Dense	35	36	348
50	580	580mm	40	8.0	Dense	29	31	301
55	600	600mm	20	4.0	Very Dense	70	75	640
60	610	610mm	10	2.0	Very Dense	170	>110	1362
65	630	630mm	20	4.0	Very Dense	70	75	640
70	640	640mm	60	12.0	Dense	17	18	193
75	660	660mm	60	12.0	Dense	17	18	193
80	670	670mm	60	12.0	Dense	17	18	193
85	675	675mm	45	9.0	Dense	25	26	264
90	680	680mm	40	8.0	Dense	29	31	301
95	690	690mm	30	6.0	Dense	42	44	411
100	695	695mm	25	5.0	Very Dense	53	56	502
105	698	698mm	23	4.6	Very Dense	59	62	550

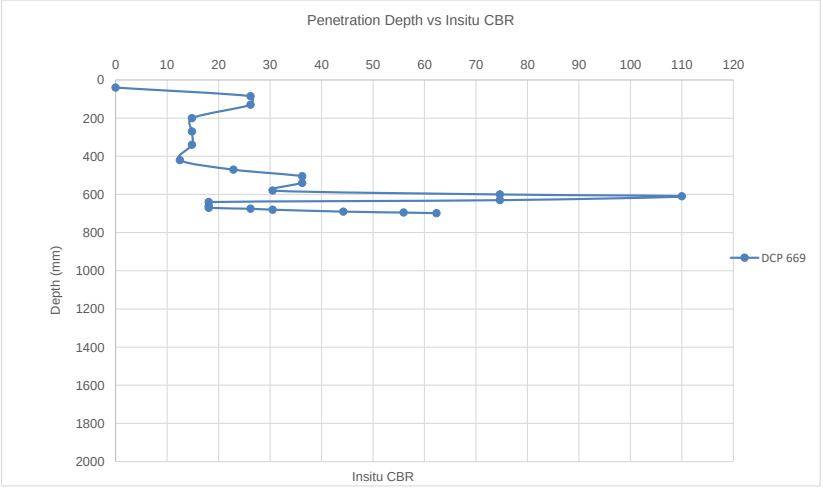
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 669
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 09/11/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 40mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	09/11/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	09/11/2024
TEST POSITION:	DCP 670	**STARTING DEPTH:**	30mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

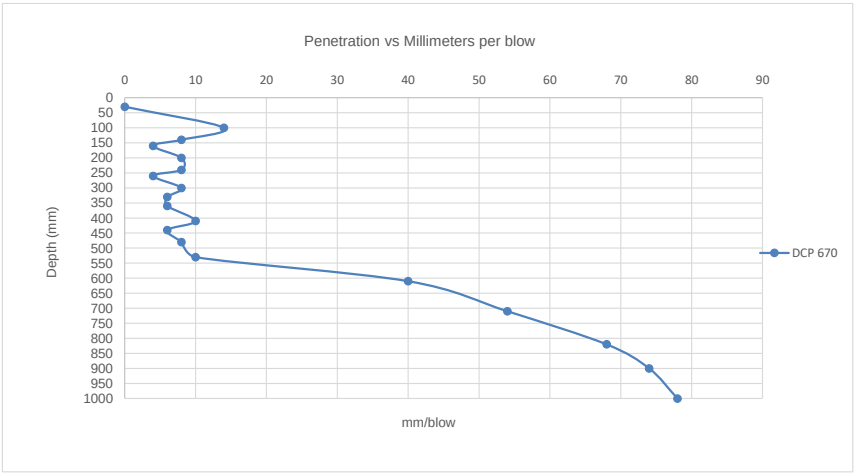
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	30	30mm	0	0				
5	100	100mm	70	14.0	Medium Dense	14	15	163
10	140	140mm	40	8.0	Dense	29	31	301
15	160	160mm	20	4.0	Very Dense	70	75	640
20	200	200mm	40	8.0	Dense	29	31	301
25	240	240mm	40	8.0	Dense	29	31	301
30	260	260mm	20	4.0	Very Dense	70	75	640
35	300	300mm	40	8.0	Dense	29	31	301
40	330	330mm	30	6.0	Dense	42	44	411
45	360	360mm	30	6.0	Dense	42	44	411
50	410	410mm	50	10.0	Dense	22	23	236
55	440	440mm	30	6.0	Dense	42	44	411
60	480	480mm	40	8.0	Dense	29	31	301
65	530	530mm	50	10.0	Dense	22	23	236
70	610	610mm	200	40.0	Loose	4	4	52
75	710	710mm	270	54.0	Loose	3	3	38
80	820	820mm	340	68.0	Loose	2	2	29
85	900	900mm	370	74.0	Loose	2	2	27
90	1000	1000mm	390	78.0	Very Loose	2	2	25

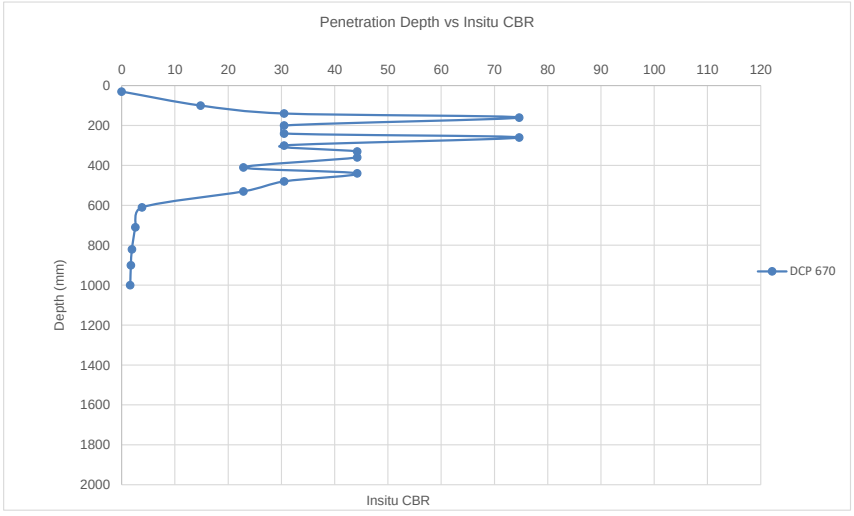
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 670
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 09/11/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 30mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	29/10/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	29/10/2024
TEST POSITION:	DCP 420	**STARTING DEPTH:**	55mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

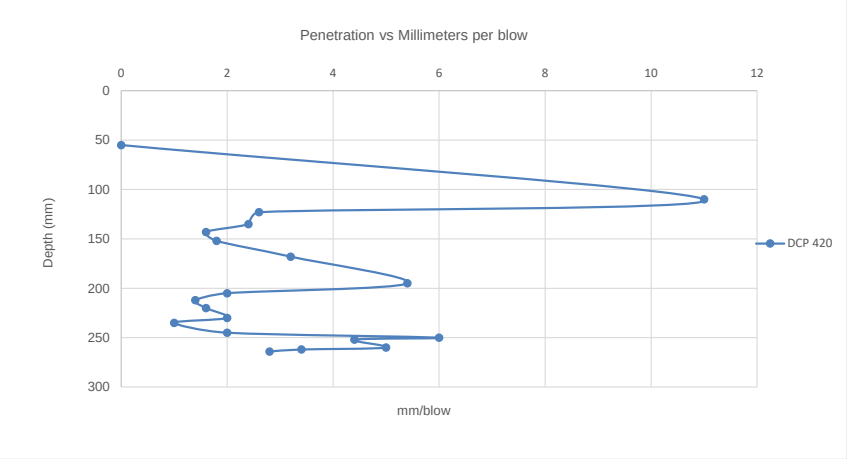
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	55	55mm	0	0				
5	110	110mm	55	11.0	Dense	20	20	212
10	123	123mm	13	2.6	Very Dense	122	>110	1023
15	135	135mm	12	2.4	Very Dense	135	>110	1117
20	143	143mm	8	1.6	Very Dense	206	>110	1737
25	152	152mm	9	1.8	Very Dense	185	>110	1528
30	168	168mm	16	3.2	Very Dense	94	100	816
35	195	195mm	27	5.4	Dense	48	51	461
40	205	205mm	10	2.0	Very Dense	170	>110	1362
45	212	212mm	7	1.4	Very Dense	232	>110	2010
50	220	220mm	8	1.6	Very Dense	206	>110	1737
55	230	230mm	10	2.0	Very Dense	170	>110	1362
60	235	235mm	5	1.0	Very Dense	300	>110	2900
65	245	245mm	10	2.0	Very Dense	170	>110	1362
70	250	250mm	30	6.0	Dense	42	44	411
75	252	252mm	22	4.4	Very Dense	62	66	577
80	260	260mm	25	5.0	Very Dense	53	56	502
85	262	262mm	17	3.4	Very Dense	87	92	764
90	264	264mm	14	2.8	Very Dense	111	>110	944

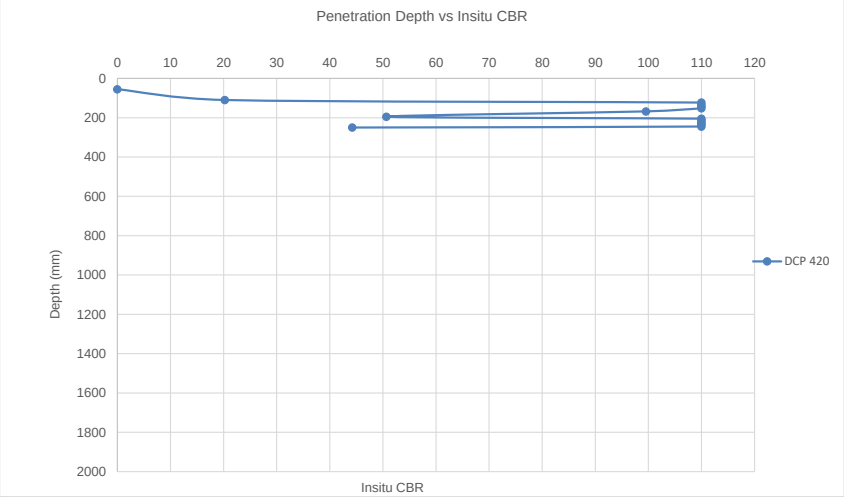
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 420
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 29/10/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 55mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	29/10/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	29/10/2024
TEST POSITION:	DCP 421	**STARTING DEPTH:**	90mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

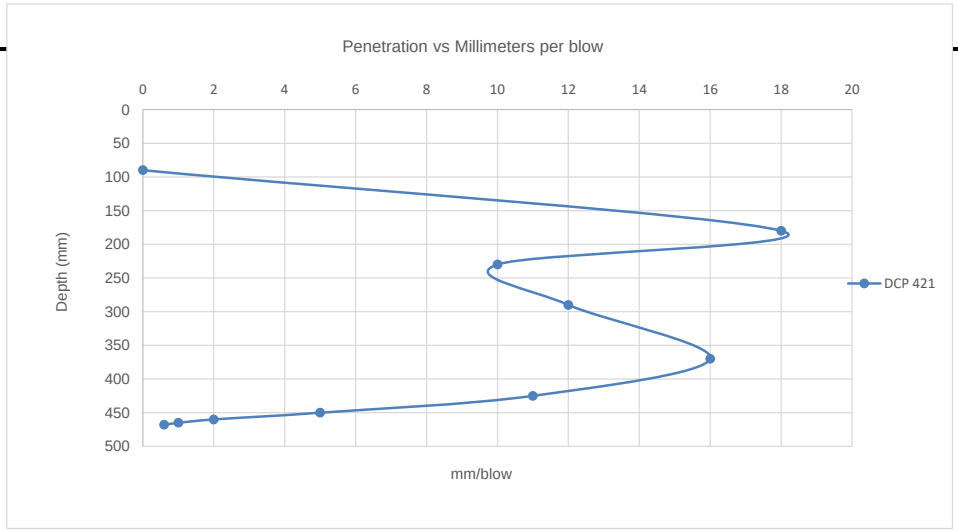
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	90	90mm	0	0				
5	180	180mm	90	18.0	Medium Dense	10	11	124
10	230	230mm	50	10.0	Dense	22	23	236
15	290	290mm	60	12.0	Dense	17	18	193
20	370	370mm	80	16.0	Medium Dense	12	12	141
25	425	425mm	55	11.0	Dense	20	20	212
30	450	450mm	25	5.0	Very Dense	53	56	502
35	460	460mm	10	2.0	Very Dense	170	>110	1362
40	465	465mm	5	1.0	Very Dense	300	>110	2900
45	468	468mm	3	0.6	Very Dense	389	>110	5061

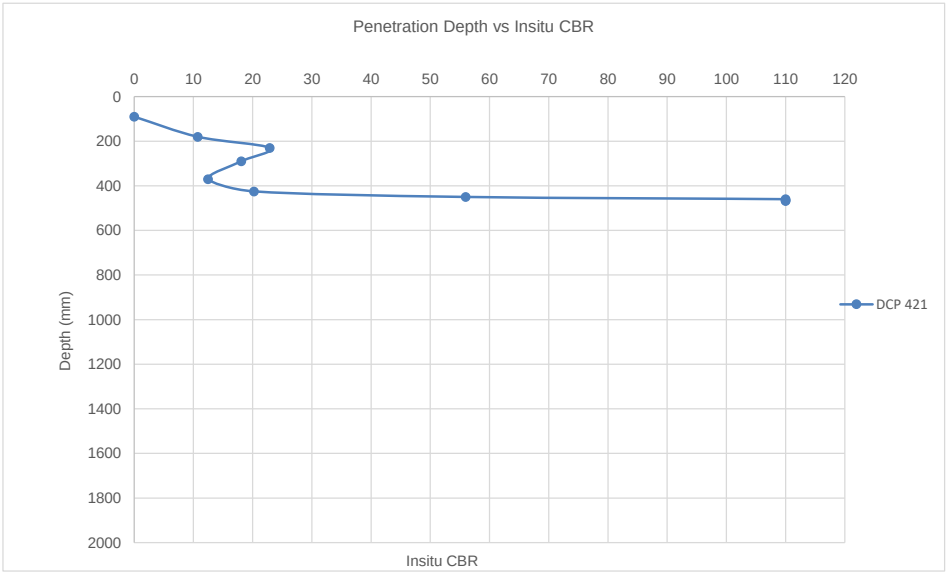
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 421
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 29/10/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 90mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	29/10/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	29/10/2024
TEST POSITION:	DCP 421	**STARTING DEPTH:**	80mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

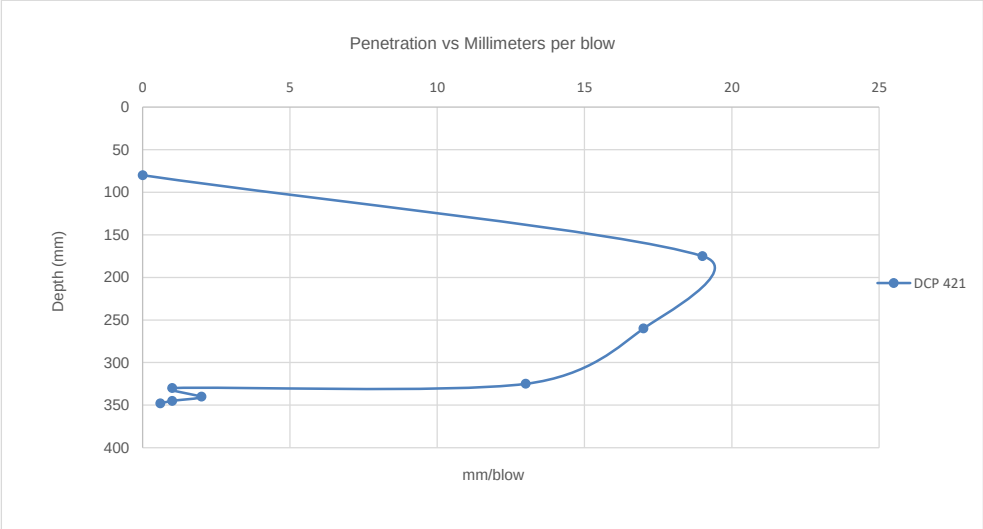
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	80	80mm	0	0				
5	175	175mm	95	19.0	Medium Dense	10	10	117
10	260	260mm	85	17.0	Medium Dense	11	12	132
15	325	325mm	65	13.0	Medium Dense	16	16	177
20	330	330mm	5	1.0	Very Dense	300	>110	2900
25	340	340mm	10	2.0	Very Dense	170	>110	1362
30	345	345mm	5	1.0	Very Dense	300	>110	2900
35	348	348mm	3	0.6	Very Dense	389	>110	5061

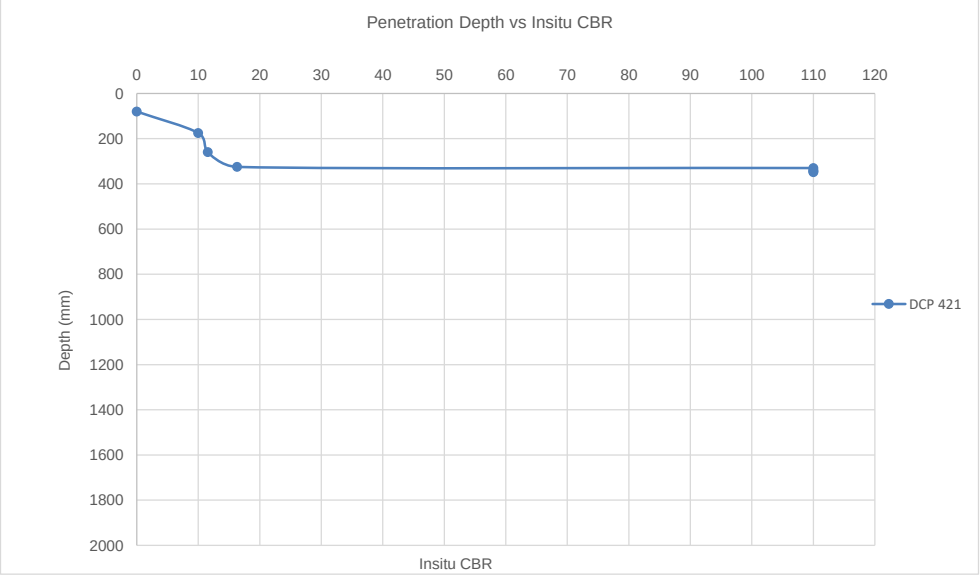
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 421
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 29/10/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 80mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

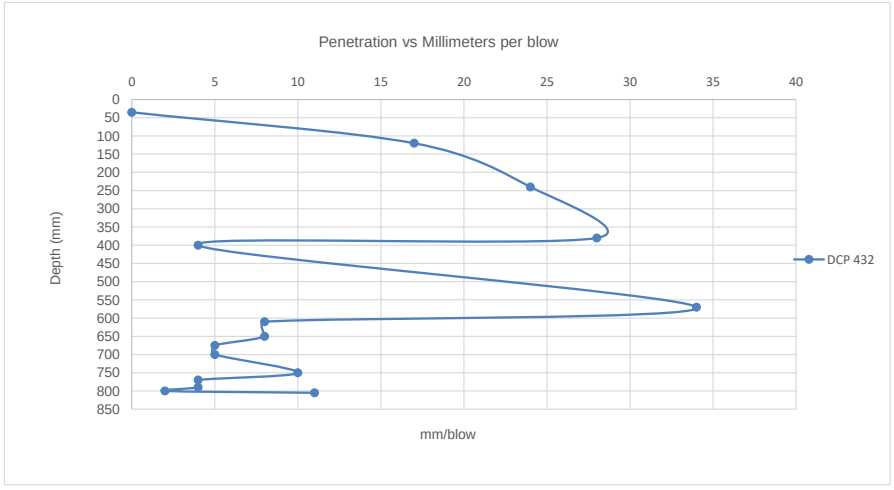
CLIENT:	Zutari	**DATE:**	29/10/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	29/10/2024
TEST POSITION:	DCP 432	**STARTING DEPTH:**	35mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

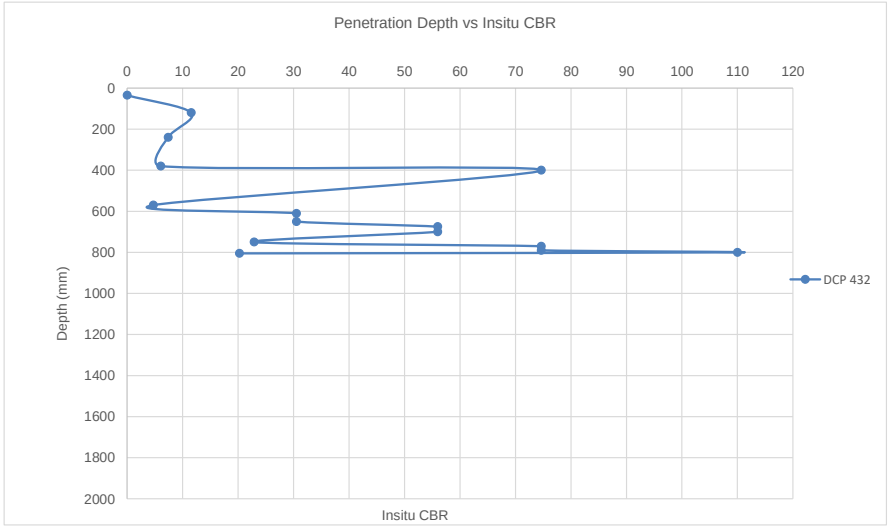
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	35	35mm	0	0				
5	120	120mm	85	17.0	Medium Dense	11	12	132
10	240	240mm	120	24.0	Medium Dense	7	7	91
15	380	380mm	140	28.0	Medium Dense	6	6	77
20	400	400mm	20	4.0	Very Dense	70	75	640
25	570	570mm	170	34.0	Loose	5	5	62
30	610	610mm	40	8.0	Dense	29	31	301
35	650	650mm	40	8.0	Dense	29	31	301
40	675	675mm	25	5.0	Very Dense	53	56	502
45	700	700mm	25	5.0	Very Dense	53	56	502
50	750	750mm	50	10.0	Dense	22	23	236
55	770	770mm	20	4.0	Very Dense	70	75	640
60	790	790mm	20	4.0	Very Dense	70	75	640
65	800	800mm	10	2.0	Very Dense	170	>110	1362
70	805	805mm	55	11.0	Dense	20	20	212
75	807	807mm	37	7.4	Dense	32	34	327

DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT:	Xhariep Project	**DATE TESTED:**	29/10/2024
CLIENT:	Zutari	**OPERATOR:**	Wendy Muofhe
TEST POSITION:	DCP 432	**STARTING DEPTH:**	35mm
MATERIAL TYPE:	0	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	15/10/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	15/10/2024
TEST POSITION:	DCP 434	**STARTING DEPTH:**	35mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

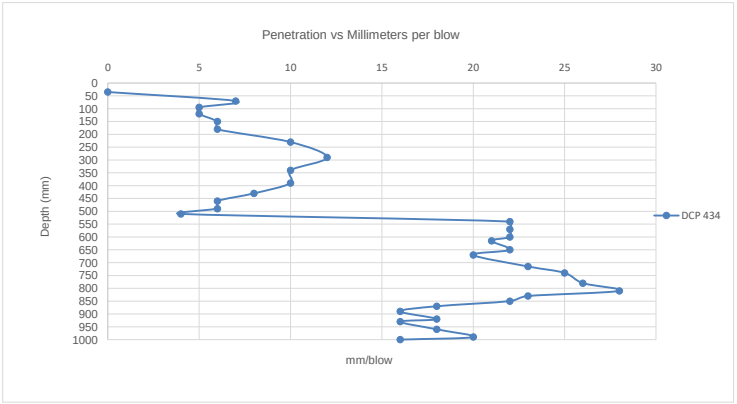
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	35	35mm	0	0				
5	70	70mm	35	7.0	Dense	35	36	348
10	95	95mm	25	5.0	Very Dense	53	56	502
15	120	120mm	25	5.0	Very Dense	53	56	502
20	150	150mm	30	6.0	Dense	42	44	411
25	180	180mm	30	6.0	Dense	42	44	411
30	230	230mm	50	10.0	Dense	22	23	236
35	290	290mm	60	12.0	Dense	17	18	193
40	340	340mm	50	10.0	Dense	22	23	236
45	390	390mm	50	10.0	Dense	22	23	236
50	430	430mm	40	8.0	Dense	29	31	301
55	460	460mm	30	6.0	Dense	42	44	411
60	490	490mm	30	6.0	Dense	42	44	411
65	510	510mm	20	4.0	Very Dense	70	75	640
70	540	540mm	110	22.0	Medium Dense	8	8	100
75	570	570mm	110	22.0	Medium Dense	8	8	100
80	600	600mm	110	22.0	Medium Dense	8	8	100
85	615	615mm	105	21.0	Medium Dense	9	9	105
90	650	650mm	110	22.0	Medium Dense	8	8	100
95	670	670mm	100	20.0	Medium Dense	9	9	111
100	715	715mm	115	23.0	Medium Dense	8	8	95
105	740	740mm	125	25.0	Medium Dense	7	7	87
110	780	780mm	130	26.0	Medium Dense	7	7	83
115	810	810mm	140	28.0	Medium Dense	6	6	77
120	830	830mm	115	23.0	Medium Dense	8	8	95
125	850	850mm	110	22.0	Medium Dense	8	8	100
130	870	870mm	90	18.0	Medium Dense	10	11	124
135	890	890mm	80	16.0	Medium Dense	12	12	141
140	920	920mm	90	18.0	Medium Dense	10	11	124
145	930	930mm	80	16.0	Medium Dense	12	12	141
150	960	960mm	90	18.0	Medium Dense	10	11	124
155	990	990mm	100	20.0	Medium Dense	9	9	111
160	1000	1000mm	80	16.0	Medium Dense	12	12	141

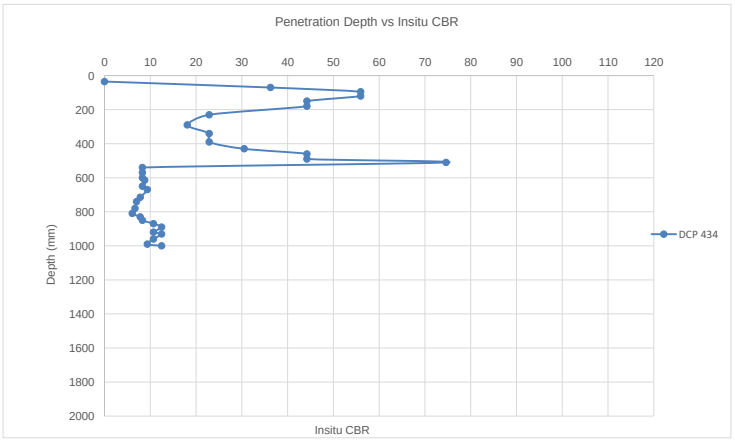
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 434
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 15/10/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 35mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	29/10/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	29/10/2024
TEST POSITION:	DCP 438	**STARTING DEPTH:**	30mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

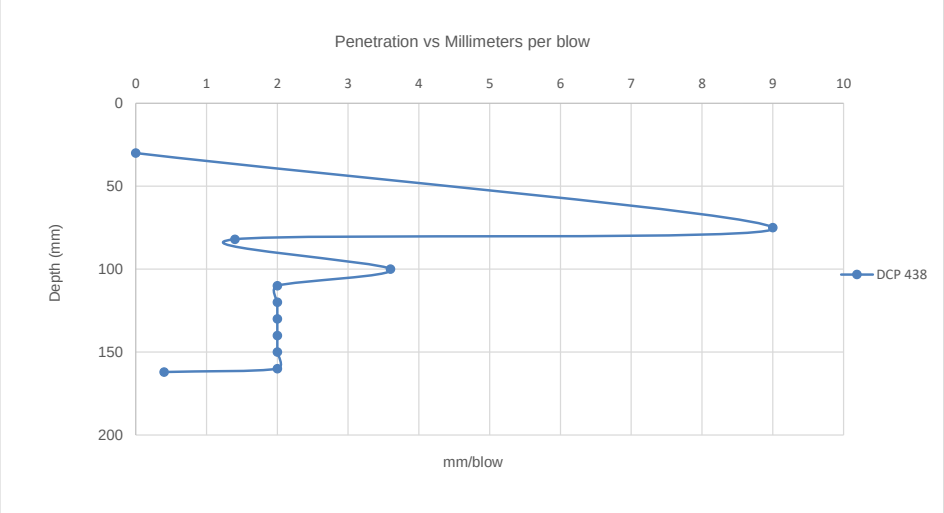
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x $(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x $(dn)^{-1.09}$
0	30	30mm	0	0				
5	75	75mm	45	9.0	Dense	25	26	264
10	82	82mm	7	1.4	Very Dense	232	>110	2010
15	100	100mm	18	3.6	Very Dense	81	86	718
20	110	110mm	10	2.0	Very Dense	170	>110	1362
25	120	120mm	10	2.0	Very Dense	170	>110	1362
30	130	130mm	10	2.0	Very Dense	170	>110	1362
35	140	140mm	10	2.0	Very Dense	170	>110	1362
40	150	150mm	10	2.0	Very Dense	170	>110	1362
45	160	160mm	10	2.0	Very Dense	170	>110	1362
50	162	162mm	2	0.4	Very Dense	442	>110	7873

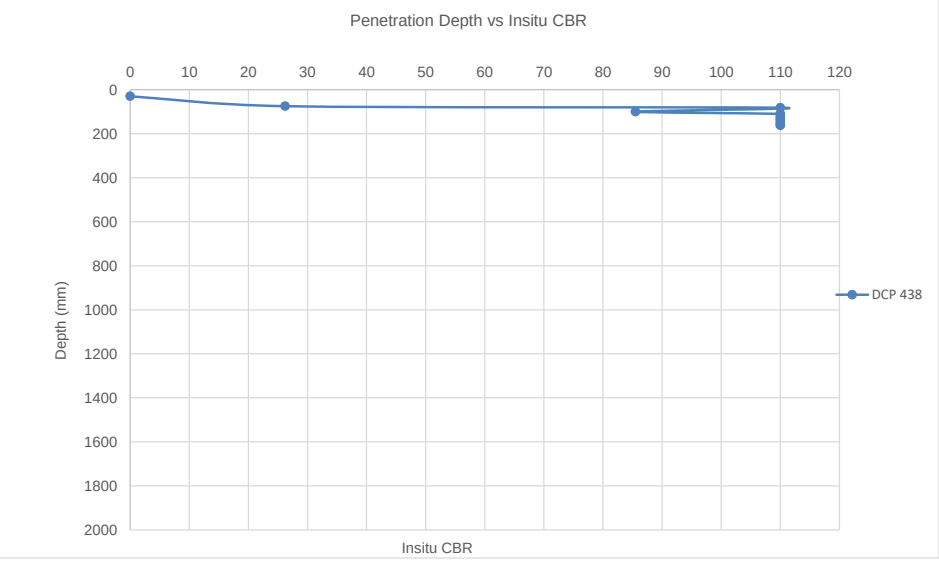
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 438
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 29/10/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 30mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	15/10/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	15/10/2024
TEST POSITION:	DCP 434	**STARTING DEPTH:**	40mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

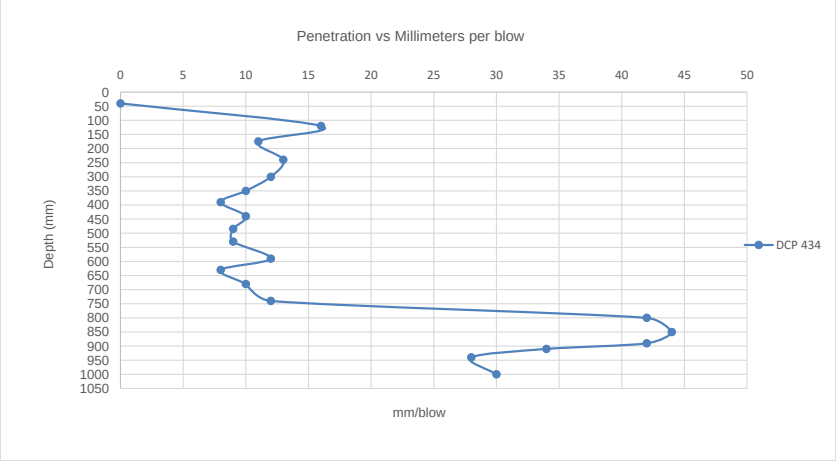
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	40	40mm	0	0				
5	120	120mm	80	16.0	Medium Dense	12	12	141
10	175	175mm	55	11.0	Dense	20	20	212
15	240	240mm	65	13.0	Medium Dense	16	16	177
20	300	300mm	60	12.0	Dense	17	18	193
25	350	350mm	50	10.0	Dense	22	23	236
30	390	390mm	40	8.0	Dense	29	31	301
35	440	440mm	50	10.0	Dense	22	23	236
40	485	485mm	45	9.0	Dense	25	26	264
45	530	530mm	45	9.0	Dense	25	26	264
50	590	590mm	60	12.0	Dense	17	18	193
55	630	630mm	40	8.0	Dense	29	31	301
60	680	680mm	50	10.0	Dense	22	23	236
65	740	740mm	60	12.0	Dense	17	18	193
70	800	800mm	210	42.0	Loose	4	4	49
75	850	850mm	220	44.0	Loose	3	3	47
80	890	890mm	210	42.0	Loose	4	4	49
85	910	910mm	170	34.0	Loose	5	5	62
90	940	940mm	140	28.0	Medium Dense	6	6	77
95	1000	1000mm	150	30.0	Medium Dense	5	6	71

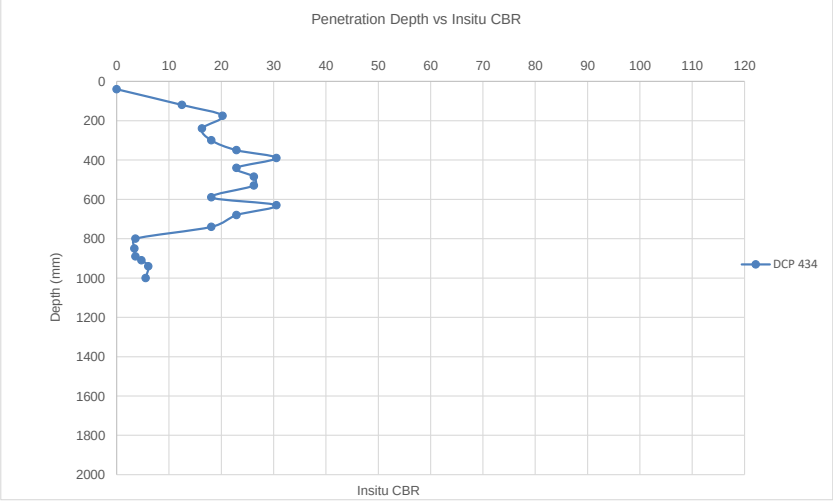
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 434
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 15/10/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 40mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	29/10/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	29/10/2024
TEST POSITION:	DCP 448	**STARTING DEPTH:**	42mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

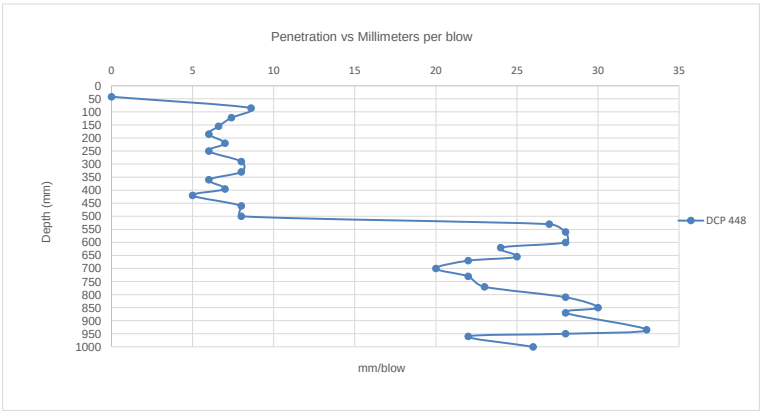
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	42	42mm	0	0				
5	85	85mm	43	8.6	Dense	27	28	278
10	122	122mm	37	7.4	Dense	32	34	327
15	155	155mm	33	6.6	Dense	37	39	371
20	185	185mm	30	6.0	Dense	42	44	411
25	220	220mm	35	7.0	Dense	35	36	348
30	250	250mm	30	6.0	Dense	42	44	411
35	290	290mm	40	8.0	Dense	29	31	301
40	330	330mm	40	8.0	Dense	29	31	301
45	360	360mm	30	6.0	Dense	42	44	411
50	395	395mm	35	7.0	Dense	35	36	348
55	420	420mm	25	5.0	Very Dense	53	56	502
60	460	460mm	40	8.0	Dense	29	31	301
65	500	500mm	40	8.0	Dense	29	31	301
70	530	530mm	135	27.0	Medium Dense	6	6	80
75	560	560mm	140	28.0	Medium Dense	6	6	77
80	600	600mm	140	28.0	Medium Dense	6	6	77
85	620	620mm	120	24.0	Medium Dense	7	7	91
90	655	655mm	125	25.0	Medium Dense	7	7	87
95	670	670mm	110	22.0	Medium Dense	8	8	100
100	700	700mm	100	20.0	Medium Dense	9	9	111
105	730	730mm	110	22.0	Medium Dense	8	8	100
110	770	770mm	115	23.0	Medium Dense	8	8	95
115	810	810mm	140	28.0	Medium Dense	6	6	77
120	850	850mm	150	30.0	Medium Dense	5	6	71
125	870	870mm	140	28.0	Medium Dense	6	6	77
130	935	935mm	165	33.0	Loose	5	5	64
135	950	950mm	140	28.0	Medium Dense	6	6	77
140	960	960mm	110	22.0	Medium Dense	8	8	100
145	1000	1000mm	130	26.0	Medium Dense	7	7	83

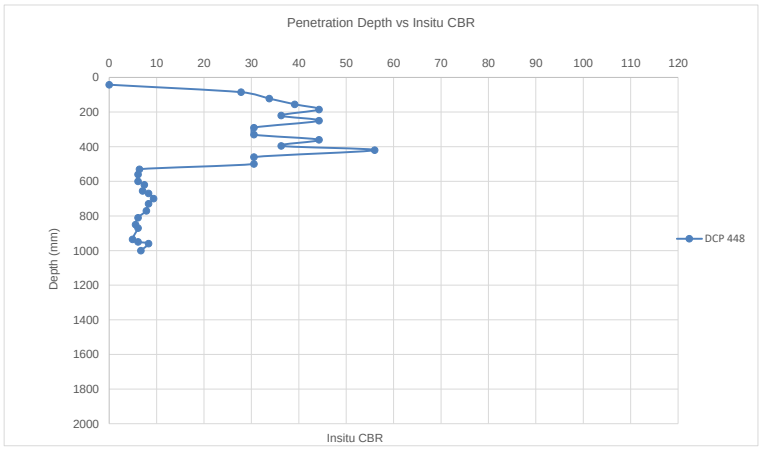
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 448
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 29/10/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 42mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	29/10/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	29/10/2024
TEST POSITION:	DCP 453	**STARTING DEPTH:**	30mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

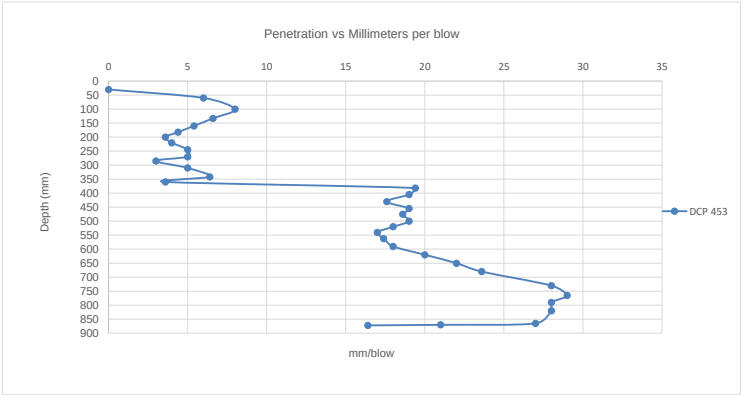
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	30	30mm	0	0				
5	60	60mm	30	6.0	Dense	42	44	411
10	100	100mm	40	8.0	Dense	29	31	301
15	133	133mm	33	6.6	Dense	37	39	371
20	160	160mm	27	5.4	Dense	48	51	461
25	182	182mm	22	4.4	Very Dense	62	66	577
30	200	200mm	18	3.6	Very Dense	81	86	718
35	220	220mm	20	4.0	Very Dense	70	75	640
40	245	245mm	25	5.0	Very Dense	53	56	502
45	270	270mm	25	5.0	Very Dense	53	56	502
50	285	285mm	15	3.0	Very Dense	102	108	876
55	310	310mm	25	5.0	Very Dense	53	56	502
60	342	342mm	32	6.4	Dense	39	41	383
65	360	360mm	18	3.6	Very Dense	81	86	718
70	382	382mm	97	19.4	Medium Dense	9	10	114
75	405	405mm	95	19.0	Medium Dense	10	10	117
80	430	430mm	88	17.6	Medium Dense	11	11	127
85	455	455mm	95	19.0	Medium Dense	10	10	117
90	475	475mm	93	18.6	Medium Dense	10	10	120
95	500	500mm	95	19.0	Medium Dense	10	10	117
100	520	520mm	90	18.0	Medium Dense	10	11	124
105	540	540mm	85	17.0	Medium Dense	11	12	132
110	562	562mm	87	17.4	Medium Dense	11	11	129
115	590	590mm	90	18.0	Medium Dense	10	11	124
120	620	620mm	100	20.0	Medium Dense	9	9	111
125	650	650mm	110	22.0	Medium Dense	8	8	100
130	680	680mm	118	23.6	Medium Dense	7	8	92
135	730	730mm	140	28.0	Medium Dense	6	6	77
140	765	765mm	145	29.0	Medium Dense	6	6	74
145	790	790mm	140	28.0	Medium Dense	6	6	77
150	820	820mm	140	28.0	Medium Dense	6	6	77
155	865	865mm	135	27.0	Medium Dense	6	6	80
160	870	870mm	105	21.0	Medium Dense	9	9	105
165	872	872mm	82	16.4	Medium Dense	12	12	137

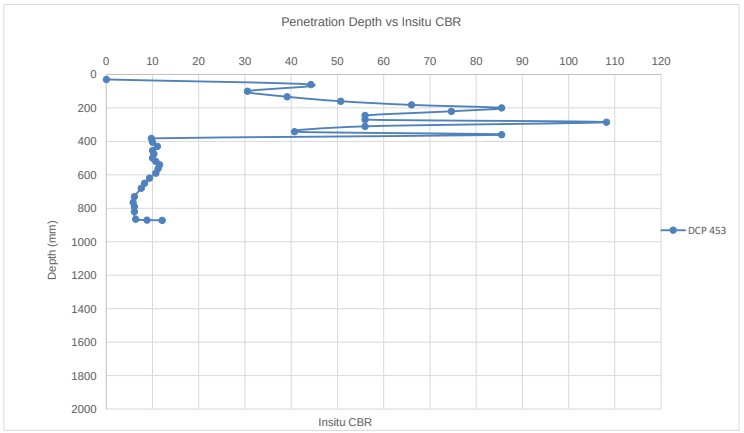
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 453
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 29/10/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 30mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	30/10/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	30/10/2024
TEST POSITION:	DCP 454	**STARTING DEPTH:**	60mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

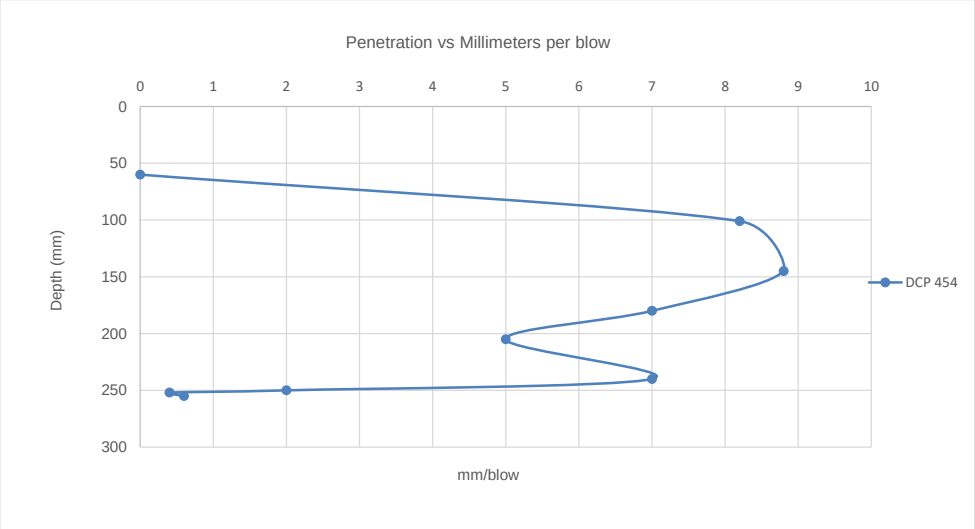
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	60	60mm	0	0				
5	101	101mm	41	8.2	Dense	28	30	293
10	145	145mm	44	8.8	Dense	26	27	271
15	180	180mm	35	7.0	Dense	35	36	348
20	205	205mm	25	5.0	Very Dense	53	56	502
25	240	240mm	35	7.0	Dense	35	36	348
30	250	250mm	10	2.0	Very Dense	170	>110	1362
35	252	252mm	2	0.4	Very Dense	442	>110	7873
40	255	255mm	3	0.6	Very Dense	389	>110	5061

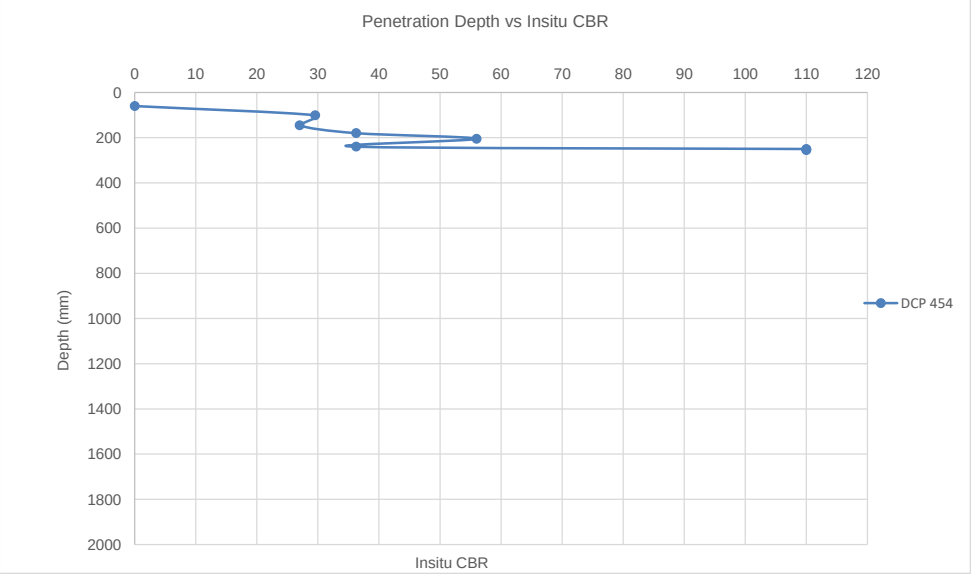
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 454
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 30/10/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 60mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	30/10/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	30/10/2024
TEST POSITION:	DCP 455	**STARTING DEPTH:**	15mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

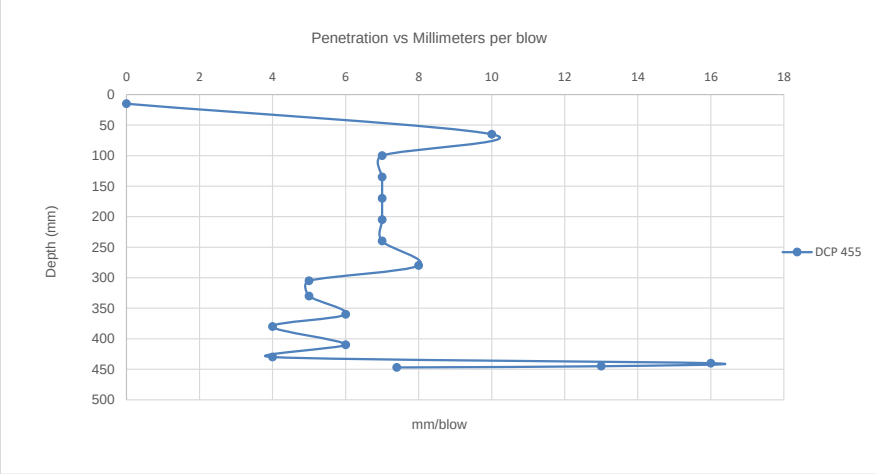
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x $(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x $(dn)^{-1.09}$
0	15	15mm	0	0				
5	65	65mm	50	10.0	Dense	22	23	236
10	100	100mm	35	7.0	Dense	35	36	348
15	135	135mm	35	7.0	Dense	35	36	348
20	170	170mm	35	7.0	Dense	35	36	348
25	205	205mm	35	7.0	Dense	35	36	348
30	240	240mm	35	7.0	Dense	35	36	348
35	280	280mm	40	8.0	Dense	29	31	301
40	305	305mm	25	5.0	Very Dense	53	56	502
45	330	330mm	25	5.0	Very Dense	53	56	502
50	360	360mm	30	6.0	Dense	42	44	411
55	380	380mm	20	4.0	Very Dense	70	75	640
60	410	410mm	30	6.0	Dense	42	44	411
65	430	430mm	20	4.0	Very Dense	70	75	640
70	440	440mm	80	16.0	Medium Dense	12	12	141
75	445	445mm	65	13.0	Medium Dense	16	16	177
80	447	447mm	37	7.4	Dense	32	34	327

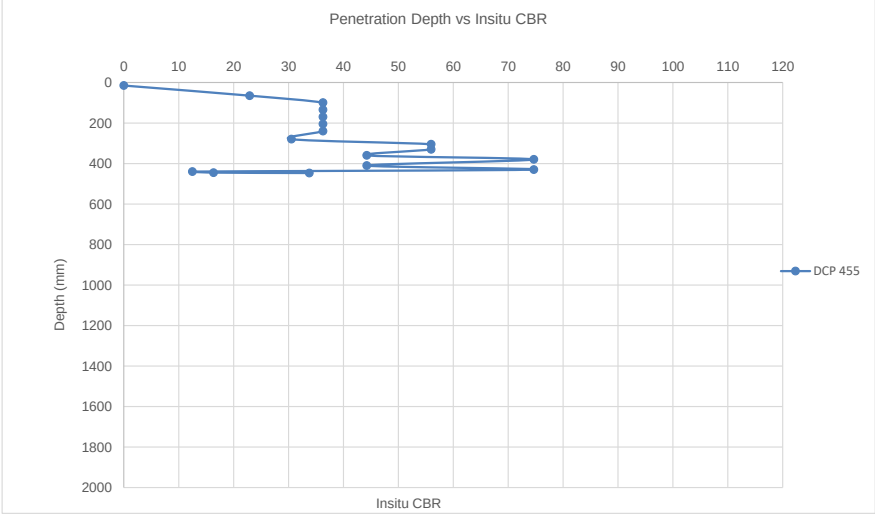
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 455
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 30/10/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 15mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	30/10/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	30/10/2024
TEST POSITION:	DCP 456	**STARTING DEPTH:**	40mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

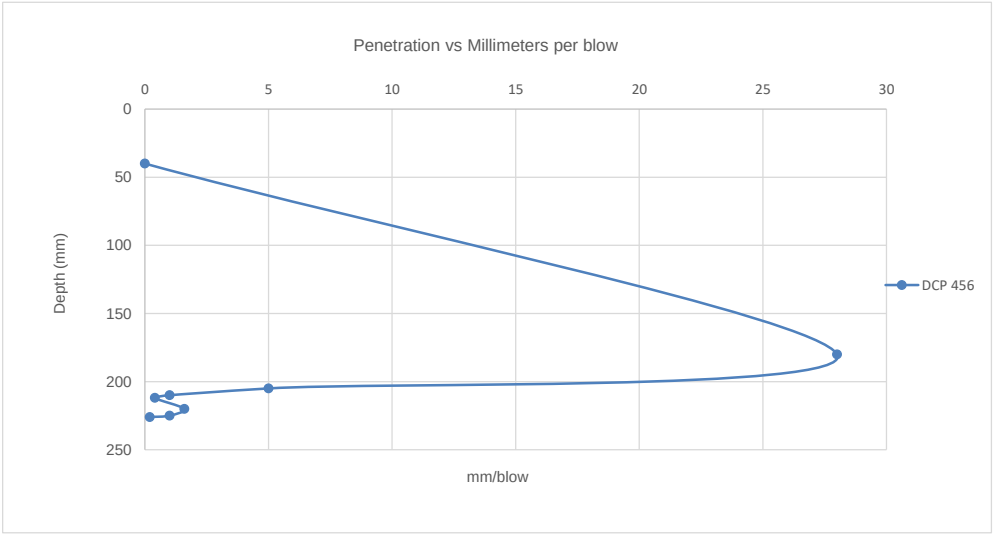
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	40	40mm	0	0				
5	180	180mm	140	28.0	Medium Dense	6	6	77
10	205	205mm	25	5.0	Very Dense	53	56	502
15	210	210mm	5	1.0	Very Dense	300	>110	2900
20	212	212mm	2	0.4	Very Dense	442	>110	7873
25	220	220mm	8	1.6	Very Dense	206	>110	1737
30	225	225mm	5	1.0	Very Dense	300	>110	2900
35	226	226mm	1	0.2	Very Dense	500	>110	16760

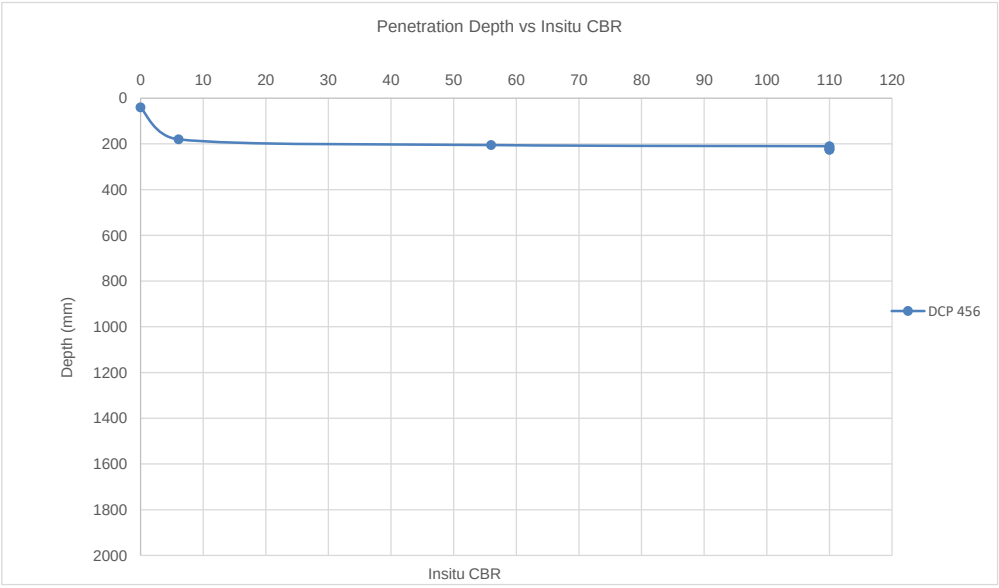
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 456
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 30/10/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 40mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

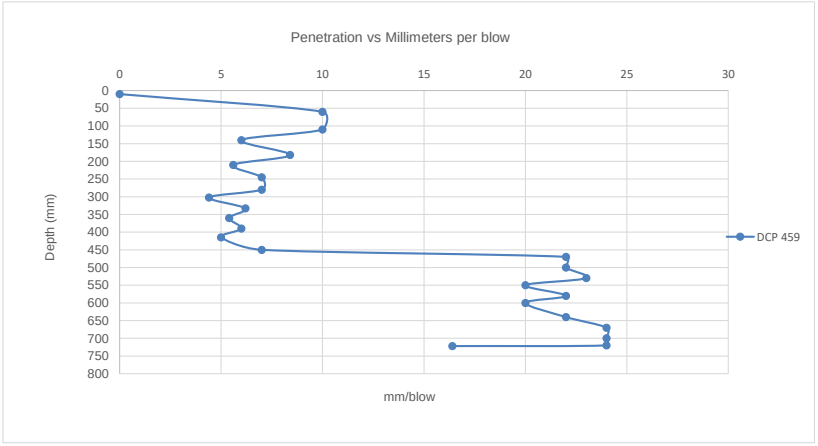
CLIENT:	Zutari	**DATE:**	30/10/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	30/10/2024
TEST POSITION:	DCP 459	**STARTING DEPTH:**	10mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

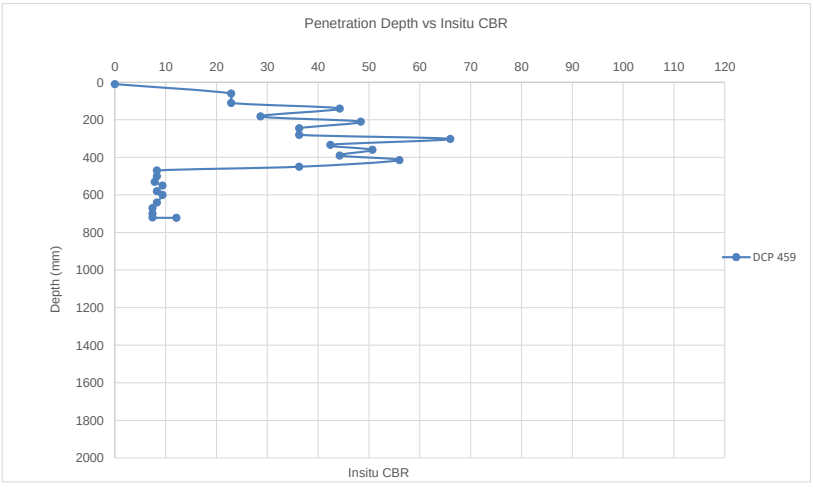
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	10	10mm	0	0				
5	60	60mm	50	10.0	Dense	22	23	236
10	110	110mm	50	10.0	Dense	22	23	236
15	140	140mm	30	6.0	Dense	42	44	411
20	182	182mm	42	8.4	Dense	27	29	285
25	210	210mm	28	5.6	Dense	46	48	443
30	245	245mm	35	7.0	Dense	35	36	348
35	280	280mm	35	7.0	Dense	35	36	348
40	302	302mm	22	4.4	Very Dense	62	66	577
45	333	333mm	31	6.2	Dense	40	42	397
50	360	360mm	27	5.4	Dense	48	51	461
55	390	390mm	30	6.0	Dense	42	44	411
60	415	415mm	25	5.0	Very Dense	53	56	502
65	450	450mm	35	7.0	Dense	35	36	348
70	470	470mm	110	22.0	Medium Dense	8	8	100
75	500	500mm	110	22.0	Medium Dense	8	8	100
80	530	530mm	115	23.0	Medium Dense	8	8	95
85	550	550mm	100	20.0	Medium Dense	9	9	111
90	580	580mm	110	22.0	Medium Dense	8	8	100
95	600	600mm	100	20.0	Medium Dense	9	9	111
100	640	640mm	110	22.0	Medium Dense	8	8	100
105	670	670mm	120	24.0	Medium Dense	7	7	91
110	700	700mm	120	24.0	Medium Dense	7	7	91
115	720	720mm	120	24.0	Medium Dense	7	7	91
120	722	722mm	82	16.4	Medium Dense	12	12	137

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 459
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 30/10/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 10mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

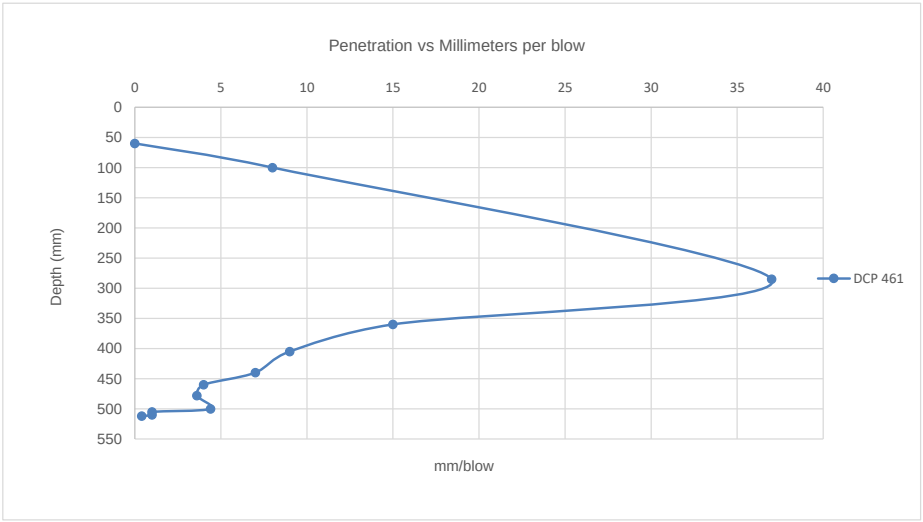
CLIENT:	Zutari	**DATE:**	31/10/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	31/10/2024
TEST POSITION:	DCP 461	**STARTING DEPTH:**	60mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

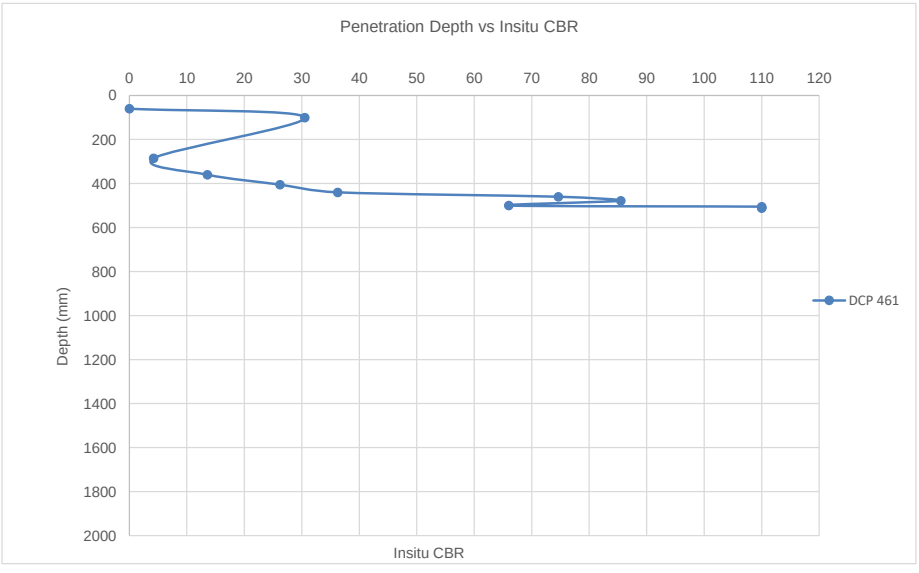
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	60	60mm	0	0				
5	100	100mm	40	8.0	Dense	29	31	301
10	285	285mm	185	37.0	Loose	4	4	57
15	360	360mm	75	15.0	Medium Dense	13	14	152
20	405	405mm	45	9.0	Dense	25	26	264
25	440	440mm	35	7.0	Dense	35	36	348
30	460	460mm	20	4.0	Very Dense	70	75	640
35	478	478mm	18	3.6	Very Dense	81	86	718
40	500	500mm	22	4.4	Very Dense	62	66	577
45	505	505mm	5	1.0	Very Dense	300	>110	2900
50	510	510mm	5	1.0	Very Dense	300	>110	2900
55	512	512mm	2	0.4	Very Dense	442	>110	7873

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 461
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 31/10/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 60mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

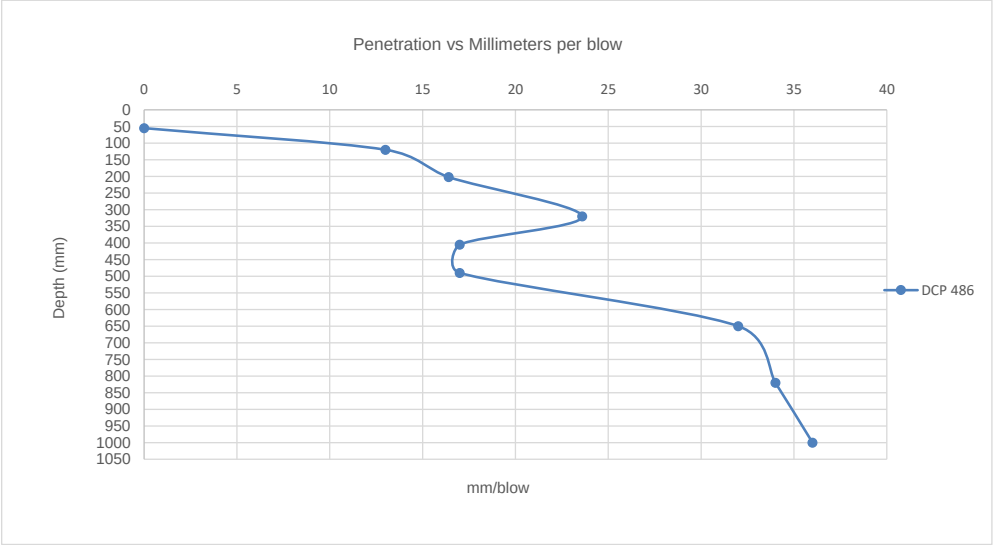
CLIENT:	Zutari	**DATE:**	31/10/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	31/10/2024
TEST POSITION:	DCP 486	**STARTING DEPTH:**	55mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

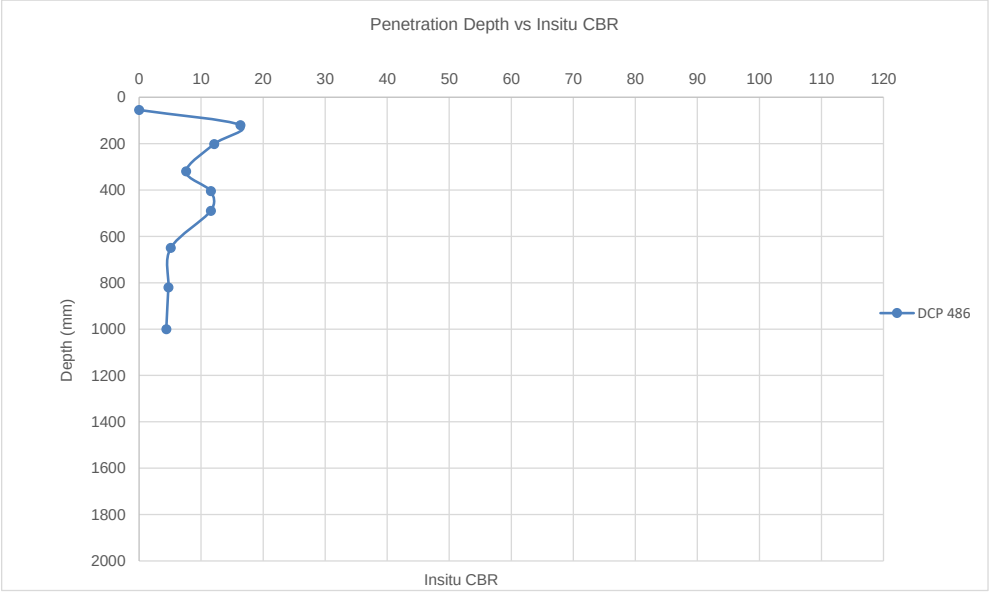
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x $(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x $(dn)^{-1.09}$
0	55	55mm	0	0				
5	120	120mm	65	13.0	Medium Dense	16	16	177
10	202	202mm	82	16.4	Medium Dense	12	12	137
15	320	320mm	118	23.6	Medium Dense	7	8	92
20	405	405mm	85	17.0	Medium Dense	11	12	132
25	490	490mm	85	17.0	Medium Dense	11	12	132
30	650	650mm	160	32.0	Loose	5	5	66
35	820	820mm	170	34.0	Loose	5	5	62
40	1000	1000mm	180	36.0	Loose	4	4	58

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 486
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 31/10/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 55mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

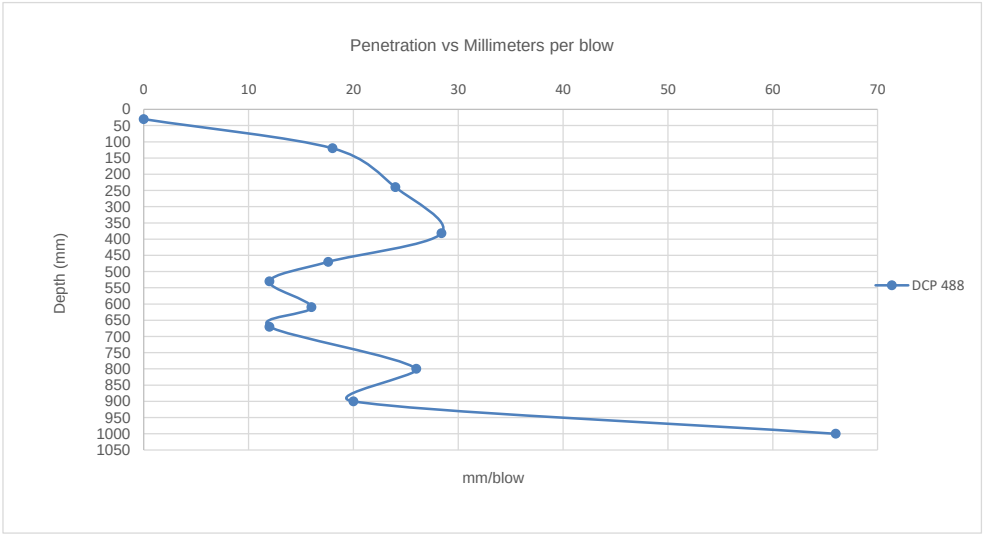
CLIENT:	Zutari	**DATE:**	01/11/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	01/11/2024
TEST POSITION:	DCP 488	**STARTING DEPTH:**	30mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

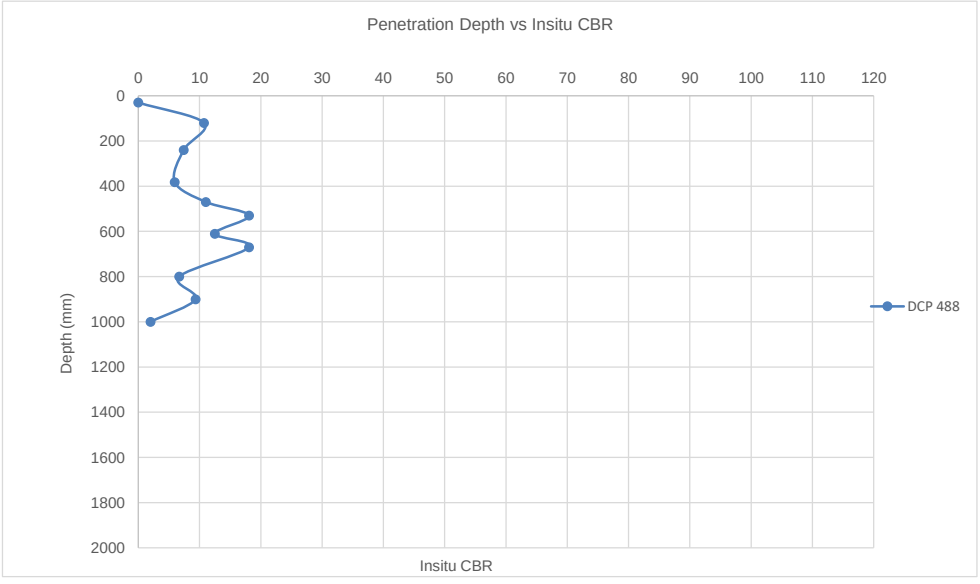
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	30	30mm	0	0				
5	120	120mm	90	18.0	Medium Dense	10	11	124
10	240	240mm	120	24.0	Medium Dense	7	7	91
15	382	382mm	142	28.4	Medium Dense	6	6	76
20	470	470mm	88	17.6	Medium Dense	11	11	127
25	530	530mm	60	12.0	Dense	17	18	193
30	610	610mm	80	16.0	Medium Dense	12	12	141
35	670	670mm	60	12.0	Dense	17	18	193
40	800	800mm	130	26.0	Medium Dense	7	7	83
45	900	900mm	100	20.0	Medium Dense	9	9	111
50	1000	1000mm	330	66.0	Loose	2	2	30

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 488
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 01/11/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 30mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	29/10/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	29/10/2024
TEST POSITION:	DCP 490	**STARTING DEPTH:**	12mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

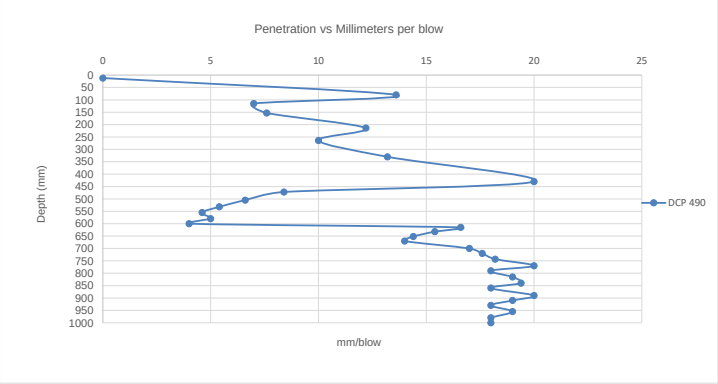
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x $(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x $(dn)^{-1.09}$
0	12	12mm	0	0				
5	80	80mm	68	13.6	Medium Dense	15	15	169
10	115	115mm	35	7.0	Dense	35	36	348
15	153	153mm	38	7.6	Dense	31	33	318
20	214	214mm	61	12.2	Dense	17	18	190
25	264	264mm	50	10.0	Dense	22	23	236
30	330	330mm	66	13.2	Medium Dense	15	16	174
35	430	430mm	100	20.0	Medium Dense	9	9	111
40	472	472mm	42	8.4	Dense	27	29	285
45	505	505mm	33	6.6	Dense	37	39	371
50	532	532mm	27	5.4	Dense	48	51	461
55	555	555mm	23	4.6	Very Dense	59	62	550
60	580	580mm	25	5.0	Very Dense	53	56	502
65	600	600mm	20	4.0	Very Dense	70	75	640
70	615	615mm	83	16.6	Medium Dense	12	12	136
75	632	632mm	77	15.4	Medium Dense	13	13	147
80	652	652mm	72	14.4	Medium Dense	14	14	158
85	670	670mm	70	14.0	Medium Dense	14	15	163
90	700	700mm	85	17.0	Medium Dense	11	12	132
95	720	720mm	88	17.6	Medium Dense	11	11	127
100	743	743mm	91	18.2	Medium Dense	10	11	123
105	770	770mm	100	20.0	Medium Dense	9	9	111
110	790	790mm	90	18.0	Medium Dense	10	11	124
115	815	815mm	95	19.0	Medium Dense	10	10	117
120	840	840mm	97	19.4	Medium Dense	9	10	114
125	860	860mm	90	18.0	Medium Dense	10	11	124
130	890	890mm	100	20.0	Medium Dense	9	9	111
135	910	910mm	95	19.0	Medium Dense	10	10	117
140	930	930mm	90	18.0	Medium Dense	10	11	124
145	955	955mm	95	19.0	Medium Dense	10	10	117
150	980	980mm	90	18.0	Medium Dense	10	11	124
155	1000	1000mm	90	18.0	Medium Dense	10	11	124

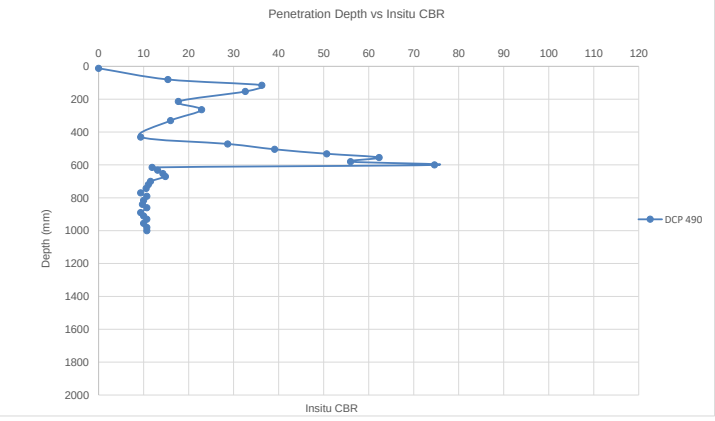
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 490
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 29/10/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 12mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	31/10/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	31/10/2024
TEST POSITION:	DCP 491	**STARTING DEPTH:**	60mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

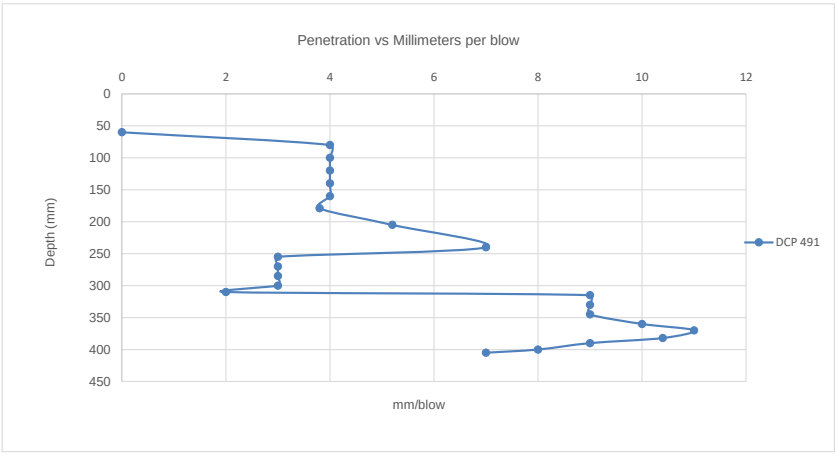
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x $(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x $(dn)^{-1.09}$
0	60	60mm	0	0				
5	80	80mm	20	4.0	Very Dense	70	75	640
10	100	100mm	20	4.0	Very Dense	70	75	640
15	120	120mm	20	4.0	Very Dense	70	75	640
20	140	140mm	20	4.0	Very Dense	70	75	640
25	160	160mm	20	4.0	Very Dense	70	75	640
30	179	179mm	19	3.8	Very Dense	75	80	677
35	205	205mm	26	5.2	Dense	51	53	481
40	240	240mm	35	7.0	Dense	35	36	348
45	255	255mm	15	3.0	Very Dense	102	108	876
50	270	270mm	15	3.0	Very Dense	102	108	876
55	285	285mm	15	3.0	Very Dense	102	108	876
60	300	300mm	15	3.0	Very Dense	102	108	876
65	310	310mm	10	2.0	Very Dense	170	>110	1362
70	315	315mm	45	9.0	Dense	25	26	264
75	330	330mm	45	9.0	Dense	25	26	264
80	345	345mm	45	9.0	Dense	25	26	264
85	360	360mm	50	10.0	Dense	22	23	236
90	370	370mm	55	11.0	Dense	20	20	212
95	382	382mm	52	10.4	Dense	21	22	226
100	390	390mm	45	9.0	Dense	25	26	264
105	400	400mm	40	8.0	Dense	29	31	301
110	405	405mm	35	7.0	Dense	35	36	348

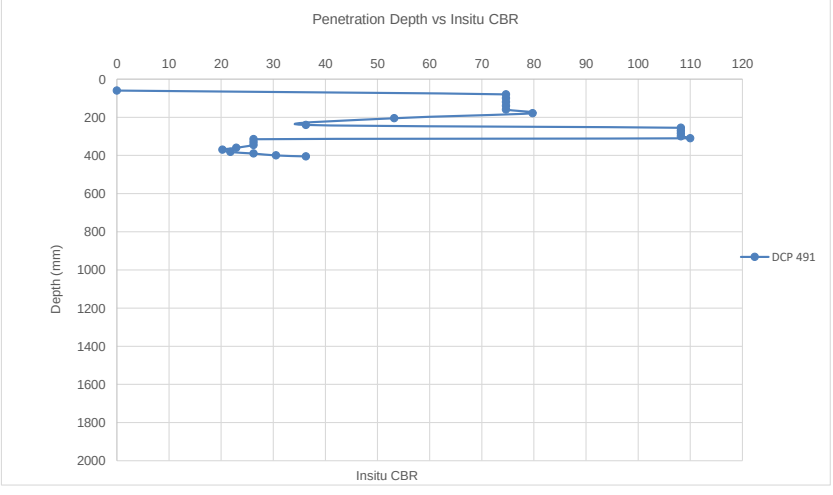
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 491
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 31/10/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 60mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	29/10/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	29/10/2024
TEST POSITION:	DCP 492	**STARTING DEPTH:**	42mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

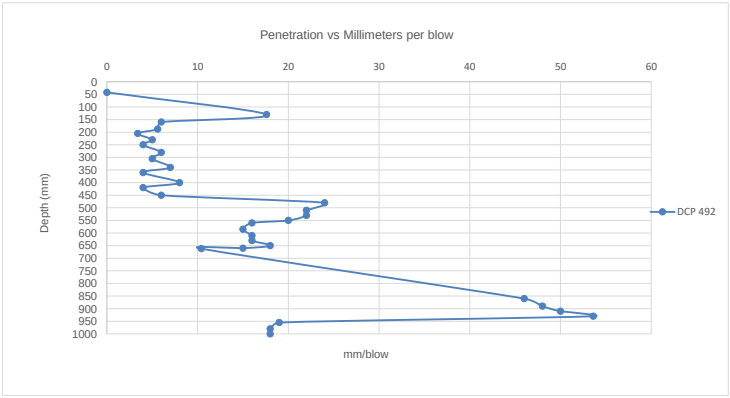
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	42	42mm	0	0				
5	130	130mm	88	17.6	Medium Dense	11	11	127
10	160	160mm	30	6.0	Dense	42	44	411
15	188	188mm	28	5.6	Dense	46	48	443
20	205	205mm	17	3.4	Very Dense	87	92	764
25	230	230mm	25	5.0	Very Dense	53	56	502
30	250	250mm	20	4.0	Very Dense	70	75	640
35	280	280mm	30	6.0	Dense	42	44	411
40	305	305mm	25	5.0	Very Dense	53	56	502
45	340	340mm	35	7.0	Dense	35	36	348
50	360	360mm	20	4.0	Very Dense	70	75	640
55	400	400mm	40	8.0	Dense	29	31	301
60	420	420mm	20	4.0	Very Dense	70	75	640
65	450	450mm	30	6.0	Dense	42	44	411
70	480	480mm	120	24.0	Medium Dense	7	7	91
75	510	510mm	110	22.0	Medium Dense	8	8	100
80	530	530mm	110	22.0	Medium Dense	8	8	100
85	550	550mm	100	20.0	Medium Dense	9	9	111
90	560	560mm	80	16.0	Medium Dense	12	12	141
95	585	585mm	75	15.0	Medium Dense	13	14	152
100	610	610mm	80	16.0	Medium Dense	12	12	141
105	630	630mm	80	16.0	Medium Dense	12	12	141
110	650	650mm	90	18.0	Medium Dense	10	11	124
115	660	660mm	75	15.0	Medium Dense	13	14	152
120	662	662mm	52	10.4	Dense	21	22	226
125	860	860mm	230	46.0	Loose	3	3	45
130	890	890mm	240	48.0	Loose	3	3	43
135	910	910mm	250	50.0	Loose	3	3	41
140	930	930mm	268	53.6	Loose	3	3	38
145	955	955mm	95	19.0	Medium Dense	10	10	117
150	980	980mm	90	18.0	Medium Dense	10	11	124
155	1000	1000mm	90	18.0	Medium Dense	10	11	124

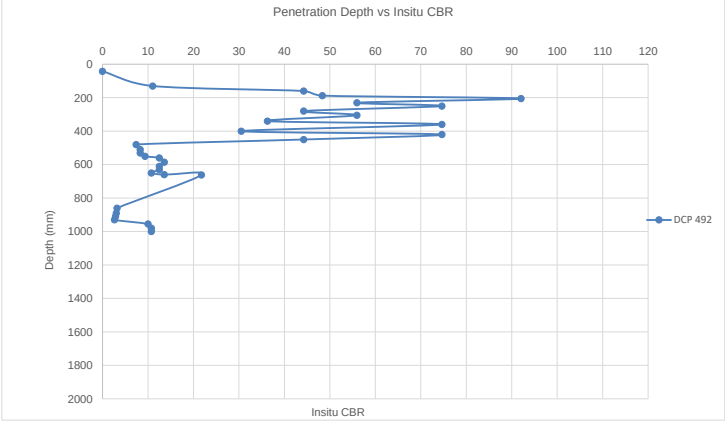
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 492
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 29/10/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 42mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	30/10/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	30/10/2024
TEST POSITION:	DCP 494	**STARTING DEPTH:**	40mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

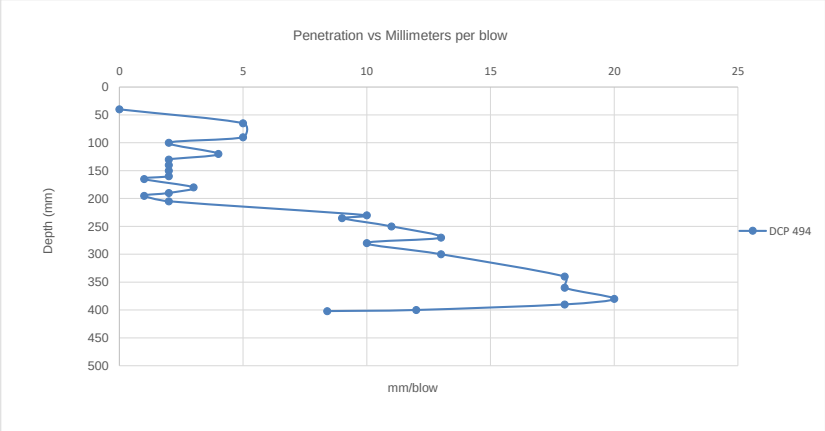
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	40	40mm	0	0				
5	65	65mm	25	5.0	Very Dense	53	56	502
10	90	90mm	25	5.0	Very Dense	53	56	502
15	100	100mm	10	2.0	Very Dense	170	>110	1362
20	120	120mm	20	4.0	Very Dense	70	75	640
25	130	130mm	10	2.0	Very Dense	170	>110	1362
30	140	140mm	10	2.0	Very Dense	170	>110	1362
35	150	150mm	10	2.0	Very Dense	170	>110	1362
40	160	160mm	10	2.0	Very Dense	170	>110	1362
45	165	165mm	5	1.0	Very Dense	300	>110	2900
50	180	180mm	15	3.0	Very Dense	102	108	876
55	190	190mm	10	2.0	Very Dense	170	>110	1362
60	195	195mm	5	1.0	Very Dense	300	>110	2900
65	205	205mm	10	2.0	Very Dense	170	>110	1362
70	230	230mm	50	10.0	Dense	22	23	236
75	235	235mm	45	9.0	Dense	25	26	264
80	250	250mm	55	11.0	Dense	20	20	212
85	270	270mm	65	13.0	Medium Dense	16	16	177
90	280	280mm	50	10.0	Dense	22	23	236
95	300	300mm	65	13.0	Medium Dense	16	16	177
100	340	340mm	90	18.0	Medium Dense	10	11	124
105	360	360mm	90	18.0	Medium Dense	10	11	124
110	380	380mm	100	20.0	Medium Dense	9	9	111
115	390	390mm	90	18.0	Medium Dense	10	11	124
120	400	400mm	60	12.0	Dense	17	18	193
125	402	402mm	42	8.4	Dense	27	29	285

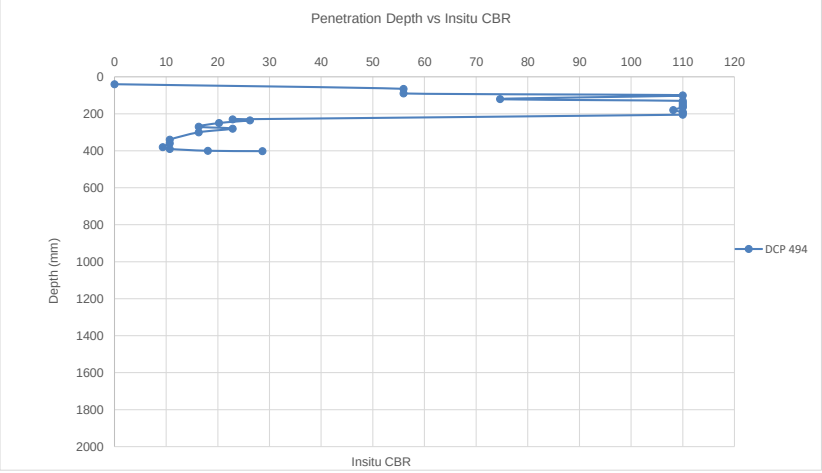
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 494
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 30/10/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 40mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	30/10/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	30/10/2024
TEST POSITION:	DCP 496	**STARTING DEPTH:**	46mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

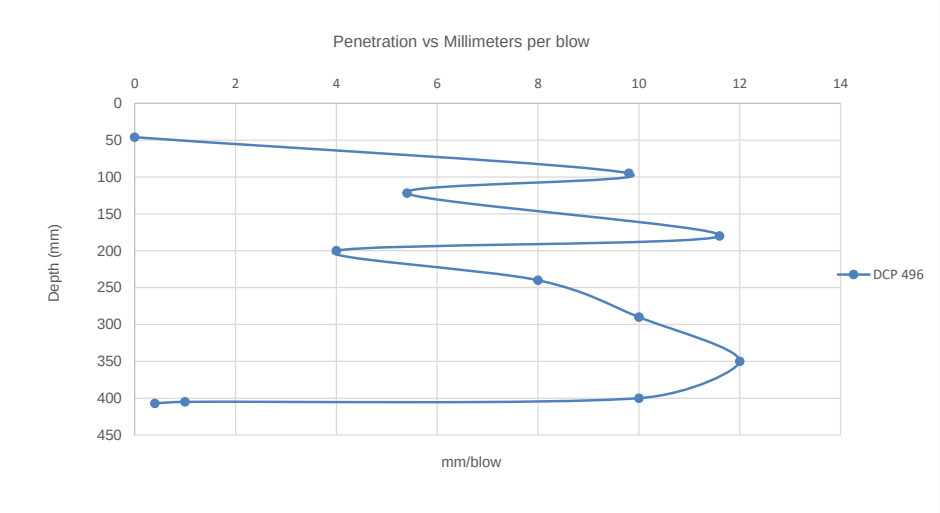
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\ (dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\ (dn)^{-1.09}$
0	46	46mm	0	0				
5	95	95mm	49	9.8	Dense	23	23	241
10	122	122mm	27	5.4	Dense	48	51	461
15	180	180mm	58	11.6	Dense	18	19	201
20	200	200mm	20	4.0	Very Dense	70	75	640
25	240	240mm	40	8.0	Dense	29	31	301
30	290	290mm	50	10.0	Dense	22	23	236
35	350	350mm	60	12.0	Dense	17	18	193
40	400	400mm	50	10.0	Dense	22	23	236
45	405	405mm	5	1.0	Very Dense	300	>110	2900
50	407	407mm	2	0.4	Very Dense	442	>110	7873

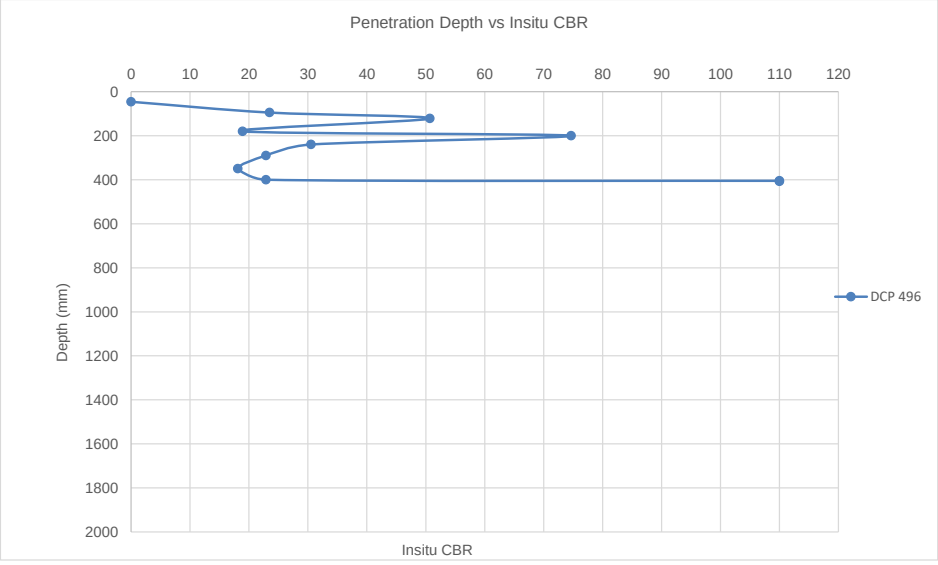
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 496
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 30/10/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 46mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	30/10/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	30/10/2024
TEST POSITION:	DCP 498	**STARTING DEPTH:**	360mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

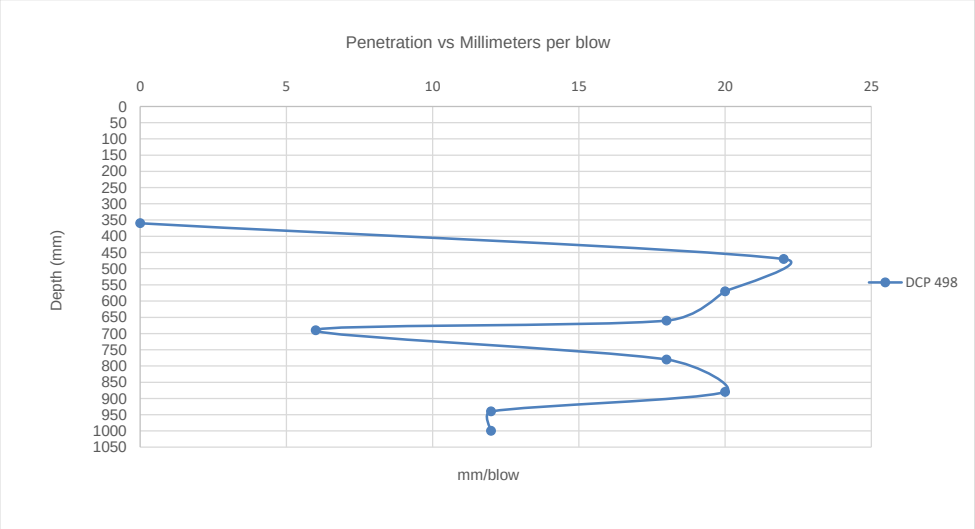
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	360	360mm	0	0				
5	470	470mm	110	22.0	Medium Dense	8	8	100
10	570	570mm	100	20.0	Medium Dense	9	9	111
15	660	660mm	90	18.0	Medium Dense	10	11	124
20	690	690mm	30	6.0	Dense	42	44	411
25	780	780mm	90	18.0	Medium Dense	10	11	124
30	880	880mm	100	20.0	Medium Dense	9	9	111
35	940	940mm	60	12.0	Dense	17	18	193
40	1000	1000mm	60	12.0	Dense	17	18	193

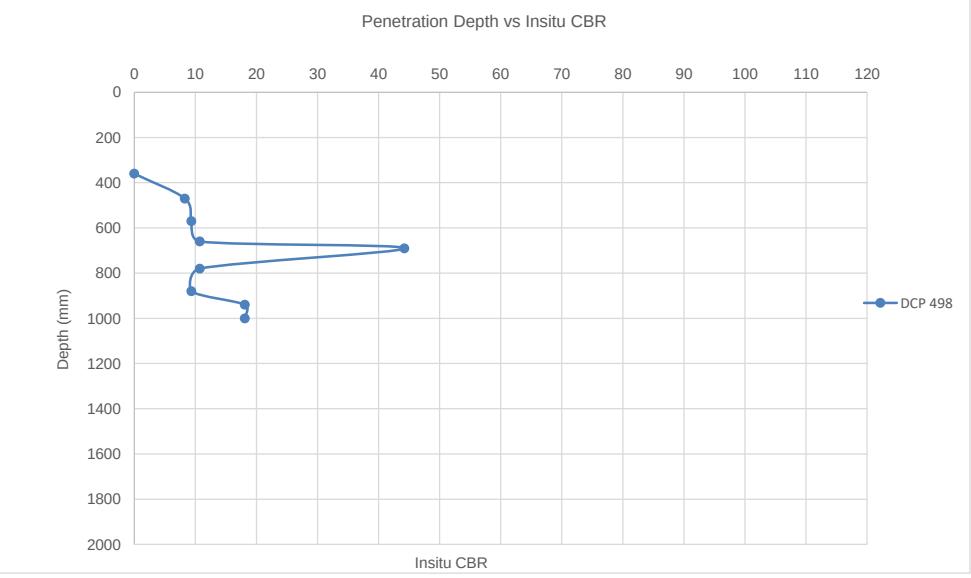
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 498
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 30/10/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 360mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	30/10/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	30/10/2024
TEST POSITION:	DCP 499	**STARTING DEPTH:**	80mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

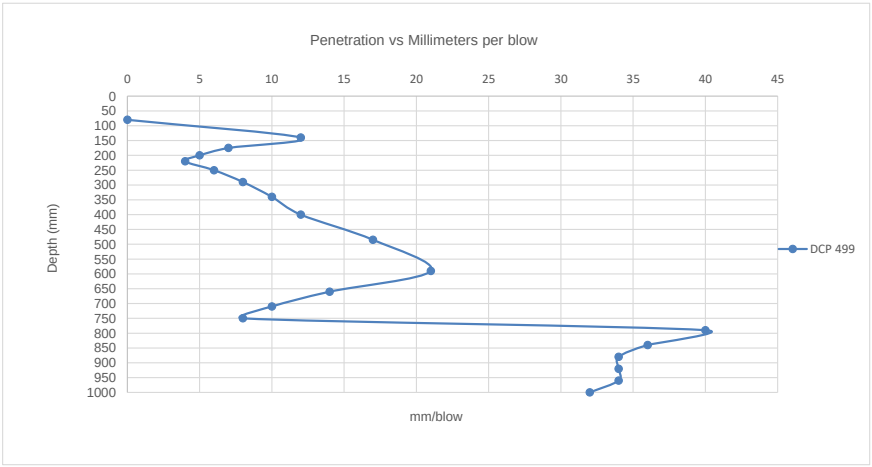
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	80	80mm	0	0				
5	140	140mm	60	12.0	Dense	17	18	193
10	175	175mm	35	7.0	Dense	35	36	348
15	200	200mm	25	5.0	Very Dense	53	56	502
20	220	220mm	20	4.0	Very Dense	70	75	640
25	250	250mm	30	6.0	Dense	42	44	411
30	290	290mm	40	8.0	Dense	29	31	301
35	340	340mm	50	10.0	Dense	22	23	236
40	400	400mm	60	12.0	Dense	17	18	193
45	485	485mm	85	17.0	Medium Dense	11	12	132
50	590	590mm	105	21.0	Medium Dense	9	9	105
55	660	660mm	70	14.0	Medium Dense	14	15	163
60	710	710mm	50	10.0	Dense	22	23	236
65	750	750mm	40	8.0	Dense	29	31	301
70	790	790mm	200	40.0	Loose	4	4	52
75	840	840mm	180	36.0	Loose	4	4	58
80	880	880mm	170	34.0	Loose	5	5	62
85	920	920mm	170	34.0	Loose	5	5	62
90	960	960mm	170	34.0	Loose	5	5	62
95	1000	1000mm	160	32.0	Loose	5	5	66

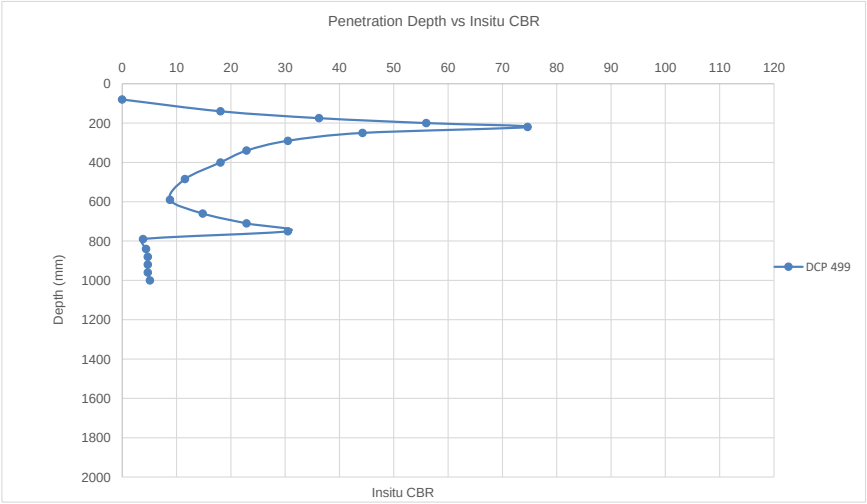
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 499
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 30/10/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 80mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	31/10/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	31/10/2024
TEST POSITION:	DCP 501	**STARTING DEPTH:**	40mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

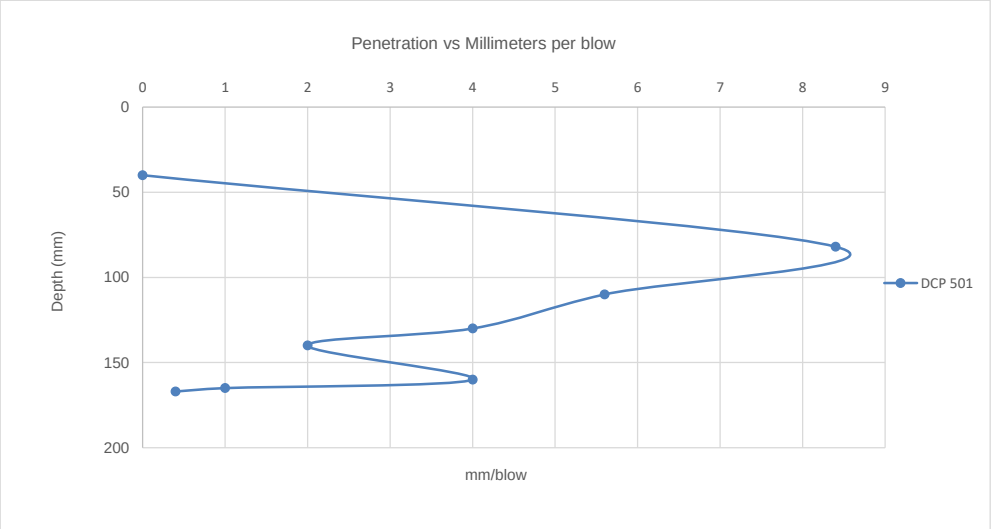
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	40	40mm	0	0				
5	82	82mm	42	8.4	Dense	27	29	285
10	110	110mm	28	5.6	Dense	46	48	443
15	130	130mm	20	4.0	Very Dense	70	75	640
20	140	140mm	10	2.0	Very Dense	170	>110	1362
25	160	160mm	20	4.0	Very Dense	70	75	640
30	165	165mm	5	1.0	Very Dense	300	>110	2900
35	167	167mm	2	0.4	Very Dense	442	>110	7873

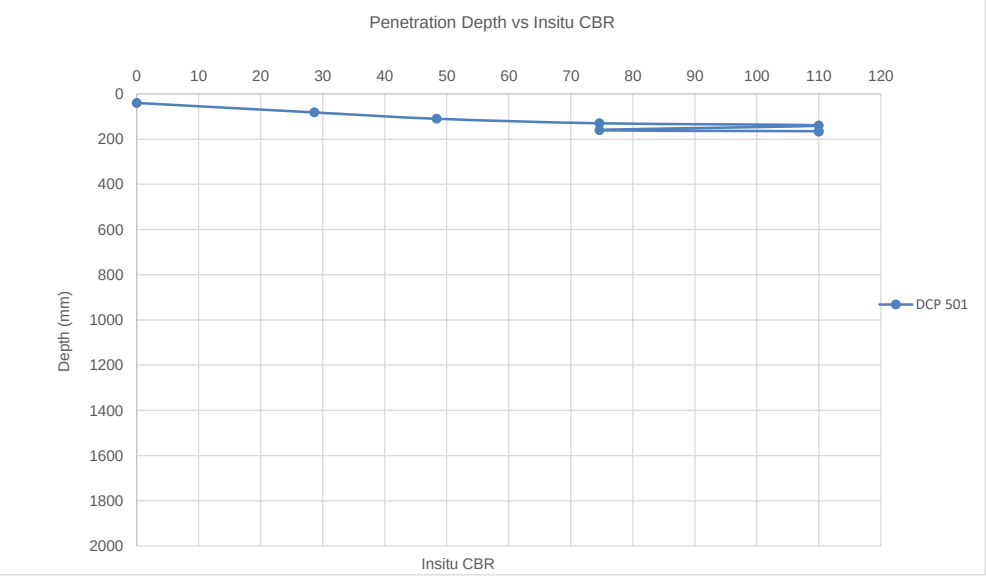
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 501
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 31/10/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 40mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	31/10/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	31/10/2024
TEST POSITION:	DCP 505	**STARTING DEPTH:**	80mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

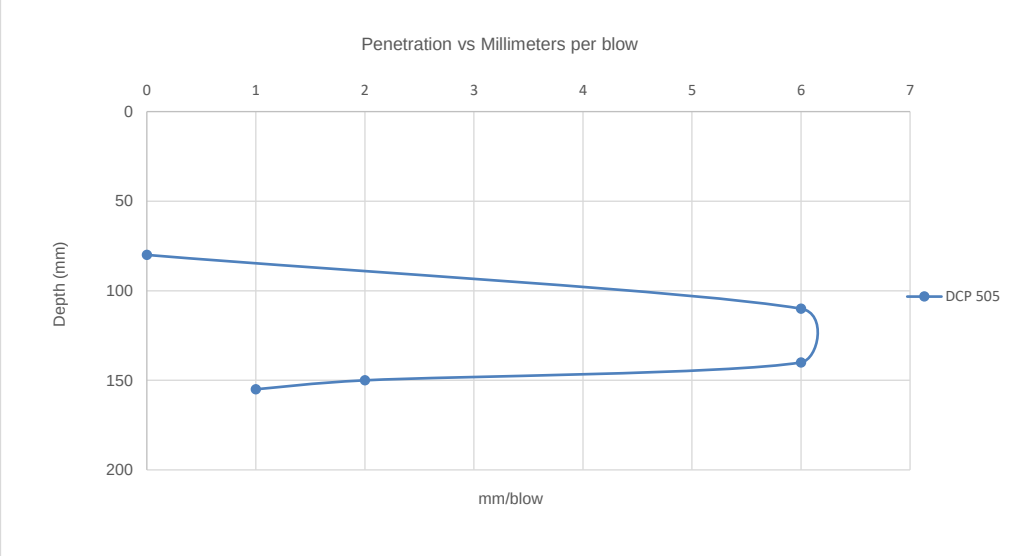
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	80	80mm	0	0				
5	110	110mm	30	6.0	Dense	42	44	411
10	140	140mm	30	6.0	Dense	42	44	411
15	150	150mm	10	2.0	Very Dense	170	>110	1362
20	155	155mm	5	1.0	Very Dense	300	>110	2900

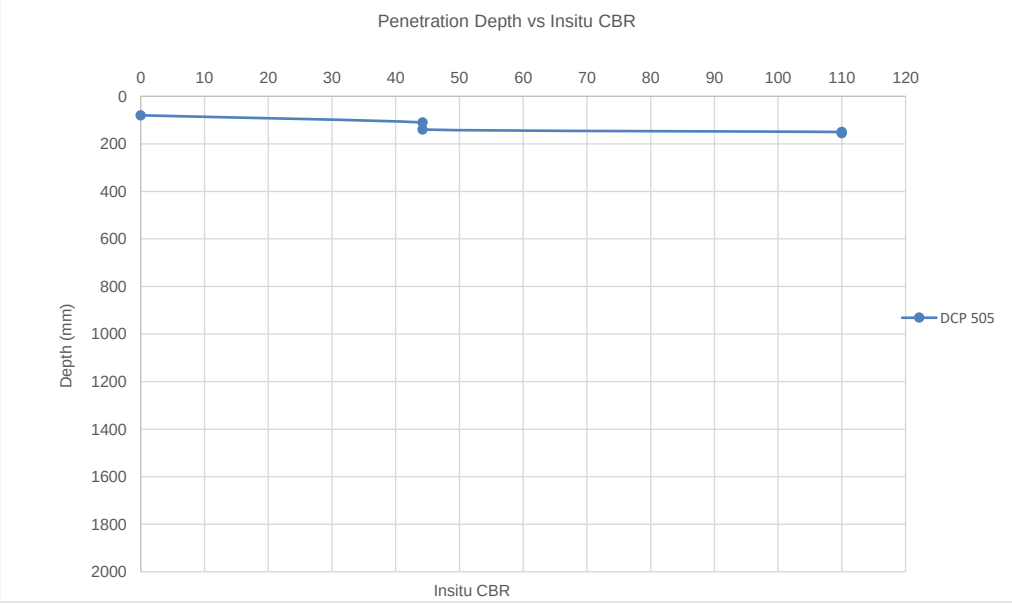
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 505
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 31/10/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 80mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	30/10/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	30/10/2024
TEST POSITION:	DCP 506	**STARTING DEPTH:**	40mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

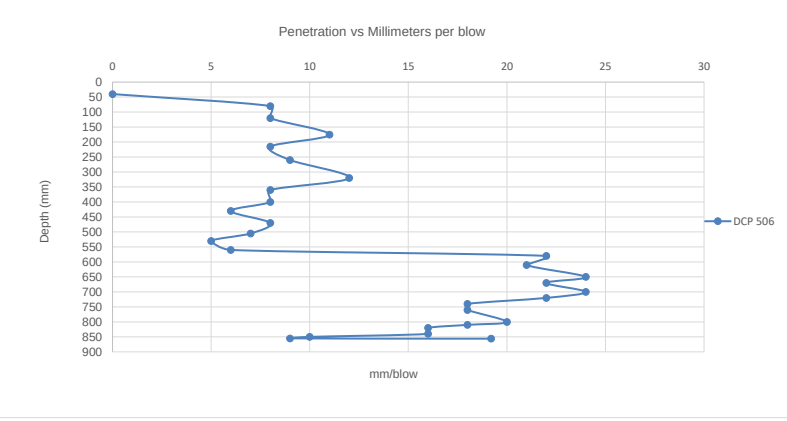
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	40	40mm	0	0				
5	80	80mm	40	8.0	Dense	29	31	301
10	120	120mm	40	8.0	Dense	29	31	301
15	175	175mm	55	11.0	Dense	20	20	212
20	215	215mm	40	8.0	Dense	29	31	301
25	260	260mm	45	9.0	Dense	25	26	264
30	320	320mm	60	12.0	Dense	17	18	193
35	360	360mm	40	8.0	Dense	29	31	301
40	400	400mm	40	8.0	Dense	29	31	301
45	430	430mm	30	6.0	Dense	42	44	411
50	470	470mm	40	8.0	Dense	29	31	301
55	505	505mm	35	7.0	Dense	35	36	348
60	530	530mm	25	5.0	Very Dense	53	56	502
65	560	560mm	30	6.0	Dense	42	44	411
70	580	580mm	110	22.0	Medium Dense	8	8	100
75	610	610mm	105	21.0	Medium Dense	9	9	105
80	650	650mm	120	24.0	Medium Dense	7	7	91
85	670	670mm	110	22.0	Medium Dense	8	8	100
90	700	700mm	120	24.0	Medium Dense	7	7	91
95	720	720mm	110	22.0	Medium Dense	8	8	100
100	740	740mm	90	18.0	Medium Dense	10	11	124
105	760	760mm	90	18.0	Medium Dense	10	11	124
110	800	800mm	100	20.0	Medium Dense	9	9	111
115	810	810mm	90	18.0	Medium Dense	10	11	124
120	820	820mm	80	16.0	Medium Dense	12	12	141
125	840	840mm	80	16.0	Medium Dense	12	12	141
130	850	850mm	50	10.0	Dense	22	23	236
135	855	855mm	45	9.0	Dense	25	26	264
140	856	856mm	96	19.2	Medium Dense	10	10	116

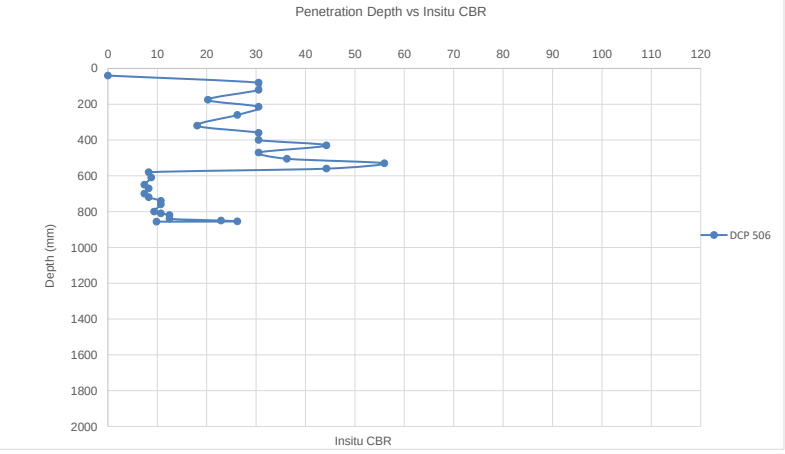
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 506
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 30/10/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 40mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	01/10/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	01/10/2024
TEST POSITION:	DCP 508	**STARTING DEPTH:**	40mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

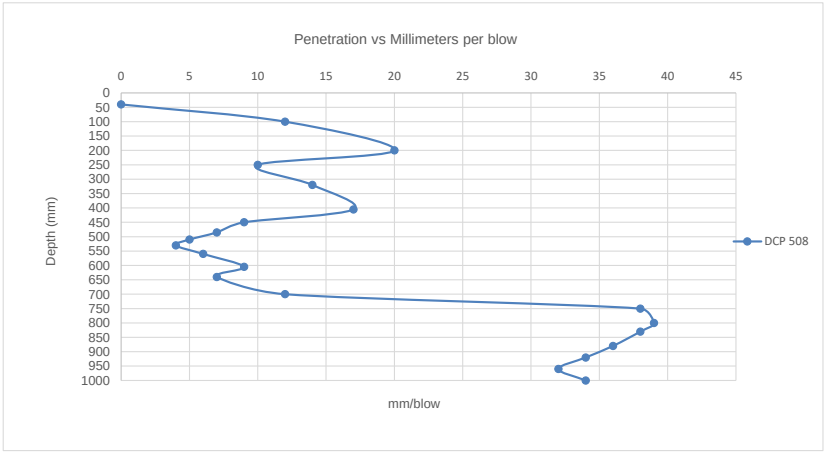
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	40	40mm	0	0				
5	100	100mm	60	12.0	Dense	17	18	193
10	200	200mm	100	20.0	Medium Dense	9	9	111
15	250	250mm	50	10.0	Dense	22	23	236
20	320	320mm	70	14.0	Medium Dense	14	15	163
25	405	405mm	85	17.0	Medium Dense	11	12	132
30	450	450mm	45	9.0	Dense	25	26	264
35	485	485mm	35	7.0	Dense	35	36	348
40	510	510mm	25	5.0	Very Dense	53	56	502
45	530	530mm	20	4.0	Very Dense	70	75	640
50	560	560mm	30	6.0	Dense	42	44	411
55	605	605mm	45	9.0	Dense	25	26	264
60	640	640mm	35	7.0	Dense	35	36	348
65	700	700mm	60	12.0	Dense	17	18	193
70	750	750mm	190	38.0	Loose	4	4	55
75	800	800mm	195	39.0	Loose	4	4	53
80	830	830mm	190	38.0	Loose	4	4	55
85	880	880mm	180	36.0	Loose	4	4	58
90	920	920mm	170	34.0	Loose	5	5	62
95	960	960mm	160	32.0	Loose	5	5	66
100	1000	1000mm	170	34.0	Loose	5	5	62

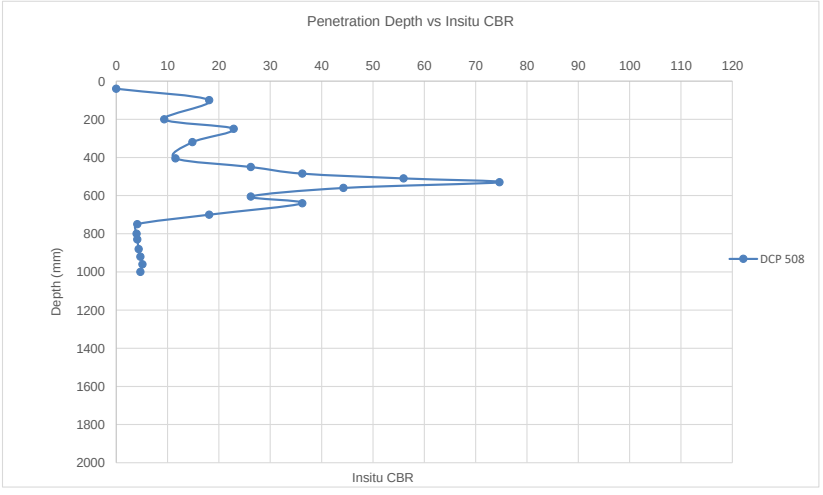
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 508
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 01/10/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 40mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	01/10/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	01/10/2024
TEST POSITION:	DCP 509	**STARTING DEPTH:**	60mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

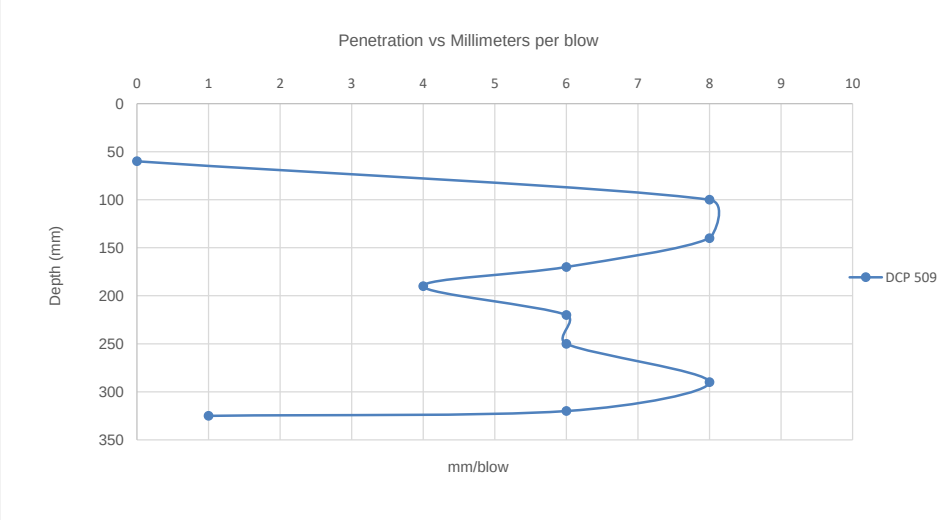
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x $(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x $(dn)^{-1.09}$
0	60	60mm	0	0				
5	100	100mm	40	8.0	Dense	29	31	301
10	140	140mm	40	8.0	Dense	29	31	301
15	170	170mm	30	6.0	Dense	42	44	411
20	190	190mm	20	4.0	Very Dense	70	75	640
25	220	220mm	30	6.0	Dense	42	44	411
30	250	250mm	30	6.0	Dense	42	44	411
35	290	290mm	40	8.0	Dense	29	31	301
40	320	320mm	30	6.0	Dense	42	44	411
45	325	325mm	5	1.0	Very Dense	300	>110	2900

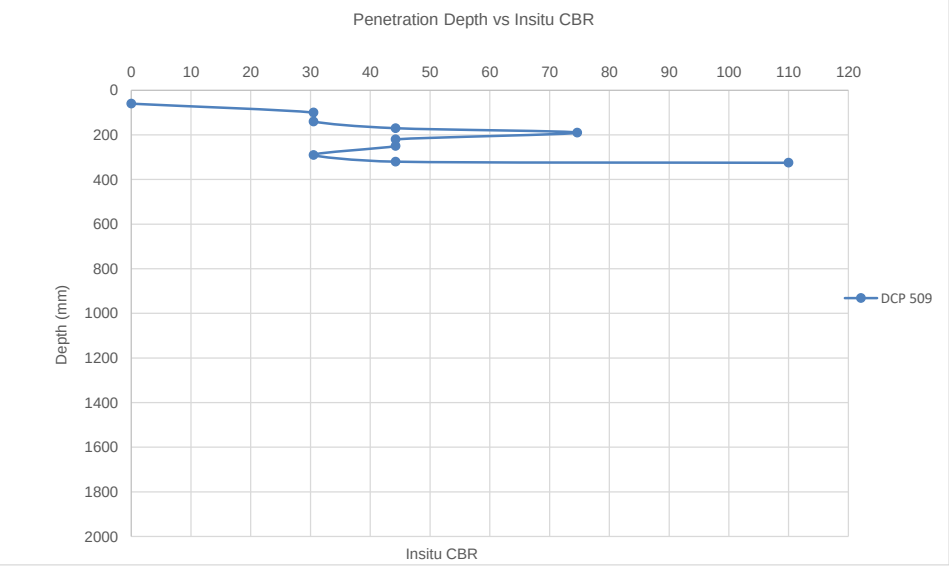
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 509
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 01/10/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 60mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	01/10/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	01/10/2024
TEST POSITION:	DCP 510	**STARTING DEPTH:**	40mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

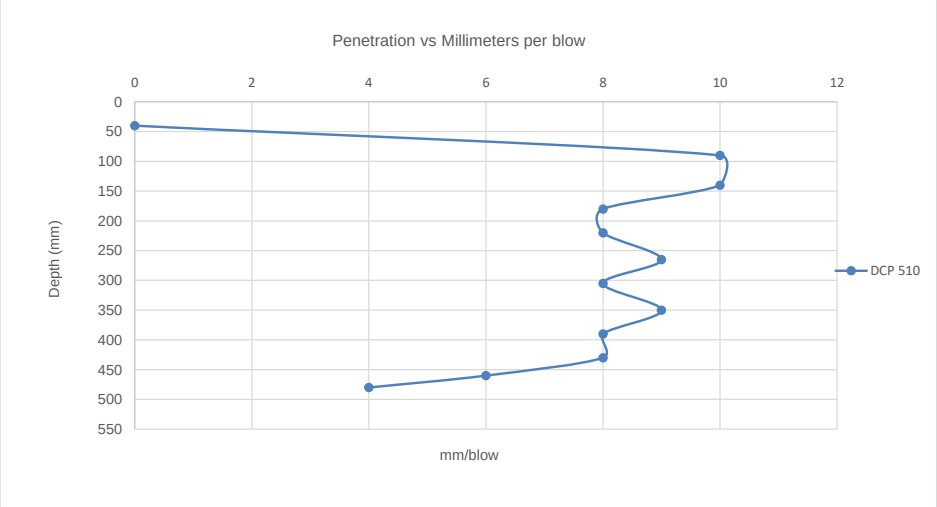
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	40	40mm	0	0				
5	90	90mm	50	10.0	Dense	22	23	236
10	140	140mm	50	10.0	Dense	22	23	236
15	180	180mm	40	8.0	Dense	29	31	301
20	220	220mm	40	8.0	Dense	29	31	301
25	265	265mm	45	9.0	Dense	25	26	264
30	305	305mm	40	8.0	Dense	29	31	301
35	350	350mm	45	9.0	Dense	25	26	264
40	390	390mm	40	8.0	Dense	29	31	301
45	430	430mm	40	8.0	Dense	29	31	301
50	460	460mm	30	6.0	Dense	42	44	411
55	480	480mm	20	4.0	Very Dense	70	75	640

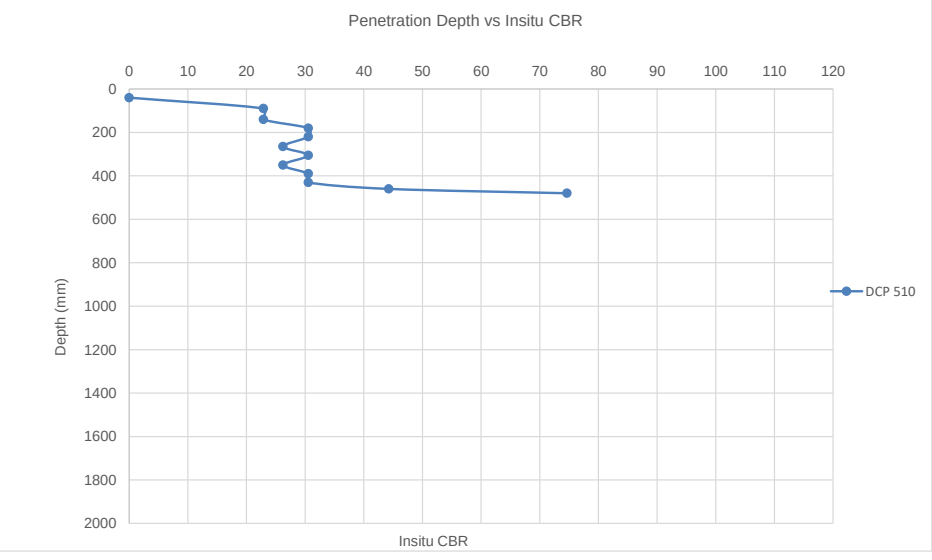
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 510
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 01/10/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 40mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	01/10/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	01/10/2024
TEST POSITION:	DCP 511	**STARTING DEPTH:**	55mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

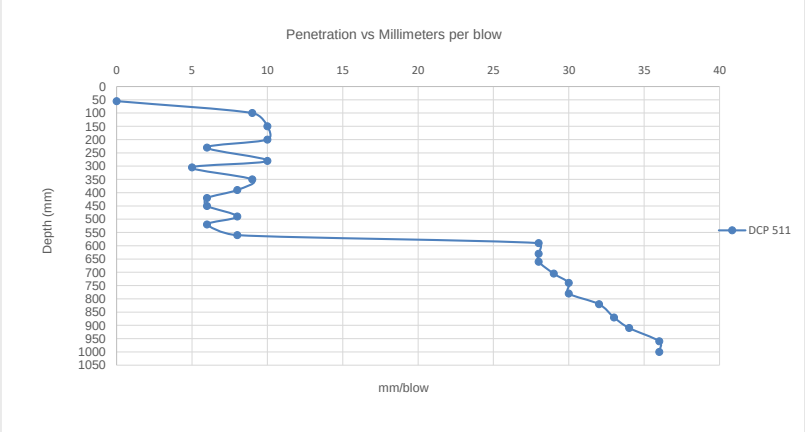
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	55	55mm	0	0				
5	100	100mm	45	9.0	Dense	25	26	264
10	150	150mm	50	10.0	Dense	22	23	236
15	200	200mm	50	10.0	Dense	22	23	236
20	230	230mm	30	6.0	Dense	42	44	411
25	280	280mm	50	10.0	Dense	22	23	236
30	305	305mm	25	5.0	Very Dense	53	56	502
35	350	350mm	45	9.0	Dense	25	26	264
40	390	390mm	40	8.0	Dense	29	31	301
45	420	420mm	30	6.0	Dense	42	44	411
50	450	450mm	30	6.0	Dense	42	44	411
55	490	490mm	40	8.0	Dense	29	31	301
60	520	520mm	30	6.0	Dense	42	44	411
65	560	560mm	40	8.0	Dense	29	31	301
70	590	590mm	140	28.0	Medium Dense	6	6	77
75	630	630mm	140	28.0	Medium Dense	6	6	77
80	660	660mm	140	28.0	Medium Dense	6	6	77
85	705	705mm	145	29.0	Medium Dense	6	6	74
90	740	740mm	150	30.0	Medium Dense	5	6	71
95	780	780mm	150	30.0	Medium Dense	5	6	71
100	820	820mm	160	32.0	Loose	5	5	66
105	870	870mm	165	33.0	Loose	5	5	64
110	910	910mm	170	34.0	Loose	5	5	62
115	960	960mm	180	36.0	Loose	4	4	58
120	1000	1000mm	180	36.0	Loose	4	4	58

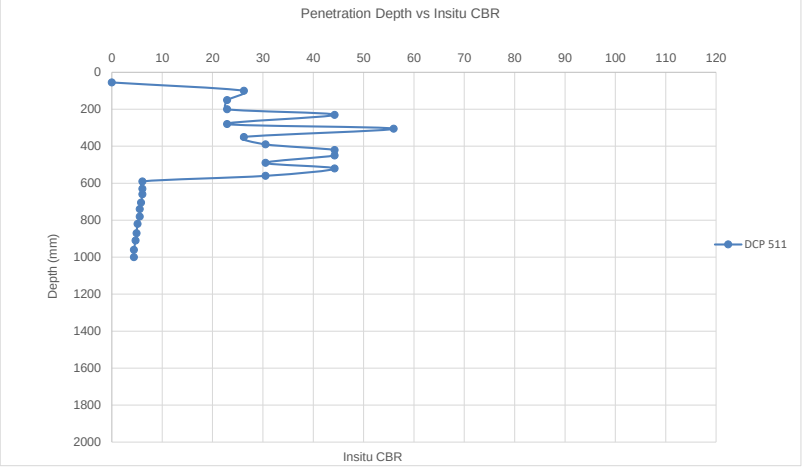
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 511
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 01/10/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 55mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	01/10/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Sam	**DATE TESTED:**	01/10/2024
TEST POSITION:	DCP 512	**STARTING DEPTH:**	20mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

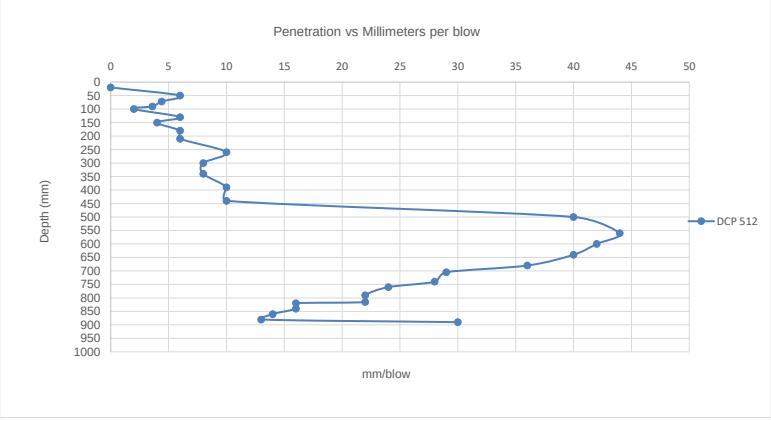
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	20	20mm	0	0				
5	50	50mm	30	6.0	Dense	42	44	411
10	72	72mm	22	4.4	Very Dense	62	66	577
15	90	90mm	18	3.6	Very Dense	81	86	718
20	100	100mm	10	2.0	Very Dense	170	>110	1362
25	130	130mm	30	6.0	Dense	42	44	411
30	150	150mm	20	4.0	Very Dense	70	75	640
35	180	180mm	30	6.0	Dense	42	44	411
40	210	210mm	30	6.0	Dense	42	44	411
45	260	260mm	50	10.0	Dense	22	23	236
50	300	300mm	40	8.0	Dense	29	31	301
55	340	340mm	40	8.0	Dense	29	31	301
60	390	390mm	50	10.0	Dense	22	23	236
65	440	440mm	50	10.0	Dense	22	23	236
70	500	500mm	200	40.0	Loose	4	4	52
75	560	560mm	220	44.0	Loose	3	3	47
80	600	600mm	210	42.0	Loose	4	4	49
85	640	640mm	200	40.0	Loose	4	4	52
90	680	680mm	180	36.0	Loose	4	4	58
95	705	705mm	145	29.0	Medium Dense	6	6	74
100	740	740mm	140	28.0	Medium Dense	6	6	77
105	760	760mm	120	24.0	Medium Dense	7	7	91
110	790	790mm	110	22.0	Medium Dense	8	8	100
115	815	815mm	110	22.0	Medium Dense	8	8	100
120	820	820mm	80	16.0	Medium Dense	12	12	141
125	840	840mm	80	16.0	Medium Dense	12	12	141
130	860	860mm	70	14.0	Medium Dense	14	15	163
135	880	880mm	65	13.0	Medium Dense	16	16	177
140	890	890mm	150	30.0	Medium Dense	5	6	71

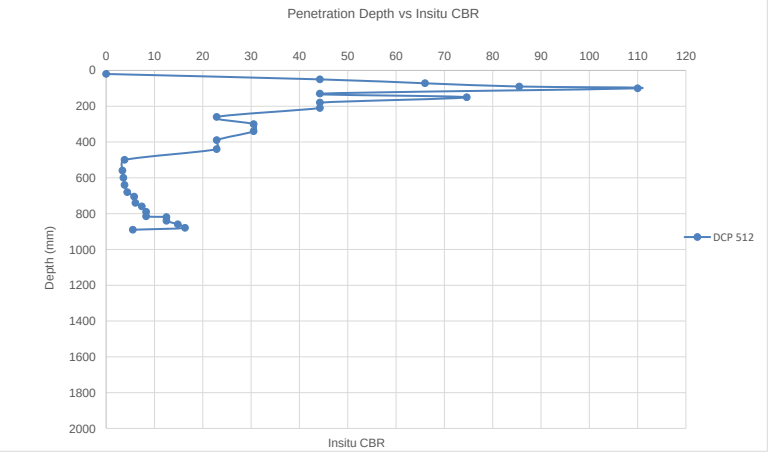
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 512
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 01/10/2024
OPERATOR: Sam
STARTING DEPTH: 20mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	01/11/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	01/11/2024
TEST POSITION:	DCP 513	**STARTING DEPTH:**	20mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

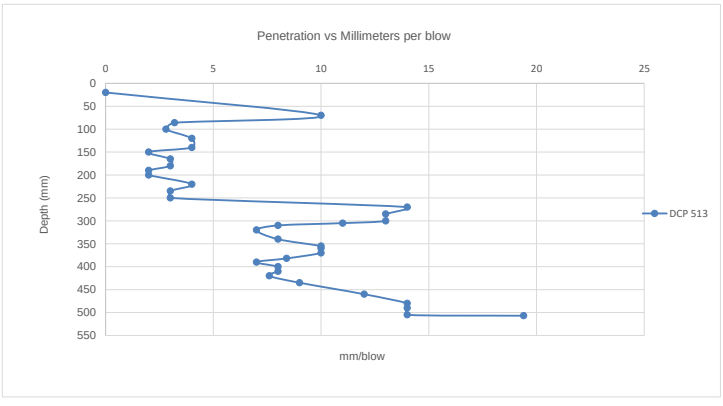
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
5	20	20mm	0	0				
10	70	70mm	50	10.0	Dense	22	23	236
15	86	86mm	16	3.2	Very Dense	94	100	816
20	100	100mm	14	2.8	Very Dense	111	>110	944
25	120	120mm	20	4.0	Very Dense	70	75	640
30	140	140mm	20	4.0	Very Dense	70	75	640
35	150	150mm	10	2.0	Very Dense	170	>110	1362
40	165	165mm	15	3.0	Very Dense	102	108	876
45	180	180mm	15	3.0	Very Dense	102	108	876
50	190	190mm	10	2.0	Very Dense	170	>110	1362
55	200	200mm	10	2.0	Very Dense	170	>110	1362
60	220	220mm	20	4.0	Very Dense	70	75	640
65	235	235mm	15	3.0	Very Dense	102	108	876
70	250	250mm	15	3.0	Very Dense	102	108	876
75	270	270mm	70	14.0	Medium Dense	14	15	163
80	285	285mm	65	13.0	Medium Dense	16	16	177
85	300	300mm	65	13.0	Medium Dense	16	16	177
90	305	305mm	55	11.0	Dense	20	20	212
95	310	310mm	40	8.0	Dense	29	31	301
100	320	320mm	35	7.0	Dense	35	36	348
105	340	340mm	40	8.0	Dense	29	31	301
110	355	355mm	50	10.0	Dense	22	23	236
115	360	360mm	50	10.0	Dense	22	23	236
120	370	370mm	50	10.0	Dense	22	23	236
125	382	382mm	42	8.4	Dense	27	29	285
130	390	390mm	35	7.0	Dense	35	36	348
135	400	400mm	40	8.0	Dense	29	31	301
140	410	410mm	40	8.0	Dense	29	31	301
145	420	420mm	38	7.6	Dense	31	33	318
150	435	435mm	45	9.0	Dense	25	26	264
155	460	460mm	60	12.0	Dense	17	18	193
160	480	480mm	70	14.0	Medium Dense	14	15	163
165	490	490mm	70	14.0	Medium Dense	14	15	163
170	505	505mm	70	14.0	Medium Dense	14	15	163
175	507	507mm	97	19.4	Medium Dense	9	10	114

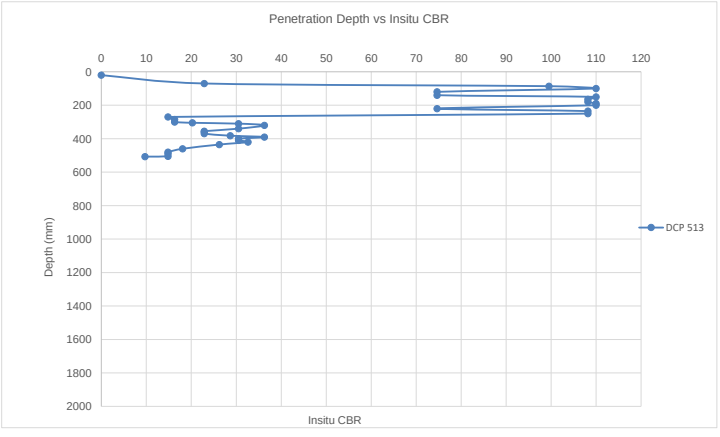
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 513
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 01/11/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 20mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	01/11/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	01/11/2024
TEST POSITION:	DCP 514	**STARTING DEPTH:**	70mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

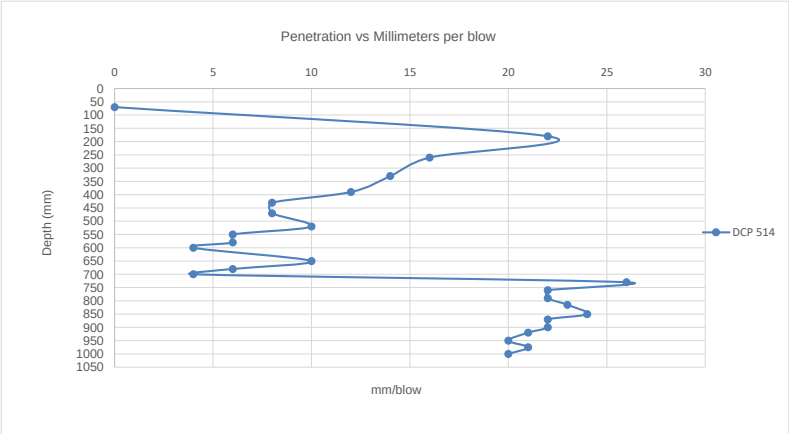
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	70	70mm	0	0				
5	180	180mm	110	22.0	Medium Dense	8	8	100
10	260	260mm	80	16.0	Medium Dense	12	12	141
15	330	330mm	70	14.0	Medium Dense	14	15	163
20	390	390mm	60	12.0	Dense	17	18	193
25	430	430mm	40	8.0	Dense	29	31	301
30	470	470mm	40	8.0	Dense	29	31	301
35	520	520mm	50	10.0	Dense	22	23	236
40	550	550mm	30	6.0	Dense	42	44	411
45	580	580mm	30	6.0	Dense	42	44	411
50	600	600mm	20	4.0	Very Dense	70	75	640
55	650	650mm	50	10.0	Dense	22	23	236
60	680	680mm	30	6.0	Dense	42	44	411
65	700	700mm	20	4.0	Very Dense	70	75	640
70	730	730mm	130	26.0	Medium Dense	7	7	83
75	760	760mm	110	22.0	Medium Dense	8	8	100
80	790	790mm	110	22.0	Medium Dense	8	8	100
85	815	815mm	115	23.0	Medium Dense	8	8	95
90	850	850mm	120	24.0	Medium Dense	7	7	91
95	870	870mm	110	22.0	Medium Dense	8	8	100
100	900	900mm	110	22.0	Medium Dense	8	8	100
105	920	920mm	105	21.0	Medium Dense	9	9	105
110	950	950mm	100	20.0	Medium Dense	9	9	111
115	975	975mm	105	21.0	Medium Dense	9	9	105
120	1000	1000mm	100	20.0	Medium Dense	9	9	111

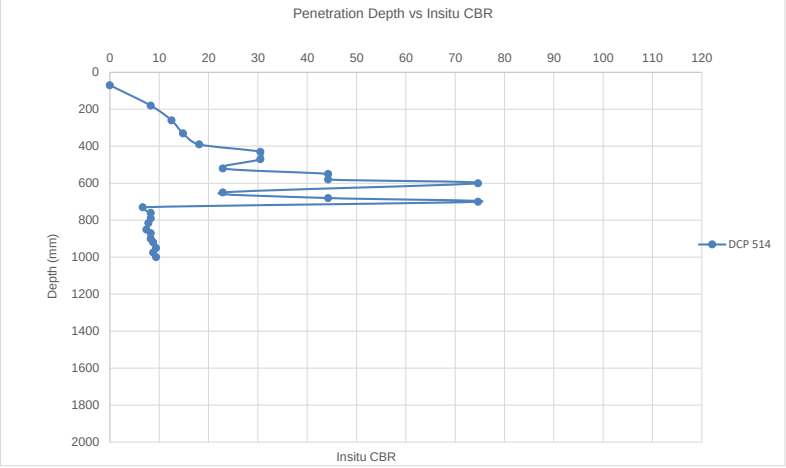
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 514
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 01/11/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 70mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	01/11/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	01/11/2024
TEST POSITION:	DCP 517	**STARTING DEPTH:**	60mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

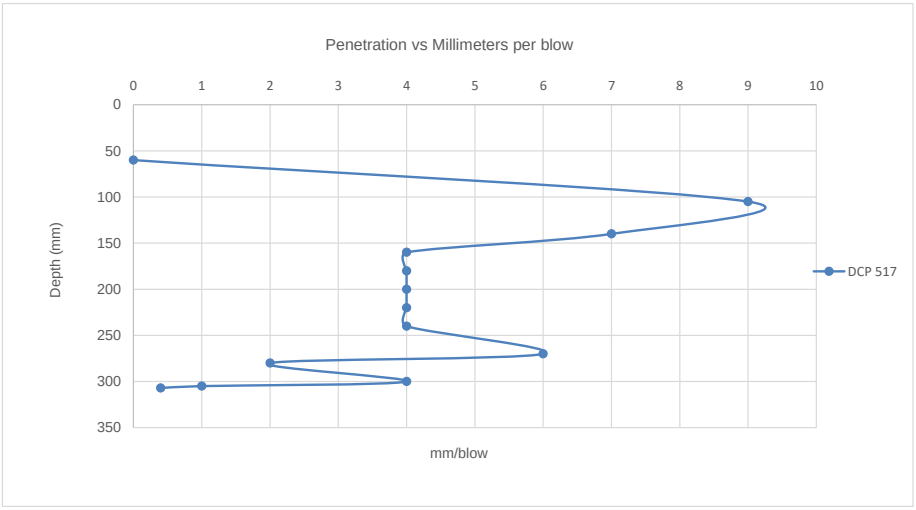
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\ (dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\ (dn)^{-1.09}$
0	60	60mm	0	0				
5	105	105mm	45	9.0	Dense	25	26	264
10	140	140mm	35	7.0	Dense	35	36	348
15	160	160mm	20	4.0	Very Dense	70	75	640
20	180	180mm	20	4.0	Very Dense	70	75	640
25	200	200mm	20	4.0	Very Dense	70	75	640
30	220	220mm	20	4.0	Very Dense	70	75	640
35	240	240mm	20	4.0	Very Dense	70	75	640
40	270	270mm	30	6.0	Dense	42	44	411
45	280	280mm	10	2.0	Very Dense	170	>110	1362
50	300	300mm	20	4.0	Very Dense	70	75	640
55	305	305mm	5	1.0	Very Dense	300	>110	2900
60	307	307mm	2	0.4	Very Dense	442	>110	7873

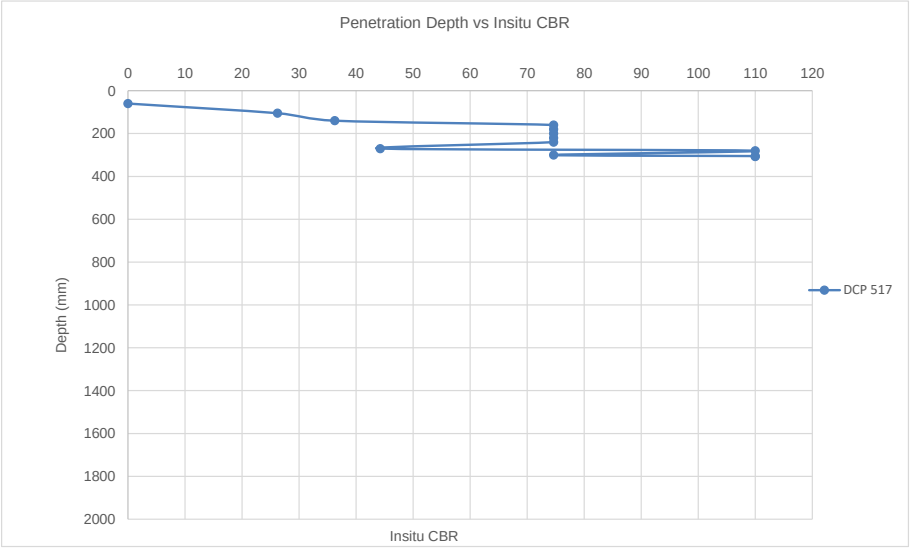
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 517
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 01/11/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 60mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	02/11/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	02/11/2024
TEST POSITION:	DCP 520	**STARTING DEPTH:**	0mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

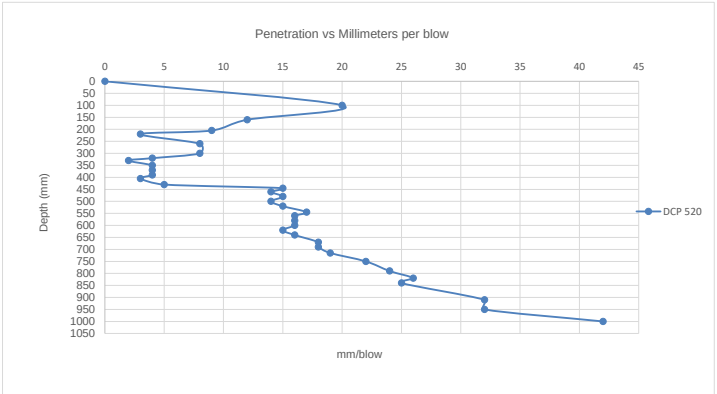
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.89}$
5	0	0mm	0	0				
10	100	100mm	100	20.0	Medium Dense	9	9	111
15	160	160mm	60	12.0	Dense	17	18	193
20	205	205mm	45	9.0	Dense	25	26	264
25	220	220mm	15	3.0	Very Dense	102	108	876
30	260	260mm	40	8.0	Dense	29	31	301
35	300	300mm	40	8.0	Dense	29	31	301
40	320	320mm	20	4.0	Very Dense	70	75	640
45	330	330mm	10	2.0	Very Dense	170	>110	1362
50	350	350mm	20	4.0	Very Dense	70	75	640
55	370	370mm	20	4.0	Very Dense	70	75	640
60	390	390mm	20	4.0	Very Dense	70	75	640
65	405	405mm	15	3.0	Very Dense	102	108	876
70	430	430mm	25	5.0	Very Dense	53	56	502
75	445	445mm	75	15.0	Medium Dense	13	14	152
80	460	460mm	70	14.0	Medium Dense	14	15	163
85	480	480mm	75	15.0	Medium Dense	13	14	152
90	500	500mm	70	14.0	Medium Dense	14	15	163
95	520	520mm	75	15.0	Medium Dense	13	14	152
100	545	545mm	85	17.0	Medium Dense	11	12	132
105	560	560mm	80	16.0	Medium Dense	12	12	141
110	580	580mm	80	16.0	Medium Dense	12	12	141
115	600	600mm	80	16.0	Medium Dense	12	12	141
120	620	620mm	75	15.0	Medium Dense	13	14	152
125	640	640mm	80	16.0	Medium Dense	12	12	141
130	670	670mm	90	18.0	Medium Dense	10	11	124
135	690	690mm	90	18.0	Medium Dense	10	11	124
140	715	715mm	95	19.0	Medium Dense	10	10	117
145	750	750mm	110	22.0	Medium Dense	8	8	100
150	790	790mm	120	24.0	Medium Dense	7	7	91
155	820	820mm	130	26.0	Medium Dense	7	7	83
160	840	840mm	125	25.0	Medium Dense	7	7	87
165	910	910mm	160	32.0	Loose	5	5	66
170	950	950mm	160	32.0	Loose	5	5	66
175	1000	1000mm	210	42.0	Loose	4	4	49

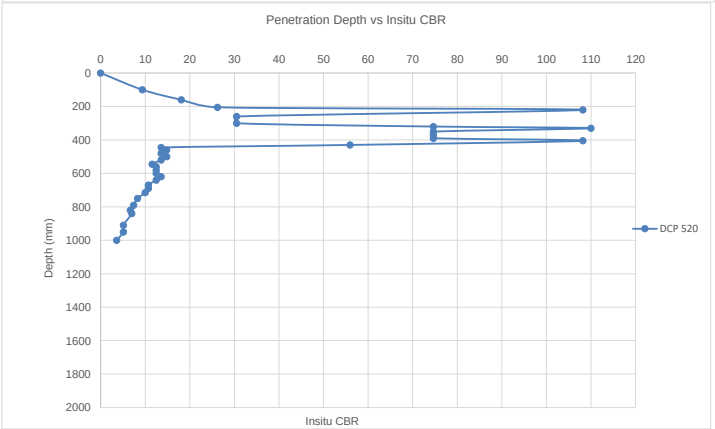
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 520
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 02/11/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 0mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	01/11/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	01/11/2024
TEST POSITION:	DCP 521	**STARTING DEPTH:**	50mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

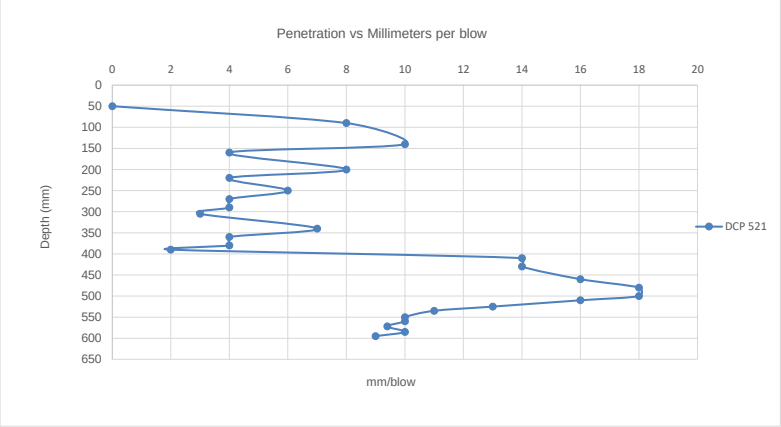
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	50	50mm	0	0				
5	90	90mm	40	8.0	Dense	29	31	301
10	140	140mm	50	10.0	Dense	22	23	236
15	160	160mm	20	4.0	Very Dense	70	75	640
20	200	200mm	40	8.0	Dense	29	31	301
25	220	220mm	20	4.0	Very Dense	70	75	640
30	250	250mm	30	6.0	Dense	42	44	411
35	270	270mm	20	4.0	Very Dense	70	75	640
40	290	290mm	20	4.0	Very Dense	70	75	640
45	305	305mm	15	3.0	Very Dense	102	108	876
50	340	340mm	35	7.0	Dense	35	36	348
55	360	360mm	20	4.0	Very Dense	70	75	640
60	380	380mm	20	4.0	Very Dense	70	75	640
65	390	390mm	10	2.0	Very Dense	170	>110	1362
70	410	410mm	70	14.0	Medium Dense	14	15	163
75	430	430mm	70	14.0	Medium Dense	14	15	163
80	460	460mm	80	16.0	Medium Dense	12	12	141
85	480	480mm	90	18.0	Medium Dense	10	11	124
90	500	500mm	90	18.0	Medium Dense	10	11	124
95	510	510mm	80	16.0	Medium Dense	12	12	141
100	525	525mm	65	13.0	Medium Dense	16	16	177
105	535	535mm	55	11.0	Dense	20	20	212
110	550	550mm	50	10.0	Dense	22	23	236
115	560	560mm	50	10.0	Dense	22	23	236
120	572	572mm	47	9.4	Dense	24	25	252
125	585	585mm	50	10.0	Dense	22	23	236
130	595	595mm	45	9.0	Dense	25	26	264

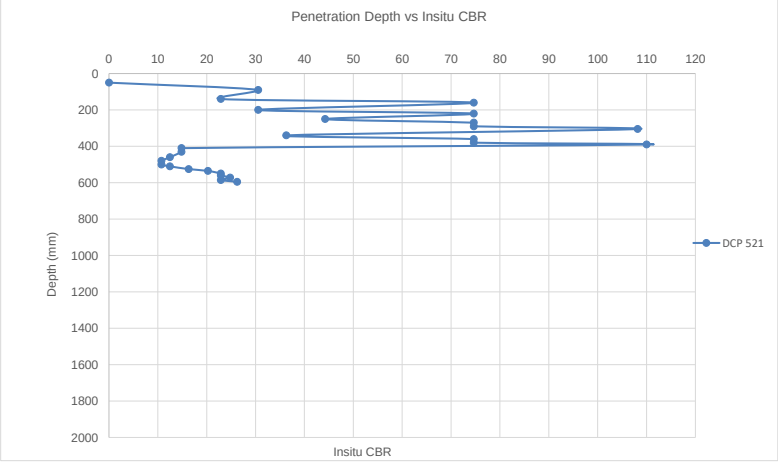
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 521
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 01/11/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 50mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	01/11/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	01/11/2024
TEST POSITION:	DCP 523	**STARTING DEPTH:**	45mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

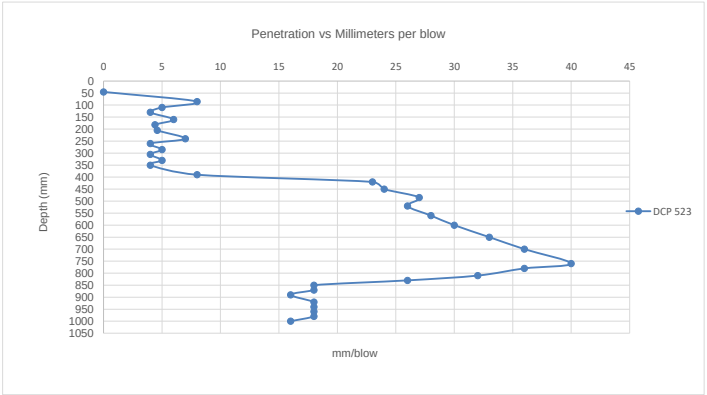
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x $(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x $(dn)^{-1.09}$
0	45	45mm	0	0				
5	85	85mm	40	8.0	Dense	29	31	301
10	110	110mm	25	5.0	Very Dense	53	56	502
15	130	130mm	20	4.0	Very Dense	70	75	640
20	160	160mm	30	6.0	Dense	42	44	411
25	182	182mm	22	4.4	Very Dense	62	66	577
30	205	205mm	23	4.6	Very Dense	59	62	550
35	240	240mm	35	7.0	Dense	35	36	348
40	260	260mm	20	4.0	Very Dense	70	75	640
45	285	285mm	25	5.0	Very Dense	53	56	502
50	305	305mm	20	4.0	Very Dense	70	75	640
55	330	330mm	25	5.0	Very Dense	53	56	502
60	350	350mm	20	4.0	Very Dense	70	75	640
65	390	390mm	40	8.0	Dense	29	31	301
70	420	420mm	115	23.0	Medium Dense	8	8	95
75	450	450mm	120	24.0	Medium Dense	7	7	91
80	485	485mm	135	27.0	Medium Dense	6	6	80
85	520	520mm	130	26.0	Medium Dense	7	7	83
90	560	560mm	140	28.0	Medium Dense	6	6	77
95	600	600mm	150	30.0	Medium Dense	5	6	71
100	650	650mm	165	33.0	Loose	5	5	64
105	700	700mm	180	36.0	Loose	4	4	58
110	760	760mm	200	40.0	Loose	4	4	52
115	780	780mm	180	36.0	Loose	4	4	58
120	810	810mm	160	32.0	Loose	5	5	66
125	830	830mm	130	26.0	Medium Dense	7	7	83
130	850	850mm	90	18.0	Medium Dense	10	11	124
135	870	870mm	90	18.0	Medium Dense	10	11	124
140	890	890mm	80	16.0	Medium Dense	12	12	141
145	920	920mm	90	18.0	Medium Dense	10	11	124
150	940	940mm	90	18.0	Medium Dense	10	11	124
155	960	960mm	90	18.0	Medium Dense	10	11	124
160	980	980mm	90	18.0	Medium Dense	10	11	124
165	1000	1000mm	80	16.0	Medium Dense	12	12	141

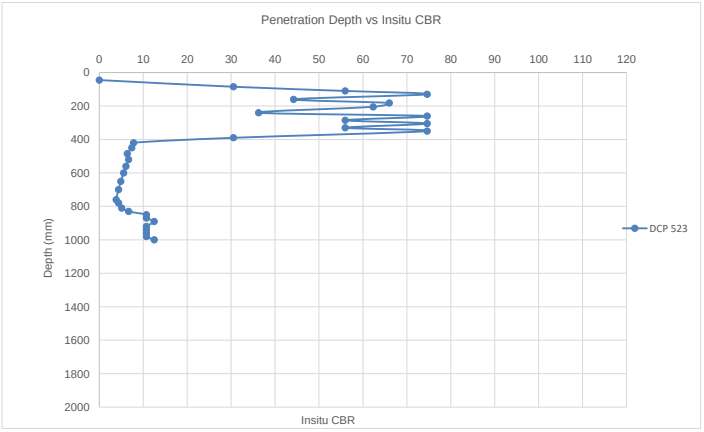
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 523
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 01/11/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 45mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	01/11/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	01/11/2024
TEST POSITION:	DCP 525	**STARTING DEPTH:**	50mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

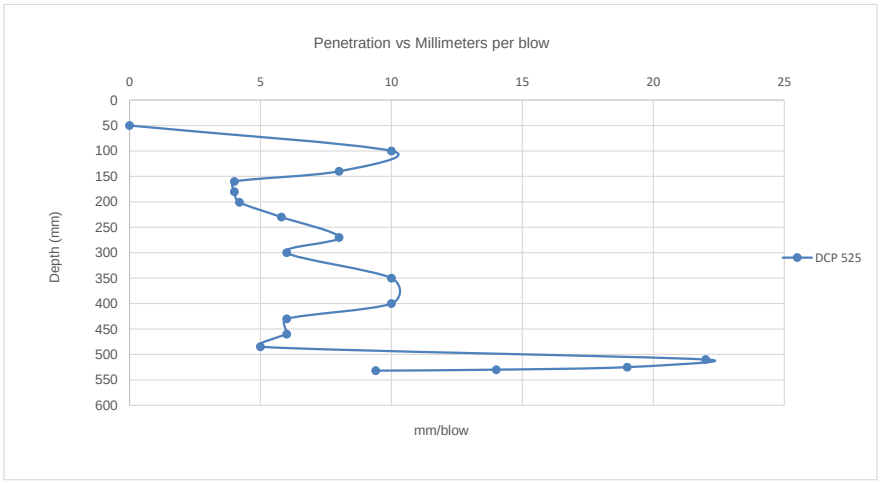
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
5	50	50mm	0	0				
10	100	100mm	50	10.0	Dense	22	23	236
15	140	140mm	40	8.0	Dense	29	31	301
20	160	160mm	20	4.0	Very Dense	70	75	640
25	180	180mm	20	4.0	Very Dense	70	75	640
30	201	201mm	21	4.2	Very Dense	66	70	607
35	230	230mm	29	5.8	Dense	44	46	427
40	270	270mm	40	8.0	Dense	29	31	301
45	300	300mm	30	6.0	Dense	42	44	411
50	350	350mm	50	10.0	Dense	22	23	236
55	400	400mm	50	10.0	Dense	22	23	236
60	430	430mm	30	6.0	Dense	42	44	411
65	460	460mm	30	6.0	Dense	42	44	411
70	485	485mm	25	5.0	Very Dense	53	56	502
75	510	510mm	110	22.0	Medium Dense	8	8	100
80	525	525mm	95	19.0	Medium Dense	10	10	117
85	530	530mm	70	14.0	Medium Dense	14	15	163
90	532	532mm	47	9.4	Dense	24	25	252

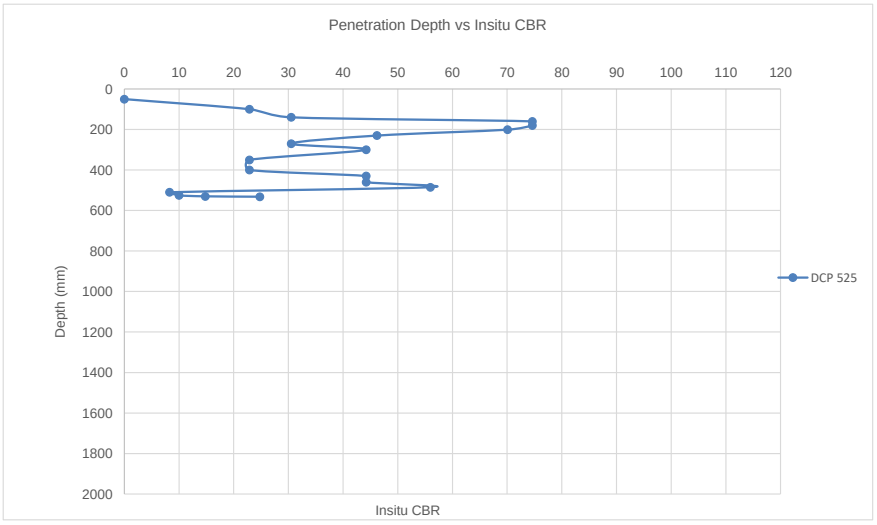
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 525
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 01/11/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 50mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	01/11/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	01/11/2024
TEST POSITION:	DCP 527	**STARTING DEPTH:**	30mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

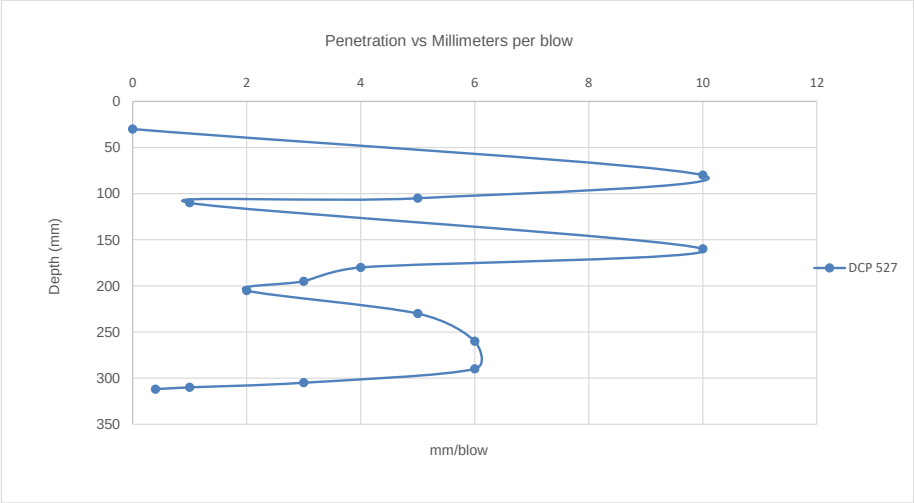
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	30	30mm	0	0				
5	80	80mm	50	10.0	Dense	22	23	236
10	105	105mm	25	5.0	Very Dense	53	56	502
15	110	110mm	5	1.0	Very Dense	300	>110	2900
20	160	160mm	50	10.0	Dense	22	23	236
25	180	180mm	20	4.0	Very Dense	70	75	640
30	195	195mm	15	3.0	Very Dense	102	108	876
35	205	205mm	10	2.0	Very Dense	170	>110	1362
40	230	230mm	25	5.0	Very Dense	53	56	502
45	260	260mm	30	6.0	Dense	42	44	411
50	290	290mm	30	6.0	Dense	42	44	411
55	305	305mm	15	3.0	Very Dense	102	108	876
60	310	310mm	5	1.0	Very Dense	300	>110	2900
65	312	312mm	2	0.4	Very Dense	442	>110	7873

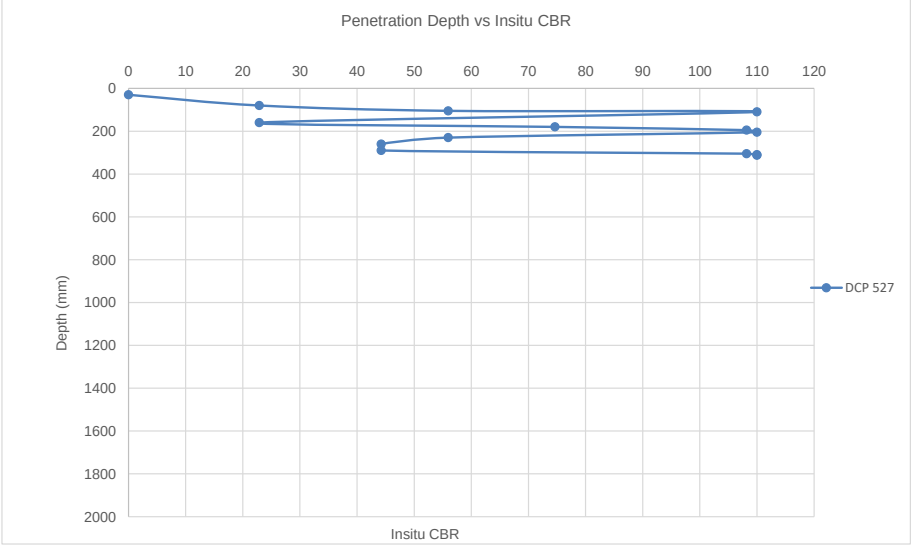
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 527
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 01/11/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 30mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	01/11/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	01/11/2024
TEST POSITION:	DCP 528	**STARTING DEPTH:**	20mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

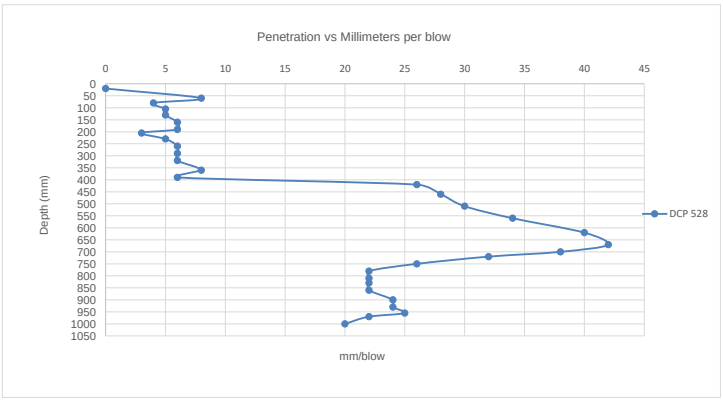
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	20	20mm	0	0				
5	60	60mm	40	8.0	Dense	29	31	301
10	80	80mm	20	4.0	Very Dense	70	75	640
15	105	105mm	25	5.0	Very Dense	53	56	502
20	130	130mm	25	5.0	Very Dense	53	56	502
25	160	160mm	30	6.0	Dense	42	44	411
30	190	190mm	30	6.0	Dense	42	44	411
35	205	205mm	15	3.0	Very Dense	102	108	876
40	230	230mm	25	5.0	Very Dense	53	56	502
45	260	260mm	30	6.0	Dense	42	44	411
50	290	290mm	30	6.0	Dense	42	44	411
55	320	320mm	30	6.0	Dense	42	44	411
60	360	360mm	40	8.0	Dense	29	31	301
65	390	390mm	30	6.0	Dense	42	44	411
70	420	420mm	130	26.0	Medium Dense	7	7	83
75	460	460mm	140	28.0	Medium Dense	6	6	77
80	510	510mm	150	30.0	Medium Dense	5	6	71
85	560	560mm	170	34.0	Loose	5	5	62
90	620	620mm	200	40.0	Loose	4	4	52
95	670	670mm	210	42.0	Loose	4	4	49
100	700	700mm	190	38.0	Loose	4	4	55
105	720	720mm	160	32.0	Loose	5	5	66
110	750	750mm	130	26.0	Medium Dense	7	7	83
115	780	780mm	110	22.0	Medium Dense	8	8	100
120	810	810mm	110	22.0	Medium Dense	8	8	100
125	830	830mm	110	22.0	Medium Dense	8	8	100
130	860	860mm	110	22.0	Medium Dense	8	8	100
135	900	900mm	120	24.0	Medium Dense	7	7	91
140	930	930mm	120	24.0	Medium Dense	7	7	91
145	955	955mm	125	25.0	Medium Dense	7	7	87
150	970	970mm	110	22.0	Medium Dense	8	8	100
155	1000	1000mm	100	20.0	Medium Dense	9	9	111

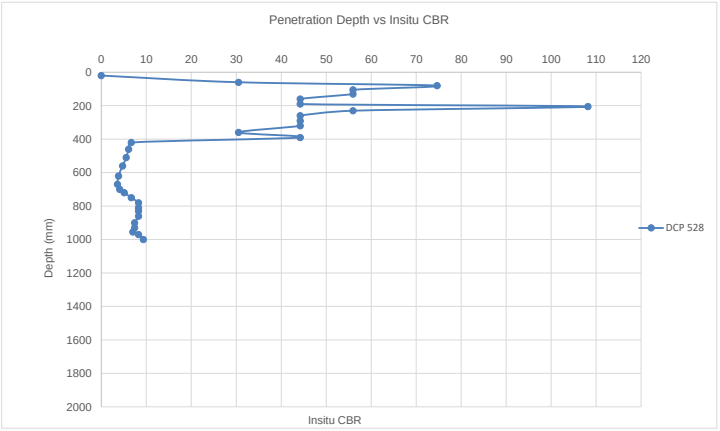
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 528
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 01/11/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 20mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	01/11/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	01/11/2024
TEST POSITION:	DCP 531	**STARTING DEPTH:**	130mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

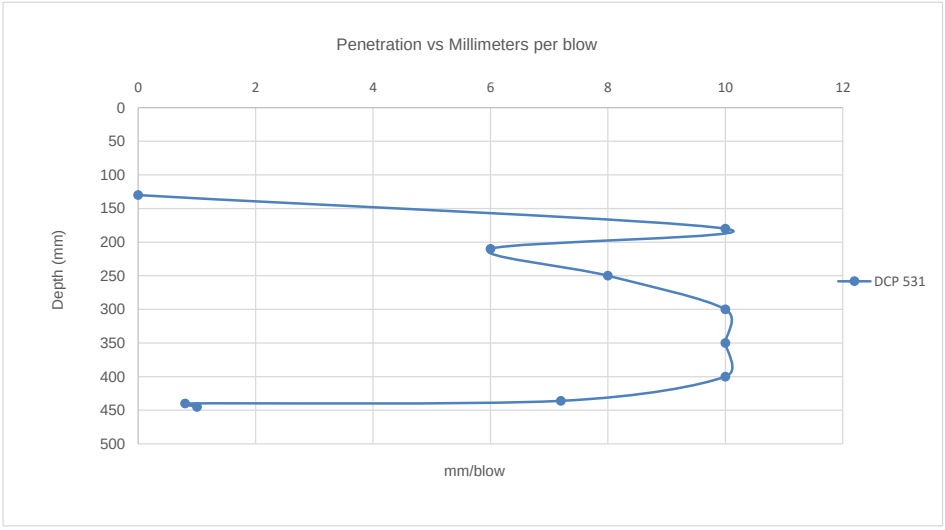
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\ (dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\ (dn)^{-1.09}$
0	130	130mm	0	0				
5	180	180mm	50	10.0	Dense	22	23	236
10	210	210mm	30	6.0	Dense	42	44	411
20	250	250mm	40	8.0	Dense	29	31	301
25	300	300mm	50	10.0	Dense	22	23	236
30	350	350mm	50	10.0	Dense	22	23	236
35	400	400mm	50	10.0	Dense	22	23	236
40	436	436mm	36	7.2	Dense	33	35	337
45	440	440mm	4	0.8	Very Dense	342	>110	3699
50	445	445mm	5	1.0	Very Dense	300	>110	2900

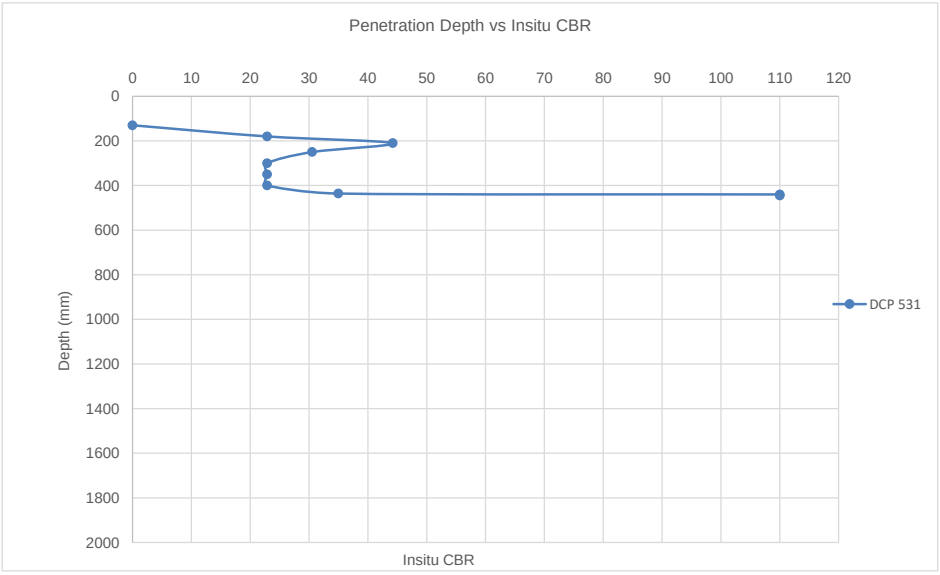
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 531
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 01/11/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 130mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	01/11/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	01/11/2024
TEST POSITION:	DCP 533	**STARTING DEPTH:**	04/02/1900
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

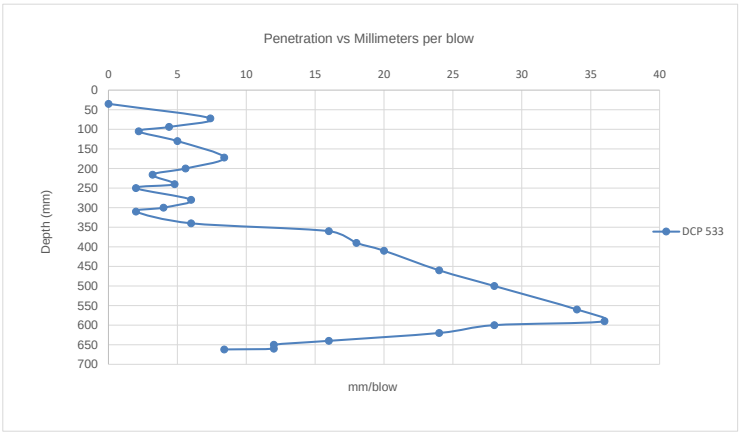
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	35	35mm	0	0				
5	72	72mm	37	7.4	Dense	32	34	327
10	94	94mm	22	4.4	Very Dense	62	66	577
15	105	105mm	11	2.2	Very Dense	151	>110	1228
20	130	130mm	25	5.0	Very Dense	53	56	502
25	172	172mm	42	8.4	Dense	27	29	285
30	200	200mm	28	5.6	Dense	46	48	443
35	216	216mm	16	3.2	Very Dense	94	100	816
40	240	240mm	24	4.8	Very Dense	56	59	525
45	250	250mm	10	2.0	Very Dense	170	>110	1362
50	280	280mm	30	6.0	Dense	42	44	411
55	300	300mm	20	4.0	Very Dense	70	75	640
60	310	310mm	10	2.0	Very Dense	170	>110	1362
65	340	340mm	30	6.0	Dense	42	44	411
70	360	360mm	80	16.0	Medium Dense	12	12	141
75	390	390mm	90	18.0	Medium Dense	10	11	124
80	410	410mm	100	20.0	Medium Dense	9	9	111
85	460	460mm	120	24.0	Medium Dense	7	7	91
90	500	500mm	140	28.0	Medium Dense	6	6	77
95	560	560mm	170	34.0	Loose	5	5	62
100	590	590mm	180	36.0	Loose	4	4	58
105	600	600mm	140	28.0	Medium Dense	6	6	77
110	620	620mm	120	24.0	Medium Dense	7	7	91
115	640	640mm	80	16.0	Medium Dense	12	12	141
120	650	650mm	60	12.0	Dense	17	18	193
125	660	660mm	60	12.0	Dense	17	18	193
130	662	662mm	42	8.4	Dense	27	29	285

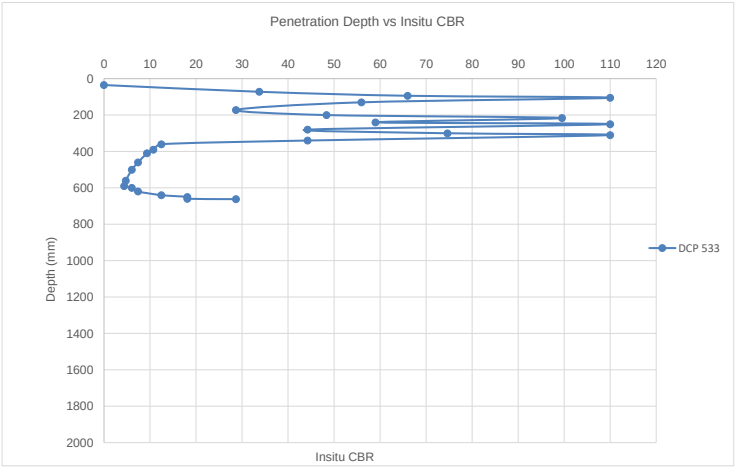
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 533
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 01/11/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 35mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	02/11/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	02/11/2024
TEST POSITION:	DCP 536	**STARTING DEPTH:**	20mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

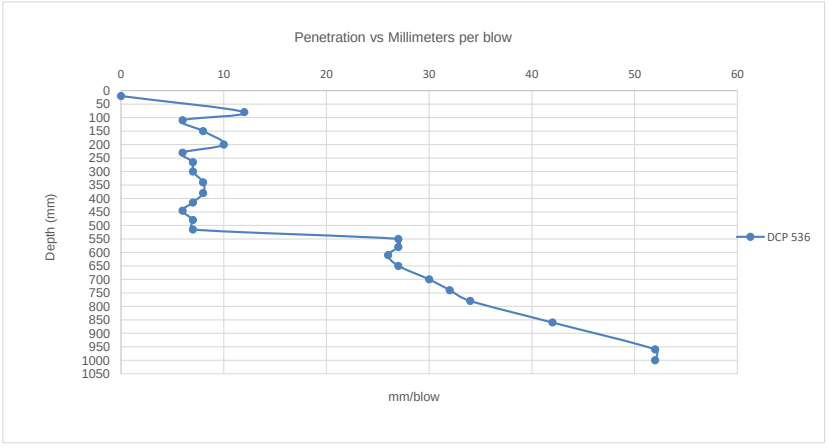
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x $(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x $(dn)^{-1.09}$
0	20	20mm	0	0				
5	80	80mm	60	12.0	Dense	17	18	193
10	110	110mm	30	6.0	Dense	42	44	411
15	150	150mm	40	8.0	Dense	29	31	301
20	200	200mm	50	10.0	Dense	22	23	236
25	230	230mm	30	6.0	Dense	42	44	411
30	265	265mm	35	7.0	Dense	35	36	348
35	300	300mm	35	7.0	Dense	35	36	348
40	340	340mm	40	8.0	Dense	29	31	301
45	380	380mm	40	8.0	Dense	29	31	301
50	415	415mm	35	7.0	Dense	35	36	348
55	445	445mm	30	6.0	Dense	42	44	411
60	480	480mm	35	7.0	Dense	35	36	348
65	515	515mm	35	7.0	Dense	35	36	348
70	550	550mm	135	27.0	Medium Dense	6	6	80
75	580	580mm	135	27.0	Medium Dense	6	6	80
80	610	610mm	130	26.0	Medium Dense	7	7	83
85	650	650mm	135	27.0	Medium Dense	6	6	80
90	700	700mm	150	30.0	Medium Dense	5	6	71
95	740	740mm	160	32.0	Loose	5	5	66
100	780	780mm	170	34.0	Loose	5	5	62
105	860	860mm	210	42.0	Loose	4	4	49
110	960	960mm	260	52.0	Loose	3	3	39
115	1000	1000mm	260	52.0	Loose	3	3	39

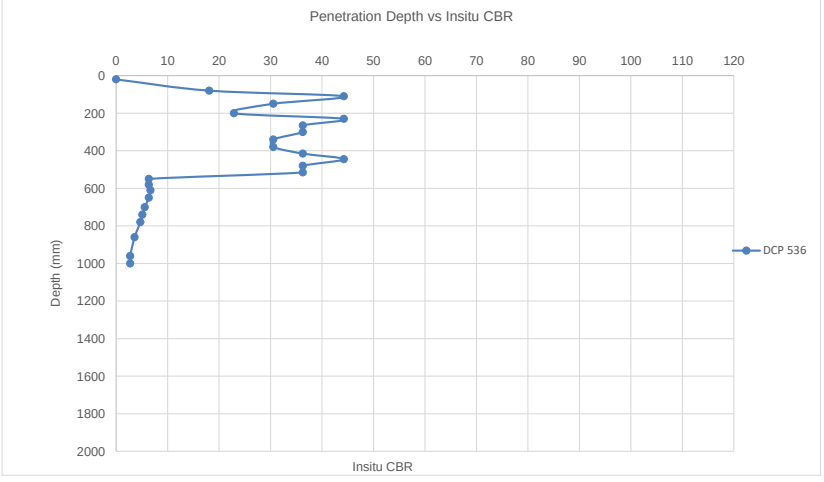
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 536
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 02/11/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 20mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	03/11/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	03/11/2024
TEST POSITION:	DCP 538	**STARTING DEPTH:**	60mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

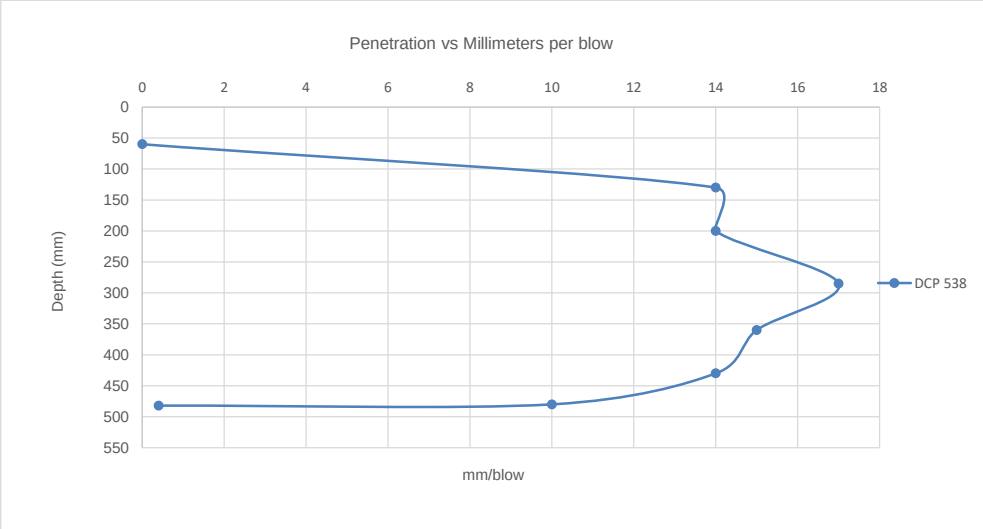
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	60	60mm	0	0				
5	130	130mm	70	14.0	Medium Dense	14	15	163
10	200	200mm	70	14.0	Medium Dense	14	15	163
15	285	285mm	85	17.0	Medium Dense	11	12	132
20	360	360mm	75	15.0	Medium Dense	13	14	152
25	430	430mm	70	14.0	Medium Dense	14	15	163
30	480	480mm	50	10.0	Dense	22	23	236
35	482	482mm	2	0.4	Very Dense	442	>110	7873

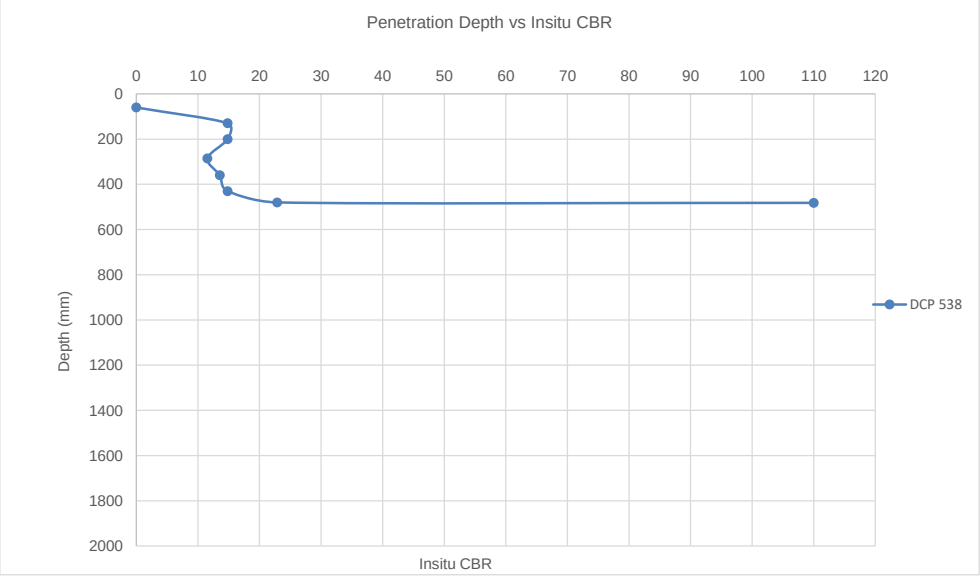
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 538
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 03/11/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 60mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	03/11/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	03/11/2024
TEST POSITION:	DCP 539	**STARTING DEPTH:**	20mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

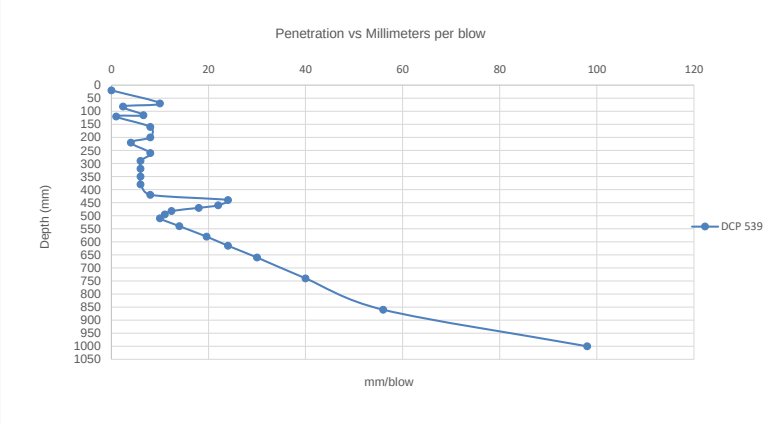
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	20	20mm	0	0				
5	70	70mm	50	10.0	Dense	22	23	236
10	82	82mm	12	2.4	Very Dense	135	>110	1117
15	115	115mm	33	6.6	Dense	37	39	371
20	120	120mm	5	1.0	Very Dense	300	>110	2900
25	160	160mm	40	8.0	Dense	29	31	301
30	200	200mm	40	8.0	Dense	29	31	301
35	220	220mm	20	4.0	Very Dense	70	75	640
40	260	260mm	40	8.0	Dense	29	31	301
45	290	290mm	30	6.0	Dense	42	44	411
50	320	320mm	30	6.0	Dense	42	44	411
55	350	350mm	30	6.0	Dense	42	44	411
60	380	380mm	30	6.0	Dense	42	44	411
65	420	420mm	40	8.0	Dense	29	31	301
70	440	440mm	120	24.0	Medium Dense	7	7	91
75	460	460mm	110	22.0	Medium Dense	8	8	100
80	470	470mm	90	18.0	Medium Dense	10	11	124
85	482	482mm	62	12.4	Dense	17	17	186
90	495	495mm	55	11.0	Dense	20	20	212
95	510	510mm	50	10.0	Dense	22	23	236
100	540	540mm	70	14.0	Medium Dense	14	15	163
105	580	580mm	98	19.6	Medium Dense	9	10	113
110	615	615mm	120	24.0	Medium Dense	7	7	91
115	660	660mm	150	30.0	Medium Dense	5	6	71
120	740	740mm	200	40.0	Loose	4	4	52
125	860	860mm	280	56.0	Loose	2	2	36
130	1000	1000mm	490	98.0	Very Loose	1	1	20

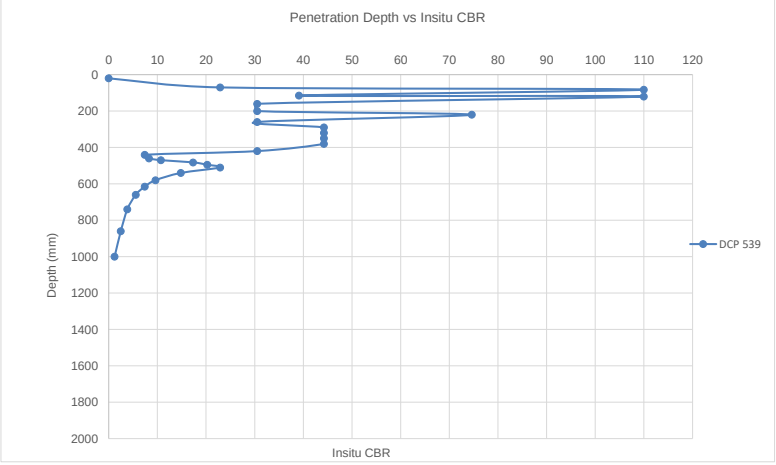
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 539
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 03/11/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 20mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	03/11/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	03/11/2024
TEST POSITION:	DCP 541	**STARTING DEPTH:**	75mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

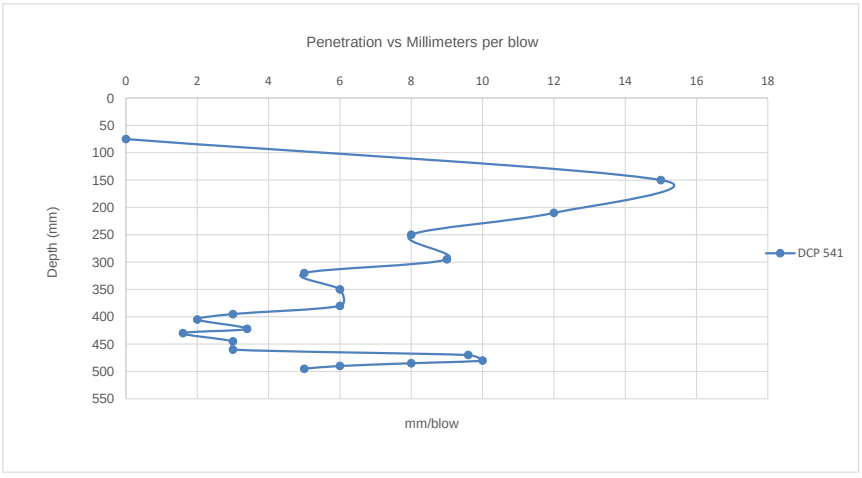
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
5	75	75mm	0	0				
10	150	150mm	75	15.0	Medium Dense	13	14	152
15	210	210mm	60	12.0	Dense	17	18	193
20	250	250mm	40	8.0	Dense	29	31	301
25	295	295mm	45	9.0	Dense	25	26	264
30	320	320mm	25	5.0	Very Dense	53	56	502
35	350	350mm	30	6.0	Dense	42	44	411
40	380	380mm	30	6.0	Dense	42	44	411
45	395	395mm	15	3.0	Very Dense	102	108	876
50	405	405mm	10	2.0	Very Dense	170	>110	1362
55	422	422mm	17	3.4	Very Dense	87	92	764
60	430	430mm	8	1.6	Very Dense	206	>110	1737
65	445	445mm	15	3.0	Very Dense	102	108	876
70	460	460mm	15	3.0	Very Dense	102	108	876
75	470	470mm	48	9.6	Dense	23	24	246
80	480	480mm	50	10.0	Dense	22	23	236
85	485	485mm	40	8.0	Dense	29	31	301
90	490	490mm	30	6.0	Dense	42	44	411
95	495	495mm	25	5.0	Very Dense	53	56	502

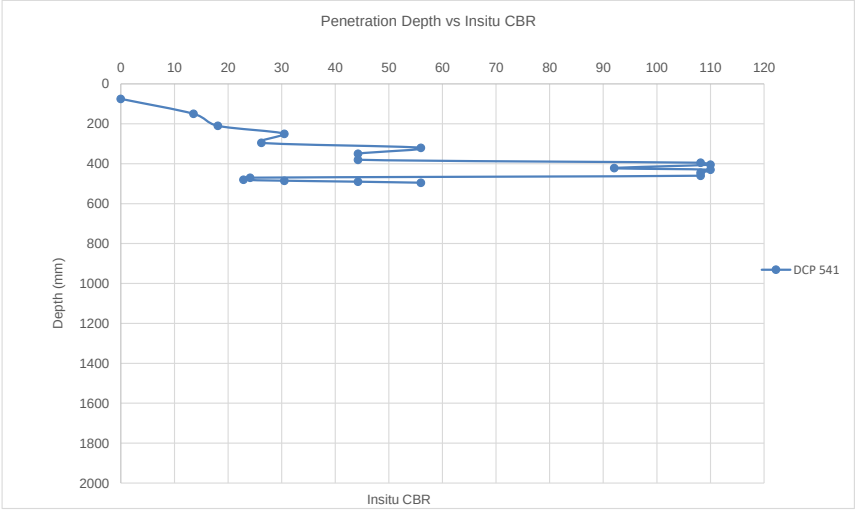
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 541
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 03/11/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 75mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	03/11/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	03/11/2024
TEST POSITION:	DCP 543	**STARTING DEPTH:**	30mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

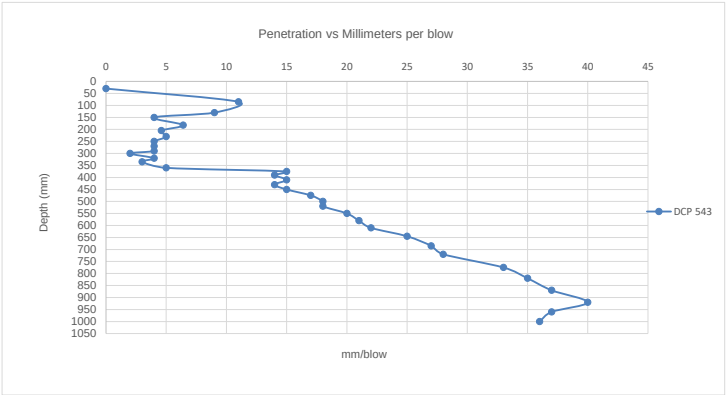
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	30	30mm	0	0				
5	85	85mm	55	11.0	Dense	20	20	212
10	130	130mm	45	9.0	Dense	25	26	264
15	150	150mm	20	4.0	Very Dense	70	75	640
20	182	182mm	32	6.4	Dense	39	41	383
25	205	205mm	23	4.6	Very Dense	59	62	550
30	230	230mm	25	5.0	Very Dense	53	56	502
35	250	250mm	20	4.0	Very Dense	70	75	640
40	270	270mm	20	4.0	Very Dense	70	75	640
45	290	290mm	20	4.0	Very Dense	70	75	640
50	300	300mm	10	2.0	Very Dense	170	>110	1362
55	320	320mm	20	4.0	Very Dense	70	75	640
60	335	335mm	15	3.0	Very Dense	102	108	876
65	360	360mm	25	5.0	Very Dense	53	56	502
70	375	375mm	75	15.0	Medium Dense	13	14	152
75	390	390mm	70	14.0	Medium Dense	14	15	163
80	410	410mm	75	15.0	Medium Dense	13	14	152
85	430	430mm	70	14.0	Medium Dense	14	15	163
90	450	450mm	75	15.0	Medium Dense	13	14	152
95	475	475mm	85	17.0	Medium Dense	11	12	132
100	500	500mm	90	18.0	Medium Dense	10	11	124
105	520	520mm	90	18.0	Medium Dense	10	11	124
110	550	550mm	100	20.0	Medium Dense	9	9	111
115	580	580mm	105	21.0	Medium Dense	9	9	105
120	610	610mm	110	22.0	Medium Dense	8	8	100
125	645	645mm	125	25.0	Medium Dense	7	7	87
130	685	685mm	135	27.0	Medium Dense	6	6	80
135	720	720mm	140	28.0	Medium Dense	6	6	77
140	775	775mm	165	33.0	Loose	5	5	64
145	820	820mm	175	35.0	Loose	4	5	60
150	870	870mm	185	37.0	Loose	4	4	57
155	920	920mm	200	40.0	Loose	4	4	52
160	960	960mm	185	37.0	Loose	4	4	57
165	1000	1000mm	180	36.0	Loose	4	4	58

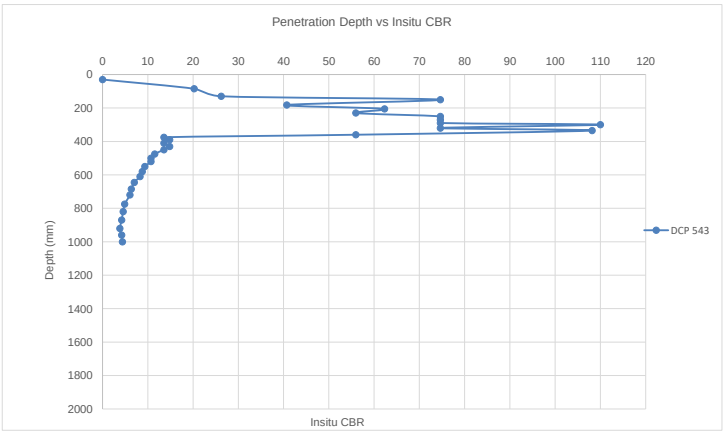
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 543
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 03/11/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 30mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	03/11/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	03/11/2024
TEST POSITION:	DCP 547	**STARTING DEPTH:**	15mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

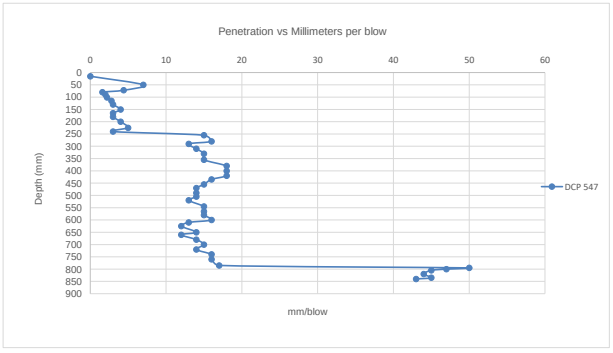
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x $(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x $(dn)^{-1.89}$
0	15	15mm	0	0				
5	50	50mm	35	7.0	Dense	35	36	348
10	72	72mm	22	4.4	Very Dense	62	66	577
15	80	80mm	8	1.6	Very Dense	206	>110	1737
20	90	90mm	10	2.0	Very Dense	170	>110	1362
25	101	101mm	11	2.2	Very Dense	151	>110	1228
30	115	115mm	14	2.8	Very Dense	111	>110	944
35	130	130mm	15	3.0	Very Dense	102	108	876
40	150	150mm	20	4.0	Very Dense	70	75	640
45	165	165mm	15	3.0	Very Dense	102	108	876
50	180	180mm	15	3.0	Very Dense	102	108	876
55	200	200mm	20	4.0	Very Dense	70	75	640
60	225	225mm	25	5.0	Very Dense	53	56	502
65	240	240mm	15	3.0	Very Dense	102	108	876
70	255	255mm	75	15.0	Medium Dense	13	14	152
75	280	280mm	80	16.0	Medium Dense	12	12	141
80	290	290mm	65	13.0	Medium Dense	16	16	177
85	310	310mm	70	14.0	Medium Dense	14	15	163
90	330	330mm	75	15.0	Medium Dense	13	14	152
95	355	355mm	75	15.0	Medium Dense	13	14	152
100	380	380mm	90	18.0	Medium Dense	10	11	124
105	400	400mm	90	18.0	Medium Dense	10	11	124
110	420	420mm	90	18.0	Medium Dense	10	11	124
115	435	435mm	80	16.0	Medium Dense	12	12	141
120	455	455mm	75	15.0	Medium Dense	13	14	152
125	470	470mm	70	14.0	Medium Dense	14	15	163
130	490	490mm	70	14.0	Medium Dense	14	15	163
135	505	505mm	70	14.0	Medium Dense	14	15	163
140	520	520mm	65	13.0	Medium Dense	16	16	177
145	545	545mm	75	15.0	Medium Dense	13	14	152
150	565	565mm	75	15.0	Medium Dense	13	14	152
155	580	580mm	75	15.0	Medium Dense	13	14	152
160	600	600mm	80	16.0	Medium Dense	12	12	141
165	610	610mm	65	13.0	Medium Dense	16	16	177
170	625	625mm	60	12.0	Dense	17	18	193
175	650	650mm	70	14.0	Medium Dense	14	15	163
180	660	660mm	60	12.0	Dense	17	18	193
185	680	680mm	70	14.0	Medium Dense	14	15	163
190	700	700mm	75	15.0	Medium Dense	13	14	152
195	720	720mm	70	14.0	Medium Dense	14	15	163
200	740	740mm	80	16.0	Medium Dense	12	12	141
205	760	760mm	80	16.0	Medium Dense	12	12	141
210	785	785mm	85	17.0	Medium Dense	11	12	132
215	795	795mm	250	50.0	Loose	3	3	41
220	800	800mm	235	47.0	Loose	3	3	44
225	805	805mm	225	45.0	Loose	3	3	46
230	820	820mm	220	44.0	Loose	3	3	47
235	835	835mm	225	45.0	Loose	3	3	46
240	840	840mm	215	43.0	Loose	3	3	48

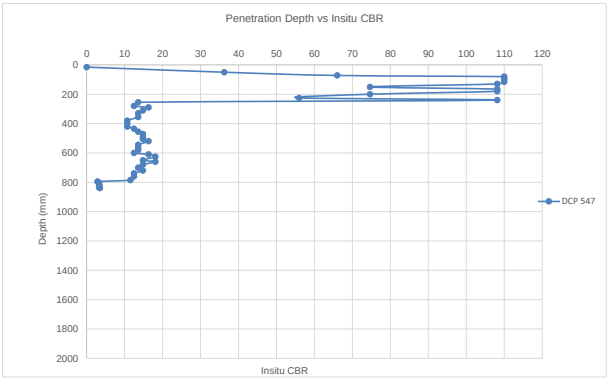
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 547
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 03/11/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 15mm
INSTRUMENT USED: 1m DCP
NOTE: 0





DYNAMIC CONE PENETROMETER TEST

CLIENT:	Zutari	**DATE:**	03/11/2024
TEST REPORT:	Wendy Muofhe	**JOB NUMBER:**	NVG013
OPERATOR:	Wendy Muofhe	**DATE TESTED:**	03/11/2024
TEST POSITION:	DCP 548	**STARTING DEPTH:**	40mm
MATERIAL TYPE:		**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

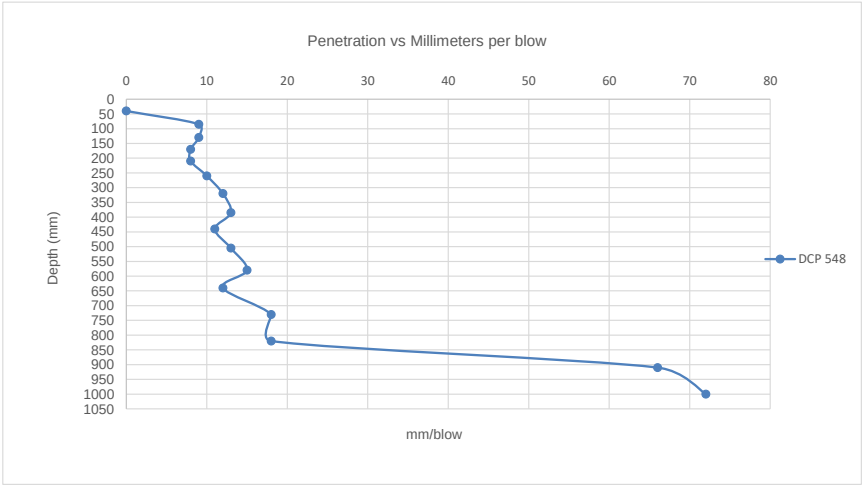
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	40	40mm	0	0				
5	85	85mm	45	9.0	Dense	25	26	264
10	130	130mm	45	9.0	Dense	25	26	264
15	170	170mm	40	8.0	Dense	29	31	301
20	210	210mm	40	8.0	Dense	29	31	301
25	260	260mm	50	10.0	Dense	22	23	236
30	320	320mm	60	12.0	Dense	17	18	193
35	385	385mm	65	13.0	Medium Dense	16	16	177
40	440	440mm	55	11.0	Dense	20	20	212
45	505	505mm	65	13.0	Medium Dense	16	16	177
50	580	580mm	75	15.0	Medium Dense	13	14	152
55	640	640mm	60	12.0	Dense	17	18	193
60	730	730mm	90	18.0	Medium Dense	10	11	124
65	820	820mm	90	18.0	Medium Dense	10	11	124
70	910	910mm	330	66.0	Loose	2	2	30
75	1000	1000mm	360	72.0	Loose	2	2	27

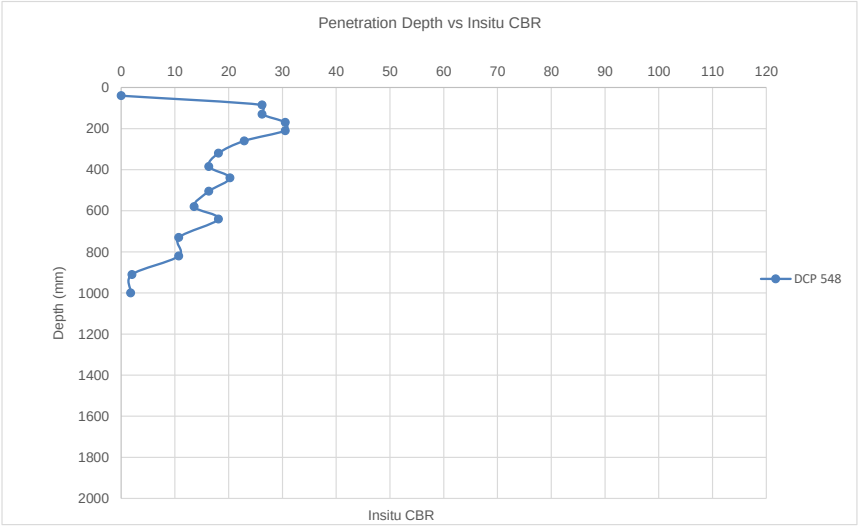
DYNAMIC CONE PENETROMETER TEST

DCP GRAPHICAL REPRESENTATION

PROJECT: Xhariep Project
CLIENT: Zutari
TEST POSITION: DCP 548
MATERIAL TYPE: 0
CONSTRUCTION TYPE: Road Construction

DATE TESTED: 03/11/2024
OPERATOR: Wendy Muofhe
STARTING DEPTH: 40mm
INSTRUMENT USED: 1m DCP
NOTE: 0





Appendix E - Borehole Logs

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

ZUTARI
IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Sanitation

HOLE No: BH1
Sheet 1 of 2

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill
	100	0	0					
	48	48	27					
	38	38	0					
	79	79	23	20				
	100	100	60	13				
	138	85	44	9				
	100	100	74	20	30 60 80 70 20	CJ VCJ VWJ WJ MJ	R R R R SR	Snd St Healed - -
	100	100	100	3				
	100	100	84	3				
	100	100	93	3	50	WJ	R	St
	100	100	95	3				

Weathering

Scale 1:80

0.00 Slightly moist to moist, reddish brown, clayey SAND with minor gravel and grass roots. Topsoil

0.30 Slightly moist to moist, reddish brown to orangish brown speckled black, sandy gravelly CLAY. Residual dolerite

0.55 Dark brown to olive green stained black on joints, completely weathered to highly weathered, medium grained, highly fractured, very soft to soft rock. Dolerite.

3.10 Olive green to dark grey, moderately weathered to slightly weathered, medium grained, very closely to medium jointed (40 mm to 500 mm), medium jointed, medium hard to hard rock. Dolerite.

Note:

1. Highly fractured zone at 4.4 to 6 m.
2. Different flow from 4.4 to 6 m.

7.00 Black speckled light grey stained olive on joints, moderately weathered to slightly weathered, medium grained, closely to medium jointed (190 to 470 mm), hard to very hard rock. Dolerite

Contractor: Mukona Geotechnics **Logged by: D.Mabannda** **Elevation:**
Machine: D90 **Logged date: 2024/11/19** **North: -30.624641**
Drilled by: Lezwi **Drilled date: 2024/09/26 - 2024/09/27** **East: 25.484831**

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

ZUTARI
IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Sanitation

HOLE No: BH1
Sheet 2 of 2

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	100	100	95	3					
	73	73	73	2					
				2	50	WJ	R	St	
					10	CJ	R	Cn	
					10	CJ	R	Cn	
	105	105	105	1	70	MJ	-	Healed	
					70	VWJ	R	St	

Scale 1:80

12
13
14
14.97
15
16
17
18
19
20
21
22
23

NOTES:

1. Borehole terminated at 14.97 m on very strong rock dolerite
2. Rockhead intersected at 0.55 m
3. Water table depth at 2.65 m

Contractor: Mukona Geotechnics **Logged by: D.Mabannda** **Elevation:**
Machine: D90 **Logged date: 2024/11/19** **North: -30.624641**
Drilled by: Lezwi **Drilled date: 2024/09/26 - 2024/09/27** **East: 25.484831**

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Sanitation

HOLE No: BH2
Sheet 1 of 2

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	100	0	0						
	84	84	17						
	100	100	33	20					
	93	93	33	12					
	93	93	57	9	10 80 30	VCJ WJ VCJ	SM R SM	Slt St Cl	
	100	100	24	10 20					
	100	100	63	18					
	100	100	68	12 15	0	CJ-MJ	-	-	
	100	100	76	10					
	100	100	93	5 4					

Scale 1:80

0.00 Moist, yellow brown, silty CLAY with equal amounts of angular, medium gravel of mudstone. Residual mudstone

0.30 Yellowish brown to light grey stained black and red on joints, highly weathered to moderately weathered, very fine grained, closely to widely jointed (40 to 800 mm) intensely laminated, soft rock. Mudstone interlayed with sandstone

7.00 Light grey to grey, moderately weathered, very fine grained, intensely laminated, medium hard rock. Sandstone

Contractor: Mukona Geotechnics **Logged by: D. Mabannda**
Machine: D90 **Logged date: 2024/11/19**
Drilled by: Lezwi **Drilled date: 2024/09/30 - 2024/10/02**

Elevation:
North: -30.625269
East: 25.485569

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Sanitation

HOLE No: BH2
Sheet 2 of 2

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	100	100	69	4 7					
	100	100	90	4	0 90 90 20 60 80	CJ-MJ WJ WJ CJ CJ-MJ MJ	- SM-SR SM-SR R SM R	- - - - St Snd	
	100	100	100	3					

Scale 1:80

15.15

NOTES:

1. Borehole terminated at 15.15 m on medium strong rock sandstone
2. Rockhead intersected at 0.3 m
3. Water table depth at 2.25 m

Contractor: Mukona Geotechnics **Logged by: D. Mabannda** **Elevation:**
Machine: D90 **Logged date: 2024/11/19** **North: -30.625269**
Drilled by: Lezwi **Drilled date: 2024/09/30 - 2024/10/02** **East: 25.485569**

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Santation

HOLE No: BH03
Sheet 1 of 1

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	100	0	0						
	91	0	0						
	100	100	46	13	10 90 60	VCJ-CJ - MJ	S-SR S-SR SR	cl cl st	
	100	100	60	9					
	100	100	64	2	10	VCJ-WJ	S-SR	st	
	100	100	100						
	97	97	96	2					

Scale 1:80

0.00 Dry, dark orange brown, clayey SAND, with scattered sub-angular to angular, soft rock gravel (max 7 mm, ave 5 mm), fine roots. Fill.

0.30 Slightly moist to moist, red brown, speckled white, sandy CLAY, with scattered sub-rounded fine gravel (up to 4 mm), a single hard rock dolerite cobble (85 mm). Residual dolerite.

1.05 Slightly weathered, dark greenish grey, becoming dark grey with depth, hard rock MUDSTONE, very dine grained.
Closely fractured at 1.21 – 1.26 m and 1.69 – 1.72 m.

2.29 Slightly weathered, pale bluish grey, hard rock SANDSTONE, fine grained.

5

NOTES:

1. Borehole terminated at 5.00 in hard rock sandstone
2. Rockhead intersected at 1.05 m
3. Water table depth at 0.65

Contractor: Mukona Geotechnics **Logged by: EdP** **Elevation:**
Machine: D90 **Logged date: 2024/02/12** **North: -30.598172**
Drilled by: Lizwi **Drilled date: 2024/10/15 - 2024/10/16** **East: 25.484081**

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

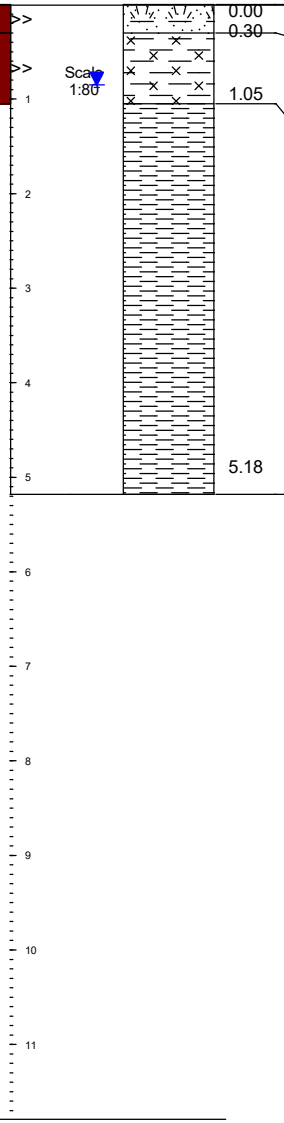
WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

ZUTARI
IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Santation

HOLE No: BH04
Sheet 1 of 1

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	100	0	0						
	60	0	0						
	100	100	70	11					
	100	100	53	16					
	100	100	70	7	10 70	VCJ-MJ WJ	S S	st-cl st-cn	
	100	100	100	3					



Grey and brown with occasionally blue gravels and cobbles in a matrix of silty CLAY with roots. Topsoil

Grey stained black and orange gravel and cobbles in a matrix of grey, silty CLAY. Residual mudstone

Notes:

Most of the silty clay material was washed out during drilling

Grey, moderately to highly weathered, massive, fine grained, very closely to medium jointed (30 mm - 580 mm), medium hard to hard rock mudstone

NOTES:

1. Borehole terminated at 5.18 m in medium hard to hard rock mudstone
2. Rockhead intersected at 1.05 m
3. Water table depth at 0.85 m

Contractor: Mukona Geotechnics **Logged by: SiN**
Machine: D90 **Logged date: 2024/10/24**
Drilled by: Lizwi **Drilled date: 2024/10/17 -**

Elevation:
North: -30.47967
East: 25.59391

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

ZUTARI
IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Santation

ZUTARI

HOLE No: BH05
Sheet 1 of 1

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	100	0	0						
	73	51	40	2	50	CJ	SR -R	st	
	96	96	42	16					
	100	96	51	7	10 70	VCJ-CJ MJ-WJ	SR -R SR -R	st st	
	100	100	54	12					
	100	100	59	5	10 70	CJ-MJ MJ	SR SR -R	st st	
	100	100	92						

Scale 1:80

0.00	Dry, light yellowish brown, slightly clayey, fine SAND, with abundant angular gravel (max 30, ave 10 mm). Fill.
0.40	
0.70	Sub-rounded to rounded, hard rock dolerite GRAVEL and COBBLES (max 90 mm, ave 35mm), stained red and black, with minor dark brown sandy clay. Interpreted as residual dolerite.
1.00	Fresh, dark bluish grey, speckled white, hard rock dolerite, jointed, rough planar to stepped, stained dark brown, fine grained.
	Slightly weathered, alternating khaki and mauve, medium hard rock MUDSTONE, with thin fine sandstone beds, very fine grained. Moderatly weathered (soft rock), partly fractured with clay infill at 1.68 – 1.7 m, 1.8 – 1.85 m, 1.99 – 2.13 m and 2.8 – 2.85 m.
3.73	Fresh, pale bluish grey, hard rock fine SANDSTONE, fine grained.
5.15	

NOTES:

1. Borehole terminated at 5.15 m in hard rock sandstone
2. Rockhead intersected at 1.00 m
3. 3. Water table depth at 1.85

Contractor: Mukona Geotechnics **Logged by: EdP**
Machine: D90 **Logged date: 2024/02/12**
Drilled by: Lizwi **Drilled date: 2024/10/18 -**

Elevation:
North: -30.45917
East: 25.608519

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

ZUTARI
IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Santation

HOLE No: BH06
Sheet 1 of 1

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	SPT Test	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	100	0	0							
	75	0	0							
	111	0	0							
	96	0	0		14					
	84	69	28	20		10	VCJ-MJ	S	st-cn	
	100	100	85	20		10	VCJ-MJ	S	st-cn	
	100	100	100	7						

Scale 1:80

0.00	Dark brown, silty CLAY with minor gravels and roots. Topsoil
0.30	Reddish brown and off-white silty CLAY. Transported material
1.30	Dark brown, off-white and black, sandy CLAY with minor gravels. Residual mudstone
2.30	Dark grey, off-white, brown, stained orange, completely weathered, massive, fine grained, very closley to medium jointed (1 < 160 mm), very soft to medium hard rock mudstone.
3.40	Grey, slightly weathered, massive, fine grained, very closley to medium jointed (40 mm - 240 mm), medium hard rock mudstone.
5.21	

NOTES:

1. Borehole terminated at 5.21 m in medium hard rock mudstone
2. Rockhead intersected at 2.30 m
3. Water table depth at 1.85

Contractor: Mukona Geotechnics **Logged by: SiN**
Machine: D90 **Logged date: 2024/10/24**
Drilled by: Lizwi **Drilled date: 2024/10/24 -**

Elevation:
North: -30.305036
East: 25.71705

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

ZUTARI
IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Santation

HOLE No: BH07
Sheet 1 of 1

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	100	0	0						
	40	29	29						
	100	80	56						
	100	100	28	10	10 90	VCJ-MJ VCJ-MJ	S S	st-snd st-snd	
	100	100	47	11					
	100	100	86	10 8	10 70	VCJ-MJ WJ	S S	st-cn st	
	100	100	93	6 1	10	VCJ-MJ	S	st-cn	
	100	100	96	4	10	VCJ-MJ	S	st-cn	
	100	100	78	5					

Scale 1:80

0.00 0.30 Grey and brown gravel in a matrix of silty SAND. Transported

Grey and black, massive BOULDERS and COBBLES in fines, likely washed out during drilling. Residual mudstone

1.60 Grey, off-white and black, moderately weathered, thinly bedded and massive, very closely to medium jointed (30 mm - 170 mm), soft to medium hard rock mudstone with sandstone interbeds

3.72 Dark grey, purple and occasionally off-white, moderately weathered, massive, very closely to medium jointed (10 mm - 550 mm), soft to medium hard rock mudstone

5.57 Grey, off-white and dark grey, moderately weathered, thinly bedded and massive, very closley to medium jointed (30 mm - 430 mm), medium hard rock sandstone with mudstone interbeds

8.05 Dark grey and purple, massive, moderately weathered, very closley to medium jointed (30 mm - 430 mm), medium hard rock mudstone

9.98

NOTES:

1. Borehole terminated at 9.98 m in medium hard rock mudstone
2. Rockhead intersected at 1.60 m
3. Water table depth at 0.85 m

Contractor: Mukona Geotechnics **Logged by: SiN**
Machine: D90 **Logged date: 2024/10/24**
Drilled by: Lizwi **Drilled date: 2024/10/19 -**

Elevation:
North: -30.436456
East: 25.627308

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

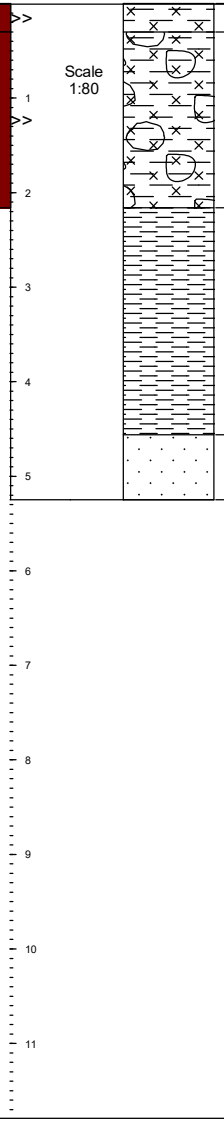
JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

ZUTARI
IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Santation

HOLE No: BH09
Sheet 1 of 1



Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	100	0	0						
	83	0	0						
	96	51	27	20					
	96	46	46	4					
	100	84	84	5	0 90	CJ-MJ CJ-MJ	S S	st-cl cn	
	100	100	100	3		N/A	N/A	N/A	

0.00 Brown, silty CLAY with minor fine gravel of different origin. Transported

0.30 Grey and brown stained orange, mudstone gravel, cobbles and boulders in a matrix of brown silty CLAY. Residual mudstone

2.16 Dark grey and brown, moderately to slightly weathered, fine grained, massive, closely to medium jointed (70 mm - 440 mm), medium hard rock mudstone

4.56 Off-white, brown and dark grey, slightly weathered, fine grained, thinly bedded, widely jointed, hard rock sandstone

5.25

NOTES:

1. Borehole terminated at 5.25 m in hard rock sandstone
2. Rockhead intersected at 2.16 m
3. Water table depth (not measured)

Contractor: Mukona Geotechnics **Logged by: SiN**
Machine: D90 **Logged date: 2024/10/24**
Drilled by: Lizwi **Drilled date: 2024/10/21 -**

Elevation:
North: -30.362567
East: 25.685832

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

ZUTARI
IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Santation

ZUTARI IMPACT. ENGINEERED.

HOLE No: BH10
Sheet 1 of 1

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	SPT Test	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	100	0	0							
	36	0	0							
	40	0	0							
	100	0	0		0					
	30	0	0							
	68	0	0	20						
	100	92	60							
	100	100	82	8		10	VCJ-MJ	S	st-cn	
	100	100	68	15						
	102	102	42	8						
	98	98	89	11		10 60 45	VCJ-MJ WJ WJ	S S S	st-cn calcite st	
	100	100	69	11 4 8						

Scale 1:80

0.00 Grey, brown and black, gravel and cobbles in a mtrix of brown silty CLAY with roots. Made ground

0.50 Brown, silty CLAY with abundant fine to coarse grained gravel and cobbles of mudstone, dolerite and sandstone. Transported material

2.63 Dark grey, off-white and black, moderately weathered, fine grained, thinly bedded, very closely to medium jointed (< 380 mm) with very highly fractured zone between 4.57 m - 4.70 m, medium hard rock sandstone with mudstone interbeds

6.07 Dark grey, moderately to slightly weathered, fine grained, massive, very closely to medium jointed (10 mm - 360 mm), medium hard to hard rock mudstone

10.15

NOTES:

1. Borehole terminated at 10.15 m in medium hard to hard rock mudstone
2. Rockhead intersected at 2.63 m
3. Water table depth at 3.65 m

Contractor: Mukona Geotechnics **Logged by: SiN**
Machine: D90 **Logged date: 2024/10/24**
Drilled by: Lizwi **Drilled date: 2024/10/22 -**

Elevation:
North: -30.337075
East: 25.698688

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

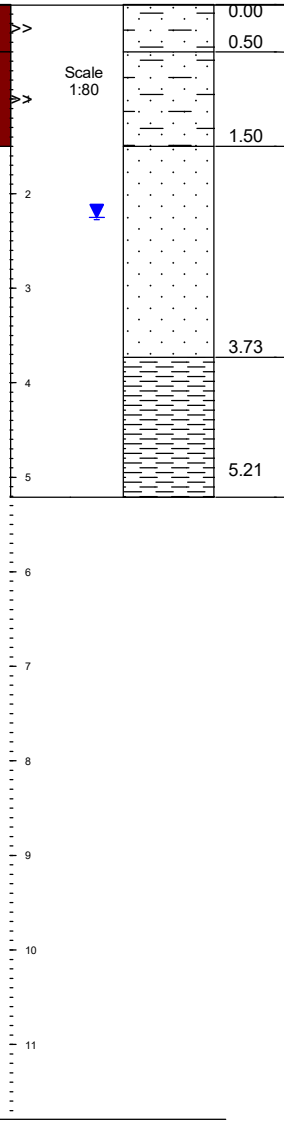
WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Santation

HOLE No: BH11
Sheet 1 of 1

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	100	0	0						
	51	21	0						
	62	62	0	20					
	100	100	54	10	10 40 70	VCJ-MJ MJ WJ	S S S	st-snd st cl	
	98	98	40	15					
	105	105	23	20	10 45 80	VCJ-MJ WJ WJ	S S S	st-snd st st	



0.00 Grey, brown and black gravel and cobbles in a matrix of brown clayey SAND with roots. Made ground

0.50 Off-white, brown and black sandstone cobbles and gravels in a matrix of silty CLAY and silty SAND. Residual sandstone

1.50 Brown, off-white and black, moderately weathered, fine grained, thinly bedded, very closley to medium jointed (20 mm - 440 mm), medium hard rock sandstone

3.73 Dark grey, brown stained red, moderately weathered, massive, very closely to medium jointed (15 mm - 130 mm), soft to medium hard rock mudstone

5.21

NOTES:

1. Borehole terminated at 5.21 m in soft to medium hard rock mudstone
2. Rockhead intersected at 1.50 m
3. Water table depth at 2.25 m

Contractor: Mukona Geotechnics **Logged by: SiN**
Machine: D90 **Logged date: 2024/10/24**
Drilled by: Lizwi **Drilled date: 2024/10/23 -**

Elevation:
North: -30.333637
East: 25.700593

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Santation

HOLE No: BH12
Sheet 1 of 1

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	SPT Test	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	44	0	0							
	307	0	0							
	100	0	0							
	100	0	0		20					
	54	0	0							
	90	0	0		0					
	100	100	38	9		10	VCJ-CJ	SR	cl	
	100	103	57	13						
	100	96	42	17						
	100	100	68	11		10	VCJ-MJ	SR	st	
	100	100	0	8		45	WJ	SR	st	
	100	100	87	4						
	100	100	100	4						

Scale 1:80

0.00	Slightly moist, dark brown, fine sandy CLAY, with angular to sub-angular dolerite gravel (max 60 mm, ave 35 mm), fine roots. Fill.
0.40	Slightly moist, dark brown, fine sandy CLAY. Alluvium.
1.15	Slightly moist, orange brown, mottled pale yellowish brown, clayey SILT, with fine, weakly cemented ferricrete nodules. Alluvium.
2.84	Moist, pale yellowish brown, clayey SAND. Residual Sandstone
3.30	Slightly weathered, pale yellowish grey, medium hard to hard rock SANDSTONE, with thin mudstone bands. Highly weathered and fractured (with clay) at 4.09 – 4.13 m and 5.07 – 5.09 m.
4.09	Slightly weathered to fresh, dark bluish grey, hard rock MUDSTONE, very fine grained. Moderately weathered and fractured at 5.55 – 5.61 m.
10.09	

NOTES:

1. Borehole terminated at 10.09 m in soft to medium hard rock mudstone
2. Rockhead intersected at 3.30 m
3. Water table depth at 2.35 m

Contractor: Mukona Geotechnics **Logged by: EdP** **Elevation:**
Machine: D90 **Logged date: 2024/02/12** **North: -30.319147**
Drilled by: Lizwi **Drilled date: 2024/10/29 - 2024/10/30** **East: 25.708534**

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

ZUTARI
IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Santation

HOLE No: BH13
Sheet 1 of 1

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	100	0	0						
	36	7	0						
	100	100	58	6					
	100	100	93	4	10 70	VCJ - WJ VWJ	S SR	st-cl cn-st	
	99	99	99	2					
	100	100	100	11					
	100	100	54		10 40	VCJ - WJ VWJ	SR S	st st	

Scale 1:80

0.00 Dry, light brown, sandy GRAVEL (angular to sub-angular, max 70 mm, ave 30 mm), fine roots. Fill.

0.80

1.00 Moist, red brown, sandy SILT, with scattered gravel (sub-angulsa, max 45mm, ave 5 mm), piece of broken pipe. Fill.

Slightly weathered, pale greenish grey, interbedded medium hard rock MUDSTONE and hard rock fine SANDSTONE, thin to thickly bedded (50 mm - 1450mm), near horizontal, rough planar, partly filled with up to 3mm sandy clay, random joint, ~ 70 degrees from horizontal, smooth undulating, partly filled with up to 2 mm calcrete, very fine to fine grained.

4.23

Slightly weathered, dark grey, hard rock MUDSTONE, thin to medium bedded (30 mm - 210mm), near horizontal, smooth undulating, stained red brown, random joint, ~ 40 degrees from horizontal, smooth, partly stained, very fine grained.
Fractured, with dark brown fine sandy silty @ 4.71 - 4.78 m

5.07

NOTES:

1. Borehole terminated at 5.07 m in hard rock mudstone
2. Rockhead intersected at 1.00 m
3. Water table depth at 2.83 m

Contractor: Mukona Geotechnics **Logged by: EdP**
Machine: D90 **Logged date: 2024/02/12**
Drilled by: Lizwi **Drilled date: 2024/10/31 -**

Elevation:
North: -30.294368
East: 25.723819

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

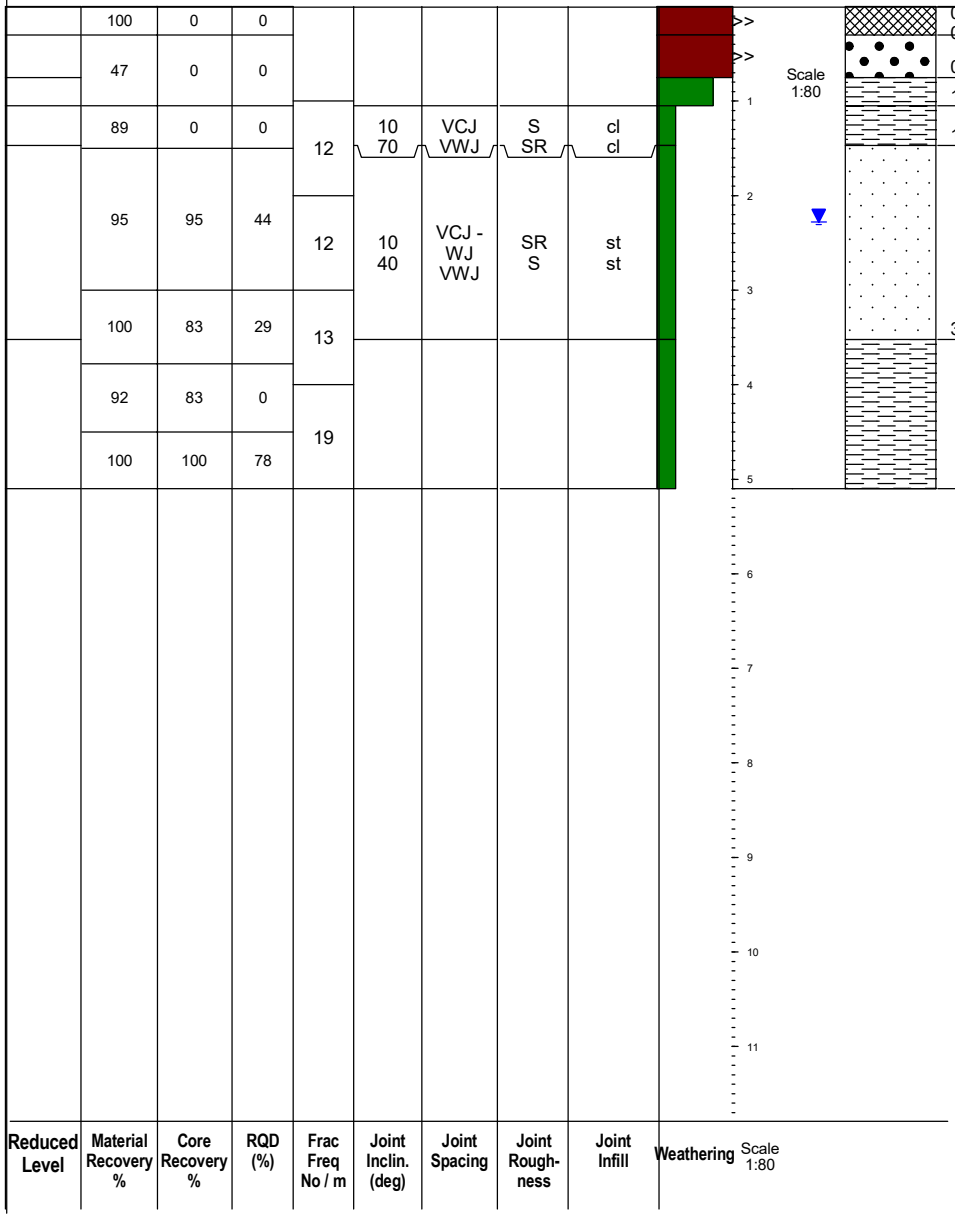
JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

ZUTARI
IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Santation

HOLE No: BH14
Sheet 1 of 1



Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	100	0	0						
	47	0	0						
	89	0	0	12	10 70	VCJ VWJ	S SR	cl cl	
	95	95	44	12	10 40	VCJ - WJ VWJ	SR S	st st	
	100	83	29	13					
	92	83	0	19					
	100	100	78						

0.00	Dry, light redish brown, sandy GRAVEL (angular to sub-angular, max 50 mm, average 10 mm), fine roots. Fill.
0.30	
0.75	Moist, red brown, fine sandy clay, with sparsely scattered fine gravel. Hillwash.
1.05	Highly weathered, dark grey, soft rock MUDSTONE, very closely fractured (recovered as gravel size fragments with orange brown silt), very fine grained.
1.47	Slightly weathered, khaki, hard rock MUDSTONE, very thinly bedded (25 mm - 40mm), near horizontal, smooth planar, filled with up to 3 mm thick, orange brown sandy clay, near vertical joint, smooth planar, filled with up to 3 mm thick, powdery calcrete, very fine grained. Closely fractured at 1.32 – 1.34m.
3.52	Slightly weathered, pale greenish grey, hard rock fine SANDSTONE, thin to medium bedded (35 – 260 mm), near horizontal, smooth planar, filled with up to 3 mm thick, orange brown sandy clay, medium to widely jointed (~60?, smooth undulating, stained red brown and black) fine grained.
5.1	Slightly weathered, dark grey, hard rock MUDSTONE, very thinly bedded (2 mm), thin to medium parted (25 mm - 210mm), near horizontal, smooth planar, filled with up to 3 mm thick, orange brown sandy clay, jointed (~80?, smooth undulating, stained red brown and black, very fine grained. Closely fractured at 4 – 4.04m and 4.27 – 4.48m. Closely fractured with orange brown, silty clay at 3.52 – 3.62 m.

NOTES:

1. Borehole terminated at 5.10 m in soft to medium hard rock mudstone
2. Rockhead intersected at 0.75 m
3. Water table depth at 2.28 m

Contractor: Mukona Geotechnics **Logged by: EdP** **Elevation:**
Machine: D90 **Logged date: 2024/02/12** **North: -30.278097**
Drilled by: Lizwi **Drilled date: 2024/10/31 -** **East: 25.728583**

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

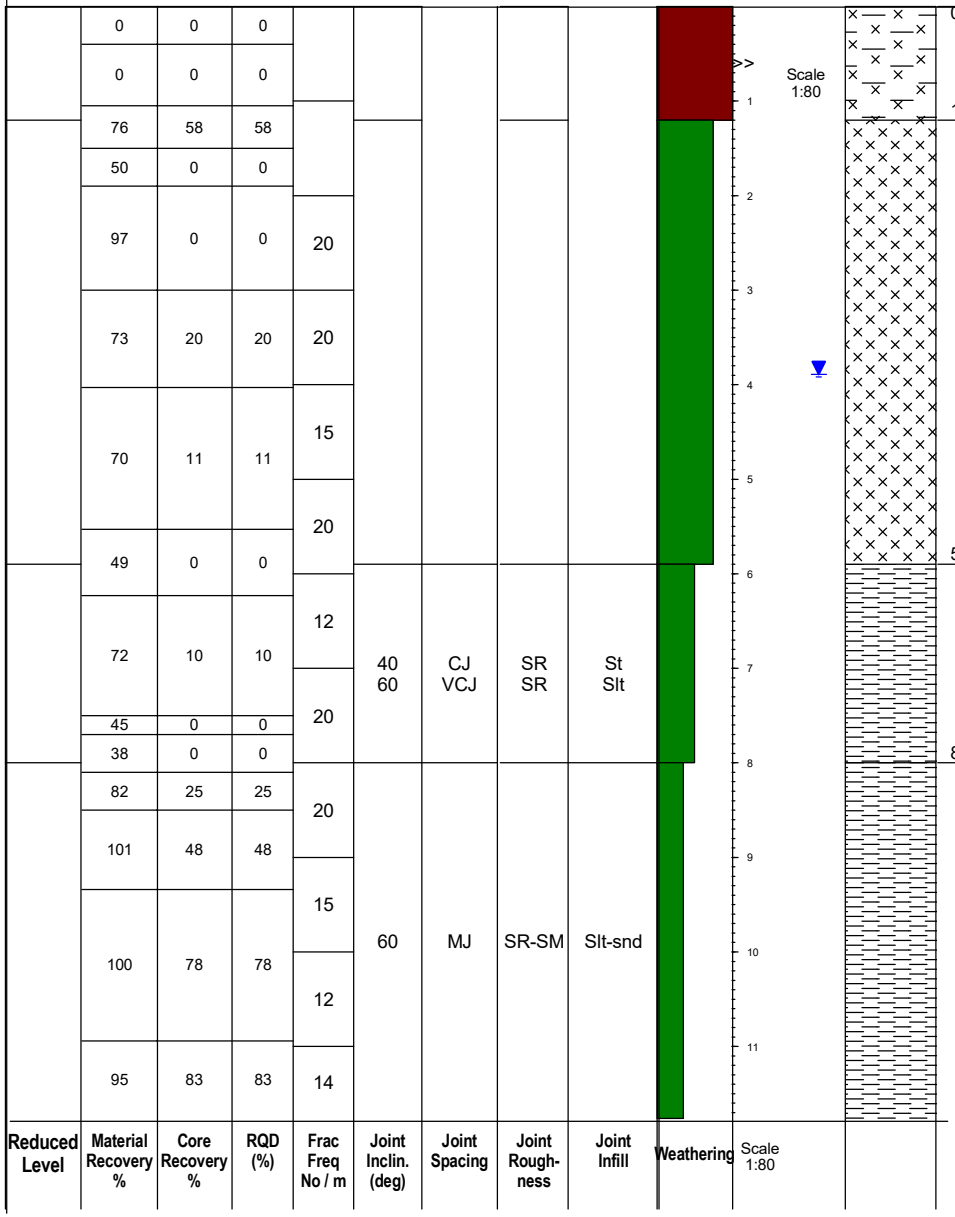
JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

ZUTARI
IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Sanitation

HOLE No: BH15
Sheet 1 of 2



Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	0	0	0						
	0	0	0						
	76	58	58						
	50	0	0						
	97	0	0	20					
	73	20	20	20					
	70	11	11	15					
	49	0	0	20					
	72	10	10	12	40 60	CJ VCJ	SR SR	St Slt	
	45	0	0	20					
	38	0	0						
	82	25	25	20					
	101	48	48						
	100	78	78	15 12	60	MJ	SR-SM	Slt-snd	
	95	83	83	14					

Slightly moist to wet, reddish brown, clayey SILT. Residual dolerite.

Olive green to dark grey, highly weathered, fine-grained, highly fractured, very soft to soft rock. Dolerite

Grey to light grey, stained black and white on joints, moderately weathered, fine-grained, very close to closely jointed (20- 170 mm), soft to medium hard rock. Mudstone.

Light grey stained black on joints, moderately weathered to slightly weathered, intensely bedded, very fine to fine grained, close to widely jointed(125- 720 mm), soft to medium hard rock. Mudstone

Contractor: Mukona Geotechnics **Logged by: D. Mabannda** **Elevation:**
Machine: D90 **Logged date: 2024/11/18** **North: -30.250305**
Drilled by: Lizwi **Drilled date: 2024/10/09 - 2024/10/10** **East: 25.738636**

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Sanitation

HOLE No: BH15
Sheet 2 of 2

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	95	83	83	14	60	MJ	SR-SM	Slt-snd	
				10	10	CJ	R	Cln	
	99	73	74		10	CJ	R	Cln	
				11	45	WJ	SM	St	
					70	WJ	SM	-	
	109	50	50	11	40	WJ	SM	-	
					80	-	SR	Slt-snd	

Scale 1:80

12 13 14 15 16 17 18 19 20 21 22 23

15

NOTES:

1. Borehole terminated at 15.00 m on medium strong rock mudstone
2. Rockhead intersected at 1.2 m
3. Water table depth at 3.89 m

Contractor: Mukona Geotechnics **Logged by: D. Mabannda** **Elevation:**
Machine: D90 **Logged date: 2024/11/18** **North: -30.250305**
Drilled by: Lizwi **Drilled date: 2024/10/09 - 2024/10/10** **East: 25.738636**

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Sanitation

HOLE No: BH16
Sheet 1 of 2

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	SPT Test	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	100	0	0							
	93	4	0							
	111	0	0							
	100	0	0		0					
	93	13	0	20		10 60 30	VCJ-MJ CJ-MJ CJ	SM SR SM	Cl Cl St	
	100	100	22	20						
				20						
	97	101	42	20						
	103	90	49	20						
				14		50	MJ	SR-R	St	
	100	98	83	17						
	100	75	0	20						
	100	96	48	20						
	100	100	43	15						

Scale 1:80

0.00 Slightly moist to moist, brown, silty SAND with grass roots. Topsoil
0.40 Slightly moist to moist, red brown to brown, silty CLAY with minor fine gravel and cobbles. Residual sandstone
1.62 Light grey stained black and white on joints, highly to moderately weathered, very fine grained, very closely to closely(70-200 mm) jointed, highly fractured, laminated , soft rock. Mudstone interlayed with Sandstone
3.00 Light grey stained black and orangish brown on joints, moderately weathered, very closely to widely jointed (60-590 mm), bedded. Mudstone.

Contractor: Mukona Geotechnics **Logged by: D. Mabannda** **Elevation:**
Machine: D90 **Logged date: 2024/11/18** **North: -30.250849**
Drilled by: Lezwi **Drilled date: 2024/10/04 - 2024/10/06** **East: 25.737847**

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

ZUTARI
IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Sanitation

HOLE No: BH16
Sheet 2 of 2

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	SPT Test	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	100	100	43	15		50	MJ	SR-R	St	
						10	VCJ-CJ	SM	Slt	
				14		10	VCJ-CJ	SM	Slt	
						70	CJ	SM	Slt-snd	
						80	-	-	Healed	
	100	100	84	2		10	MJ	SM	Cl	
						70	MJ	SR	St	
	100	100	73	10						

12.00 — Light grey stained black on joints, moderately weathered, very closely to medium jointed (40-470mm), very fine grained, bedded. Mudstone interlayed with sandstone.

15.1

Scale 1:80

NOTES:

1. Borehole terminated at 15.10 m on weak rock mudstone interlayed with sandstone
2. Rockhead intersected at 1.62 m
3. Water table depth at 1.66 m

Contractor: Mukona Geotechnics **Logged by: D. Mabannda** **Elevation:**
Machine: D90 **Logged date: 2024/11/18** **North: -30.250849**
Drilled by: Lezwi **Drilled date: 2024/10/04 - 2024/10/06** **East: 25.737847**

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

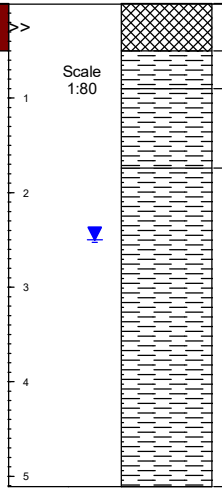
JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Santation

HOLE No: BH17
Sheet 1 of 1



Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	100	0	0						
	100	100	25	14	10 70	VCJ-CJ MJ	S - SR S	st cl	
	100	100	46	11					
	100	100	64	15	10 45	VCJ-CJ WJ	S - SR S	cl st	
	100	100	87	8					
	100	100	65						

0.00 Slightly moist, red brown, clayey SAND, with abundant angular to sub-angular dolerite gravel. Fill.

0.50 Slightly weathered, pale greenish grey, MUDSTONE / FINE SANDSTONE, fractured, recovered as angular, gravel size fragments (max 50 mm / ave 35 mm), very fine to fine grained.

0.90 Slightly weathered, pale greenish grey, MUDSTONE / FINE SANDSTONE, very fine to fine grained.
Fractured at 1.38 – 1.42 m.

1.74 Fresh to slightly weathered, alternating pale bluish grey and dark purplish grey, hard rock MUDSTONE, very fine grained.
Moderately weathered and very closely fractured, with bluish grey, mottled orange clay at 2.73 – 2.76 m, 2.79 – 2.81 m, 2.86 – 2.92 m and 3.08 – 3.09 m.
Fine sandstone bed at 3.54 – 4.18 m, 4.32 – 4.57 m and 5.13 – 5.26 m.

5.11

NOTES:

1. Borehole terminated at 5.11 m in hard rock mudstone
2. Rockhead intersected at 0.50 m
3. Water table depth at 2.50 m

Contractor: Mukona Geotechnics **Logged by: EdP** **Elevation:**
Machine: D90 **Logged date: 2024/02/12** **North: -30.239907**
Drilled by: Lizwi **Drilled date: 2024/01/11 - 2024/04/11** **East: 25.724382**

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

ZUTARI
IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Santation

HOLE No: BH18
Sheet 1 of 1

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	97	0	0						
	50	0	0						
	100	0	0						
	100	100	33	12	10 50 80	CJ CJ-MJ WJ	S SR SR	cl st cl	
	100	100	19	21	10 75	VCJ-CJ MJ	SR SR	st st	
	100	100	55						
	96	96	44	14					

Scale 1:80

0.00 — Slightly moist, red brown, speckled white, clayey SAND, with abundant angular to sub-angular gravel, fine roots. Fill.

0.70 — Slightly moist to moist, red brown, mottled pale yellowish grey, clayey, fine SAND, with abundant sub-angular to rounded gravel (max 55, ave 4 mm). Residual Dolerite.

1.76 — Slightly weathered, dark greyish black, hard rock MUDSTONE, very fine grained.
Slightly weathered, pale bluish grey, hard rock, fine sandstone at 2.2 – 2.52 m.
Closely fractured at 4.68 – 4.71 m and 4.76 – 4.79 m.

3.23 — Fresh, dark grey, mottled purplish red, hard rock MUDSTONE, very fine grained.
Closely fractured at 4.68 – 4.71 m and 4.76 – 4.79 m.

5.11

NOTES:

1. Borehole terminated at 5.11 m in hard rock mudstone
2. Rockhead intersected at 1.76 m
3. Water table depth at 1.87 m

Contractor: Mukona Geotechnics **Logged by: EdP**
Machine: D90 **Logged date: 2024/02/12**
Drilled by: Lizwi **Drilled date: 2024/05/11 -**

Elevation:
North: -30.218483
East: 25.721716

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

ZUTARI
IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Santation

ZUTARI

HOLE No: BH19
Sheet 1 of 1

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	SPT Test	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	90	0	0							
	88	0	0							
	89	0	0		24					
	78	0	0							
	100	100	81	5						
	97	90	90	2						
	100	100	100	0		10	CJ-VWJ	SR	cl	
	100	100	100	1						
	87	87	87	1						
	99	99	99	2		10	VCJ-MJ	S-SR	cl	
	100	100	98	4						

Scale 1:80

0.00 Dry, dark orange brown, mottled dark brown, with abundant sub-rounded gravel (max 10, ave 4 mm), scattered fine roots. Alluvium.

1.50 Moist, dark brown, becoming orange brown, mottled light grey with depth, with abundant fine grained gravel. Alluvium.

2.90 Slightly weathered, pale bluish grey, hard rock, fine SANDSTONE, fine grained.
Slightly weathered, mauve, hard rock mudstone bed at 3.58 – 3.67 m.
Highly weathered and fractured (with clay) at 3.95 – 4.02 m.

7.95 Fresh, bluish grey, mottled mauve, very fine grained.

10.16

NOTES:

1. Borehole terminated at 10.16 m in
2. Rockhead intersected at 2.90 m
3. Water table depth at 1.65 m

Contractor: Mukona Geotechnics **Logged by: EdP**
Machine: D90 **Logged date: 2024/02/12**
Drilled by: Lizwi **Drilled date: 2024/06/11 -**

Elevation:
North: -30.217163
East: 25.721756

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

ZUTARI
IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Sanitation

HOLE No: BH20
Sheet 1 of 1

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	SPT Test	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	100	0	0	0						
	95	0	0							
	100	0	0	0						
	87	0	0		35					
	100	92	25	20						
	100	86	19	20						
	100	100	69	20		0 30 70	VCJ CJ N/A	SM SR SM	St Clay Cln	

Scale 1:80

0.00 – 0.30	Slightly moist, light brown, sandy SILT with angular gravel. Topsoil
0.30 – 1.95	Slightly moist to wet, dark brown to olive grey, stiff, sandy CLAY. Residual mudstone
1.95 – 4.47	Olive green to light grey, completely to highly weathered, very fine grained, very intensely laminated, highly fractured, very soft to soft rock. Mudstone
4.47 – 5.17	Olive green to light grey, highly weathered, very fine grained, very intensely laminated, highly fractured, soft rock. Mudstone

NOTES:

1. Borehole terminated at 5.17 m on weak rock mudstone
2. Rockhead intersected at 4.47 m
3. Water table depth at

Contractor: Mukona Geotechnics **Logged by: D. Mabannda** **Elevation:**
Machine: D90 **Logged date: 2024/12/12** **North: -29.215804**
Drilled by: Lizwi **Drilled date: 2024/12/04 - 2024/12/04** **East: 26.22333**

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Santation

HOLE No: BH21
Sheet 1 of 1

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	100	0	0						
	91	91	64	8	10	VCJ-MJ	S	cn	
	99	99	65	7					
	100	100	76	8	10	VCJ-CJ	S	cl	
	100	100	49		10	VCJ-CJ	S	st	
	100	86	31	9	90		SR	st	

Scale 1:80

0.00	Slightly moist, orange brown, silty SAND, with abundant sub-angular to angular dolerite gravel (max 30 mm/ ave 5 mm), fine roots. Fill.
0.80	Slightly weathered, pale brownish grey, fine grained, medium to hard rock SANDSTONE
2.38	Slightly weathered, pale brownish grey, medium to hard rock SANDSTONE, very thinly to thinly bedded, sub-horizontal, filled up to 1 cm sandy clay, fine grained. Moderately weathered (yellowish brown) and fractured at 2.38 – 3 m.
3.54	Slightly weathered, light grey, hard rock SANDSTONE, fine grained. Light grey mudstone at 4.22 – 4.44 m. Very closely fractured, with sandy clay at 4.45 – 4.49 m. Very closely fractured at 4.73 – 4.76 m and 4.84 – 4.86 m.
5.13	

NOTES:

1. Borehole terminated at 5.13 m in hard rock sandstone
2. Rockhead intersected at 0.80 m
3. Water table depth at 0.30 m

Contractor: Mukona Geotechnics **Logged by: EdP**
Machine: D90 **Logged date: 2024/02/12**
Drilled by: Lizwi **Drilled date: 2024/07/11 -**

Elevation:
North: -30.038119
East: 25.793249

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

ZUTARI
IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Santation

ZUTARI IMPACT. ENGINEERS

HOLE No: BH22
Sheet 1 of 1

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	SPT Test	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	97	0	0							
	62	0	0							
	87	0	0		30					
	98	98	42	10		10	CJ	S	cl	
						10 50	CJ-MJ CJ-MJ	S SR	st st	
	99	99	18	10		10	CJ	S	cl	
	100	100	70			10 50	MJ CJ-MJ	S SR	st st	
	100	100	80	10 11						
	100	100	91	8						
	100	100	78	7		10 80	VCJ-MJ MJ	S SR	cl st	
	100	100	78	11						
	98	98	53	16						

Scale 1:80

0.00 Moist, red brown, mottled dark brown, (stiff) sandy CLAY, with abundant sub-rounded gravel. Alluvium.

1.95 Moderately weathered, mauve, soft rock MUDSTONE, partly fractured and filled with clay, very fine grained.

2.38 Slightly weathered, pale grey, hard rock, fine SANDSTONE, fine grained.

3.00 Slightly weathered, mauve, medium hard rock MUDSTONE, partly fractured and filled with clay, very fine grained.

3.54 Slightly weathered, pale grey, hard rock, fine SANDSTONE, fine grained.

4.23 Fresh, alternating pale bluish grey and light grey, hard rock MUDSTONE / fine SANDSTONE.
Moderately weathered and closely fractured, with sandy clay at 8.42 – 8.44 m.
Fractured at 8.6 – 8.7 m and 9.79 – 9.83 m.

10.08

NOTES:

1. Borehole terminated at 10.08 m in hard rock mudstone
2. Rockhead intersected at 1.95 m
3. Water table depth at 1.35 m

Contractor: Mukona Geotechnics **Logged by: EdP** **Elevation:**
Machine: D90 **Logged date: 2024/02/12** **North: -29.996282**
Drilled by: Lizwi **Drilled date: 2024/08/11 - 2024/09/11** **East: 25.810605**

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

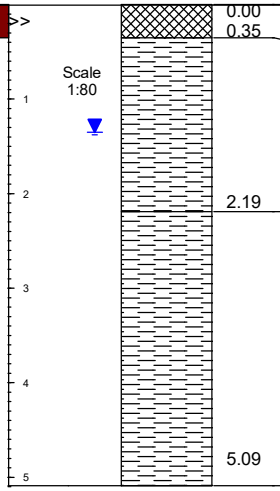
JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

ZUTARI
IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Santation

HOLE No: BH23
Sheet 1 of 1



Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	97	0	0						
	86	0	0						
	89	68	21	14					
	100	100	31	16	10 70	CJ-MJ MJ	S - SR SR	cl st	
	98	98	69	14					
	100	100	47						

0.00 0.35 Dry, red brown, clayey SAND, with scattered angular to sub-angular gravel (max 15 mm, ave 5 mm), scattered fine roots. Fill.

Highly weathered, purplish red, becoming light grey, mottled pale orange with depth, extremely soft rock MUDSTONE, fractured, filled with silty clay, very fine grained.

2.19 Slightly weathered, interbedded purplish black and khaki, medium hard rock MUDSTONE, with thin sandstone beds, very fine to fine grained.
Fractured, filled with clay at 3.44 – 3.5 m and 3.62 – 3.67 m.

5.09

NOTES:

1. Borehole terminated at 5.09 m in soft to medium hard rock mudstone
2. Rockhead intersected at 0.35 m
3. Water table depth at 0.25 m

Contractor: Mukona Geotechnics **Logged by: EdP**
Machine: D90 **Logged date: 2024/02/12**
Drilled by: Lizwi **Drilled date: 2024/11/13 -**

Elevation:
North: -29.96204
East: 25.824875

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

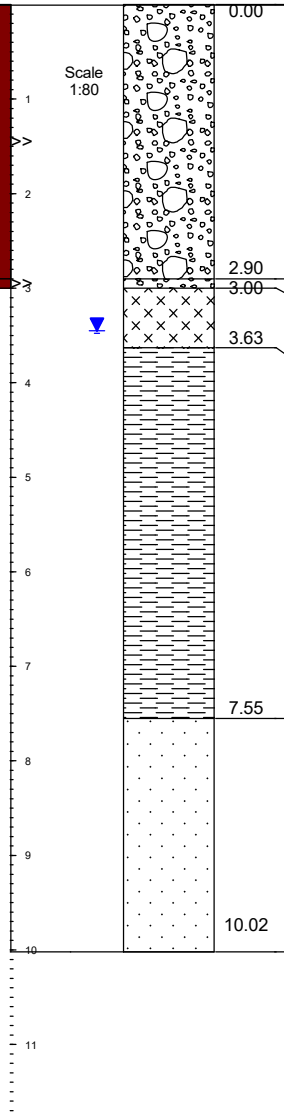
WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

ZUTARI
IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Santation

HOLE No: BH24
Sheet 1 of 1

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	SPT Test	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill
	100	0	0						
	100	0	0						
	100	0	0						
	100	0	0		17				
	63	0	0						
	98	98	27	17		5 70	CJ MJ	S S	st cl
	79	70	36	12					
	100	100	31	14		10 45 70	VCJ-CJ CJ CJ-MJ	S - SR S S	cl st st
	99	99	82	7					
	97	97	32	5					
	100	92	81	4		10 50	WJ CJ-WJ	S S	st st
	89	50	23	5					



0.00 Moist, red brown, mottled orange brown and light grey, fine sandy CLAY, with abundant sub-rounded gravel (max 20 mm, ave 3 mm). Alluvium.

2.90 Sub-rounded, soft to medium hard rock GRAVEL, with minor orange brown, sandy clay. Alluvium

3.00 Moderately weathered, grey, medium hard to hard rock DOLERITE, fine grained.
Fractured at 3.37 – 3.41 m.

3.63 Slightly weathered, alternating dark grey and khaki, hard rock MUDSTONE, very fine grained.
Fractured at 5.83 – 5.86 m.

7.55 Slightly weathered, light grey, medium hard rock, fine SANDSTONE, fine grained.
Fractured at 8.9 – 9.08 m, and 9.45 – 9.9 m.

10.02

NOTES:

1. Borehole terminated at 10.02 m in medium hard rock sandstone
2. Rockhead intersected at 3.00 m
3. Water table depth at 3.45 m

Contractor: Mukona Geotechnics **Logged by: EdP**
Machine: D90 **Logged date: 2024/02/12**
Drilled by: Lizwi **Drilled date: 2024/11/14 -**

Elevation:
North: -29.894485
East: 25.862342

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

ZUTARI
IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Santation

HOLE No: BH25
Sheet 1 of 1

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	SPT Test	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	100	0	0							
	77	0	0							
	58	0	0							
	100	0	0		20					
	100	0	0							
	100	100	25	11						
	100	100	46			10 80	CJ-MJ CJ-MJ	S - SR S - SR	st st	
	100	100	32	14						

Scale 1:80

0.00 Slightly moist, dark reddish brown, sandy CLAY, with abundant sub-angular dolerite gravel (max 30, ave 5 mm), fine roots. Fill.

0.45 Slightly moist to moist, dark brown, becoming orange brown with depth, (firm), sandy CLAY. Alluvium

1.90 Completely weathered, alternating khaki and mauve, extremely soft rock MUDSTONE, partly fracture and filled with fine sandy clay, very fine grained.

3.05 Highly weathered, alternating khaki and mauve, very soft rock MUDSTONE, very fine grained.
Fractured at 3.68 – 3.76 m and 4.08 – 4.15 m.

5.21

NOTES:

1. Borehole terminated at 5.21 m in very soft rock mudstone
2. Rockhead intersected at 1.90 m
3. Water table depth at 1.65 m

Contractor: Mukona Geotechnics **Logged by: EdP**
Machine: D90 **Logged date: 2024/02/12**
Drilled by: Lizwi **Drilled date: 2024/11/15 -**

Elevation:
North: -29.867362
East: 25.879719

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

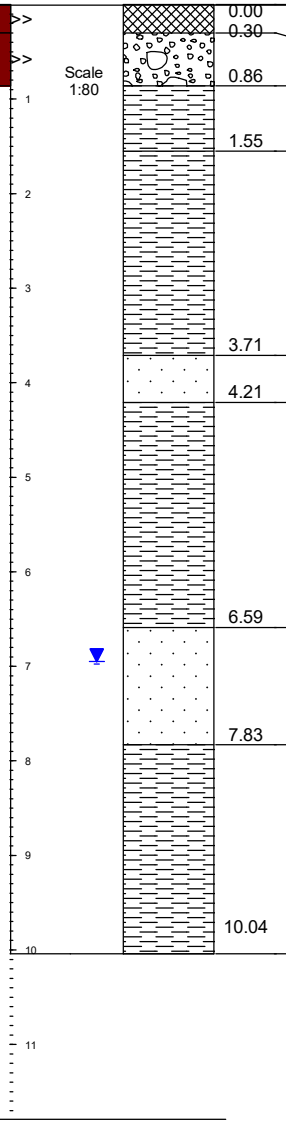
WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

ZUTARI
IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Santation

ZUTARI

HOLE No: BH26
Sheet 1 of 1



Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	100	0	0						
	64	0	0						
	90	0	0						
	100	89	7	10 12	10 80	VCJ-CJ -	S - SR S	cl cl	
	100	100	51	4					
	100	100	64		10 45	VCJ-MJ -	SR R	cl st	
	100	91	48	15 16	10 45	VCJ-MJ -	SR S	st st	
	100	95	83	8					
	100	100	66	17	10 45	VCJ-MJ -	SR R	cl st	
	100	93	71	10	10	VCJ-MJ	SR	st	
	98	89	33	11					

Scale 1:80

0.00 Dry, red brown, clayey sand, with abundant angular gravel (max 60 mm, ave 25 mm), abundant fine roots. FILL.

0.30 Dry to slightly moist, dark brown, fin sandy clay, with scattered fine gravel. Alluvium.

0.86 Highly weathered, pale greenish grey, soft to medium hard rock MUDSTONE, fractured, with yellowish grey, sandy clay, very fine grained.

1.55 "Slightly weathered, pale greenish grey, mottled mauve, medium hard rock MUDSTONE, very fine grained.
Highly weathered, extremely soft rock at 2.7 – 3.17 m and 3.37 – 3.4 m. "

3.71 Slightly weathered, pale yellowish grey, hard rock SANDSTONE, fine grained.

4.21 Slightly weathered, pale greenish grey, mottled mauve, medium hard rock MUDSTONE, very fine grained.
Fractured at 4.77 -4.81 m, 4.95 – 4.98 m and5.32 – 5.36 m.

6.59 Slightly weathered, pale yellowish grey, hard rock SANDSTONE, fine grained.

7.83 Slightly weathered, pale greenish grey, mottled mauve, medium hard rock MUDSTONE, very fine grained.
Fractured and partly filled with sandy clay at 7.83 – 7.91 m, 9.38 – 9.41 m, 9.7 – 9.79 m and 9.86 – 9.88 m.

10.04

NOTES:

1. Borehole terminated at 10.04 m in medium hard rock mudstone
2. Rockhead intersected at 0.86 m
3. Water table depth at 6.95 m

Contractor: Mukona Geotechnics **Logged by: EdP**
Machine: D90 **Logged date: 2024/02/12**
Drilled by: Lizwi **Drilled date: 2016/11/24 -**

Elevation:
North: -29.826512
East: 25.910854

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

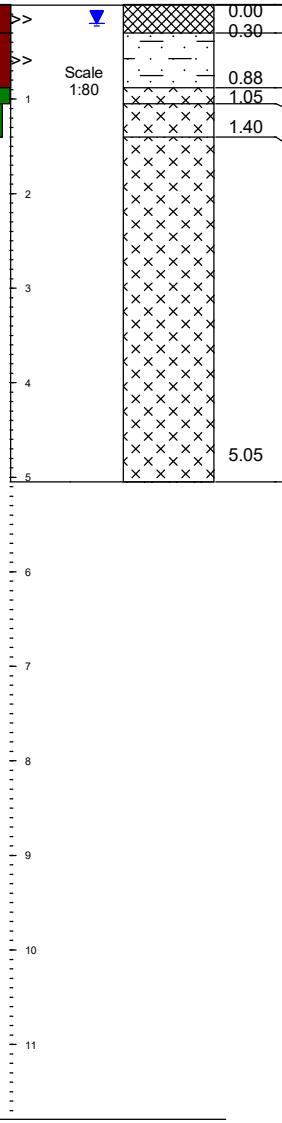
WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

ZUTARI
IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Santation

ZUTARI

HOLE No: BH28
Sheet 1 of 1



Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	100	0	0	0					
	92	20	20						
				16					
	100	100	20						
	100	100	33						
				13					
	98	98	50						
				15	20 80	VCJ-CJ CJ	SR SR	cl cl	
	100	100	30						
				20					
	100	100	0						

0.00	Slightly moist, dark brown, clayey SAND, with abundant fine gravel, fine roots. Fill.
0.30	Slightly moist, dark brown, clayey, fine SAND, with scattered fine gravel (up to 4 mm). Residual Dolerite.
0.88	Completely weathered, slightly moist, pale orange, mottled orange, with abundant soft rock fragments. Extremely soft rock DOLERITE.
1.05	Very highly to completely weathered, slightly moist, orange, friable. Very soft rock DOLERITE.
1.40	Moderately weathered, dark brownish grey, speckled black, medium hard rock DOLERITE, fine to medium grained.
5.05	

NOTES:

1. Borehole terminated at 5.05 m in medium hard rock dolerite
2. Rockhead intersected at 0.88 m
3. Water table depth at 0.20 m

Contractor: Mukona Geotechnics **Logged by: EdP**
Machine: D90 **Logged date: 2024/02/12**
Drilled by: Lizwi **Drilled date: 2024/11/20 -**

Elevation:
North: -29.757828
East: 25.957331

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

ZUTARI
IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Santation

ZUTARI

HOLE No: BH29
Sheet 1 of 1

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	100	0	0						
	51	0	0	0					
	100	26	0						
	99	86	43	16	10	WJ	R	cl	
	100	93	35	10	75	VCJ-MJ	SR	cl	
	76	76	34	14					
	100	100	85	6					

Scale 1:80

0.00 Moist, orange, mottled yellowish grey, clayey, fine SAND, with abundant sub-rounded gravel (max 40, ave 25 mm), fine roots. Fill.

1.00 Moderately weathered, khaki, soft rock MUDSTONE, very closely fractured (recovered as angular gravel to cobble size fragments with orange to yellowish grey sandy clay), very fine grained.

1.54 Slightly weathered, alternating dark greenish grey and mauve, medium hard rock MUDSTONE, with occasional thin, fine sandstone lenses.
Closely fractured at 2.63 – 2.66 m, 2.75 – 2.86 m and 2.94 – 3.05 m

5.07

NOTES:

1. Borehole terminated at 5.07 m in medium hard rock mudstone
2. Rockhead intersected at 1.00 m
3. Water table depth at 1.08 m

Contractor: Mukona Geotechnics **Logged by: EdP**
Machine: D90 **Logged date: 2024/02/11**
Drilled by: Lizwi **Drilled date: 2024/11/21 -**

Elevation:
North: -29.733755
East: 25.964622

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

ZUTARI
IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Santation

ZUTARI IMPACT. ENGINEERING

HOLE No: BH30
Sheet 1 of 1

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	SPT Test	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	100								
	99								
	96								
	100			42					
	100								
	100			38					
	100								
	100			24					
	98								
	100								
	100								
	100			10					
	84								
	96			14					
	85								

Scale 1:80

0.00 Dry, orange brown, clayey, fine SAND, with scattered angular to sub-angular dolerite and mudstone gravel (up to 40 mm). Fill

0.30 Slightly moist, orange brown, speckled red brown, (stiff) sandy CLAY. Alluvium. Abundant, fine, sub-rounded gravel at 3.4 – 3.8 m.

4.50 Slightly moist, orange brown, speckled red brown, (firm) sandy CLAY. Alluvium.

7.27 Moist, dark brown, (soft) silty CLAY. Alluvium.

8.60 Moist, light grey, speckled dark grey, (firm) sandy CLAY, with light brown sand pockets. Alluvium.

9.70 Moist, dark brown, silty CLAY, sparsely scattered medium hard rock sandstone gravel (up to 30 mm). Alluvium.

10

NOTES:

1. Borehole terminated at 10.00 m in silty clay
2. Rockhead not intersected
3. Water table depth at 2.15 m

Contractor: Mukona Geotechnics **Logged by: EdP**
Machine: D90 **Logged date: 2024/02/12**
Drilled by: Lizwi **Drilled date: 2024/11/22 -**

Elevation:
North: -29.66372
East: 25.987064

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Sanitation

HOLE No: BH31
Sheet 1 of 1

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering Scale 1:80
	73	0	0					0.00 Slightly moist to moist, dark brown to brown, silty SAND with coarse gravel to cobble. Fill
	60	0	0					
	91	0	0					1.72 Moist, orange brown to light brown speckled black, sandy silty CLAY . Residual mudstone
	75	0	0					3.00 Wet, orange brown speckled black and white, sandy SILT. Pedogenised residual mudstone
	100	0	0					5.1

Scale 1:80

NOTES:

1. Borehole terminated at 5.17 m on weak rock mudstone
2. Rockhead intersected at 4.47 m
3. Water table depth at 0.58 m

Contractor: Mukona Geotechnics **Logged by: D.Mabannda** **Elevation:**
Machine: D90 **Logged date: 2024/12/12** **North: -29.198584**
Drilled by: Lizwi **Drilled date: 2024/12/06 - 2024/12/06** **East: 26.203087**

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Santation

HOLE No: BH32
Sheet 1 of 1

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	SPT Test	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	100	0	0							
	46	0	0							
	100	0	0			10 50	CJ VCJ-CJ	S SR	st cl	
	100	0	0		0					
	91	91	15	16						
	100	100	15	24						
	100	100	52	15		10 60	CJ VCJ-CJ	S SR	cl st	
	100	100	51	12						
	100	100	65	13						
	95	95	67	7						
	100	100	83	6		10	CJ - MJ	S - SR	cn	
	100	100	100	4						
				5						

Scale 1:80

0.00 Slightly moist, red brown, silty sand, abundant fine gravel, fine roots. FILL.

0.30 Moist, dark brown sandy clay, with abundant sub-rounded, soft to medium hard rock dolerite and sandstone gravel (max 70 mm, ave 20 mm). Fill.

0.87 Moist, dark brown, mottled orange, fine sandy clay, with abundant fine mudstone gravel and ferricrete nodules (up to 4 mm). Residual MUDSTONE

1.64 Slightly weathered, khaki, becoming light grey with depth, hard rock MUDSTONE, very thinly to thinly bedded, near horizontal, smooth, stained purplish black, closely jointed (slightly rough, partly filled with brownish grey, sandy clay), with thin fine sandstone beds, very fine to fine grained.
Very closely fractured at 4.96 – 4.99 m.
Very closely fractured, with silty clay at 3.82 – 3.86 m, 3.94 – 3.97 m and 4.14 – 4.18 m.

6.44 Slightly weathered, light grey, medium hard to hard rock, fine SANDSTONE, with occasional thin mudstone beds. Very fine to fine grained.

10.08

NOTES:

1. Borehole terminated at 10.08 m in medium to hard rock sandstone
2. Rockhead intersected at 1.64 m
3. Water table depth at 1.38 m

Contractor: Mukona Geotechnics **Logged by: EdP**
Machine: D90 **Logged date: 2024/02/12**
Drilled by: Lizwi **Drilled date: 2024/11/23 -**

Elevation:
North: -29.597968
East: 26.02658

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

ZUTARI
IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Sanitation

HOLE No: BH35
Sheet 1 of 2

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	100	0	0						
	100	60	0						
	100	89	89	20					
	95	89	54	10					
	100	100	64	11					
				3					
	100	100	89	7					
	100	90	75	16	10 60 70 80	CJ CJ - VWJ	SR SM - SR	cl-slt Cl - St	
	100	100	97	5					
	100	100	97	5					
	100	100	97	3					
	100	100	100	2	10	CJ-MJ	R	Cln	
				3					

Scale 1:80

0.00 Slightly moist, light brown, silty GRAVEL with angular gravel of mudstone. Residual mudstone

0.30 Yellow brown stained black on joints, highly weathered, very fine grained, intensely laminated, highly fractured, very soft rock. Mudstone

2.50 Light grey to grey, moderately weathered to slightly weathered, fine grained, thinly bedded, very closely to very widely jointed (65- 2500 mm), hard rock. Sandstone

Notes:

1. Highly fractured zone and weathered zone at 6.4 to 6.6 m

10.00 Light grey stained reddish brown on jointed, moderately jointed, thinly bedded, very closely to widely jointed, hard rock. Sandstone.

Contractor: Mukona Geotechnics **Logged by: D. Mabannda** **Elevation:**
Machine: D90 **Logged date: 2024/11/19** **North: -29.515897**
Drilled by: Lizwi **Drilled date: 2024/10/11 - 2024/10/12** **East: 26.086552**

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Sanitation

HOLE No: BH35
Sheet 2 of 2

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
				3					
	74	74	50	3					
				16	10 60 60	CJ-MJ WJ WJ	R R R	Cln Slt-snd Slt-snd	
	145	145	145	10					

Scale 1:80

NOTES:

1. Borehole terminated at 15 m on strong rock sandstone
2. Rockhead intersected at 0.3 m
3. Water table depth at 5.90 m

Contractor: Mukona Geotechnics **Logged by: D. Mabannda** **Elevation:**
Machine: D90 **Logged date: 2024/11/19** **North: -29.515897**
Drilled by: Lizwi **Drilled date: 2024/10/11 - 2024/10/12** **East: 26.086552**

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

ZUTARI
IMPACT. ENGINEERED.

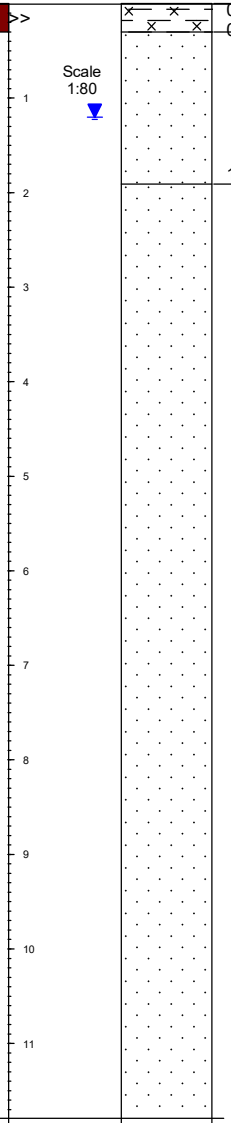
Free State Province
Xhariep Dam
1002533
Department of Water and Santation

ZUTARI

HOLE No: BH36
Sheet 1 of 2

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	100	0	0						
	84	84	28		10	VCJ-MJ	S	st-snd	
	100	100	100	4					
	98	98	98	2					
	100	100	88						
	100	100	100	8					
	100	100	100	1	10	VCJ-WJ	S	st-cn	
	100	100	96	1					
	100	100	95	4					
	100	100	91	2					
				2					
				5					

Scale 1:80



0.00 Grey and brown, mudstone and sandstone gravel in a matrix of brown silty CLAY with roots. Transported

0.30 Brown and black, moderately weathered, thinly bedded, very closely to medium jointed (20 mm - 300 mm), medium hard rock sandstone

1.91 Off-white, brown and black, moderately to slightly weathered, thinly bedded, very clsoely to widely jointed (40 mm - 1350 mm), hard rock sandstone

Contractor: Mukona Geotechnics **Logged by: SiN**
Machine: D90 **Logged date: 2024/10/24**
Drilled by: Lizwi **Drilled date: 2024/10/14 -**

Elevation:
North: -29.514733
East: 26.087749

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Santation

HOLE No: BH36
Sheet 2 of 2

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering	Scale 1:80
	100	100	91	5						12
	100	100	95	6						13
				2	10	VCJ-WJ	S	st-cn		14
					70	VCJ-WJ	S	st		
	100	100	91	5	70	VCJ-WJ	S	st		15
										15.22
										16
										17
										18
										19
										20
										21
										22
										23

NOTES:

1. Borehole terminated at 15.22 m in hard rock sandstone
2. Rockhead intersected at 0.30 m
3. Water table depth at 1.20 m

Contractor: Mukona Geotechnics **Logged by: SiN**
Machine: D90 **Logged date: 2024/10/24**
Drilled by: Lizwi **Drilled date: 2024/10/14 -**

Elevation:
North: -29.514733
East: 26.087749

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

ZUTARI
IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Santation

HOLE No: BH37
Sheet 1 of 1

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	SPT Test	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	100	0	0							
	100	0	0							
	100	0	0							
	82	0	0							
					17					
	100	0	0							
	81	0	0							
	29	0	0							
					9					
	100	100	25							
	99	99	74	8		45	VCJ	S - SR	cl	
	100	100	100	15		10	N/A	R	cl	
	100	100	100							
				13						
				0						
				2		10	WJ	S - SR	cl	
				1						

Scale 1:80

0.00 Dry, orange brown, silty SAND, with scattered, sub-rounded gravel (max 20 mm, ave 4 mm). Alluvium.

0.97 Slightly moist, dark brown, clayey SAND. Alluvium.

1.30 slightly moist, orange brown, silty SAND, with scattered, sub-rounded gravel (max 20 mm, ave 4 mm). Alluvium.

1.50 Slightly moist, dark brown, mottled light brown (medium dense), clayey SAND. Alluvium.

2.62 Slightly moist, light grey, clayey SAND. Alluvium.

4.20 Completely weathered, light grey, mottled orange, extremely soft rock MUDSTONE, very fine grained.

4.50 Slightly weathered, alternating mauve and dark grey, medium hard rock MUDSTONE, very fine grained.
Closely fractured, with clay at 5.01 – 5.04 m, 5.42 – 5.46 m and 5.5 – 5.52 m.
Hard rock sandstone (as below) at 5.52 – 5.58 m

6.30 Slightly weathered, pale bluish grey, hard rock SANDSTONE, fine grained.

10.29

NOTES:

1. Borehole terminated at 10.29 m in hard rock sandstone
2. Rockhead intersected at 4.20 m
3. Water table depth at 2.55 m

Contractor: Mukona Geotechnics **Logged by: EdP** **Elevation:**
Machine: D90 **Logged date: 2024/02/12** **North: -29.474448**
Drilled by: Lizwi **Drilled date: 2024/11/28 - 2024/11/29** **East: 26.1017**

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

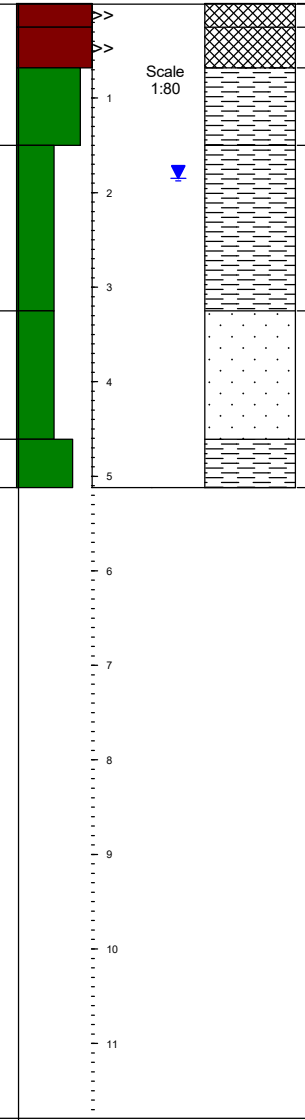
WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

ZUTARI
IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Santation

ZUTARI

HOLE No: BH38
Sheet 1 of 1



Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	78	0	0					
	67	0	0					
	63	39	13	10	CJ	S	cl	
	92	92	56					
	100	100	22	10	VCJ-CJ	S	cl	
	48	48	0					
	100	100	0	10	VCJ	SR	cl	

0.00 Slightly moist, dark brown, sandy CLAY. Fill.

0.25 Slightly moist, yellowish brown, mottled light orange, clayey fine SAND, with scattered sub-angular gravel (max 60 mm, ave 4 mm), piece of glass. Fill.

0.68 Very highly to completely weathered, pale grey, partly stained orange and black, extremely soft rock MUDSTONE, very closely fractured, recovered as angular, gravel size fragments in orange brown sandy clay.

1.50 Moderately weathered, dark reddish brown, soft rock MUDSTONE, very fine grained.
Very closely fractured at 1.55 – 1.6 m, 1.66 – 1.69 m and 1.94 – 2.3 m.
Completely weathered (orange sandy clay) at 2.41 – 2.54 m and 3.01 – 3.25 m.

3.25 Moderately weathered, red brown, soft rock, fine SANDSTONE, fine grained.
Completely weathered (sandy clay) at 3.3 – 3.44 m.

4.61 Highly weathered, dark reddish brown, soft rock MUDSTONE, very fine grained.

5.12 Fractured at 4.06 – 4.73 m.

Completely weathered (light brown sandy clay) at 5.08 – 5.12 m.

NOTES:

1. Borehole terminated at 5.12 m in soft rock mudstone
2. Rockhead intersected at 0.68 m
3. Water table depth at 1.85 m

Contractor: Mukona Geotechnics **Logged by: EdP** **Elevation:**
Machine: D90 **Logged date: 2024/02/12** **North: -29.452535**
Drilled by: Lizwi **Drilled date: 2024/11/29 - 2024/11/30** **East: 26.199082**

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Santation

HOLE No: BH39
Sheet 1 of 1

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	100	0	0						
	99	0	0						
	50	0	0						
	100	100	87	8					
	100	96	73	9					
	100	100	99						
				2					
	100	100	82		10	VCJ-WJ	SR	st	
	100	100	100		45	N/A	S-SR	cl	
	100	100	89	7					
	100	100	100						
	100	100	85	6					
				6	10	CJ	S	cl	
				5					
					10	VCJ-WJ	SR	st	
				3	45	N/A	S-SR	cl	
				5	10	CJ-MJ	S - SR	cl (calcrete)	

Scale 1:80

0.00 Dry, orange brown, silty SAND, with abundant sub-angular to sub-rounded gravel (max 10 mm, ave 4 mm). Alluvium.

0.42 Slightly moist, light grey, mottled dark brown, with abundant sub-angular to sub-rounded gravel (max 15 mm, ave 7 mm), with a single sub-rounded hard rock sandstone (90 mm). Alluvium.

1.53 Slightly weathered, pale bluish grey, fine SANDSTONE, fine grained.
Hard rock MUDSTONE at 2.55 – 2.7 m and 2.8 – 3 m.
Moderately weathered and closely fractured, with sandy clay at 2.84 – 2.9 m.

5.80 Slightly weathered, dark grey, hard rock MUDSTONE, very fine grained.
Hard rock SANDSTONE (pale purplish grey) at 6.19 – 6.59m
Highly weathered and very closely fractured at 6.59 – 6.62 m

7.11 Slightly weathered, pale bluish grey, fine SANDSTONE, fine grained.

8.83 Fresh, bluish grey, hard rock MUDSTONE, with thin fine sandstone beds, very fine to fine grained.

10.11

NOTES:

1. Borehole terminated at 10.11 m in hard rock mudstone
2. Rockhead intersected at 1.53 m
3. Water table depth at 3.25 m

Contractor: Mukona Geotechnics **Logged by: EdP**
Machine: D90 **Logged date: 2024/02/12**
Drilled by: Lizwi **Drilled date: 2024/11/30 -**

Elevation:
North: -29.455057
East: 26.218372

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

ZUTARI
IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Sanitation

ZUTARI

HOLE No: BH40
Sheet 1 of 1

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	83	0	0	20	20 0 10	VCJ VCJ VCJ	SM SM SM	Clay St St	
	31	7	0						
	62	47	0	20					
	63	63	0	20					
	100	100	36	20	0 10 20 70	CJ CJ CJ N/A	SM SR SR SR	Cln Cln Cln St	

Scale 1:80

0.00 Slightly moist, dark brown, clayey SAND. Residual sandstone

0.70 Dark grey streaked light brown, stained dorange on joints, highly to moderately weathered, very fine grained, very closely to closely weathered, intensely laminated. Sandstone

1.50 Dark grey streaked light brown, stained orange on joints, highly to moderately weathered, very fine grained, very closely to closely weathered, intensely laminated. Sandstone

4.60 Dark grey streaked light brown, moderately weathered, very fine grained, very close to closely jointed(75 to 102 mm), intensely laminated. Sandstone interlayed with mudstone

5.08

NOTES:

1. Borehole terminated at 5.08 m on weak rock mudstone
2. Rockhead intersected at 4.6 m
3. Water table depth at 0.85 m

Contractor: Mukona Geotechnics **Logged by: D.Mabannda** **Elevation:**
Machine: D90 **Logged date: 2024/12/12** **North: -29.437607**
Drilled by: Lizwi **Drilled date: 2024/11/03 - 2024/11/03** **East: 26.27896**

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

ZUTARI
IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Santation

ZUTARI IMPACT. ENGINEERED.

HOLE No: BH42
Sheet 1 of 1

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	SPT Test	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	100	0	0						
	100	0	0						
	100	0	0						
	100	0	0	30					
	100	78	0		10 80		S SR	cl st	
	100	100	0						
	99	99	0						
	100	100	0						
	100	100	0		10 45		S S	cl cl	
	100	100	0						
	99	99	0						
	100	100	0						

Scale 1:80

0.00 Slightly moist, dark brown, mottled pale orange brown, silty, fine SAND, scattered fine roots. Alluvium.

1.20 Slightly moist, brownish grey, mottled dark brown, speckled orange, (stiff), fine sandy CLAY, with abundant sub-rounded gravel and ferricrete nodules (max 10 mm, ave 4 mm). Slightly ferruginous alluvium.

2.17 Slightly weathered, dark brownish grey, medium hard rock, fine SANDSTONE, fine grained.

3.51 Slightly weathered, alternating grey and pale yellowish grey, medium hard rock, fine SANDSTONE, with abundant thin mudstone beds, very fine to fine grained.

10.08

NOTES:

1. Borehole terminated at 10.08 m in soft rock mudstone
2. Rockhead intersected at 2.17 m
3. Water table depth at 7.90 m

Contractor: Mukona Geotechnics **Logged by: EdP**
Machine: D90 **Logged date: 2024/02/12**
Drilled by: Lizwi **Drilled date: 2024/01/11 -**

Elevation:
North: -29.404691
East: 26.322801

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

ZUTARI
IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Sanitation

HOLE No: BH47
Sheet 1 of 1

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	100	0	0						
	71	0	0						
	74	0	0						
	57	51	28	15					
	100	100	13	20	0 10 60	VCJ-CJ CJ N/A	SM SR SM	Cln Cln Clay	
	100	100	24	20					

Scale 1:80

0.00 Slightly moist to moist, dark brown, sandy CLAY with minor gravel. Topsoil

1.00 Slightly moist to moist, light grey, silty CLAY . Residual mudstone

1.60 Light grey, completely weathered to highly weathered, very fine grained, highly fractured, very soft rock. Mudstone. 1. Highly fractured core

3.00 Light grey to maroon, highly to moderately weathered, very fiine grained, very closely to closely jointed, very fractured, very soft to soft rock. Mudstone

5.09

NOTES:

1. Borehole terminated at 5.09 m on weak rock mudstone
2. Rockhead intersected at 3.0 m
3. Water table depth at 1.25 m

Contractor: Mukona Geotechnics **Logged by: D.Mabannda** **Elevation:**
Machine: D90 **Logged date: 2024/12/12** **North: -29.325249**
Drilled by: Lizwi **Drilled date: 2024/12/03 - 2024/12/03** **East: 26.366621**

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

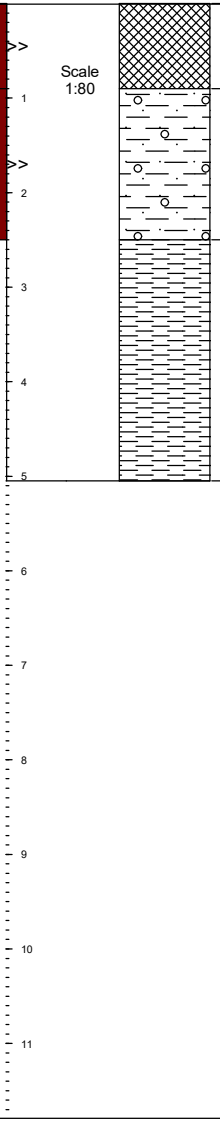
JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

ZUTARI
IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Sanitation

HOLE No: BH48
Sheet 1 of 1



Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering Scale 1:80
	100	0	0						
	73	0	0						
	100	0	0						
	100	0	0						
	51	0	0						
	62	62	0	20					
	95	90	0	20					

Slightly moist to moist, light grey to brow, silty CLAY with sub-angular gravel. Fill

Slightly moist to moist, dark brown speckled black, sandy CLAY with minor gravel. Colluvium

Light grey to olive green, speckled black, completely weathered to highly weathered, very fine grained, intensely laminated, very soft rock. Mudstone

NOTES:

1. Borehole terminated at 5.05 m on weak rock mudstone
2. Rockhead intersected at 2.5 m
3. Water table depth at 1.35 m

Contractor: Mukona Goetechnics **Logged by: D.Mabannda** **Elevation:**
Machine: D90 **Logged date: 2024/12/12** **North: -29.210791**
Drilled by: Lizwi **Drilled date: 2024/11/05 - 2024/11/05** **East: 26.214161**

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Sanitation

HOLE No: BH54
Sheet 1 of 1

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	100	0	0	0					
	100	0	0						
	100	0	0	0					
	100	0	0						
	49	0	0	0					
	96	0	0	3					
	86	58	58						
	100	100	64	13	30 45 50 80	CJ CJ CJ CJ	R R R R	St Sandy clay Clay St	
	100	100	69	7					
	100	100	94	6	10 20 30 40	CJ-MJ TJ MJ-WJ WJ	R SR R R	St St St St	
	100	100	79	2 5 7					

Scale 1:80

0.00 Slightly moist , light brown, silty SAND with grass roots. Topsoil

0.30 Slightly moist to moist, dark brown, sandy CLAY. Residual dolerite

3.45 Grey speckled light grey, moderately weathered, medium grained, massive, very closely to closely jointed, hard rock. Dolerite

Note:
1. Joints filled with clay (30 mm).
2. Highly fractured zone from 6.3 - 6.47 m.

6.57 Light grey speckled dark grey stained dark brown, to light brown on joints, moderately to slightly weathered, medium grained, closely to widely jointed, hard to very hard rock. Dolerite

Note:
1. Highly fractured zone at 9.56 to 9.66 m.

10.05

NOTES:

1. Borehole terminated at 10.05 m on weak rock mudstone
2. Rockhead intersected at 2.5 m
3. Water table depth at 2.35 m

Contractor: Mukona Geotechnics **Logged by: D.Mabannda**
Machine: D90 **Logged date: 2024/12/13**
Drilled by: Lizwi **Drilled date: 2024/12/06 - 2024/12/06**

Elevation:
North: -29.268076
East: 26.615953

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

ZUTARI
IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Sanitation

ZUTARI

HOLE No: BH58
Sheet 1 of 2

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering	Scale 1:80
	100	0	0						0.00
									0.50
	61	61	31						
	76	76	24						
	93	93	36						
	100	100	81	20 0 80	CJ VCJ-CJ WJ	SR SR R	- Cl-st St		
	94	94	45						
									6.00
	100	100	61						
	100	100	60						
	100	100	75	0	CJ-MJ	SR	Cln		
	100	100	93						

Slightly moist, brown to light grey, silty sandy CLAY. Residual mudstone

Grey to light grey stained black on joints, highly weathered to moderately weathered, fine grained, intensely laminated, very closely to widely jointed (10- 1840 mm), very soft to soft rock. Mudstone interlayed with sandstone.

Light grey to grey stained maroon, moderately weathered to slightly weathered, fine grained, intensely laminated, closely to widely jointed, soft rock with lenses of sandstone. Mudstone

Contractor: Mukona Geotechnics **Logged by: D. Mabannda** **Elevation:**
Machine: D90 **Logged date: 2024/11/20** **North: -30.544842**
Drilled by: Lizwi **Drilled date: 2024/09/23 - 2024/09/25** **East: 25.512356**

ABREVIATIONS	JOINT INFILL	JOINT SPACING	JOINT ROUGHNESS	WEATHERING SHADING
N/A not applicable	Cl Clay	VCJ very close spacing	S smooth	BROWN soil
N/M not measureable	Slt Silt	CJ close spacing	SR slightly rough	100% completely weathered
IT invalid test	Snd Sand	MJ medium spacing	R rough	75% highly weathered
NT no test	St Stained	WJ wide spacing		50% moderately weathered
	Cn Clean	VWJ very wide spacing		25% slightly weathered
				0% unweathered

ZUTARI IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Sanitation

HOLE No: BH58
Sheet 2 of 2

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering	Scale 1:80	
	100	100	93							
	100	100	52	0 60 60 80	CJ-MJ WJ WJ -	SR SR SR SR-R	Cln Cln Cln Cln		12 13	13.00
	100	100	77	0	VCJ-MJ	SR	Cln		14 15	15.17

Light grey to maroon, moderately weathered, very fine to fine grained, intensely laminated, very closely to widely jointed, fine grained, soft rock. Mudstone

NOTES:

1. Borehole terminated at 15.17 m on weak rock mudstone
2. Rockhead intersected at 1.25 m
3. Water table depth at 5.70 m

Contractor: Mukona Geotechnics **Logged by: D. Mabannda** **Elevation:**
Machine: D90 **Logged date: 2024/11/20** **North: -30.544842**
Drilled by: Lizwi **Drilled date: 2024/09/23 - 2024/09/25** **East: 25.512356**

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Sanitation

HOLE No: BH59
Sheet 1 of 2

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	100	0	0						
	100	0	0						
	82	20	0	20					
	97	90	80	4					
	103	100	79	17					
	100	100	73	9 6	10 40 0	VJ-MJ - CJ-MJ	SR-SM R R	- - -	
	100	100	93	13					
	100	100	96	6 6					
	100	100	100	2 6	0	CJ	SM	Cln	
	100	100	80	6					

Scale 1:80

0.00 Slightly moist, brown, silty clayey SAND. Topsoil
0.30 Slightly moist to moist, brown, silty clay with minor angular gravel of mudstone. Mudstone
1.25 Light yellowish brown to olive to grey, completely weathered, intensely laminated, very fine grained, highly fractured, very soft to soft rock. Mudstone
1.70 Light grey to dark grey, moderately to slightly weathered, very fine grained, intensely laminated, very closely to medium jointed, (120- 560mm) spacing, soft rock - medium strong rock. Mudstone
7.00 Light grey to dark grey, moderately to slightly weathered, very fine grained, intensely laminated, very closely to medium jointed (120- 560mm) spacing, soft to medium hard rock. Mudstone

Contractor: Mukona Geotechnics **Logged by: D. Mabannda** **Elevation:**
Machine: D90 **Logged date: 2024/11/20** **North: -30.545069**
Drilled by: Lizwi **Drilled date: 2024/09/20 - 2024/09/21** **East: 25.510214**

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

ZUTARI
IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Sanitation

HOLE No: BH59
Sheet 2 of 2

Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill
100	100	80	6				
100	100	100	6	0	CJ	SM	Cln
			6	30	VWJ	SR	Cln
				30	VWJ	SR	Cln
100	95	90	4	40	CJ-MJ	SR-SM	Cl

Reduced Level: 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23

Weathering

Scale 1:80

15

NOTES:

1. Borehole terminated at 15.00 m on medium strong rock mudstone
2. Rockhead intersected at 1.25 m
3. Water table depth at 1.55 m

Contractor: Mukona Geotechnics **Logged by: D. Mabannda** **Elevation:**
Machine: D90 **Logged date: 2024/11/20** **North: -30.545069**
Drilled by: Lizwi **Drilled date: 2024/09/20 - 2024/09/21** **East: 25.510214**

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Sanitation

HOLE No: BH60
Sheet 1 of 2

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	SPT Test	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	250	0	0							
	107	0	0							
	83	0	0							
	100	0	0		0					
	96	84	52	13						
	100	100	45	12		0 30 60	VCJ-CJ VCJ MJ	SR-SM - SR-SM	Cl - Slt	
				17						
	100	100	84	6						
	100	100	90	4						
				14						
	100	100	91	3		0	CJ	R	Cln	
	100	100	97	6						
				6						
	100	100	83	8						

Scale 1:80

0.00

Slightly moist to moist, dark brown to light brown, very stiff, silty CLAY with gravel of mudstone. Residual mudstone

2.00

Light grey stained black on joints, completely to highly weathered, fine grained, intensely laminated, very closely to closely jointed (15 - 360 mm), very soft to soft rock. Mudstone

4.50

Light grey, moderately weathered, fine grained, intensely laminated, very closely to widely jointed, soft to medium hard rock. Mudstone interlayered with sandstone.

Note:

1. Highly fractured zone at 7.8 to 7.85 m

Contractor: Mukona Geotechnics **Logged by: D.Mabannda** **Elevation:**
Machine: D90 **Logged date: 2024/11/20** **North: -30.54584**
Drilled by: Lizwi **Drilled date: 2024/09/18 - 2024/09/19** **East: 25.510864**

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Sanitation

HOLE No: BH60
Sheet 2 of 2

Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	SPT Test	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill
100	100	83	8		0	CJ	R	Cln
100	100	92	6		60	WJ	SR	Cln
			4		60	WJ	SR	Cln
100	100	89	2		30	WJ	SR	St
					90	-	R	Cln

Reduced Level | Weathering | Scale 1:80

12
13
14
15
15.1
16
17
18
19
20
21
22
23

NOTES:

1. Borehole terminated at 15.10 m on medium strong rock mudstone interlayered with sandstone
2. Rockhead intersected at 2.00 m
3. Water table depth at 1.95 m

Contractor: Mukona Geotechnics **Logged by: D.Mabannda** **Elevation:**
Machine: D90 **Logged date: 2024/11/20** **North: -30.54584**
Drilled by: Lizwi **Drilled date: 2024/09/18 - 2024/09/19** **East: 25.510864**

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

ZUTARI
IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Sanitation

ZUTARI

HOLE No: BH61
Sheet 1 of 2

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
	100	0	0						
	100	40	0						
	100	100	26	20	10	VCJ	SR	-	
	100	89	57	15	20 40	VCJ-MJ -	SR SR-SM	- St	
	100	100	86	10					
	100	93	98	5 7					
	100	100	95	4					
	100	100	66	6 20	10	CJ-MJ	AR-SM	St	
	100	100	92	6					
	100	100	95	5 4					

Scale 1:80

0.00 Dry to slightly moist, silty CLAY with abundant fine to coarse, angular gravel of mudstone. Residual mudstone

0.20 Light grey, completely weathered to highly weathered, fine-grained intensely laminated, very closely to medium jointed (40 to 320 mm), very soft to soft rock. Mudstone

3.20 Light grey, moderately weathered, fine-grained, intensely laminated, very closely to widely jointed (40 to 450 mm), soft to medium hard rock. Mudstone interlayered with sandstone.

Contractor: Mukona Geotechnics **Logged by: D. Mabannda** **Elevation:**
Machine: D90 **Logged date: 2024/11/20** **North: -30.544247**
Drilled by: Lizwi **Drilled date: 2024/09/14 - 2024/09/17** **East: 25.511615**

ABREVIATIONS
N/A not applicable
N/M not measureable
IT invalid test
NT no test

JOINT INFILL
Cl Clay
Slt Silt
Snd Sand
St Stained
Cn Clean

JOINT SPACING
VCJ very close spacing
CJ close spacing
MJ medium spacing
WJ wide spacing
VWJ very wide spacing

JOINT ROUGHNESS
S smooth
SR slightly rough
R rough

WEATHERING SHADING
BROWN soil
100% completely weathered
75% highly weathered
50% moderately weathered
25% slightly weathered
0% unweathered

ZUTARI
IMPACT. ENGINEERED.

Free State Province
Xhariep Dam
1002533
Department of Water and Sanitation

HOLE No: BH61
Sheet 2 of 2

Reduced Level	Material Recovery %	Core Recovery %	RQD (%)	Frac Freq No / m	Joint Inclin. (deg)	Joint Spacing	Joint Rough-ness	Joint Infill	Weathering
				4					
	100	100	62	9					
				5	10 40 40 80	CJ-MJ CJ CJ -	AR-SM R R SR	St Cln Cln St	
	100	101	95	2					

Scale 1:80

15.01

NOTES:

1. Borehole terminated at 15.01 m on medium strong rock mudstone interlayered with sandstone
2. Rockhead intersected at 0.20 m
3. Water table depth at 2.60 m

Contractor: Mukona Geotechnics **Logged by: D. Mabannda** **Elevation:**
Machine: D90 **Logged date: 2024/11/20** **North: -30.544247**
Drilled by: Lizwi **Drilled date: 2024/09/14 - 2024/09/17** **East: 25.511615**

Appendix F - Borehole Photographs

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH01
DATE PROFILED	2024/11/19	**Box No.**	1 of 5
DEPTH (m) FROM	0 **to** 3.71		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH01
DATE PROFILED	2024/11/19	**Box No.**	2 of 5
DEPTH (m) FROM	3.71 **to** 7.31		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH01
DATE PROFILED	2024/11/19	**Box No.**	3 of 5
DEPTH (m) FROM	7.31 **to** 10.87		

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IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH01
DATE PROFILED	2024/11/19	**Box No.**	4 of 5
DEPTH (m) FROM	10.87 **to** 14.3		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH01
DATE PROFILED	2024/11/19	**Box No.**	5 of 5
DEPTH (m) FROM	14.3 **to** 14.97		

ZUTARI
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Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	
DATE PROFILED	2024/11/19	**Box No.**	
DEPTH (m) FROM	**to**		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH02
DATE PROFILED	2024/11/19	**Box No.**	1 of 5
DEPTH (m) FROM	0 **to** 3.38		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH02
DATE PROFILED	2024/11/19	**Box No.**	2 of 5
DEPTH (m) FROM	3.38 **to** 6.98		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH02
DATE PROFILED	2024/11/19	**Box No.**	3 of 5
DEPTH (m) FROM	6.98 **to** 10.30		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH02
DATE PROFILED	2024/11/19	**Box No.**	4 of 5
DEPTH (m) FROM	10.30 **to** 13.76		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH02
DATE PROFILED	2024/11/19	**Box No.**	5 of 5
DEPTH (m) FROM	13.76 **to** 15.15		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	
DATE PROFILED		**Box No.**	
DEPTH (m) FROM	**to**		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH03
DATE PROFILED	2024	**Box No.**	1 of 2
DEPTH (m) FROM	0.00 **to** 3.31		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH03
DATE PROFILED		**Box No.**	2 of 2
DEPTH (m) FROM	**to**		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnis	**BH No.**	BH04
DATE PROFILED	2024/10/24	**Box No.**	1 of 2
DEPTH (m) FROM	0 **to** 3.66		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH04
DATE PROFILED	2024/10/24	**Box No.**	2 of 2
DEPTH (m) FROM	3.66 **to** 5.18		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnis	**BH No.**	BH05
DATE PROFILED	2024	**Box No.**	1 of 2
DEPTH (m) FROM	0 **to** 3.57		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH05
DATE PROFILED	2024	**Box No.**	2 of 2
DEPTH (m) FROM	**to**		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH06
DATE PROFILED	2024/10/24	**Box No.**	1 of 2
DEPTH (m) FROM	0 **to** 3.26		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH06
DATE PROFILED	2024/10/24	**Box No.**	2 of 2
DEPTH (m) FROM	3.26 **to** 5.21		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH07
DATE PROFILED	2024/10/24	**Box No.**	1 of 3
DEPTH (m) FROM	0 **to** 3.63		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR		**BH No.**	BH07
DATE PROFILED	2024/10/24	**Box No.**	2 of 3
DEPTH (m) FROM	3.63 **to** 7.21		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH07
DATE PROFILED	2024/10/24	**Box No.**	3 of 3
DEPTH (m) FROM	7.21 **to** 9.98		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH09
DATE PROFILED	2024/10/24	**Box No.**	1 of 2
DEPTH (m) FROM	0 **to** 3.61		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH09
DATE PROFILED	2024/10/24	**Box No.**	2 of 2
DEPTH (m) FROM	3.61 **to** 5.25		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH10
DATE PROFILED	2024/10/24	**Box No.**	1 of 3
DEPTH (m) FROM	0 **to** 4.33		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH10
DATE PROFILED	2024/10/24	**Box No.**	2 of 3
DEPTH (m) FROM	4.33 **to** 7.85		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH10
DATE PROFILED	2024/10/24	**Box No.**	3 of 3
DEPTH (m) FROM	7.85 **to** 10.15		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH11
DATE PROFILED	2024/10/24	**Box No.**	1 of 2
DEPTH (m) FROM	0 **to** 3.89		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH11
DATE PROFILED	2024/10/24	**Box No.**	2 of 2
DEPTH (m) FROM	3.89 **to** 5.29		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH12
DATE PROFILED	2024	**Box No.**	1 of 3
DEPTH (m) FROM	0 **to**		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH12
DATE PROFILED	2024/	**Box No.**	2 of 3
DEPTH (m) FROM	**to**		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH12
DATE PROFILED	2024	**Box No.**	3 of 3
DEPTH (m) FROM	0 **to**		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH13
DATE PROFILED	2024	**Box No.**	1 of 2
DEPTH (m) FROM	0 **to** 3.72		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH13
DATE PROFILED	2024/	**Box No.**	2 of 2
DEPTH (m) FROM	3.72 **to** 5.07		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH14
DATE PROFILED	2024	**Box No.**	1 of 2
DEPTH (m) FROM	0.00 **to** 3.78		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH14
DATE PROFILED	2024/	**Box No.**	2 of 2
DEPTH (m) FROM	3.78 **to** 5.10		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH15
DATE PROFILED	2024/11/18	**Box No.**	1 of 5
DEPTH (m) FROM	0 **to** 3.52		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH15
DATE PROFILED	2024/11/18	**Box No.**	2 of 5
DEPTH (m) FROM	3.52 **to** 7.7		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH15
DATE PROFILED	2024/11/18	**Box No.**	3 of 5
DEPTH (m) FROM	7.7 **to** 11.18		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH15
DATE PROFILED	2024/11/18	**Box No.**	4 of 5
DEPTH (m) FROM	11.18 **to** 14.36		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH15
DATE PROFILED	2024/11/18	**Box No.**	5 of 5
DEPTH (m) FROM	14.36 **to** 15.19		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	
DATE PROFILED	2024/11/18	**Box No.**	
DEPTH (m) FROM	**to**		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH16
DATE PROFILED	2024/11/18	**Box No.**	1 of 5
DEPTH (m) FROM	0 **to** 3.26		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	16
DATE PROFILED	2024/11/18	**Box No.**	2 of 5
DEPTH (m) FROM	3.26 **to** 6.86		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH16
DATE PROFILED	2024/11/18	**Box No.**	3 of 5
DEPTH (m) FROM	6.86 **to** 10.35		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH16
DATE PROFILED	2024/11/18	**Box No.**	4 of 5
DEPTH (m) FROM	10.35 **to** 13.81		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH16
DATE PROFILED	2024/11/18	**Box No.**	5 of 5
DEPTH (m) FROM	13.81 **to** 15.10		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	
DATE PROFILED		**Box No.**	
DEPTH (m) FROM	**to**		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH17a
DATE PROFILED	2024	**Box No.**	1 of 2
DEPTH (m) FROM	0.00 **to** 3.59		

ZUTARI
IMPACT. ENGINEERED.

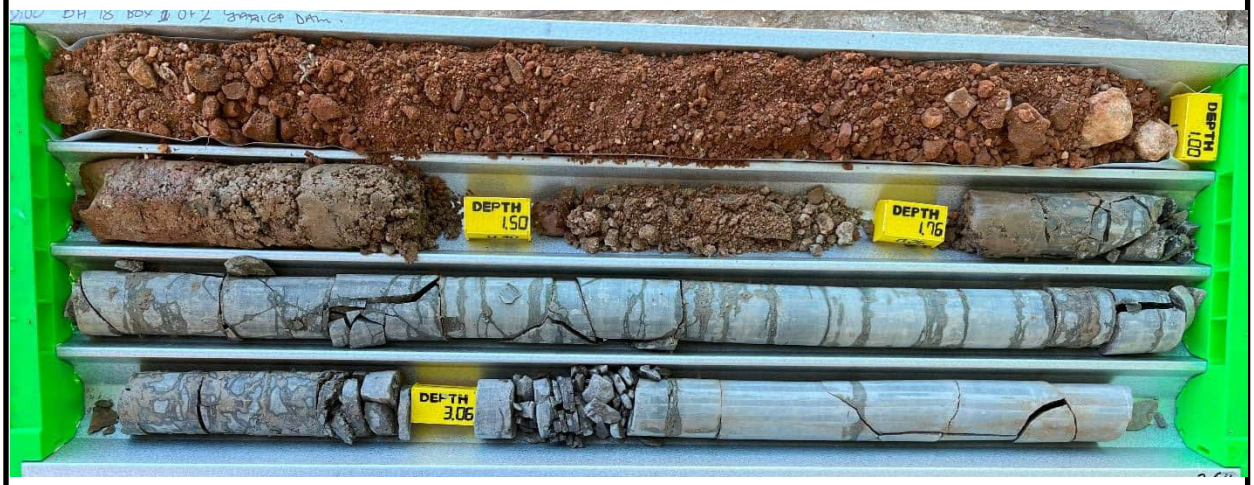
Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH17a
DATE PROFILED		**Box No.**	2 of 2
DEPTH (m) FROM	3.59 **to** 5.26		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH18
DATE PROFILED	2024	**Box No.**	1 of 2
DEPTH (m) FROM	0.00 **to** 3.64		



ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH18
DATE PROFILED		**Box No.**	2 of 2
DEPTH (m) FROM	3.64 **to** 5.11		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH19
DATE PROFILED	2024	**Box No.**	1 of 3
DEPTH (m) FROM	0.00 **to** 3.95		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH19
DATE PROFILED		**Box No.**	2 of 3
DEPTH (m) FROM	3.95 **to** 7.47		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH19
DATE PROFILED	2024	**Box No.**	3 of 3
DEPTH (m) FROM	7.47 **to**	10.16	

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	
DATE PROFILED		**Box No.**	
DEPTH (m) FROM	**to**		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH20
DATE PROFILED	2024/12/12	**Box No.**	1 of 2
DEPTH (m) FROM	0 **to** 3.00		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH20
DATE PROFILED	2024/12/12	**Box No.**	2 of 2
DEPTH (m) FROM	3.00 **to** 5.17		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH21
DATE PROFILED	2024	**Box No.**	1 of 2
DEPTH (m) FROM		**to**	3.63

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH21B
DATE PROFILED		**Box No.**	2 of 2
DEPTH (m) FROM	3.63	**to**	5.02

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH21B
DATE PROFILED	2024	**Box No.**	1 of 2
DEPTH (m) FROM		**to**	3.54

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH21B
DATE PROFILED		**Box No.**	2 of 2
DEPTH (m) FROM	3.54	**to**	5.13

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH22
DATE PROFILED	2024	**Box No.**	1 of 3
DEPTH (m) FROM	0.00 **to** 3.40		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH22
DATE PROFILED		**Box No.**	2 of 3
DEPTH (m) FROM	3.40 **to** 7.27		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH22
DATE PROFILED	2024	**Box No.**	3 of 3
DEPTH (m) FROM	7.27 **to**	10.08	

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	
DATE PROFILED		**Box No.**	
DEPTH (m) FROM	**to**		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH22B
DATE PROFILED	2024	**Box No.**	1 of 3
DEPTH (m) FROM	0.00 **to** 3.40		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH22B
DATE PROFILED		**Box No.**	2 of 3
DEPTH (m) FROM	3.40 **to** 7.50		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH22B
DATE PROFILED	2024	**Box No.**	3 of 3
DEPTH (m) FROM	7.50 **to**	10.12	

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	
DATE PROFILED		**Box No.**	
DEPTH (m) FROM		**to**	

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH23
DATE PROFILED	2024	**Box No.**	1 of 2
DEPTH (m) FROM	0.00 **to** 3.93		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH23
DATE PROFILED		**Box No.**	2 of 2
DEPTH (m) FROM	3.93 **to** 5.09		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH24
DATE PROFILED	2024	**Box No.**	1 of 3
DEPTH (m) FROM	0.00 **to** 3.63		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH24
DATE PROFILED		**Box No.**	2 of 3
DEPTH (m) FROM	3.63 **to** 7.2		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH24
DATE PROFILED	2024	**Box No.**	3 of 3
DEPTH (m) FROM	7.2 **to** 10.02		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	
DATE PROFILED		**Box No.**	
DEPTH (m) FROM	**to**		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH25
DATE PROFILED	2024	**Box No.**	1 of 2
DEPTH (m) FROM	0.00 **to** 3.68		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH25
DATE PROFILED		**Box No.**	2 of 2
DEPTH (m) FROM	3.68 **to** 5.21		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH26
DATE PROFILED	2024	**Box No.**	1 of 3
DEPTH (m) FROM	0.00 **to** 3.63		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH26
DATE PROFILED		**Box No.**	2 of 3
DEPTH (m) FROM	3.63 **to** 7.21		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH26
DATE PROFILED	2024	**Box No.**	3 of 3
DEPTH (m) FROM	7.21 **to** 10.04		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	
DATE PROFILED		**Box No.**	
DEPTH (m) FROM		**to**	

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH27
DATE PROFILED	2024	**Box No.**	1 of 2
DEPTH (m) FROM	0.00 **to** 3.60		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH27
DATE PROFILED		**Box No.**	2 of 2
DEPTH (m) FROM	3.60 **to** 5.10		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH28
DATE PROFILED	2024	**Box No.**	1 of 2
DEPTH (m) FROM	0.00 **to** 3.25		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH28
DATE PROFILED		**Box No.**	2 of 2
DEPTH (m) FROM	3.25 **to** 5.05		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH29
DATE PROFILED	2024	**Box No.**	1 of 2
DEPTH (m) FROM	0.00 **to** 3.68		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH29
DATE PROFILED		**Box No.**	2 of 2
DEPTH (m) FROM	3.68 **to** 5.07		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH30
DATE PROFILED	2024	**Box No.**	1 of 3
DEPTH (m) FROM	0.00 **to** 3.00		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH30
DATE PROFILED		**Box No.**	2 of 3
DEPTH (m) FROM	3.00 **to** 6.00		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH30
DATE PROFILED	2024	**Box No.**	3 of 3
DEPTH (m) FROM	6.00 **to** 10.00		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	
DATE PROFILED		**Box No.**	
DEPTH (m) FROM		**to**	

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH31
DATE PROFILED	2024/12/12	**Box No.**	1 of 2
DEPTH (m) FROM	0 **to** 3.65		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH31
DATE PROFILED	2024/11/19	**Box No.**	1 of 2
DEPTH (m) FROM	3.65 **to** 5.10		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH32
DATE PROFILED	2024	**Box No.**	1 of 3
DEPTH (m) FROM	0.00 **to**	3.71	

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH32
DATE PROFILED		**Box No.**	2 of 3
DEPTH (m) FROM	3.71 **to**	7.16	

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH32
DATE PROFILED	2024	**Box No.**	3 of 3
DEPTH (m) FROM	7.16 **to** 10.08		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	
DATE PROFILED		**Box No.**	
DEPTH (m) FROM		**to**	

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH35
DATE PROFILED	2024/11/19	**Box No.**	1 of 5
DEPTH (m) FROM	0 **to** 3.30		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH35
DATE PROFILED	2024/11/19	**Box No.**	2 of 5
DEPTH (m) FROM	3.30 **to** 6.8		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH35
DATE PROFILED	2024/11/19	**Box No.**	3 of 5
DEPTH (m) FROM	6.8 **to** 10.17		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH35
DATE PROFILED	2024/11/19	**Box No.**	4 of 5
DEPTH (m) FROM	10.17 **to** 13.40		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH35
DATE PROFILED	2024/11/19	**Box No.**	5 of 5
DEPTH (m) FROM	13.4 **to**	15.00	

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	
DATE PROFILED		**Box No.**	
DEPTH (m) FROM	**to**		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH36
DATE PROFILED	2024/10/24	**Box No.**	1 of 5
DEPTH (m) FROM	0 **to** 3.76		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH36
DATE PROFILED	2024/10/24	**Box No.**	2 of 5
DEPTH (m) FROM	3.76 **to** 7.34		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH36
DATE PROFILED	2024/10/24	**Box No.**	3 of 5
DEPTH (m) FROM	7.34 **to** 10.92		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH36
DATE PROFILED	2024/10/24	**Box No.**	4 of 5
DEPTH (m) FROM	10.92 **to** 14.49		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH36
DATE PROFILED	2024/10/24	**Box No.**	5 of 5
DEPTH (m) FROM	14.49 **to** 15.22		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH37
DATE PROFILED	2024	**Box No.**	1 of 2
DEPTH (m) FROM	0.00 **to** 4.24		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH37
DATE PROFILED		**Box No.**	2 of 2
DEPTH (m) FROM	4.24 **to** 5.12		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH37
DATE PROFILED	2024	**Box No.**	1 of 3
DEPTH (m) FROM	0.00 **to** 3.45		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH37
DATE PROFILED		**Box No.**	2 of 3
DEPTH (m) FROM	3.45 **to** 7.62		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH37
DATE PROFILED	2024	**Box No.**	3 of 3
DEPTH (m) FROM	7.62 **to**	10.29	

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	
DATE PROFILED		**Box No.**	
DEPTH (m) FROM	**to**		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH38
DATE PROFILED	2024	**Box No.**	1 of 2
DEPTH (m) FROM	0.00 **to** 4.24		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH38
DATE PROFILED		**Box No.**	2 of 2
DEPTH (m) FROM	4.24 **to** 5.12		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH39
DATE PROFILED	2024	**Box No.**	1 of 3
DEPTH (m) FROM	0.00 **to** 3.52		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH39
DATE PROFILED		**Box No.**	2 of 3
DEPTH (m) FROM	3.52 **to** 7.11		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH39
DATE PROFILED	2024	**Box No.**	3 of 3
DEPTH (m) FROM	7.11 **to** 10.11		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	
DATE PROFILED		**Box No.**	
DEPTH (m) FROM	**to**		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH40
DATE PROFILED	2024/12/12	**Box No.**	1 of 1
DEPTH (m) FROM	0 **to** 5.08		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR		**BH No.**	
DATE PROFILED		**Box No.**	
DEPTH (m) FROM	**to**		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH42
DATE PROFILED	2024	**Box No.**	1 of 3
DEPTH (m) FROM	0.00 **to** 3.24		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH42
DATE PROFILED		**Box No.**	2 of 3
DEPTH (m) FROM	3.24 **to** 6.80		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH42
DATE PROFILED	2024	**Box No.**	3 of 3
DEPTH (m) FROM	6.80 **to** 10.08		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	
DATE PROFILED		**Box No.**	
DEPTH (m) FROM	**to**		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH47
DATE PROFILED	2024/12/12	**Box No.**	1 of 2
DEPTH (m) FROM	0 **to** 4.38		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH47
DATE PROFILED	2024/12/12	**Box No.**	2 of 2
DEPTH (m) FROM	4.38 **to** 5.09		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH48
DATE PROFILED	2024/12/12	**Box No.**	1 of 2
DEPTH (m) FROM	0 **to** 4.05		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH48
DATE PROFILED	2024/12/13	**Box No.**	2 of 2
DEPTH (m) FROM	4.05 **to** 5.05		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH54
DATE PROFILED	2024/12/13	**Box No.**	1 of 3
DEPTH (m) FROM	0 **to** 3.83		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH54
DATE PROFILED	2024/12/13	**Box No.**	2 of 3
DEPTH (m) FROM	3.83 **to** 7.54		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH54
DATE PROFILED	2024/12/13	**Box No.**	3 of 3
DEPTH (m) FROM	7.54 **to** 10.05		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR		**BH No.**	
DATE PROFILED		**Box No.**	
DEPTH (m) FROM	**to**		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH58
DATE PROFILED	2024/11/19	**Box No.**	1 of 5
DEPTH (m) FROM	0 **to** 3.6		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH58
DATE PROFILED	2024/11/19	**Box No.**	2 of 5
DEPTH (m) FROM	3.6 **to** 7.04		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH58
DATE PROFILED	2024/11/19	**Box No.**	3 of 5
DEPTH (m) FROM	7.04 **to** 10.57		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH58
DATE PROFILED	2024/11/19	**Box No.**	4 of 5
DEPTH (m) FROM	10.57 **to** 13.91		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH58
DATE PROFILED	2024/11/19	**Box No.**	5 of 5
DEPTH (m) FROM	13.91 **to** 15.17		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	
DATE PROFILED		**Box No.**	
DEPTH (m) FROM		**to**	

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH59
DATE PROFILED	2024/11/19	**Box No.**	1 of 5
DEPTH (m) FROM	0 **to** 3.58		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH59
DATE PROFILED	2024/11/20	**Box No.**	2 of 5
DEPTH (m) FROM	3.58 **to** 7.04		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH59
DATE PROFILED	2024/11/19	**Box No.**	3 of 5
DEPTH (m) FROM	7.04 **to** 10.50		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH59
DATE PROFILED	2024/11/20	**Box No.**	4 of 5
DEPTH (m) FROM	10.50 **to** 13.98		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH59
DATE PROFILED	2024/11/19	**Box No.**	5 of 5
DEPTH (m) FROM	13.98 **to**	15.15	

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR		**BH No.**	
DATE PROFILED		**Box No.**	
DEPTH (m) FROM	**to**		

ZUTARI
IMPACT. ENGINEERED.

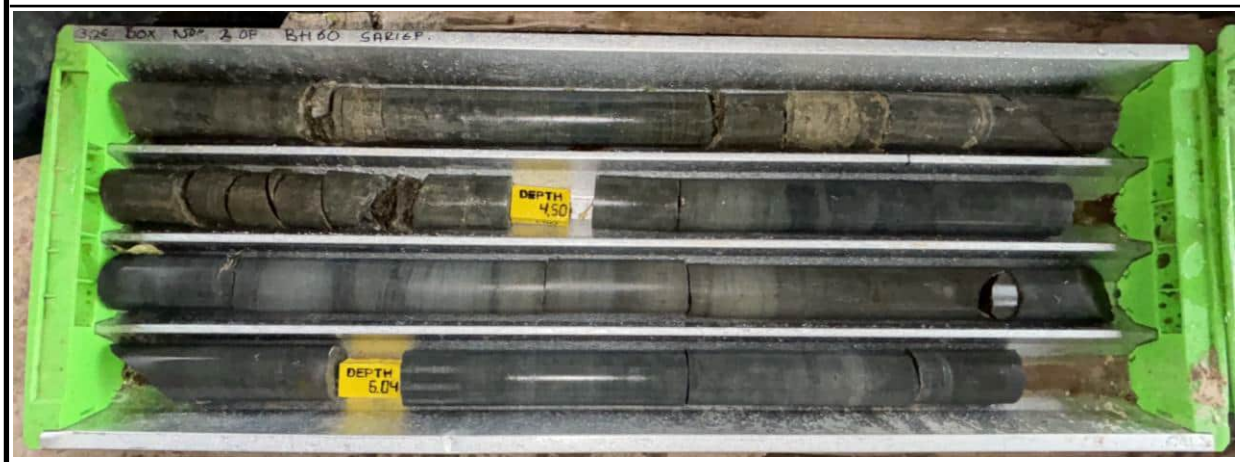
Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH60
DATE PROFILED	2024/11/20	**Box No.**	1 of 5
DEPTH (m) FROM	0 **to** 3.26		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH60
DATE PROFILED	2024/11/20	**Box No.**	2 of 5
DEPTH (m) FROM	3.26 **to** 6.41		



ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH60
DATE PROFILED	2024/11/20	**Box No.**	3 of 5
DEPTH (m) FROM	6.41 **to** 10.25		

ZUTARI
IMPACT. ENGINEERED.

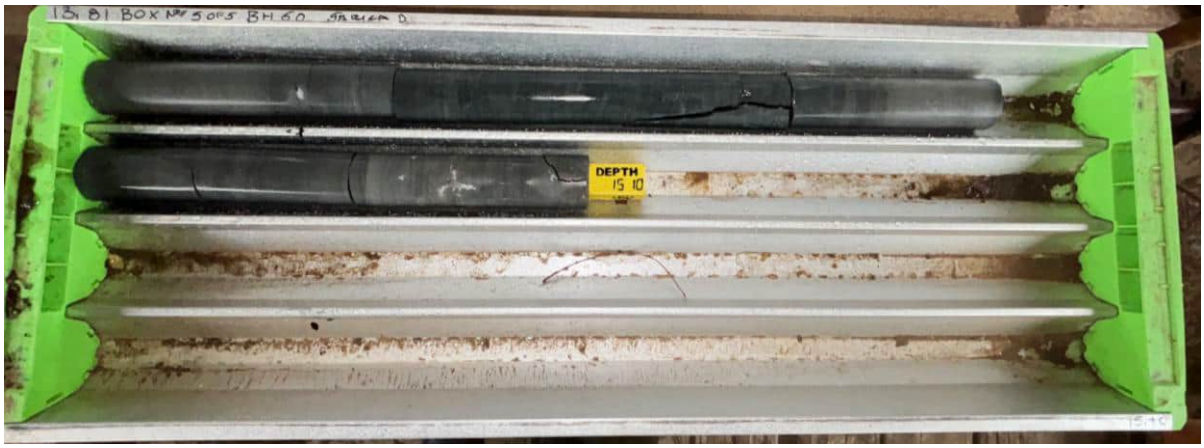
Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH60
DATE PROFILED	2024/11/20	**Box No.**	4 of 5
DEPTH (m) FROM	10.25 **to** 13.81		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH60
DATE PROFILED	2024/11/20	**Box No.**	5 of 5
DEPTH (m) FROM	13.81 **to**	15.10	



ZUTARI
IMPACT. ENGINEERED.

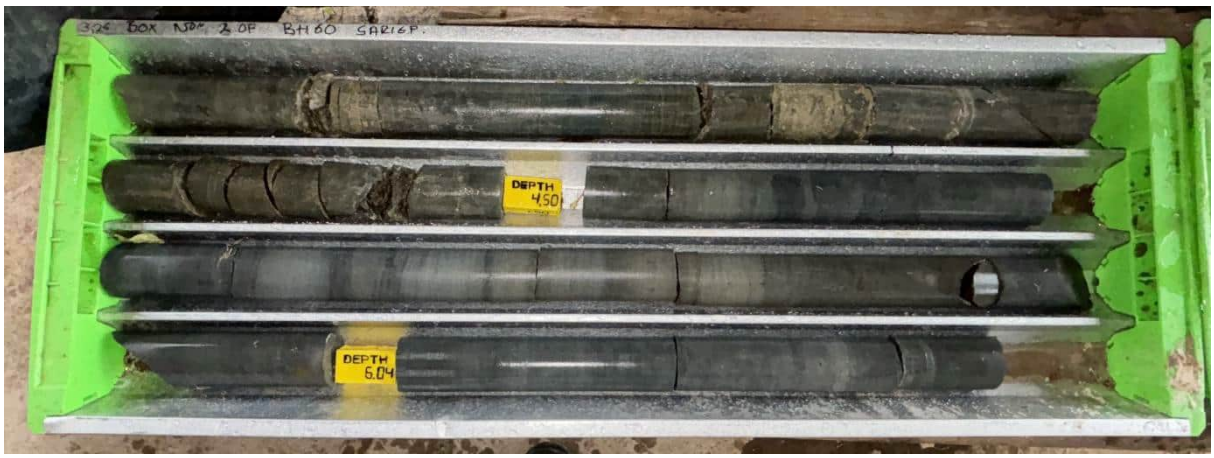
Xhariep Pipeline - 1002533

CONTRACTOR		**BH No.**	
DATE PROFILED		**Box No.**	
DEPTH (m) FROM	**to**		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH60
DATE PROFILED	2024/11/20	**Box No.**	3 of 5
DEPTH (m) FROM	3.25 **to** 6.41		



ZUTARI
IMPACT. ENGINEERED.

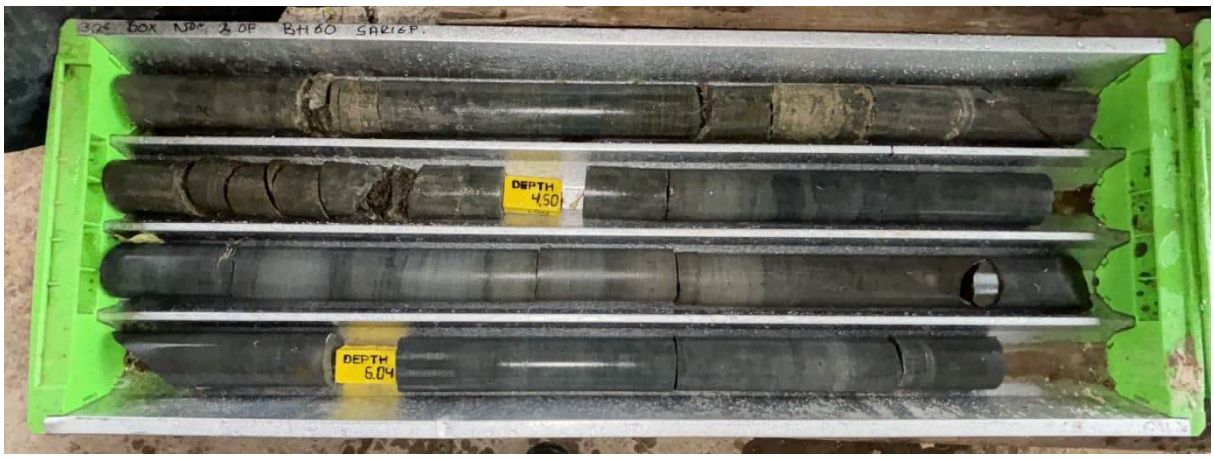
Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH60
DATE PROFILED	2024/11/20	**Box No.**	4 of 5
DEPTH (m) FROM	6.41 **to** 10.25		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH60
DATE PROFILED	2024/11/20	**Box No.**	5 of 5
DEPTH (m) FROM	3.25 **to**	6.41	



ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR		**BH No.**	
DATE PROFILED		**Box No.**	
DEPTH (m) FROM	**to**		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH61
DATE PROFILED	2024/11/20	**Box No.**	1 of 5
DEPTH (m) FROM	0 **to** 3.4		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH61
DATE PROFILED	2024/11/20	**Box No.**	2 of 5
DEPTH (m) FROM	3.4 **to** 6.9		

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH61
DATE PROFILED	2024/11/20	**Box No.**	3 of 5
DEPTH (m) FROM	6.9 **to**	10.31	

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH61
DATE PROFILED	2024/11/20	**Box No.**	4 of 5
DEPTH (m) FROM	10.31 **to**	13.85	

ZUTARI
IMPACT. ENGINEERED.

Xhariep Pipeline - 1002533

CONTRACTOR	Mukona Geotechnics	**BH No.**	BH61
DATE PROFILED	2024/11/20	**Box No.**	5 of 5
DEPTH (m) FROM	13.85 **to**	15.01	

ZUTARI
IMPACT. ENGINEERED.

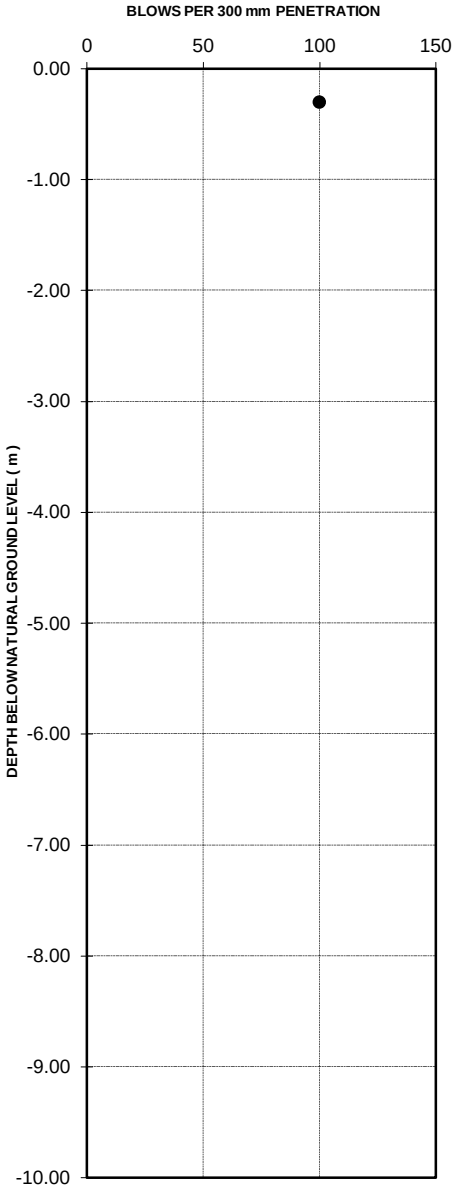
CONTRACTOR		**BH No.**	
DATE PROFILED		**Box No.**	
DEPTH (m) FROM	**to**		

Appendix G - DPSH Test Results

DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DPSH 01
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

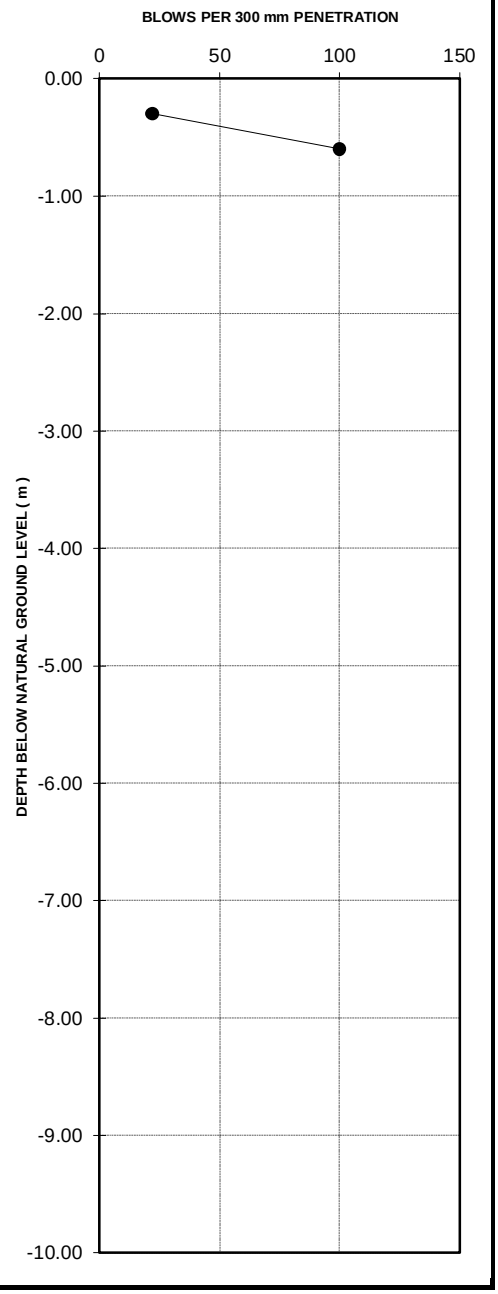
NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
100	300	-0.300	3	100	



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep Pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH D1
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

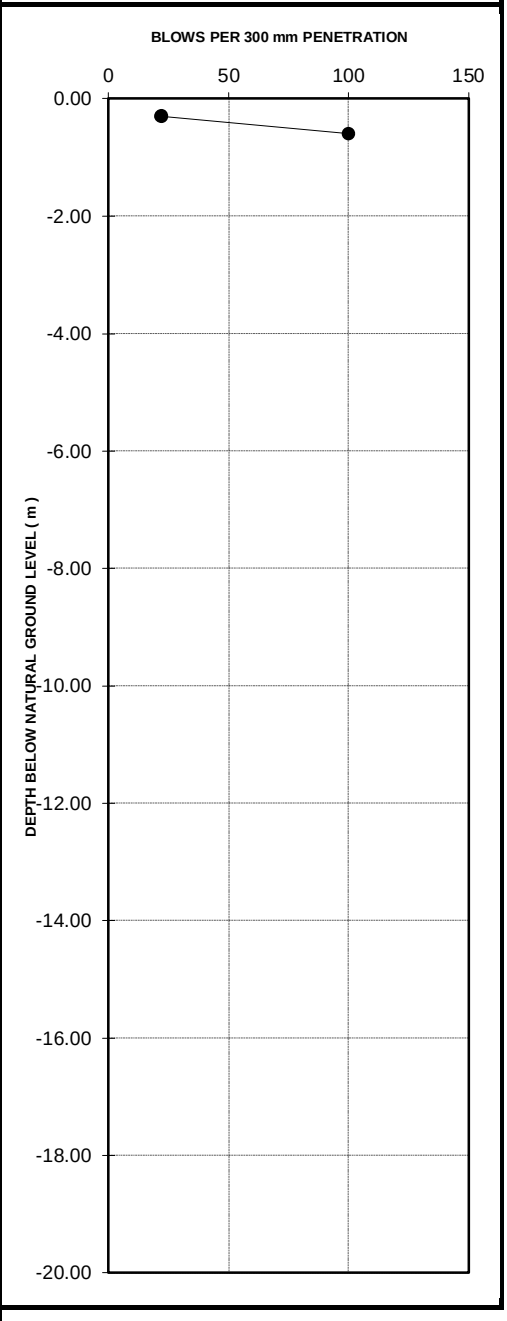
NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
22	300	-0.300	14	22	
100	600	-0.600	3	100	



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DPSH 2
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

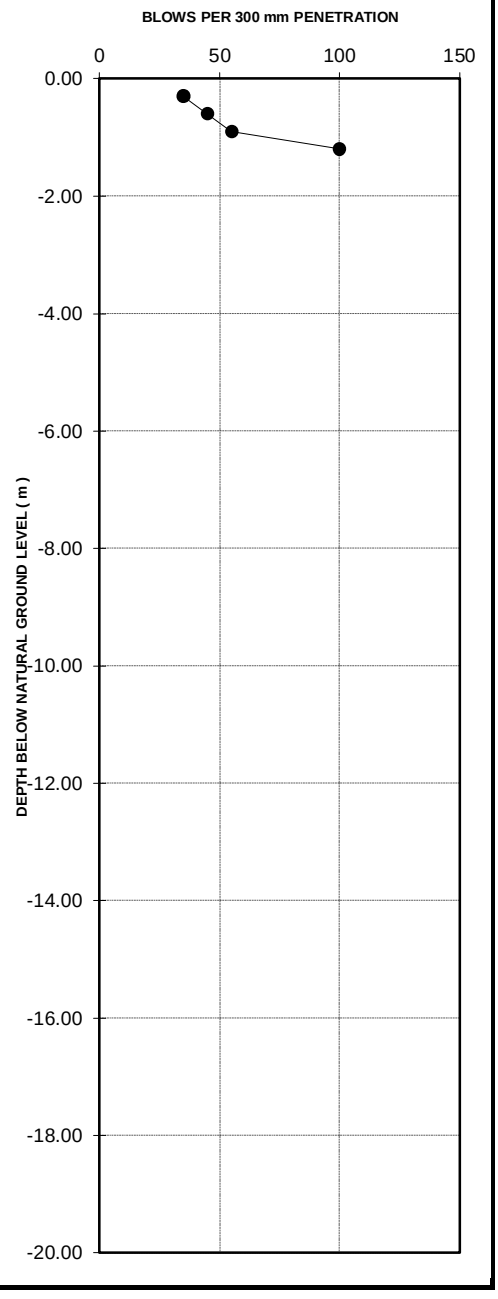
NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
22	300	-0.300	14	22	
100	600	-0.600	3	100	



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 3
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
35	300	-0.300	9	35	
45	600	-0.600	7	45	
55	900	-0.900	5	55	
100	1200	-1.200	3	100	

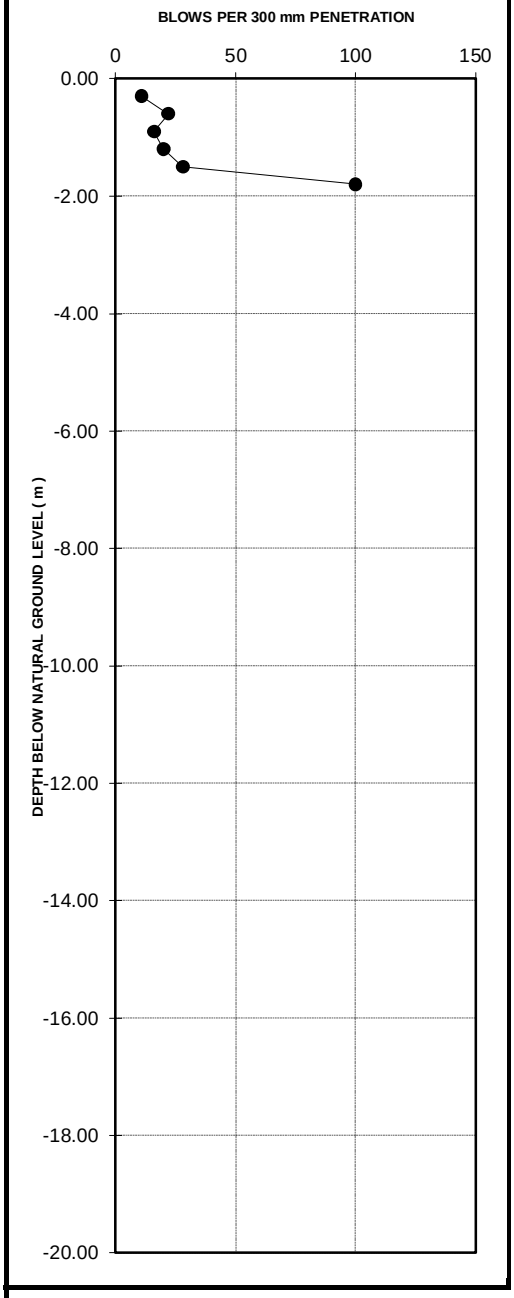


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 4
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
11	300	-0.300	27	11
22	600	-0.600	14	22
16	900	-0.900	19	16
20	1200	-1.200	15	20
28	1500	-1.500	11	28
100	1800	-1.800	3	100

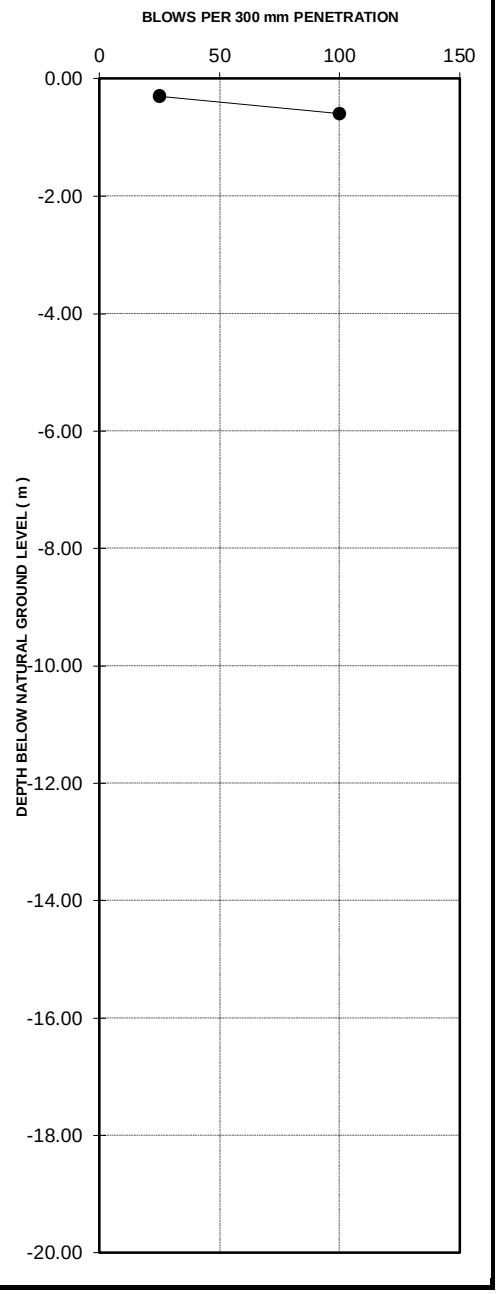
GRAPH



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH D4
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
25	300	-0.300	12	25	
100	600	-0.600	3	100	

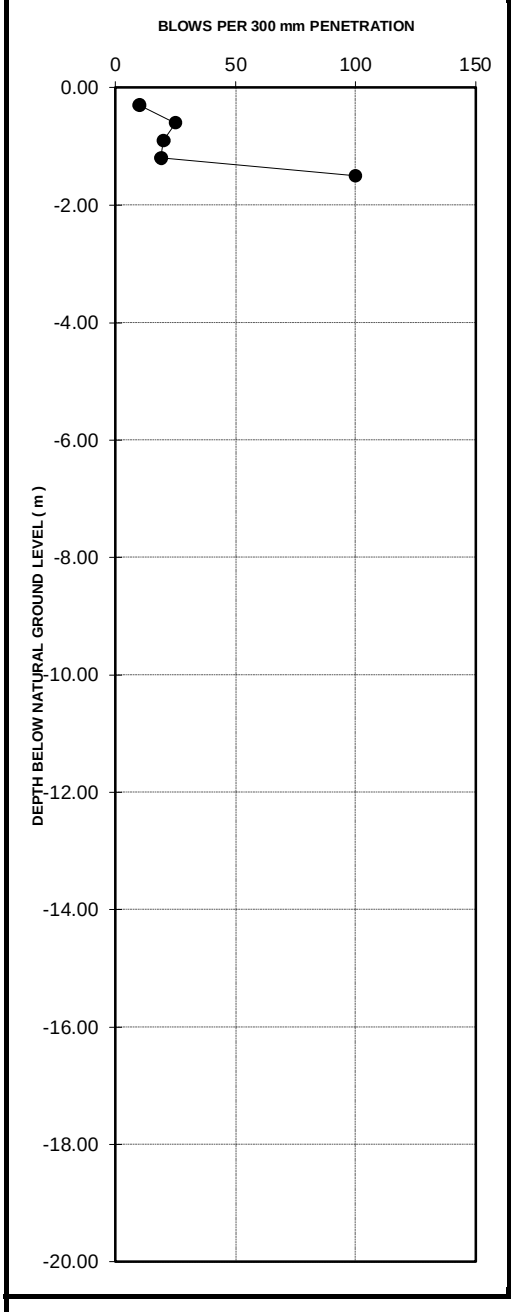


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 5
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
10	300	-0.300	30	10
25	600	-0.600	12	25
20	900	-0.900	15	20
19	1200	-1.200	16	19
100	1500	-1.500	3	100

GRAPH

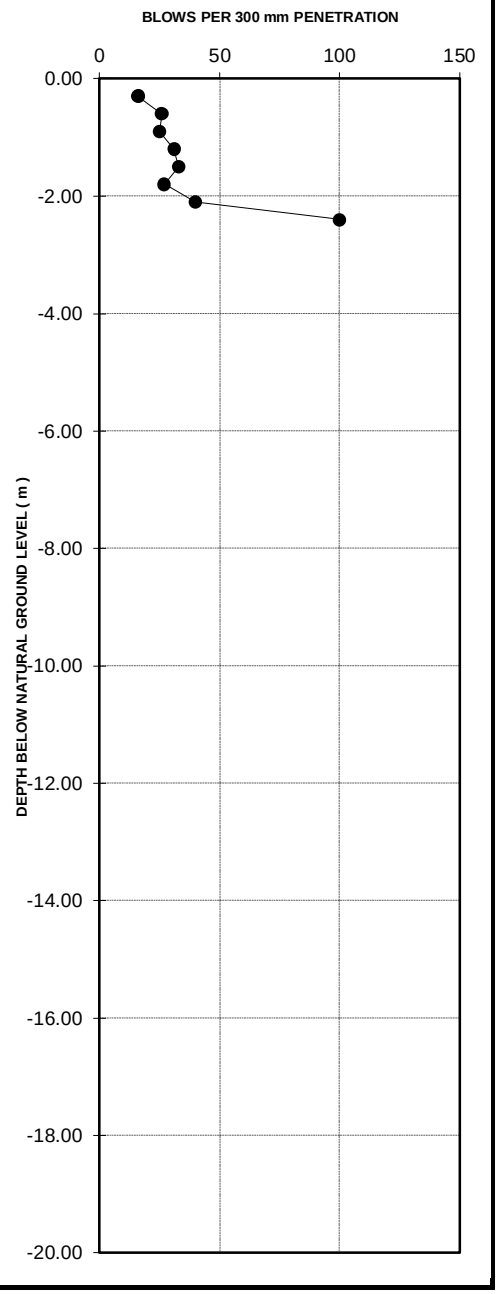


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 6
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
16	300	-0.300	19	16
26	600	-0.600	12	26
25	900	-0.900	12	25
31	1200	-1.200	10	31
33	1500	-1.500	9	33
27	1800	-1.800	11	27
40	2100	-2.100	8	40
100	2400	-2.400	3	100

GRAPH

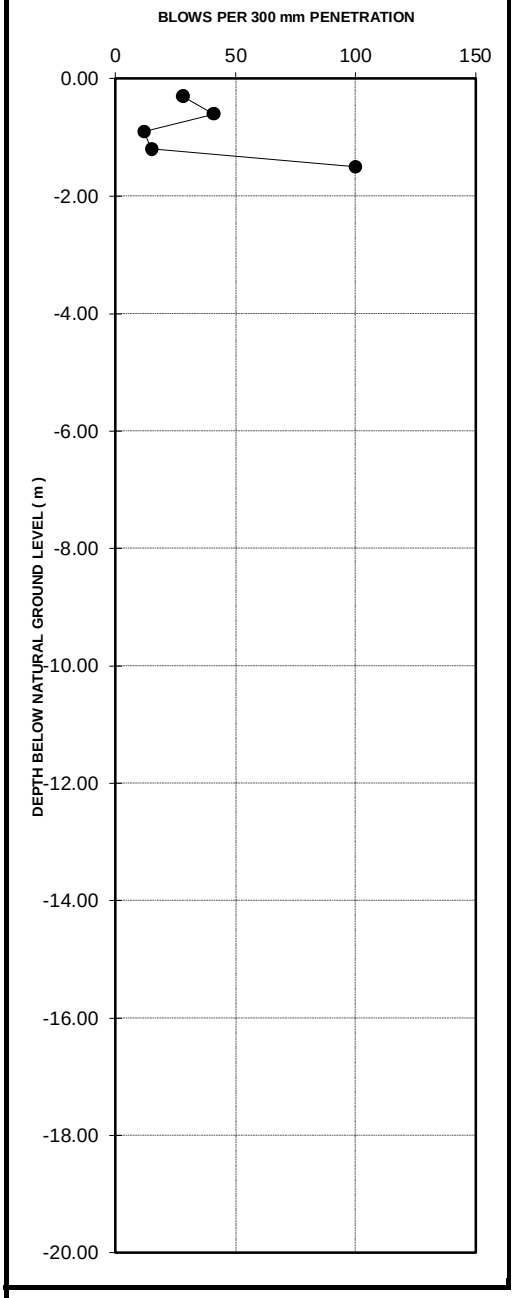


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 7
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
28	300	-0.300	11	28
41	600	-0.600	7	41
12	900	-0.900	25	12
15	1200	-1.200	20	15
100	1500	-1.500	3	100

GRAPH

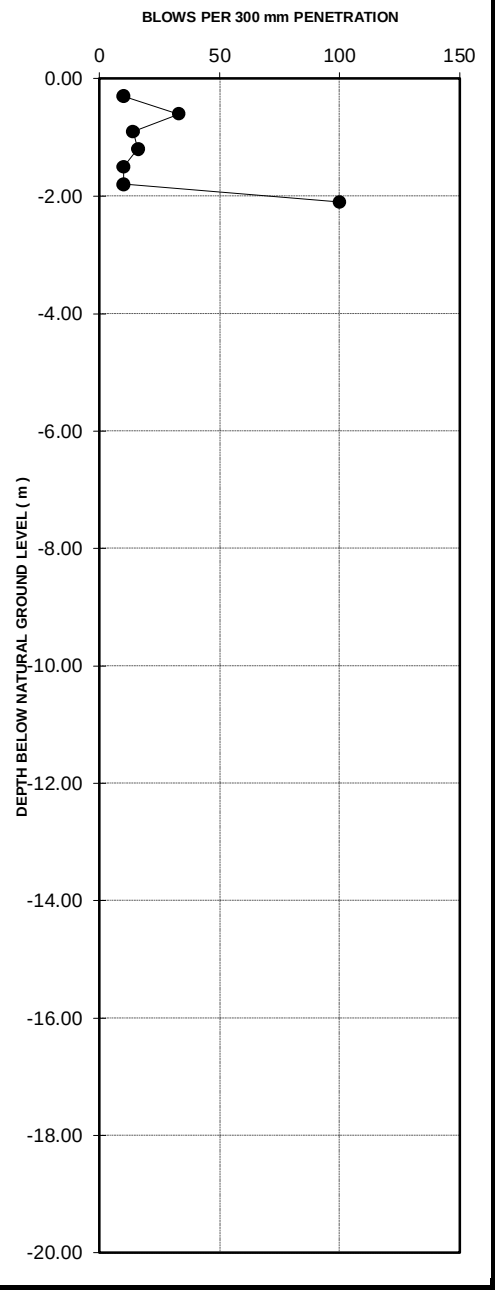


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 8
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
10	300	-0.300	30	10
33	600	-0.600	9	33
14	900	-0.900	21	14
16	1200	-1.200	19	16
10	1500	-1.500	30	10
10	1800	-1.800	30	10
100	2100	-2.100	3	100

GRAPH

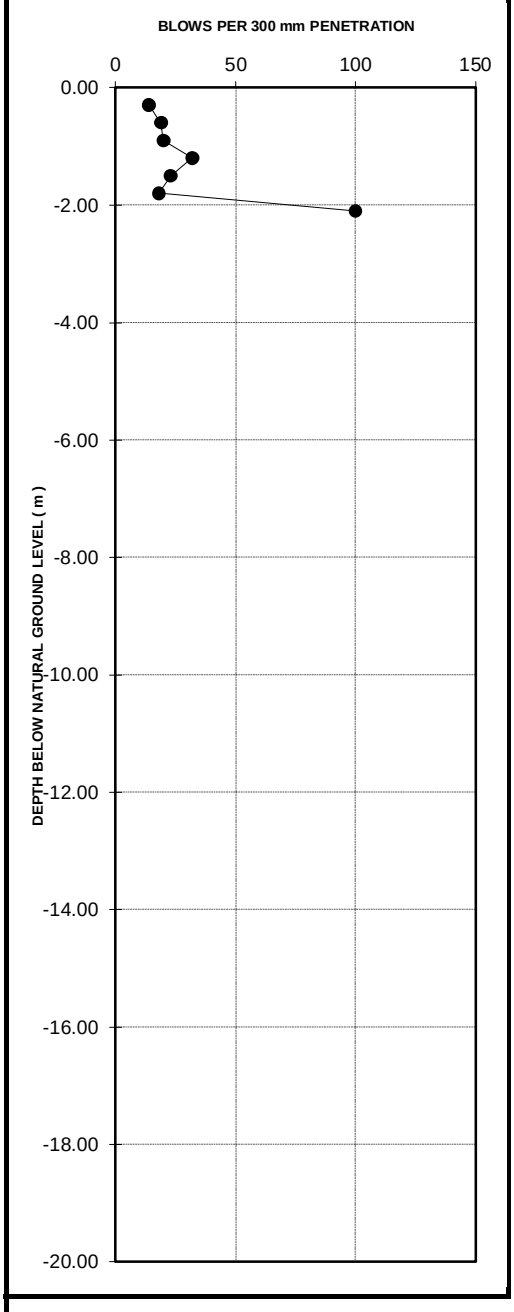


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 9
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
14	300	-0.300	21	14
19	600	-0.600	16	19
20	900	-0.900	15	20
32	1200	-1.200	9	32
23	1500	-1.500	13	23
18	1800	-1.800	17	18
100	2100	-2.100	3	100

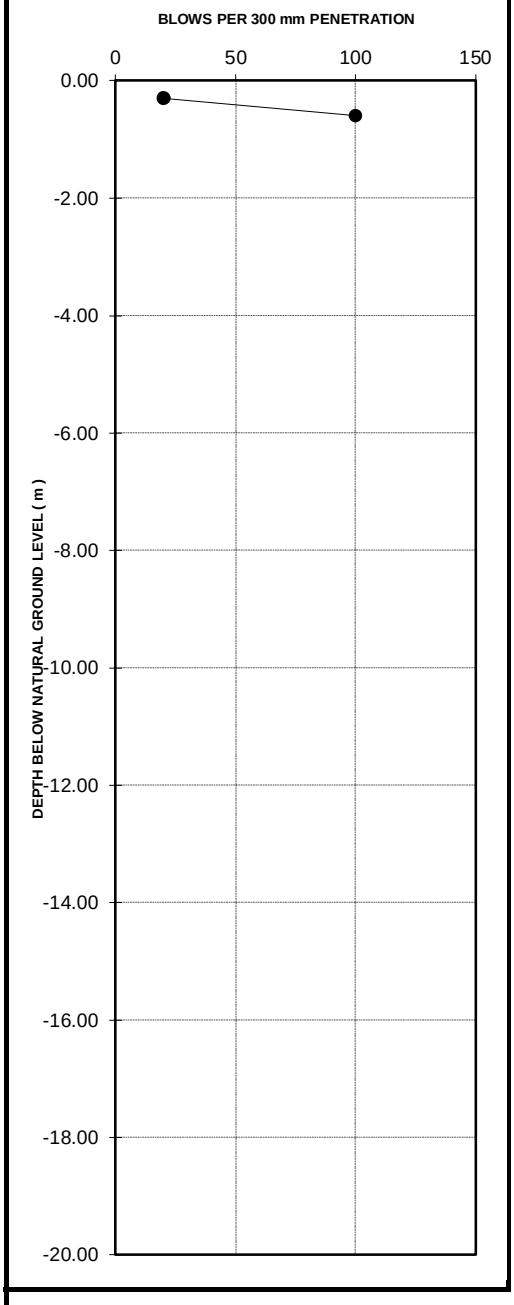
GRAPH



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 10
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
20	300	-0.300	15	20	
100	600	-0.600	3	100	

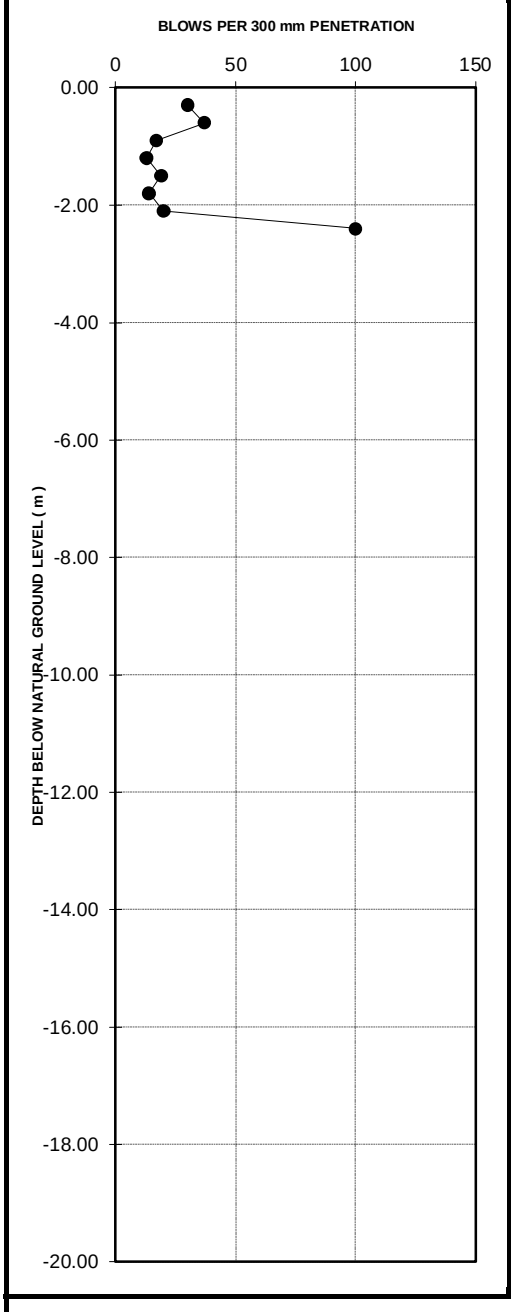


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 11
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
30	300	-0.300	10	30
37	600	-0.600	8	37
17	900	-0.900	18	17
13	1200	-1.200	23	13
19	1500	-1.500	16	19
14	1800	-1.800	21	14
20	2100	-2.100	15	20
100	2400	-2.400	3	100

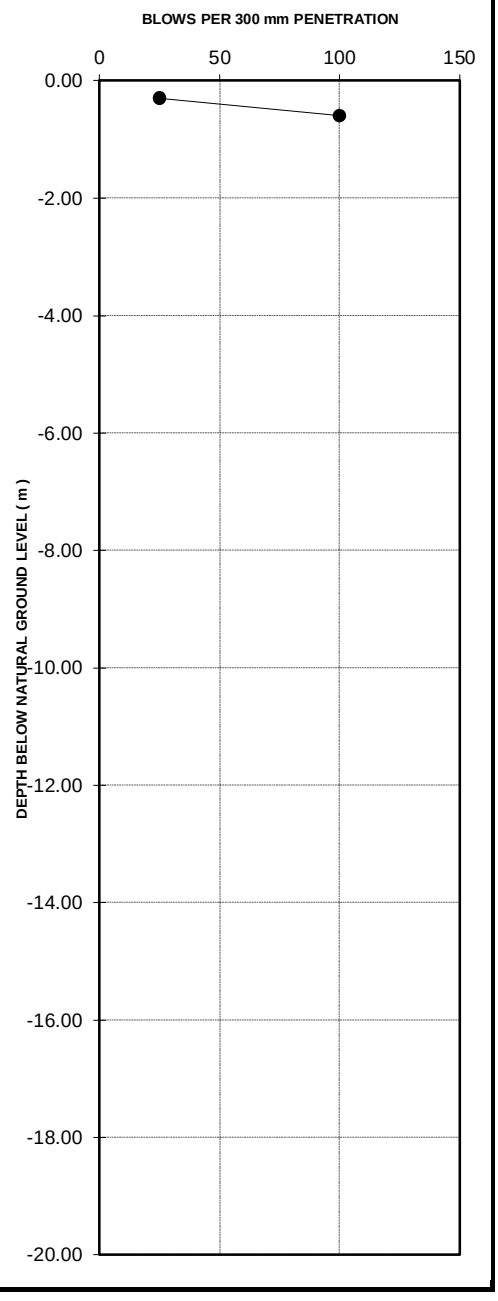
GRAPH



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DPSH BH 03
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

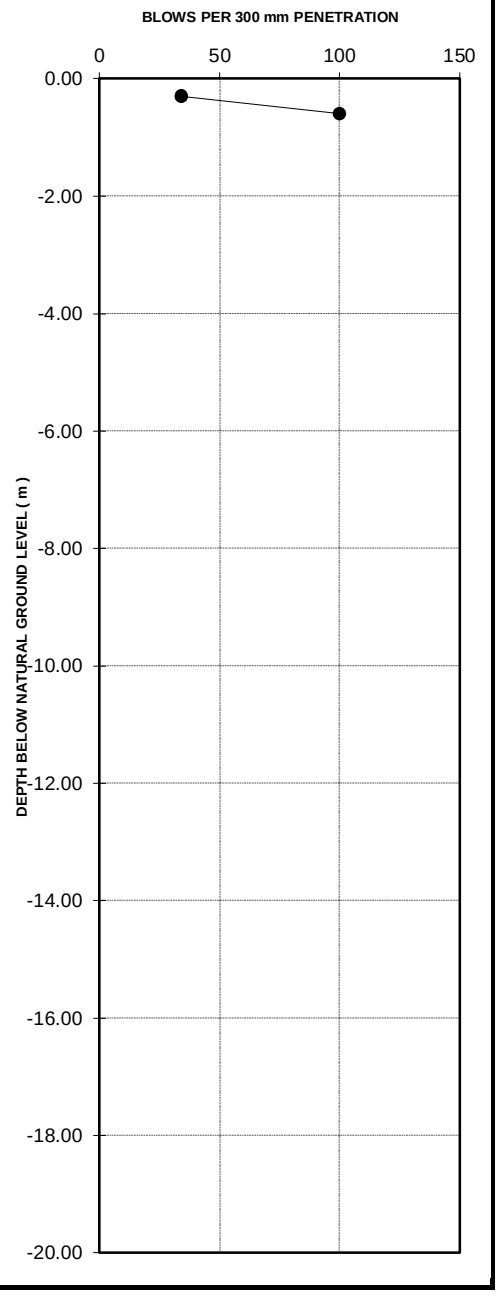
NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
25	300	-0.300	12	25	
100	600	-0.600	3	100	



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 12
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

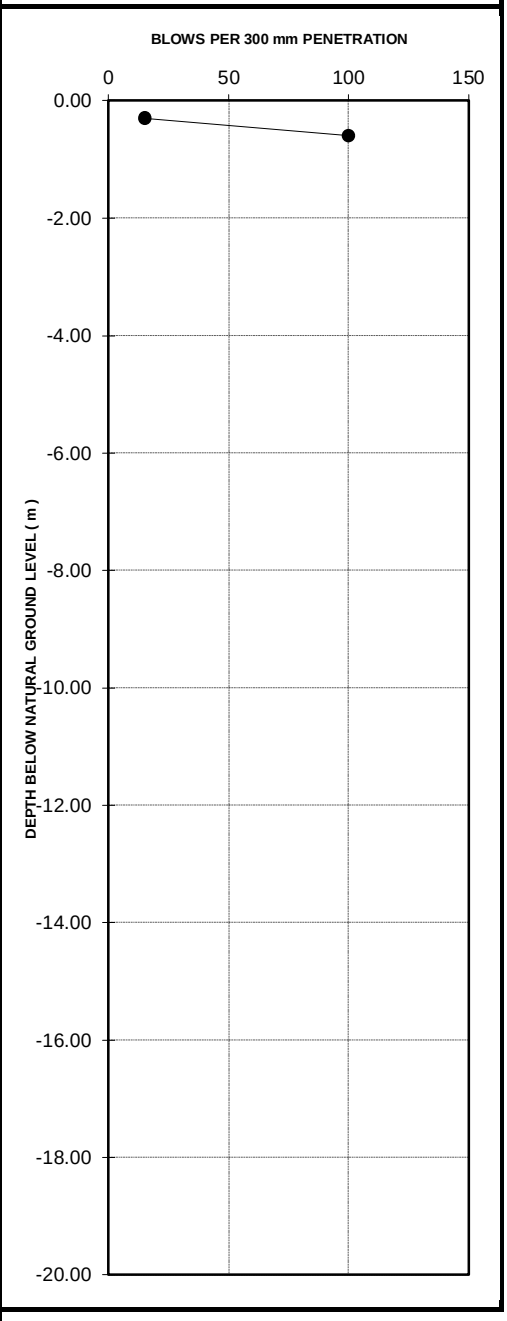
NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
34	300	-0.300	9	34	
100	600	-0.600	3	100	



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 13
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
15	300	-0.300	20	15	
100	600	-0.600	3	100	

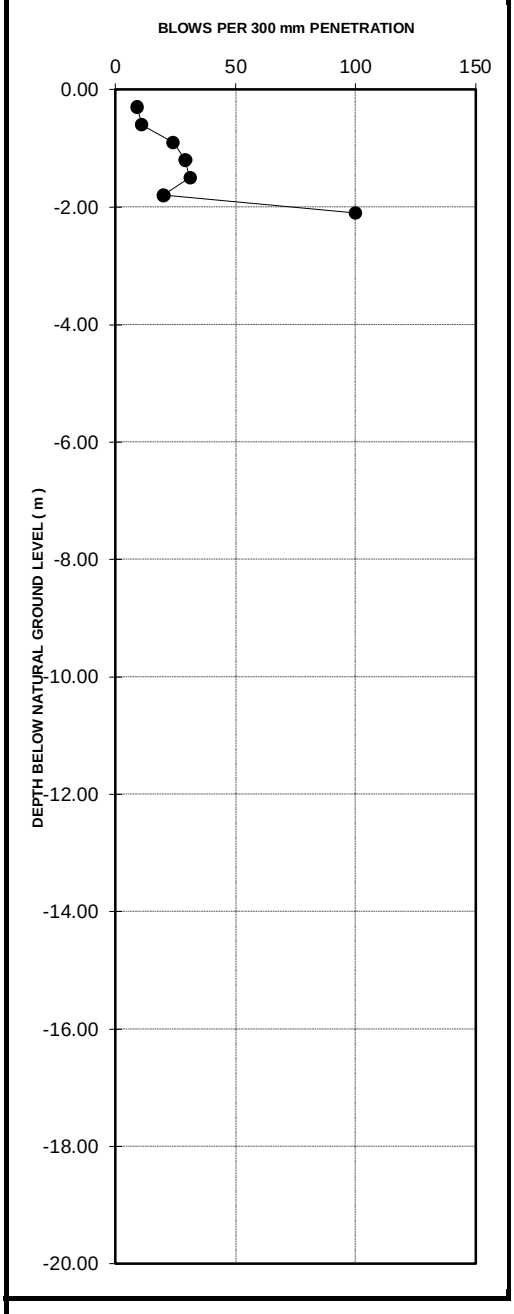


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 14
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
9	300	-0.300	33	9
11	600	-0.600	27	11
24	900	-0.900	13	24
29	1200	-1.200	10	29
31	1500	-1.500	10	31
20	1800	-1.800	15	20
100	2100	-2.100	3	100

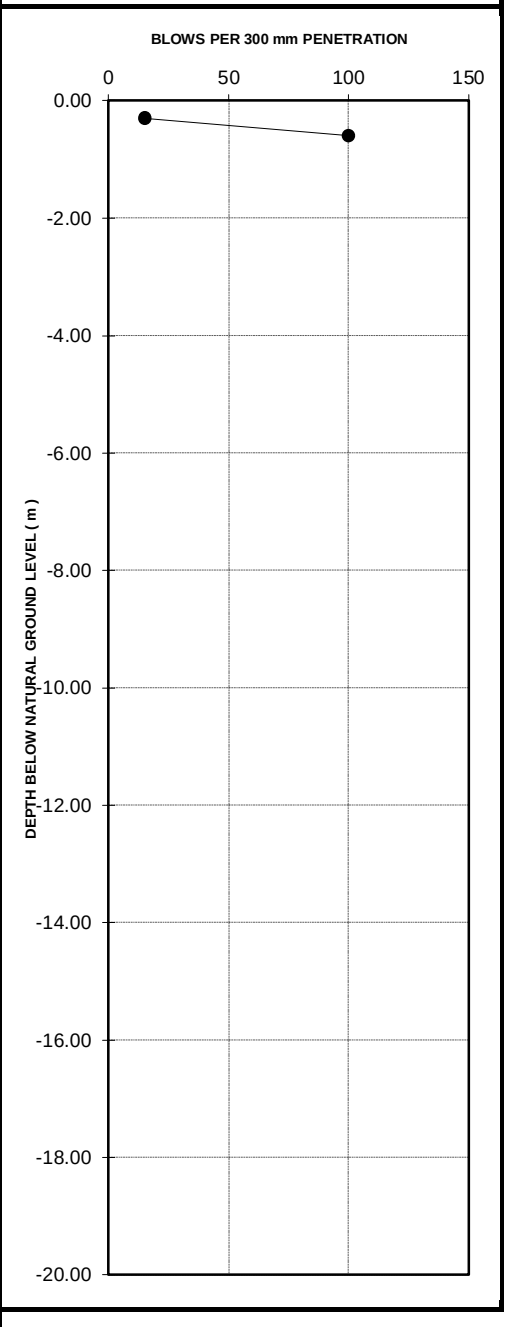
GRAPH



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 15
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

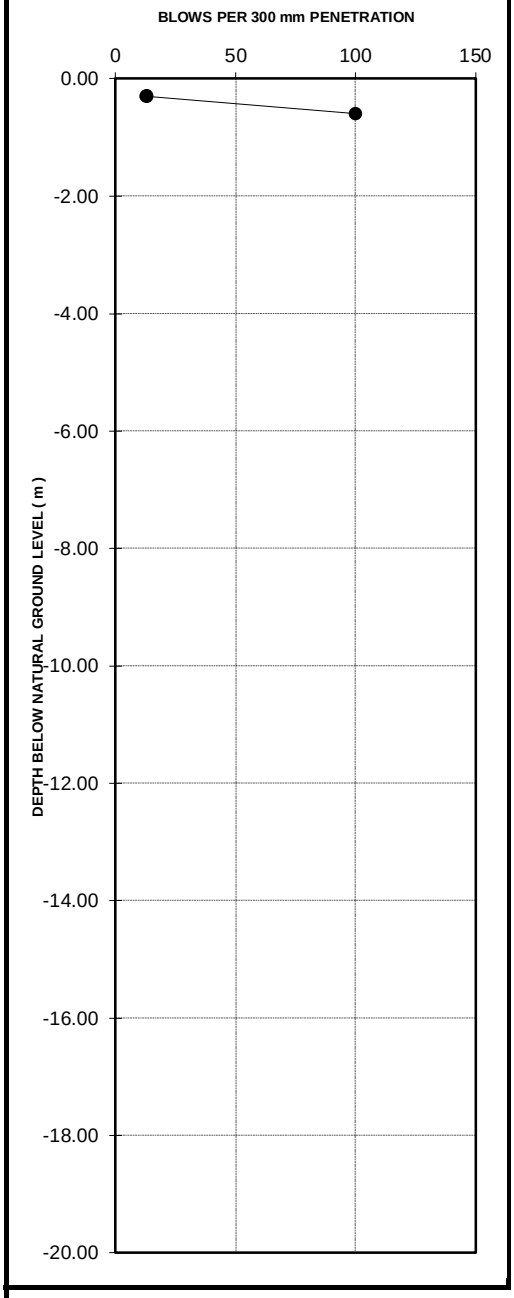
NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
15	300	-0.300	20	15	
100	600	-0.600	3	100	



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH D2
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

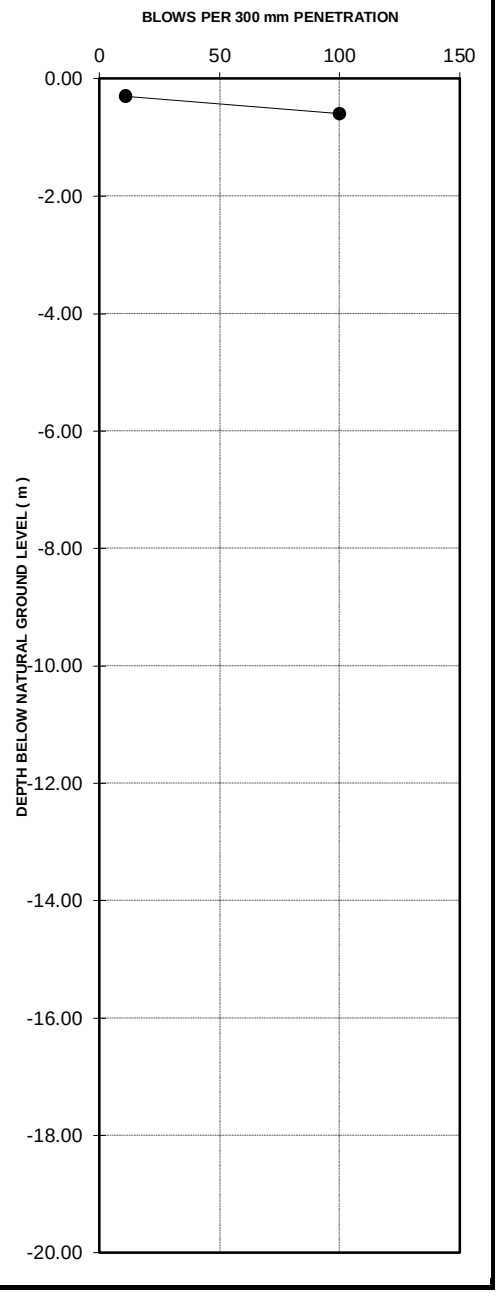
NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
13	300	-0.300	23	13	
100	600	-0.600	3	100	



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 16
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

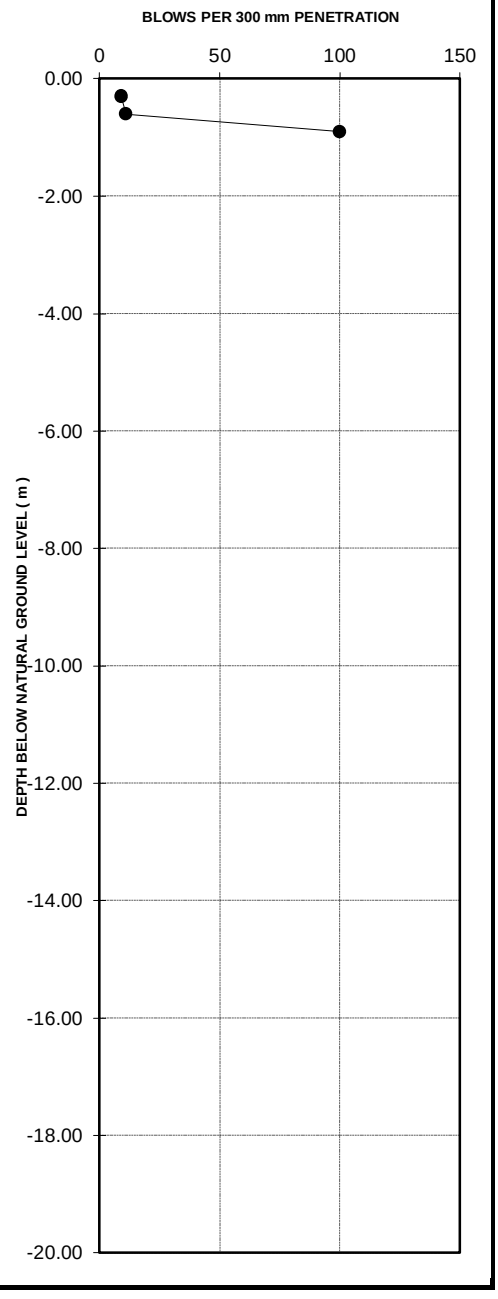
NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
11	300	-0.300	27	11	
100	600	-0.600	3	100	



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 17
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

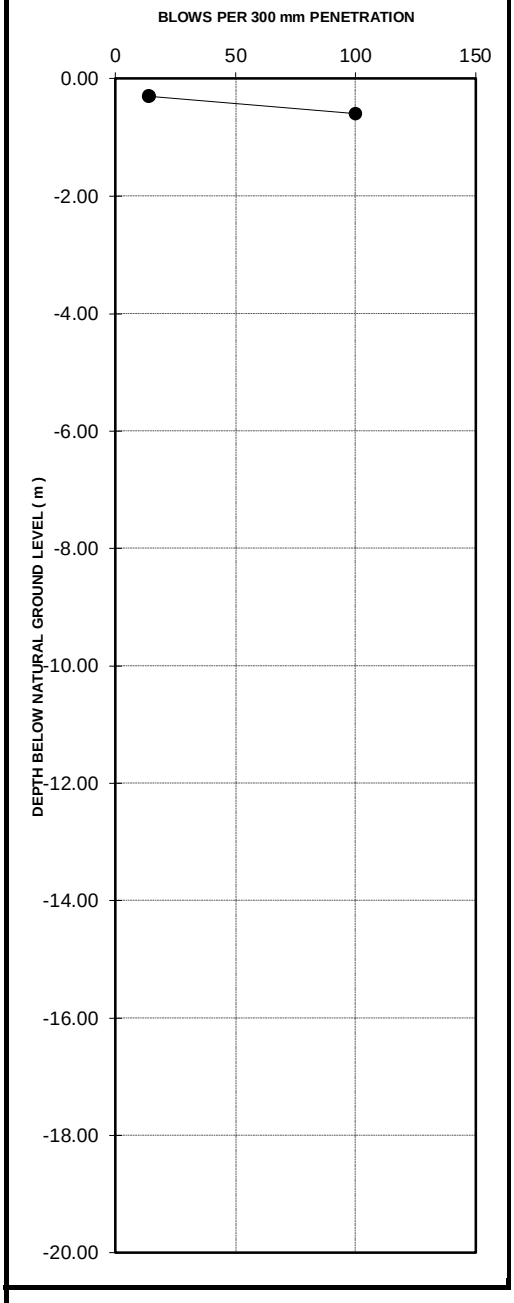
NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
9	300	-0.300	33	9	
11	600	-0.600	27	11	
100	900	-0.900	3	100	



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 18
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

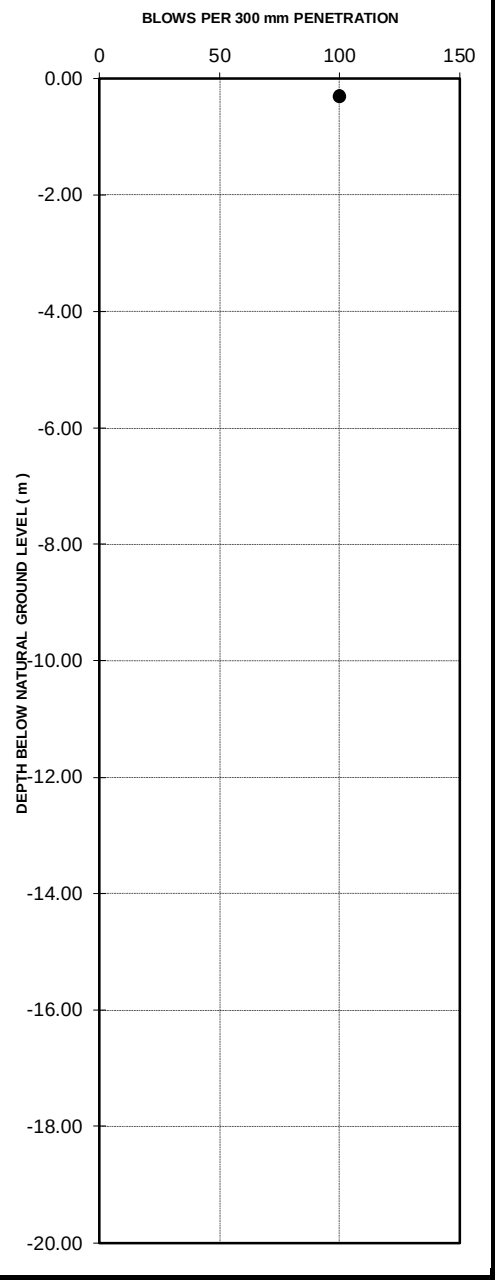
NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
14	300	-0.300	21	14	
100	600	-0.600	3	100	



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 19
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

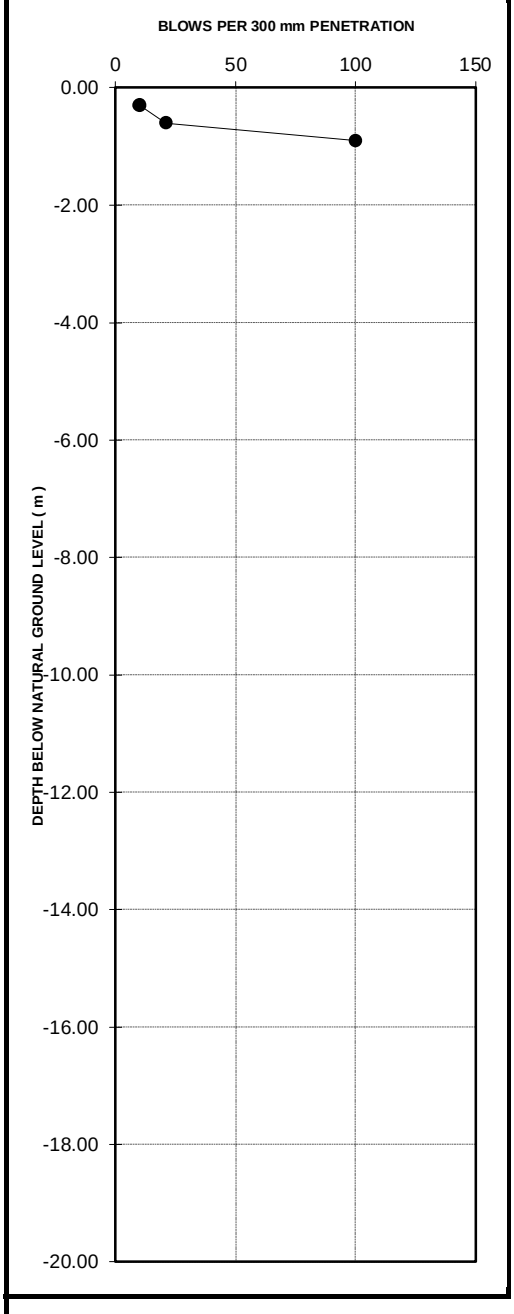
NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
100	300	-0.300	3	100	



DYNAMIC PROBE SUPER HEAVY TEST

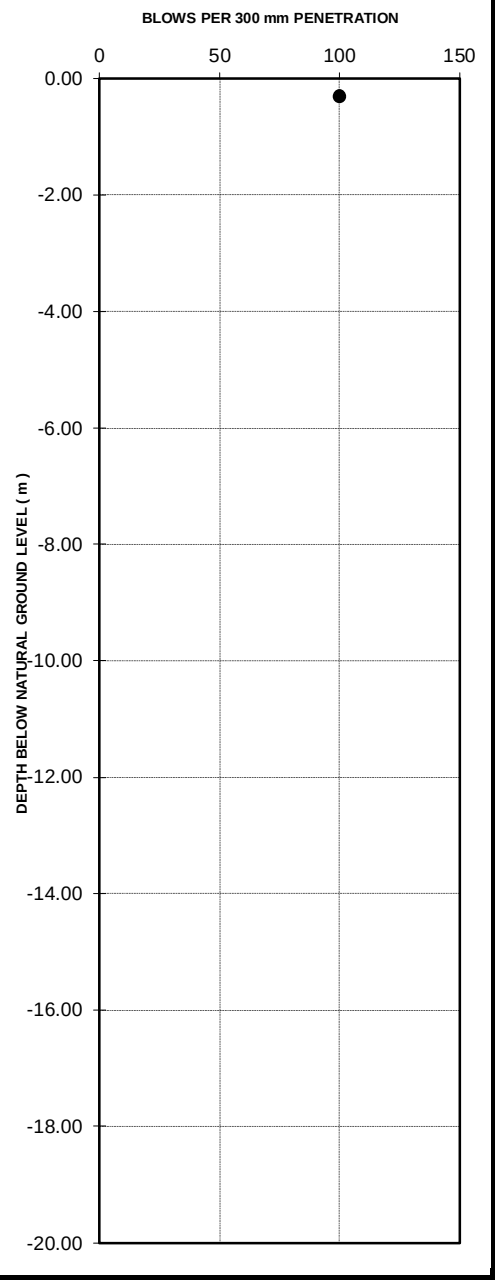
PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 20
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
10	300	-0.300	30	10	
21	600	-0.600	14	21	
100	900	-0.900	3	100	



DYNAMIC PROBE SUPER HEAVY TEST

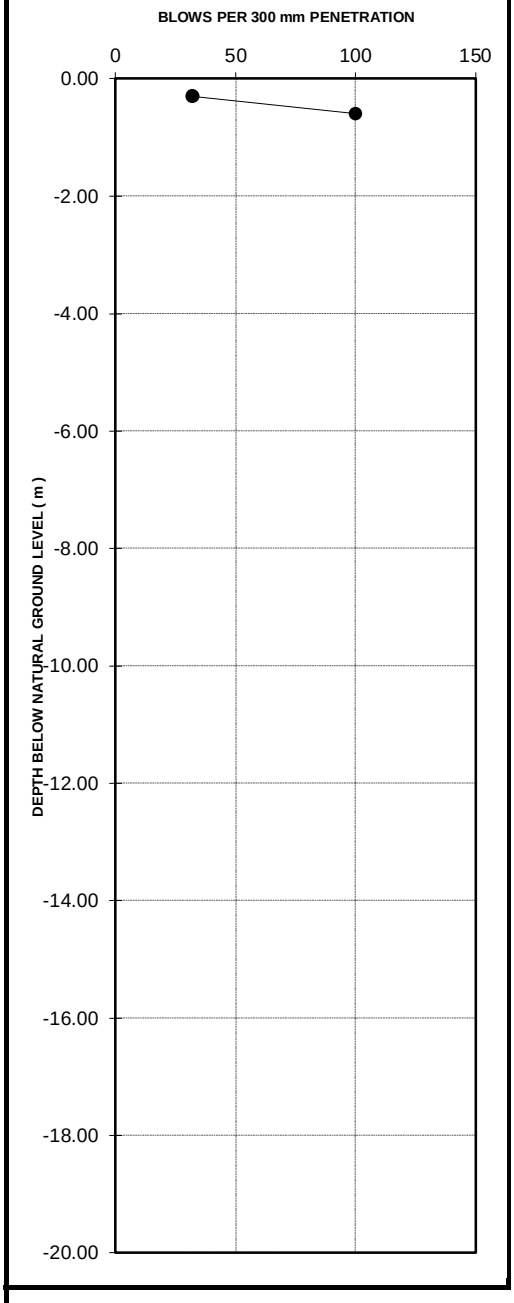
PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 21
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
100	300	-0.300	3	100	

DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH D3
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

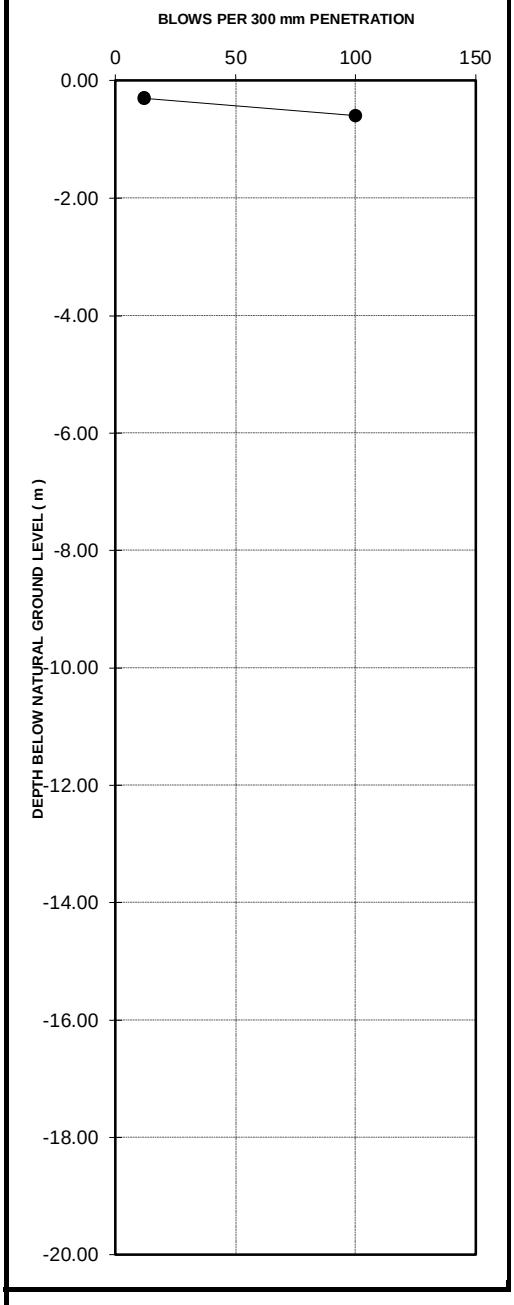
NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
32	300	-0.300	9	32	
100	600	-0.600	3	100	



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 22
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

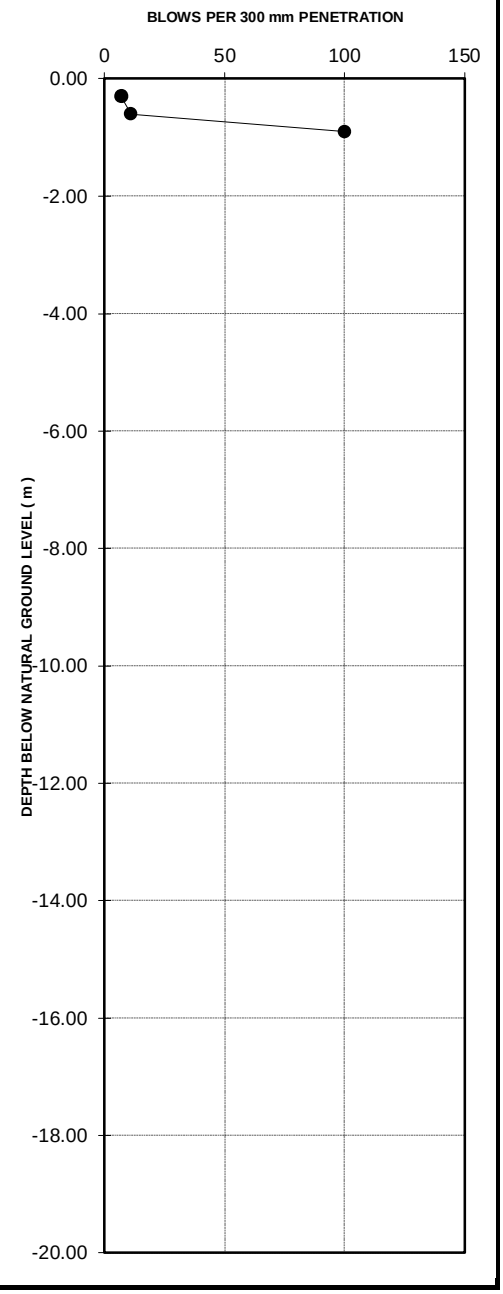
NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
12	300	-0.300	25	12	
100	600	-0.600	3	100	



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 23
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

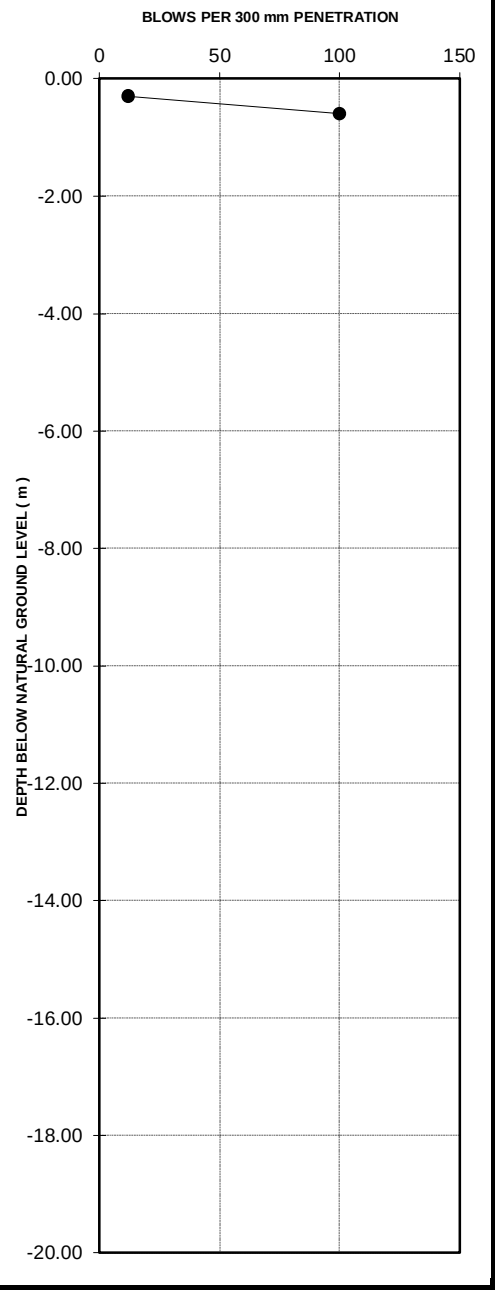
NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
7	300	-0.300	43	7	
11	600	-0.600	27	11	
100	900	-0.900	3	100	



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 24
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

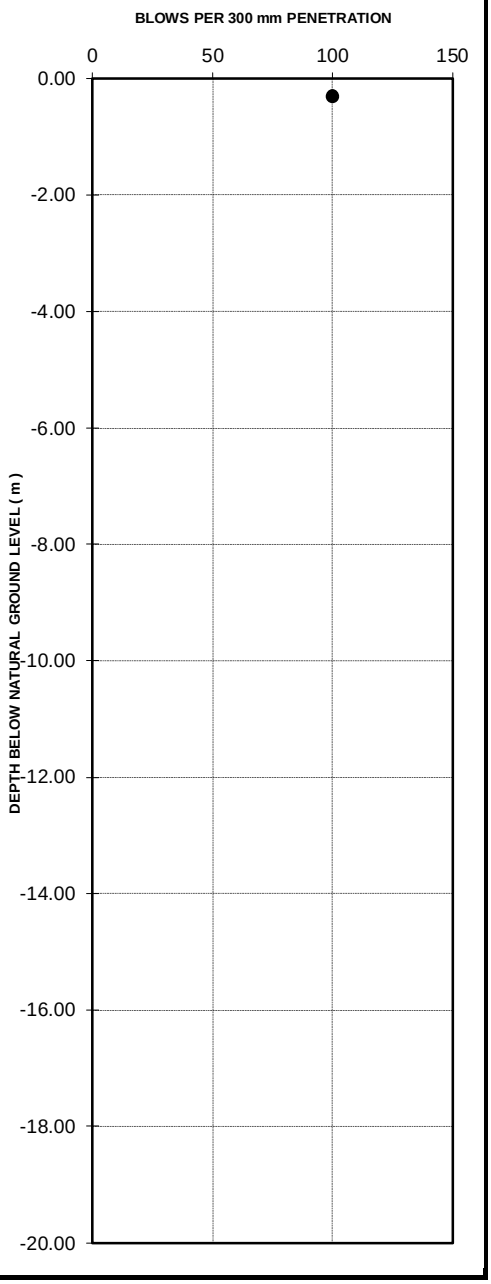
NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
12	300	-0.300	25	12	
100	600	-0.600	3	100	



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 25
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

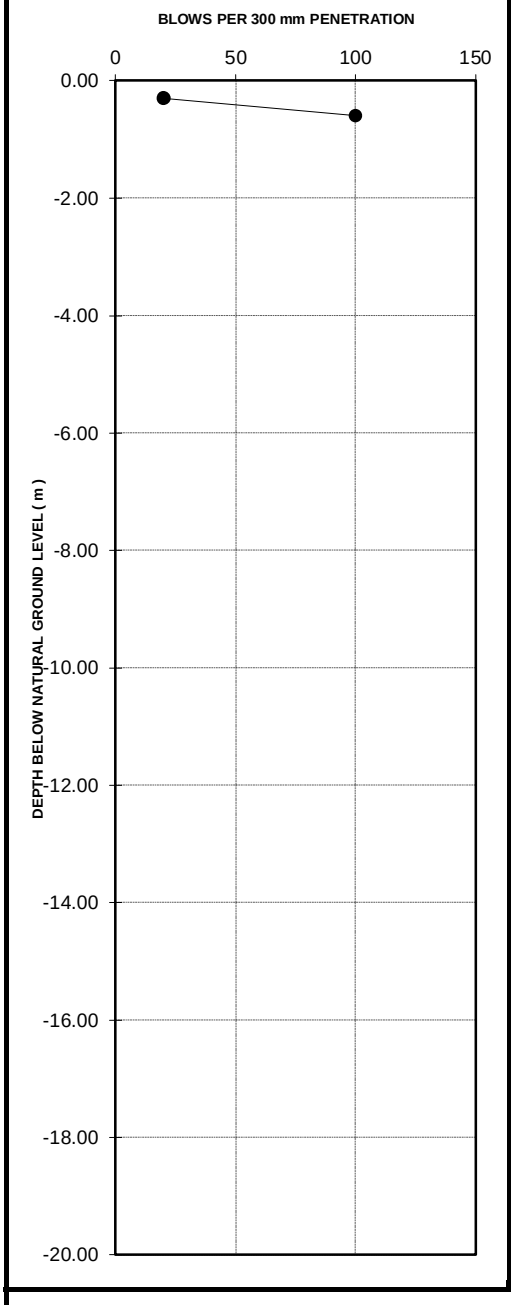
NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
100	300	-0.300	3	100	



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 26
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
20	300	-0.300	15	20	
100	600	-0.600	3	100	

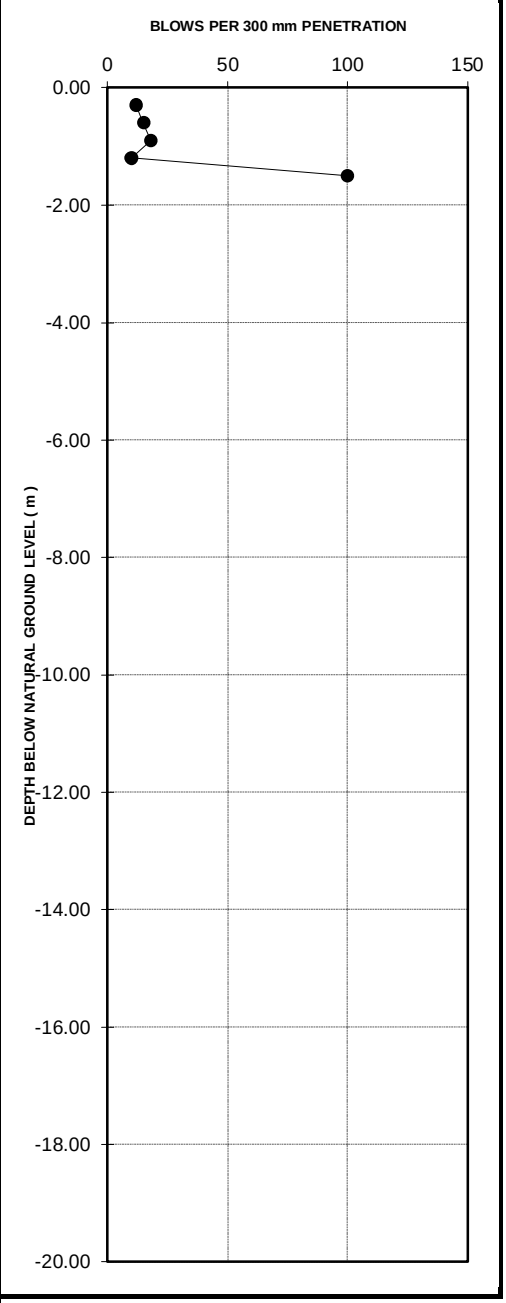


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 27
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
12	300	-0.300	25	12
15	600	-0.600	20	15
18	900	-0.900	17	18
10	1200	-1.200	30	10
100	1500	-1.500	3	100

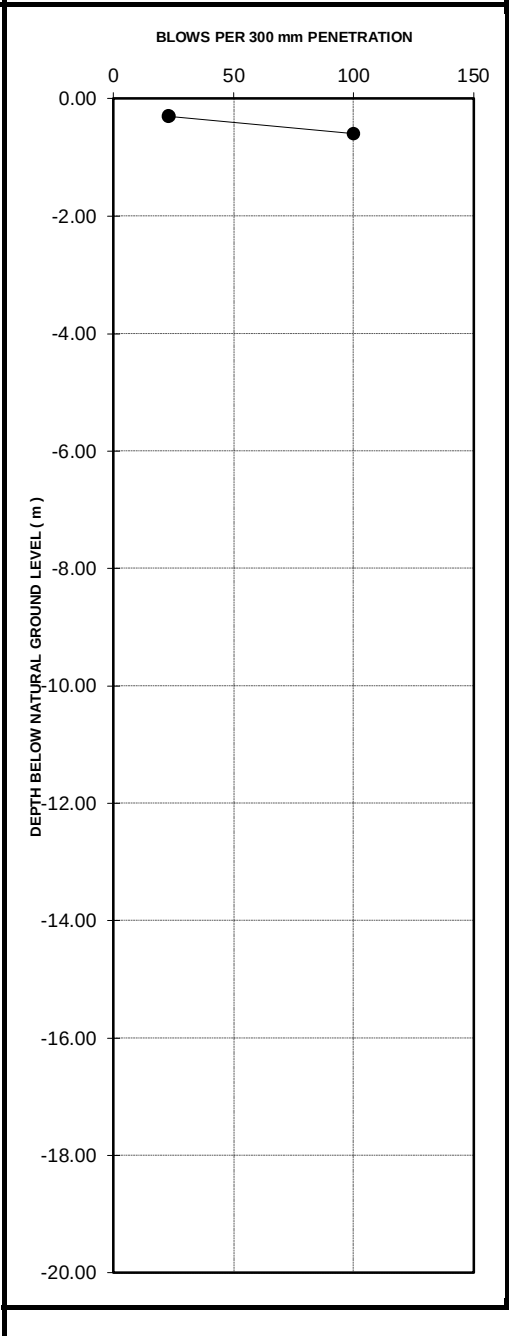
GRAPH



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 28
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
23	300	-0.300	13	23	
100	600	-0.600	3	100	

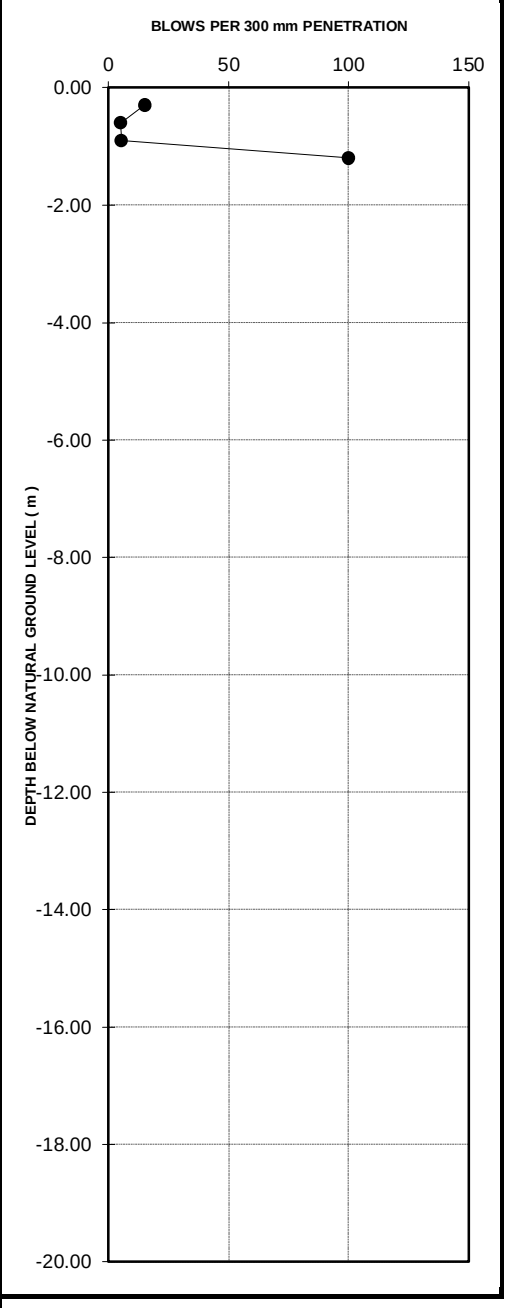


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 29
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
15	300	-0.300	20	15
5	600	-0.600	60	5
16	900	-0.900	56	5
100	1200	-1.200	3	100

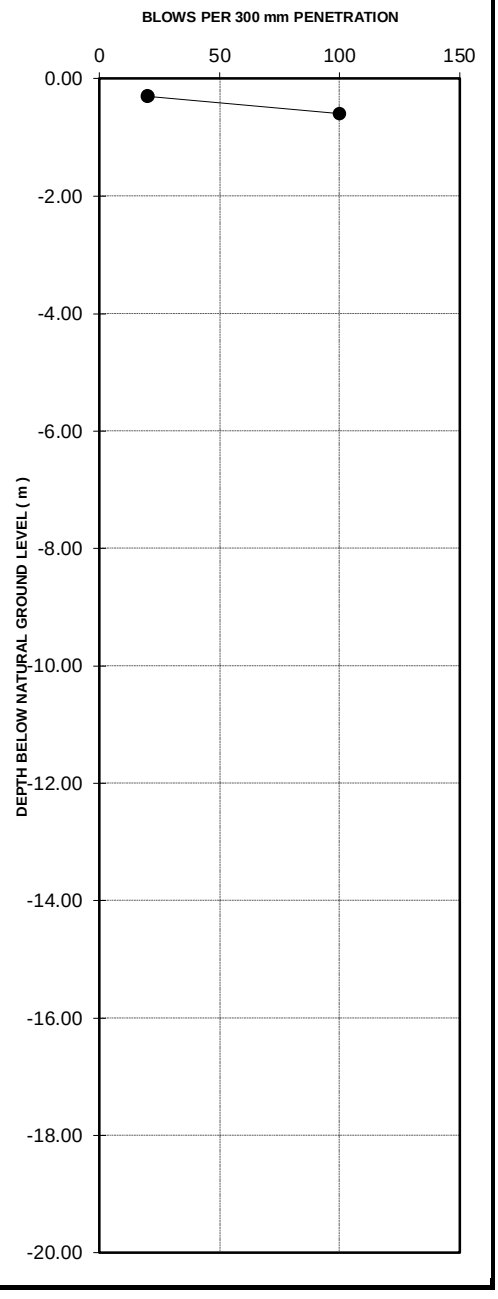
GRAPH



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 30
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

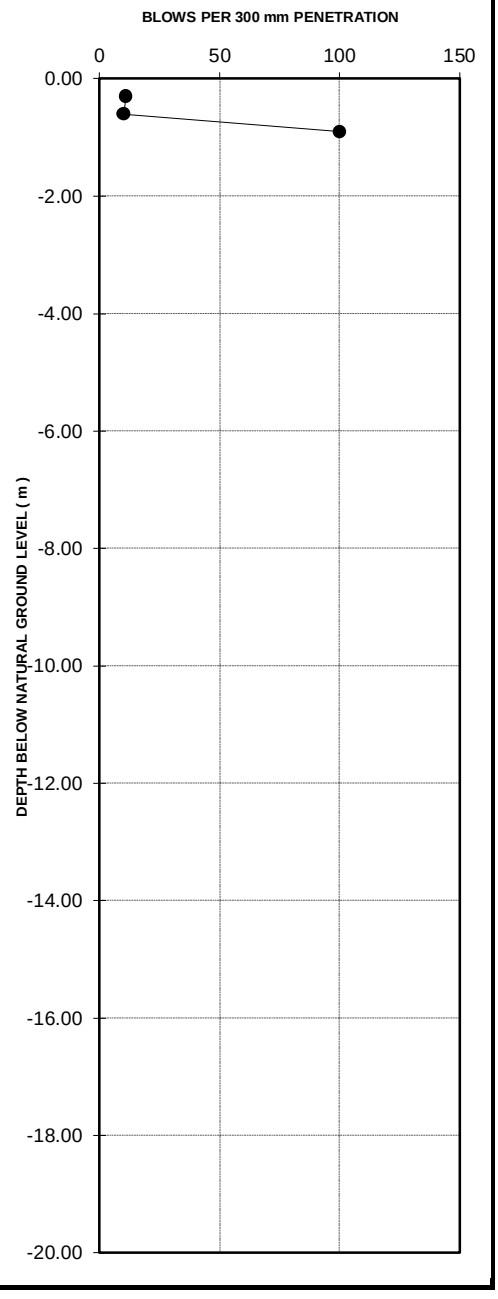
NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
20	300	-0.300	15	20	
100	600	-0.600	3	100	



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 35
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

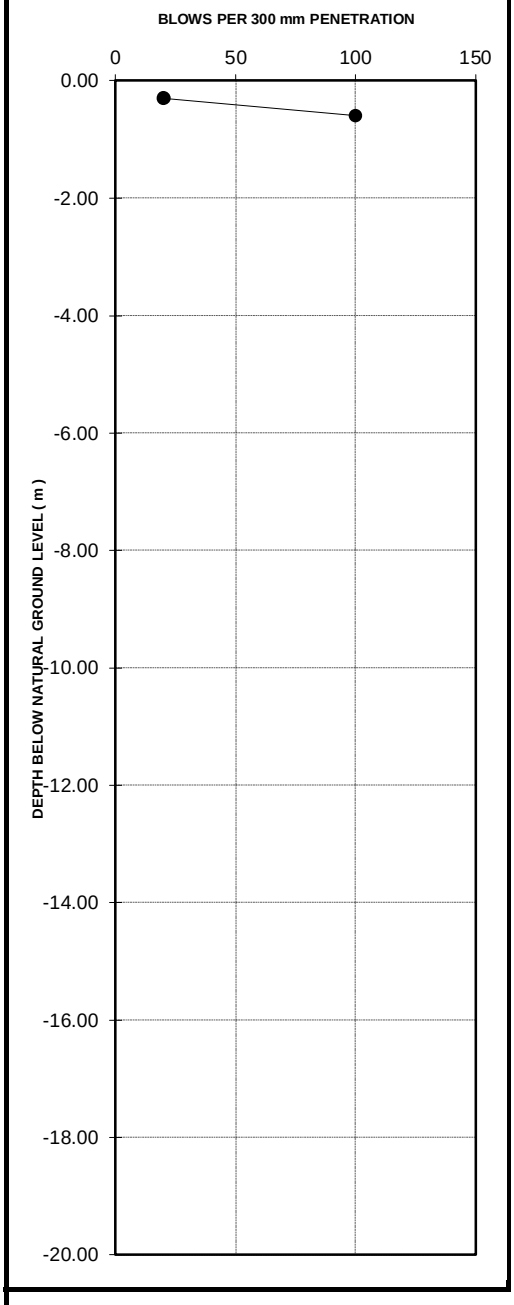
NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
11	300	-0.300	27	11	
10	600	-0.600	30	10	
100	900	-0.900	3	100	



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 39
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
20	300	-0.300	15	20	
100	600	-0.600	3	100	

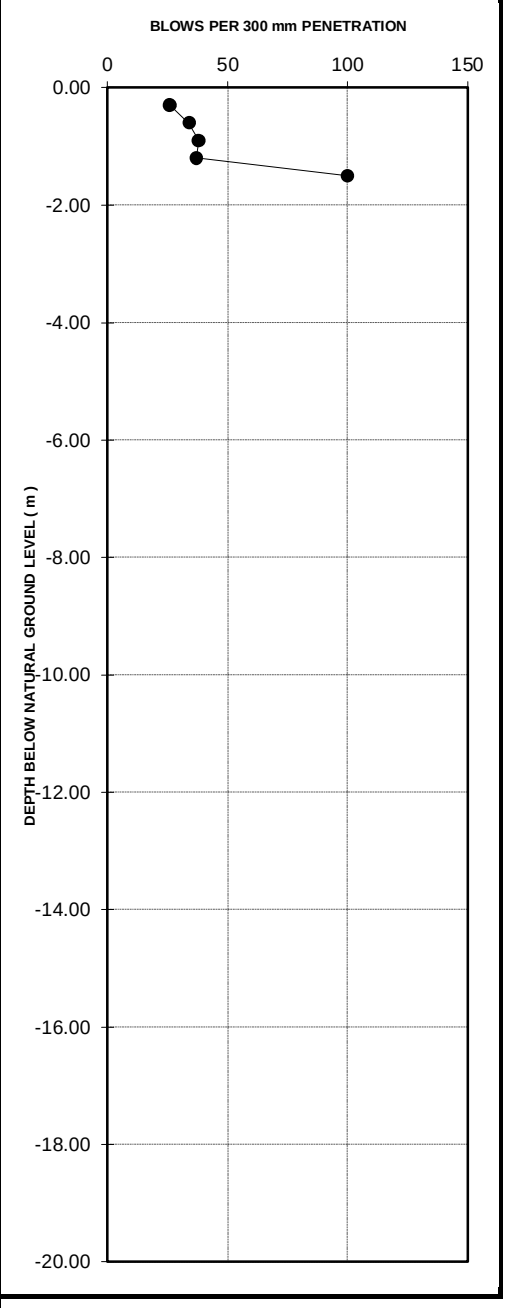


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 44
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
26	300	-0.300	12	26
34	600	-0.600	9	34
38	900	-0.900	8	38
37	1200	-1.200	8	37
100	1500	-1.500	3	100

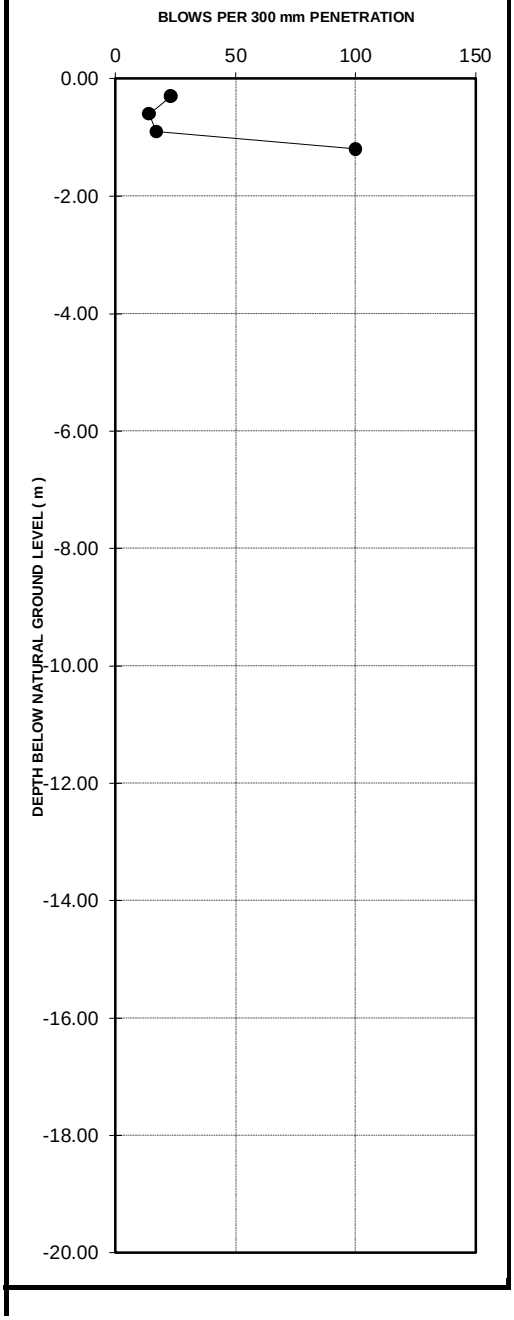
GRAPH



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 49
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

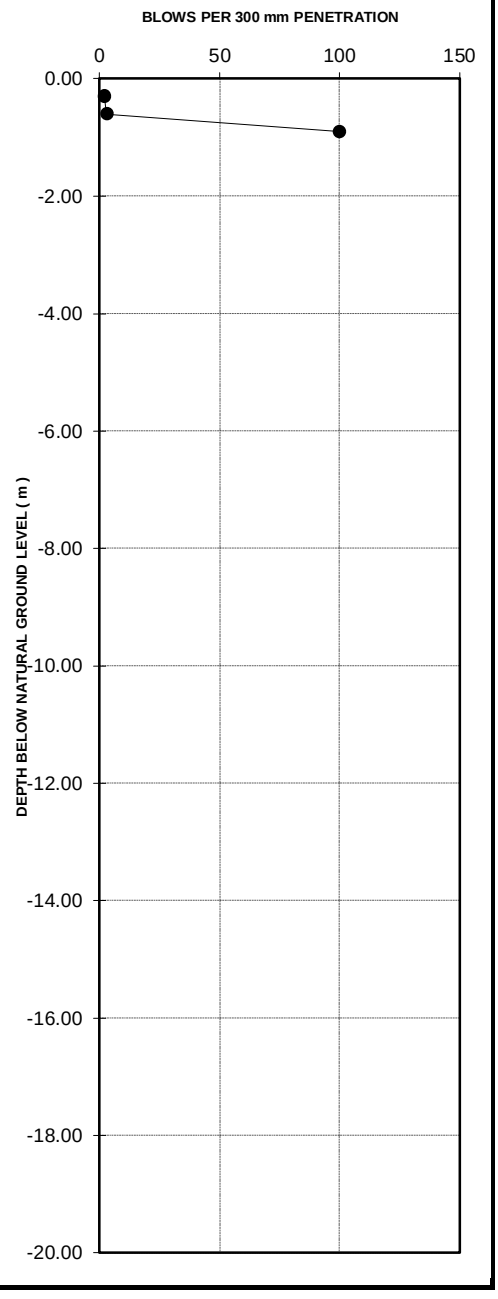
NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
23	300	-0.300	13	23	
14	600	-0.600	21	14	
17	900	-0.900	18	17	
100	1200	-1.200	3	100	



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 56
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

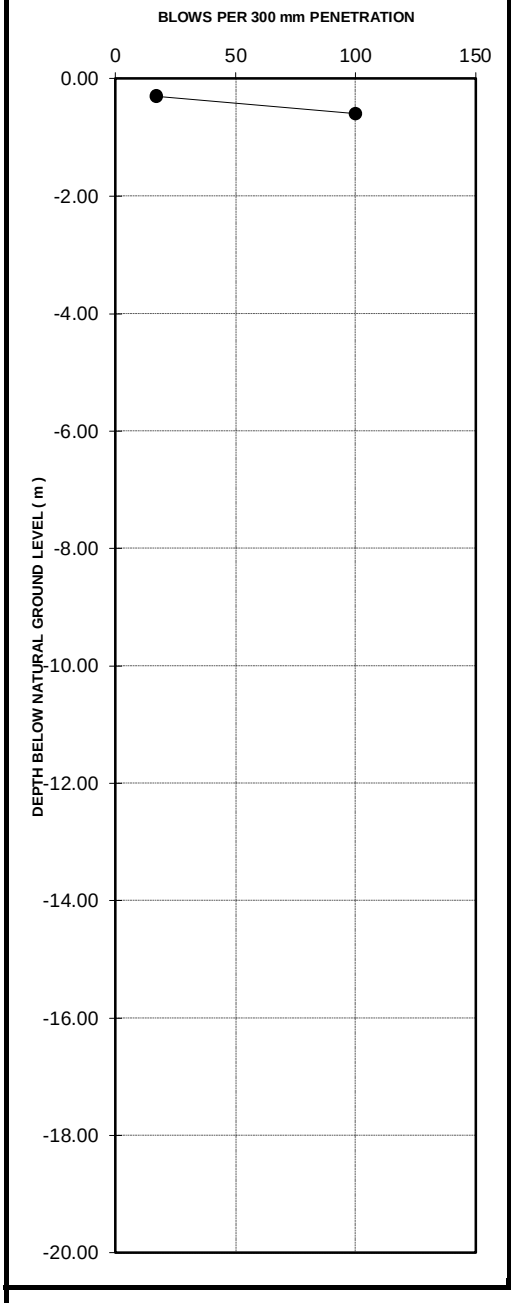
NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
2	300	-0.300	150	2	
3	600	-0.600	100	3	
100	900	-0.900	3	100	



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 60
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

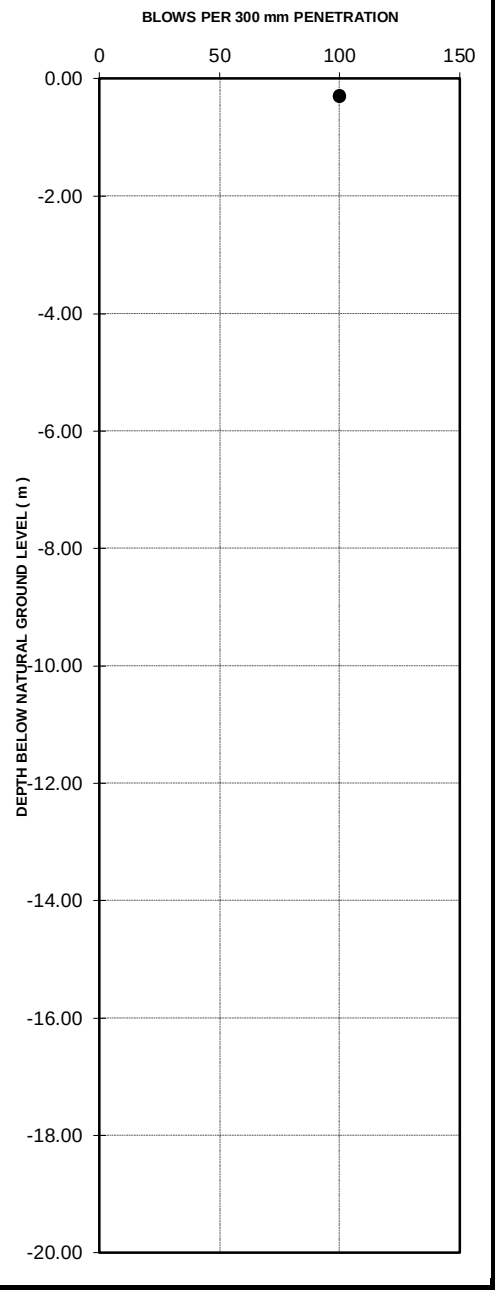
NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
17	300	-0.300	18	17	
100	600	-0.600	3	100	



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH BH 04
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

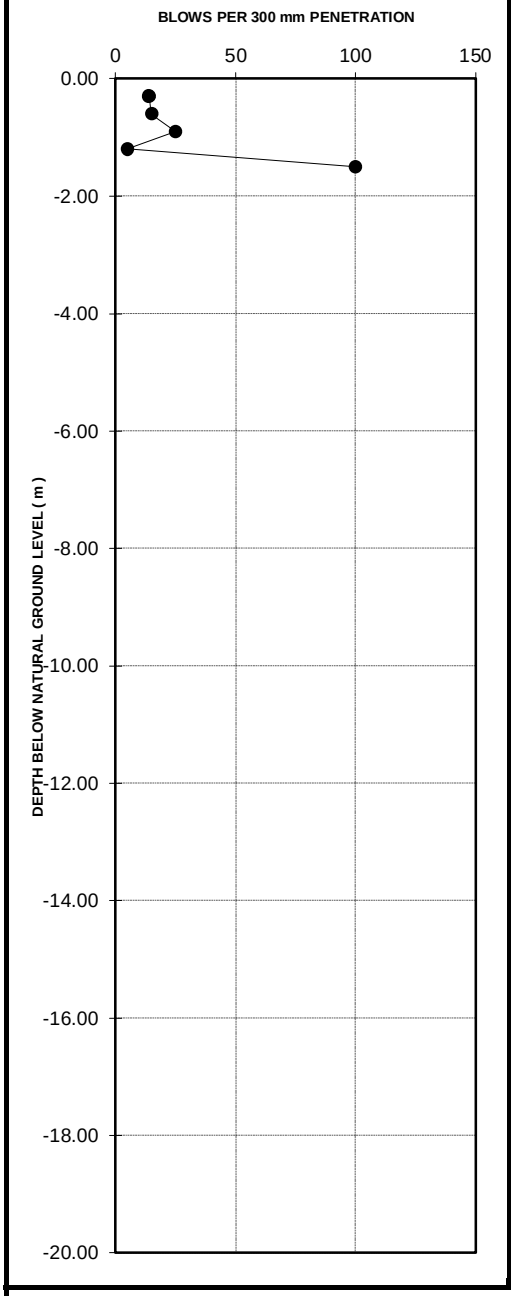
NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
100	300	-0.300	3	100	



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 63
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

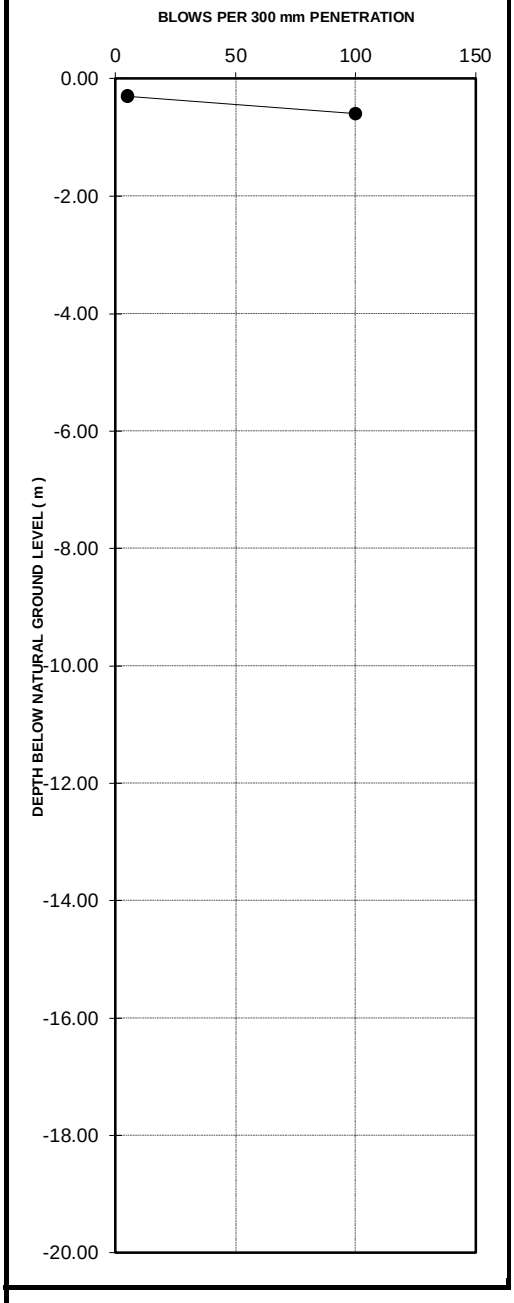
NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
14	300	-0.300	21	14	
15	600	-0.600	20	15	
25	900	-0.900	12	25	
5	1200	-1.200	60	5	
100	1500	-1.500	3	100	



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 65
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

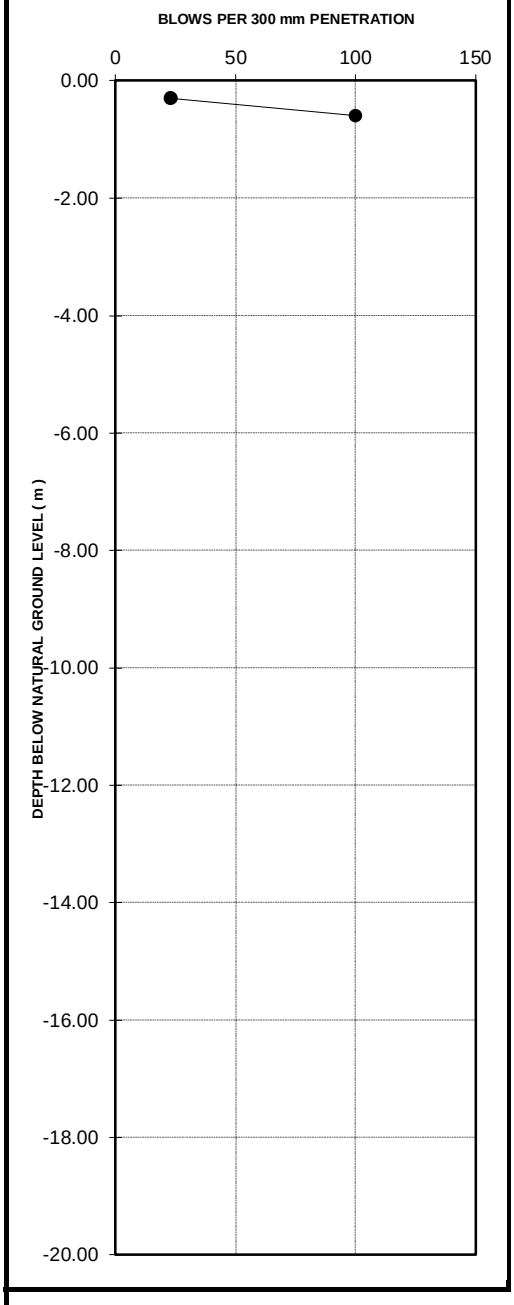
NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
5	300	-0.300	60	5	
100	600	-0.600	3	100	



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 74
STARTING DEPTH FROM N.G.L. (m)	0
DATE	06/02/2025 - 07/02/2025

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
23	300	-0.300	13	23	
100	600	-0.600	3	100	

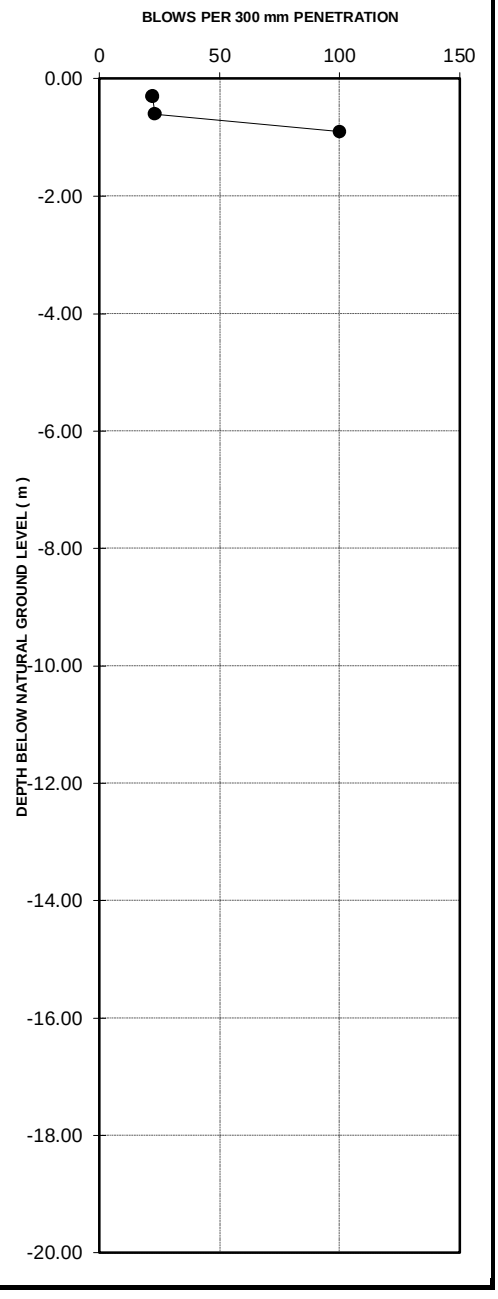


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 76
STARTING DEPTH FROM N.G.L. (m)	0
DATE	06/02/2025 - 07/02/2025

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
22	300	-0.300	14	22
23	600	-0.600	13	23
100	900	-0.900	3	100

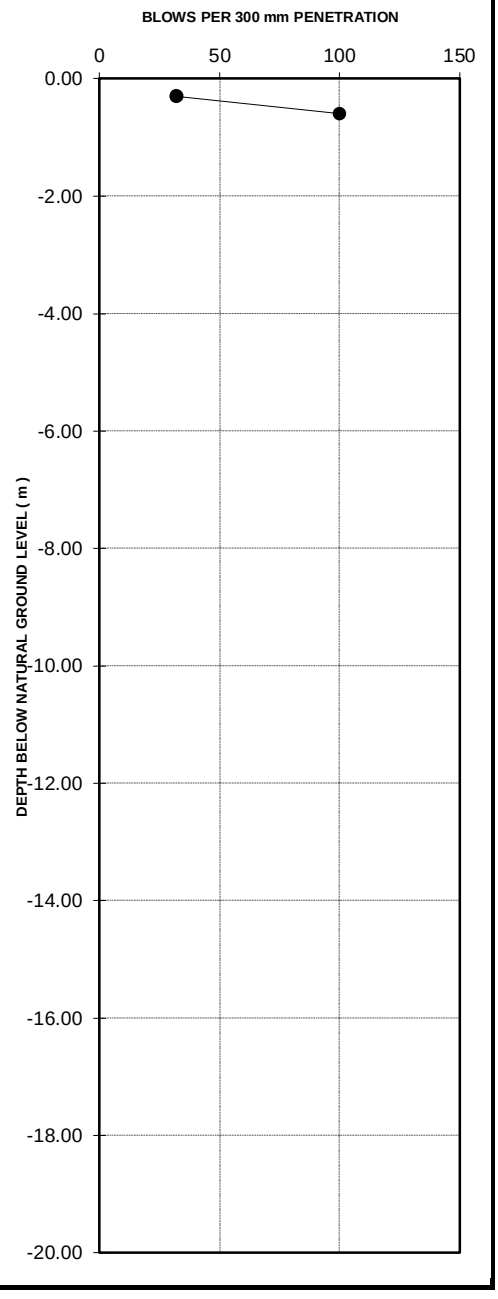
GRAPH



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH BH 5
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
32	300	-0.300	9	32	
100	600	-0.600	3	100	

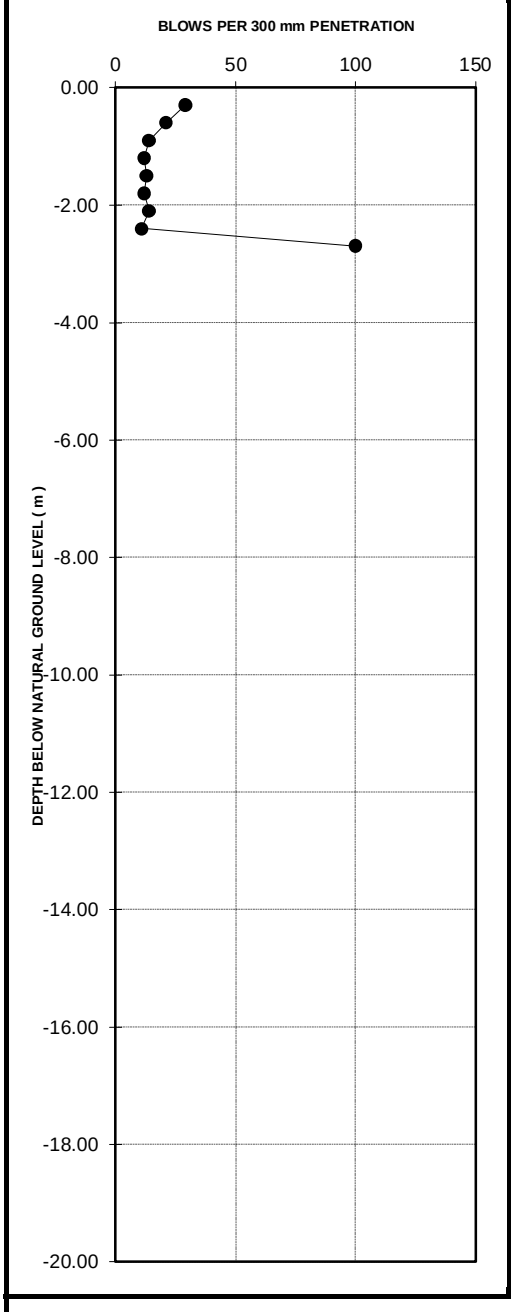


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 108
STARTING DEPTH FROM N.G.L. (m)	0
DATE	06/02/2025 - 07/02/2025

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
29	300	-0.300	10	29
21	600	-0.600	14	21
14	900	-0.900	21	14
12	1200	-1.200	25	12
13	1500	-1.500	23	13
12	1800	-1.800	25	12
14	2100	-2.100	21	14
11	2400	-2.400	27	11
100	2700	-2.700	3	100

GRAPH

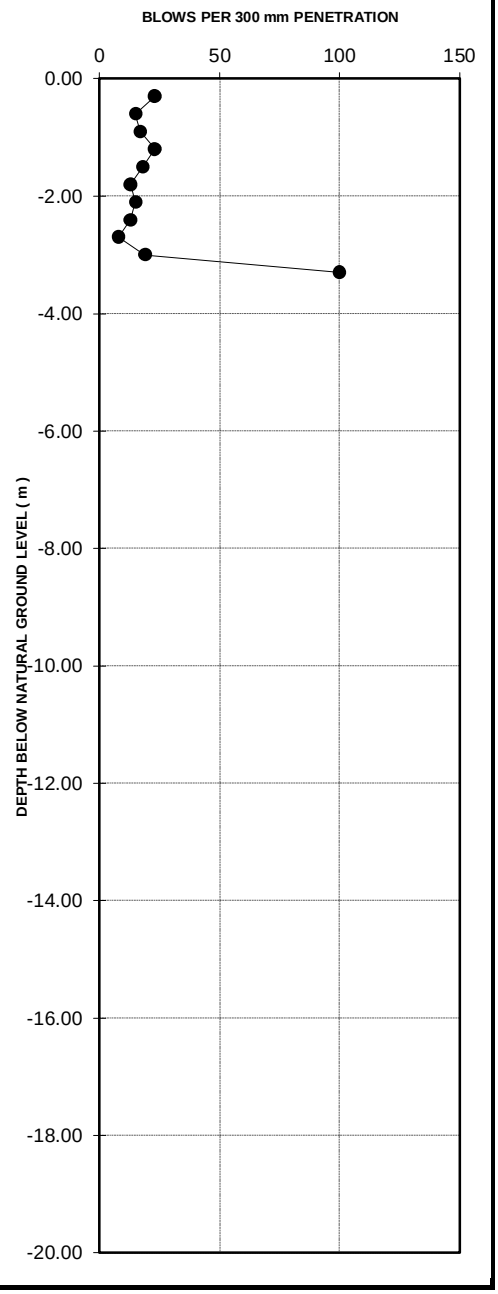


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 112
STARTING DEPTH FROM N.G.L. (m)	0
DATE	06/02/2025 - 07/02/2025

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
23	300	-0.300	13	23
15	600	-0.600	20	15
17	900	-0.900	18	17
23	1200	-1.200	13	23
18	1500	-1.500	17	18
13	1800	-1.800	23	13
15	2100	-2.100	20	15
13	2400	-2.400	23	13
8	2700	-2.700	38	8
19	3000	-3.000	16	19
100	3300	-3.300	3	100

GRAPH

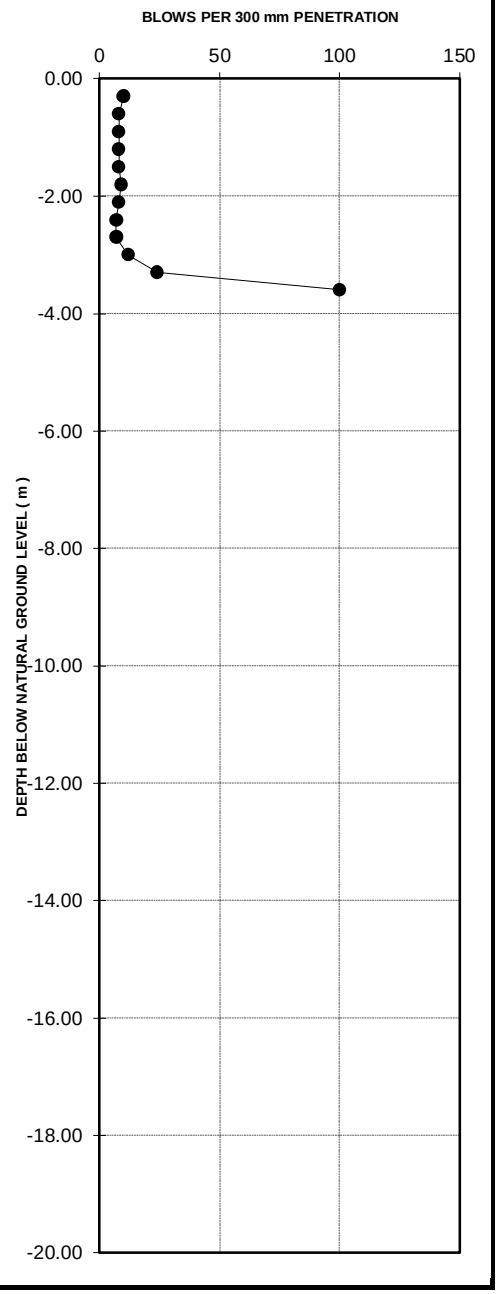


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 114
STARTING DEPTH FROM N.G.L. (m)	0
DATE	06/02/2025 - 07/02/2025

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
10	300	-0.300	30	10
8	600	-0.600	38	8
8	900	-0.900	38	8
8	1200	-1.200	38	8
8	1500	-1.500	38	8
9	1800	-1.800	33	9
8	2100	-2.100	38	8
7	2400	-2.400	43	7
7	2700	-2.700	43	7
12	3000	-3.000	25	12
24	3300	-3.300	13	24
100	3600	-3.600	3	100

GRAPH

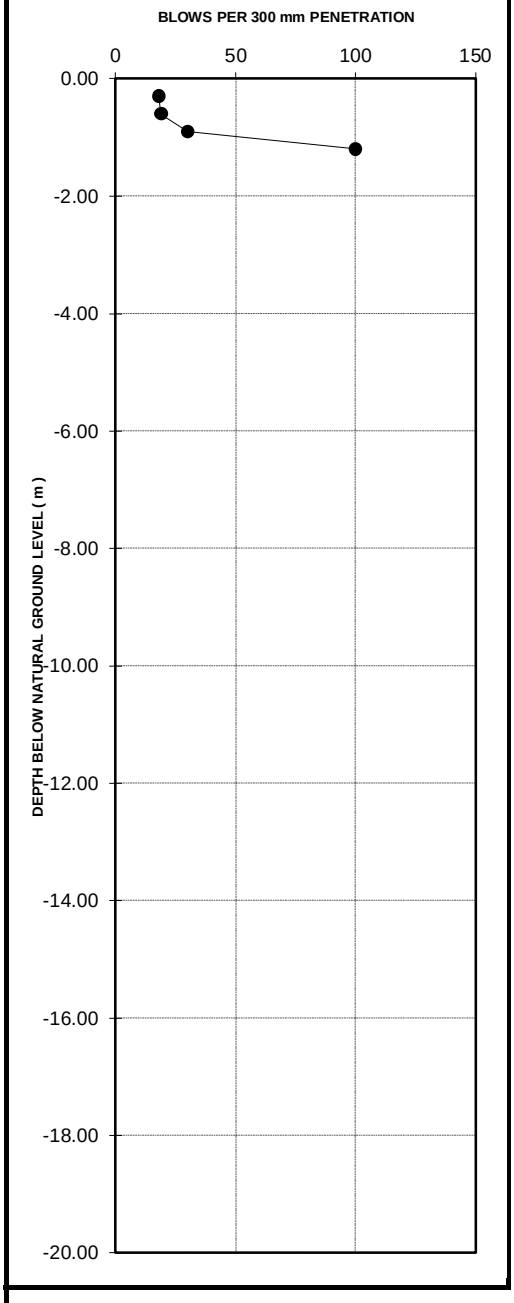


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 115
STARTING DEPTH FROM N.G.L. (m)	0
DATE	06/02/2025 - 07/02/2025

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
18	300	-0.300	17	18
19	600	-0.600	16	19
30	900	-0.900	10	30
100	1200	-1.200	3	100

GRAPH

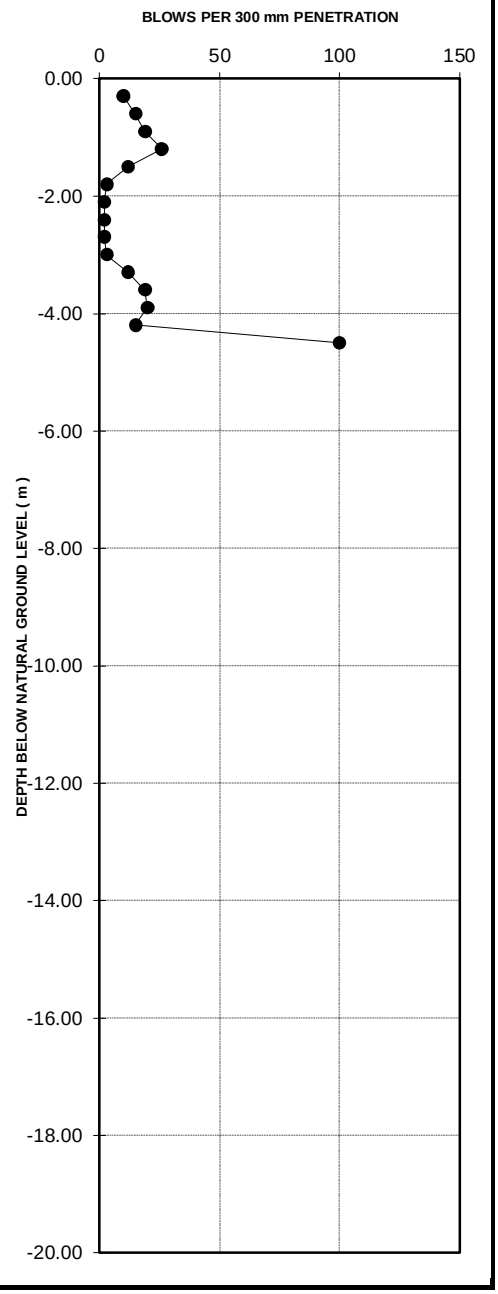


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 118
STARTING DEPTH FROM N.G.L. (m)	0
DATE	06/02/2025 - 07/02/2025

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
10	300	-0.300	30	10
15	600	-0.600	20	15
19	900	-0.900	16	19
26	1200	-1.200	12	26
12	1500	-1.500	25	12
3	1800	-1.800	100	3
2	2100	-2.100	150	2
2	2400	-2.400	150	2
2	2700	-2.700	150	2
3	3000	-3.000	100	3
12	3300	-3.300	25	12
19	3600	-3.600	16	19
20	3900	-3.900	15	20
15	4200	-4.200	20	15
100	4500	-4.500	3	100

GRAPH

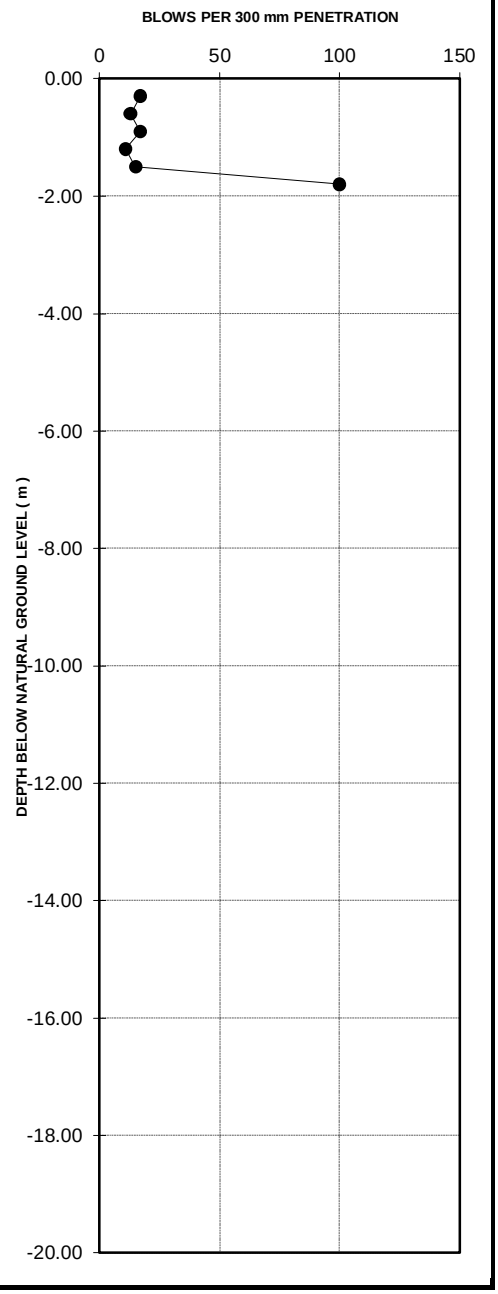


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 127
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
17	300	-0.300	18	17
13	600	-0.600	23	13
17	900	-0.900	18	17
11	1200	-1.200	27	11
15	1500	-1.500	20	15
100	1800	-1.800	3	100

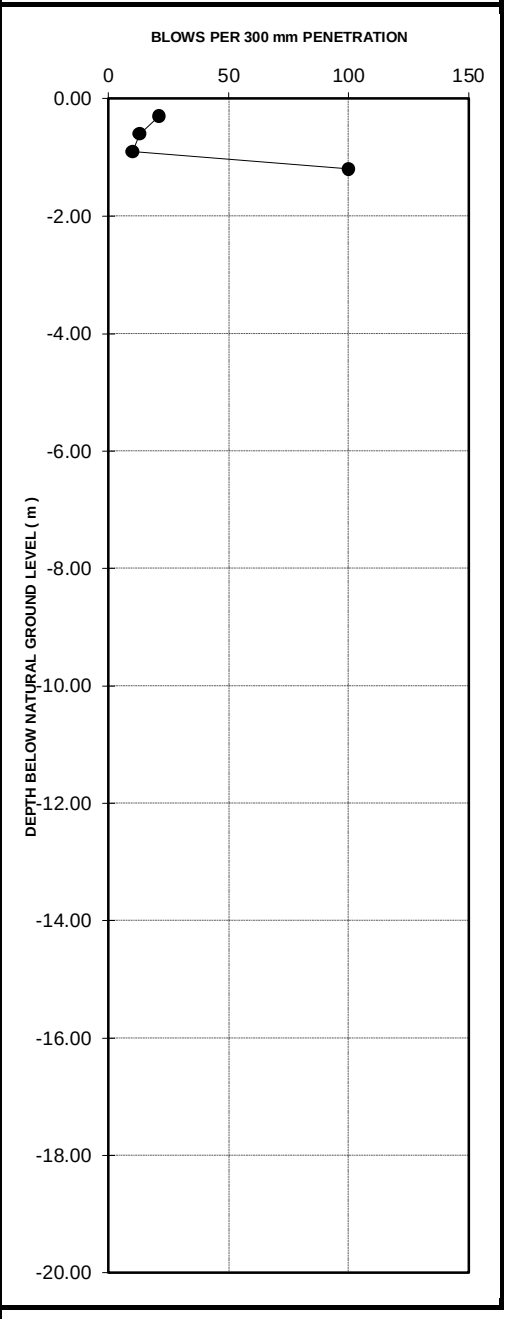
GRAPH



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 134
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
21	300	-0.300	14	21	
13	600	-0.600	23	13	
10	900	-0.900	30	10	
100	1200	-1.200	3	100	

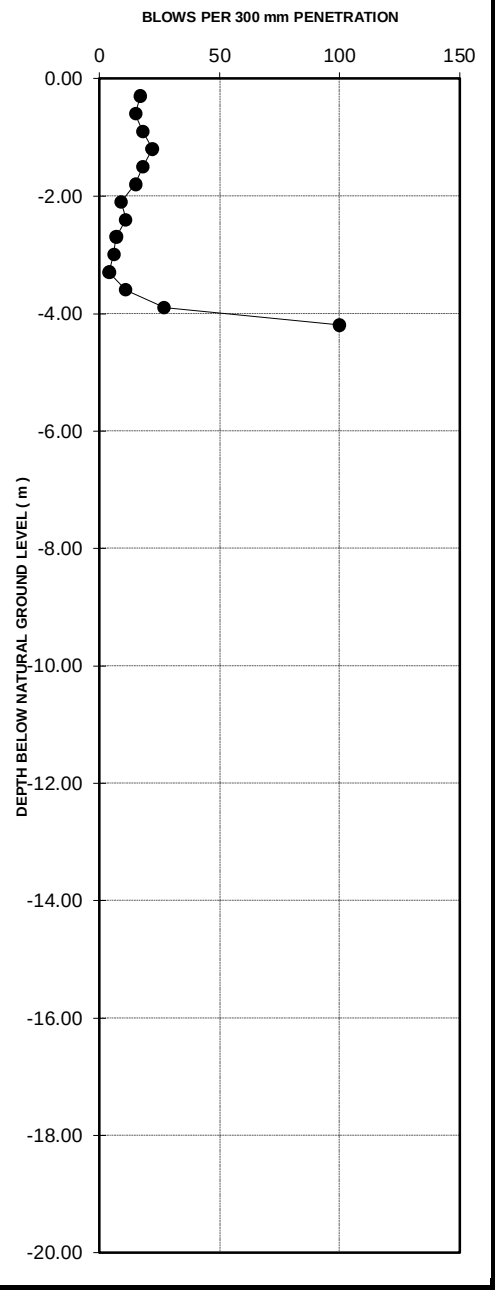


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 138
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
17	300	-0.300	18	17
15	600	-0.600	20	15
18	900	-0.900	17	18
22	1200	-1.200	14	22
18	1500	-1.500	17	18
15	1800	-1.800	20	15
9	2100	-2.100	33	9
11	2400	-2.400	27	11
7	2700	-2.700	43	7
6	3000	-3.000	50	6
4	3300	-3.300	75	4
11	3600	-3.600	27	11
27	3900	-3.900	11	27
100	4200	-4.200	3	100

GRAPH

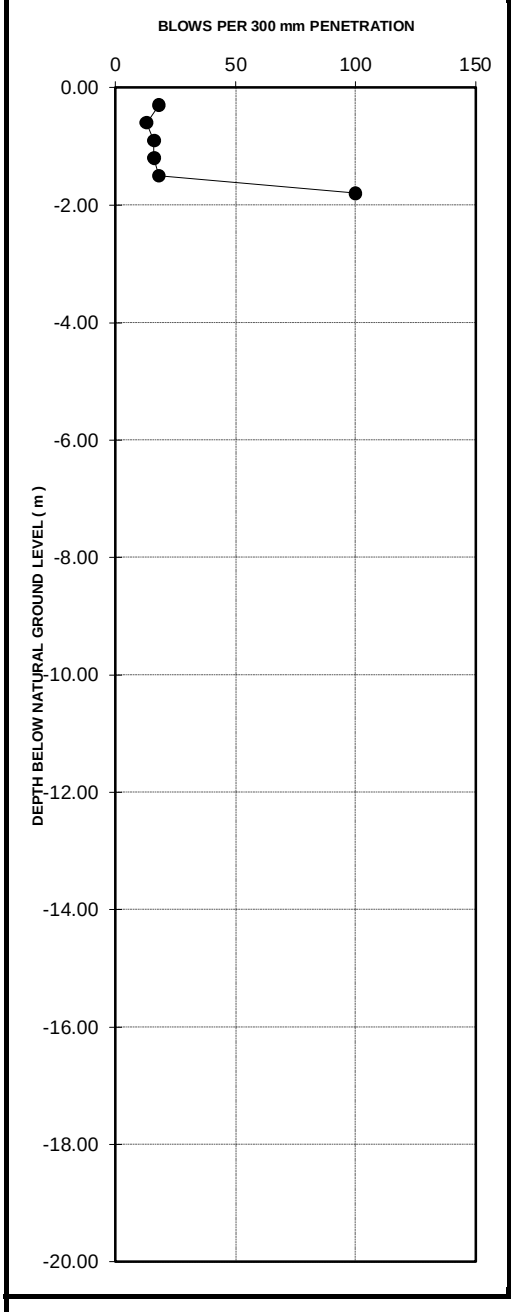


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 145
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
18	300	-0.300	17	18
13	600	-0.600	23	13
16	900	-0.900	19	16
16	1200	-1.200	19	16
18	1500	-1.500	17	18
100	1800	-1.800	3	100

GRAPH

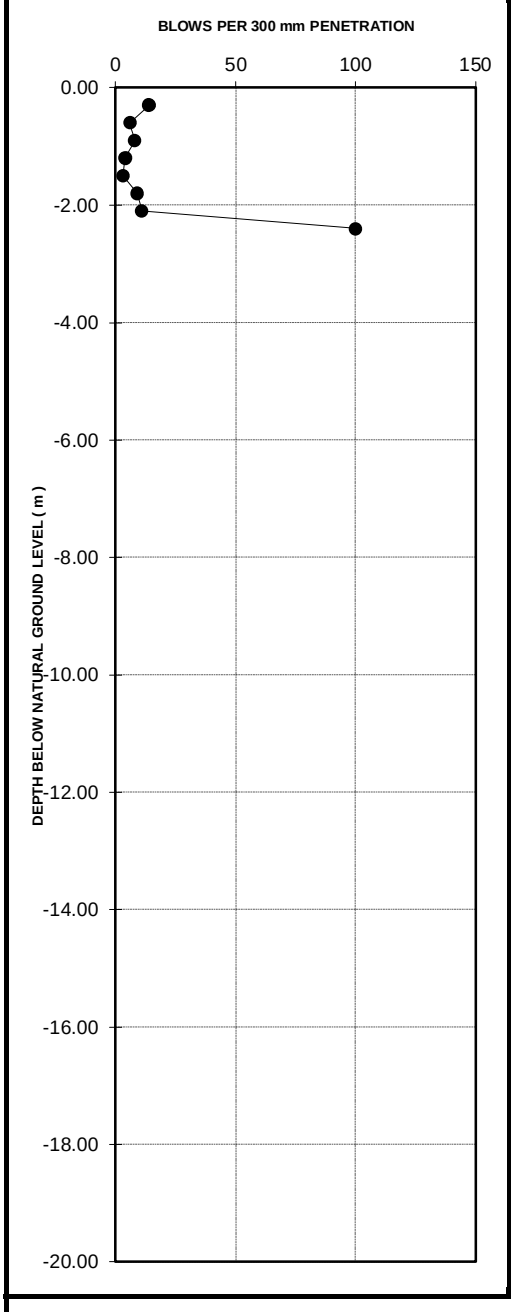


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 149
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
14	300	-0.300	21	14
6	600	-0.600	50	6
8	900	-0.900	38	8
4	1200	-1.200	75	4
3	1500	-1.500	100	3
9	1800	-1.800	33	9
11	2100	-2.100	27	11
100	2400	-2.400	3	100

GRAPH

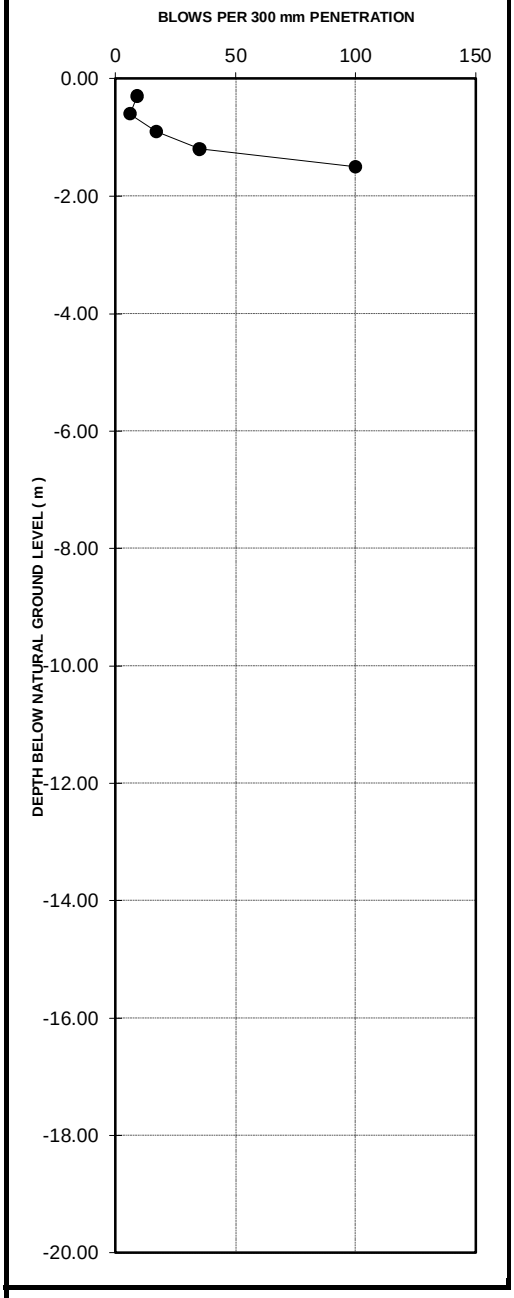


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 150
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
9	300	-0.300	33	9
6	600	-0.600	50	6
17	900	-0.900	18	17
35	1200	-1.200	9	35
100	1500	-1.500	3	100

GRAPH

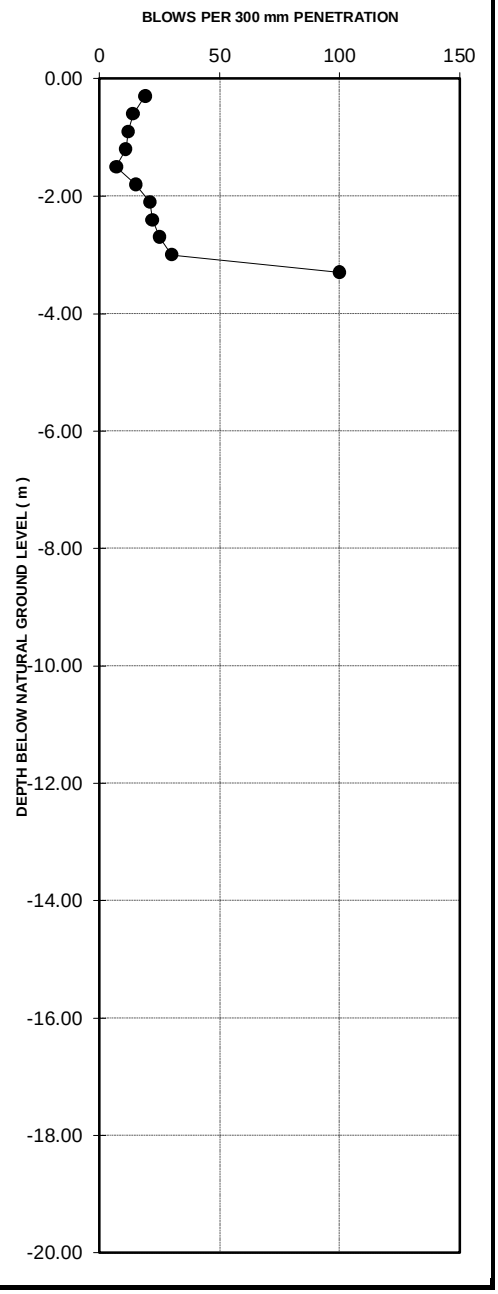


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 155
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
19	300	-0.300	16	19
14	600	-0.600	21	14
12	900	-0.900	25	12
11	1200	-1.200	27	11
7	1500	-1.500	43	7
15	1800	-1.800	20	15
21	2100	-2.100	14	21
22	2400	-2.400	14	22
25	2700	-2.700	12	25
30	3000	-3.000	10	30
100	3300	-3.300	3	100

GRAPH

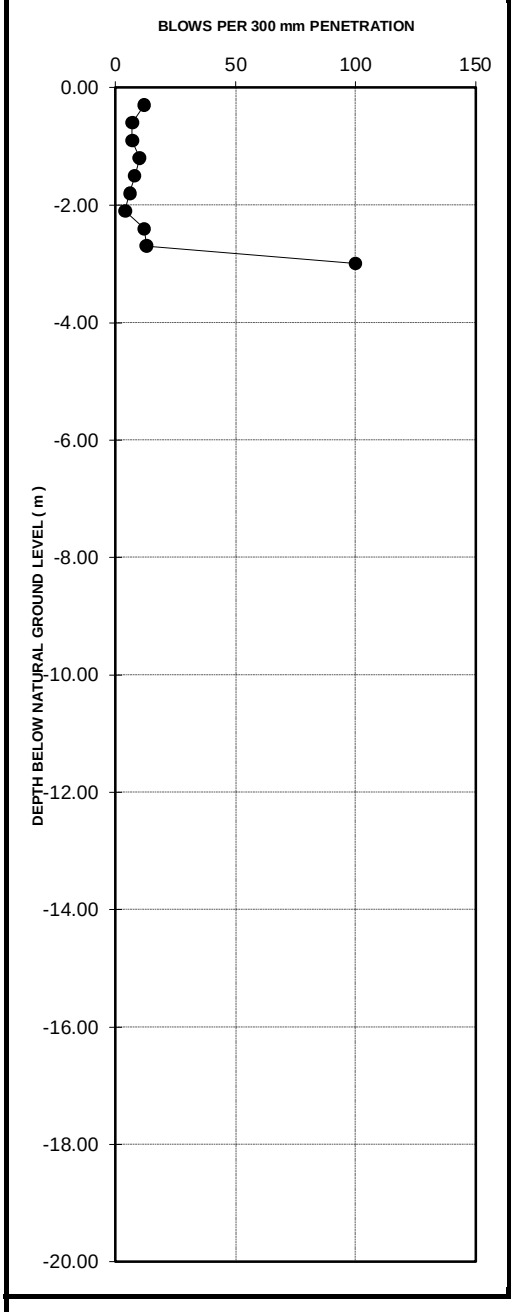


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 158
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
12	300	-0.300	25	12
7	600	-0.600	43	7
7	900	-0.900	43	7
10	1200	-1.200	30	10
8	1500	-1.500	38	8
6	1800	-1.800	50	6
4	2100	-2.100	75	4
12	2400	-2.400	25	12
13	2700	-2.700	23	13
100	3000	-3.000	3	100

GRAPH

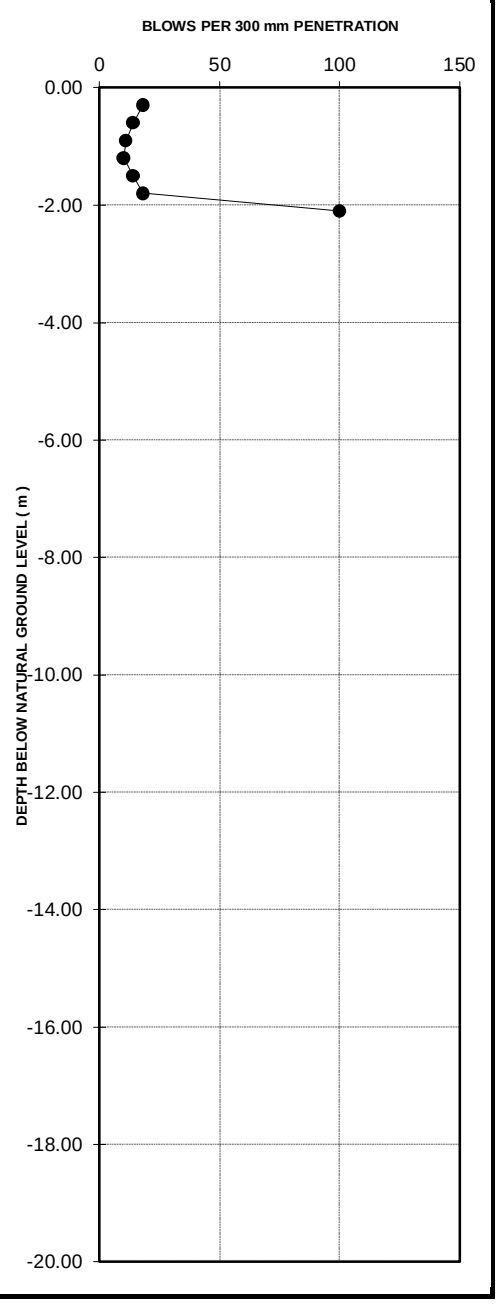


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 160
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
18	300	-0.300	17	18
14	600	-0.600	21	14
11	900	-0.900	27	11
10	1200	-1.200	30	10
14	1500	-1.500	21	14
18	1800	-1.800	17	18
100	2100	-2.100	3	100

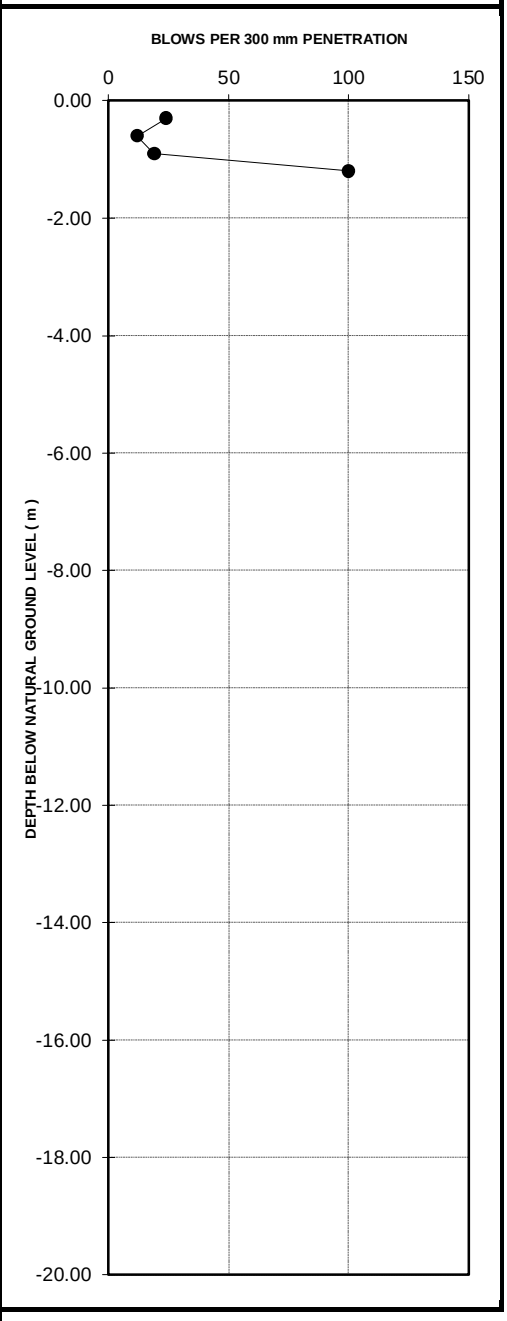
GRAPH



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 164
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

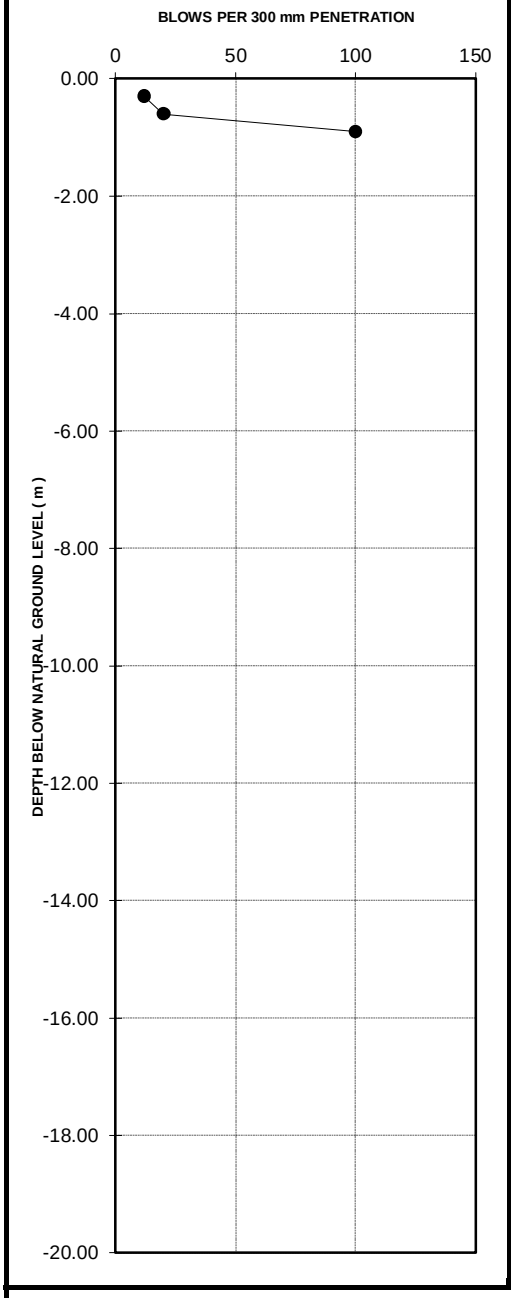
NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
24	300	-0.300	13	24	
12	600	-0.600	25	12	
19	900	-0.900	16	19	
100	1200	-1.200	3	100	



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 166
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
12	300	-0.300	25	12	
20	600	-0.600	15	20	
100	900	-0.900	3	100	

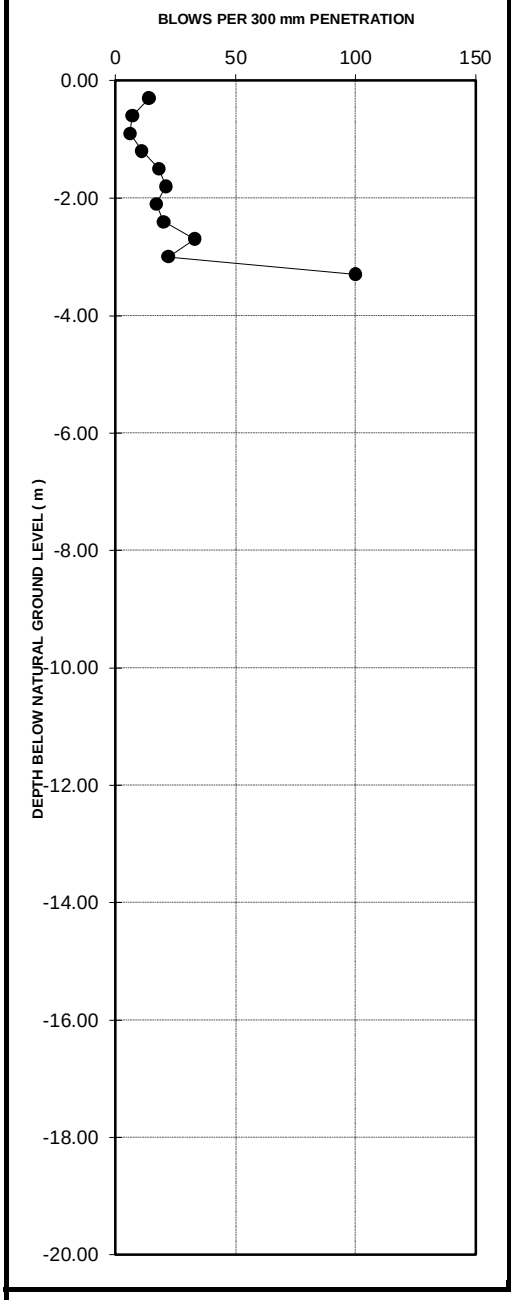


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 178
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
14	300	-0.300	21	14
7	600	-0.600	43	7
6	900	-0.900	50	6
11	1200	-1.200	27	11
18	1500	-1.500	17	18
21	1800	-1.800	14	21
17	2100	-2.100	18	17
20	2400	-2.400	15	20
33	2700	-2.700	9	33
22	3000	-3.000	14	22
100	3300	-3.300	3	100

GRAPH

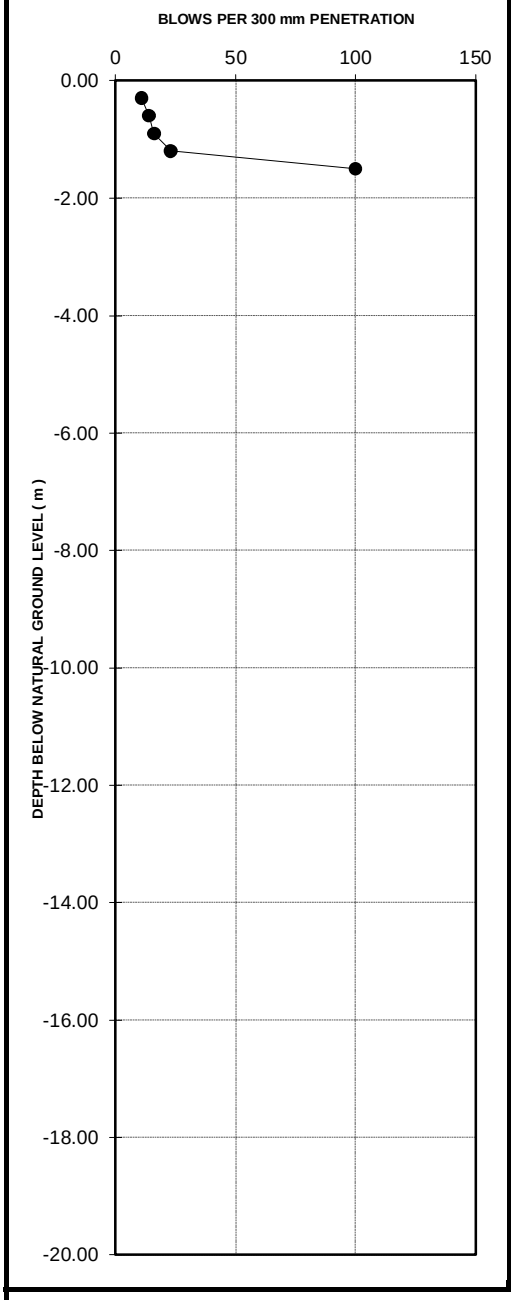


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 191
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
11	300	-0.300	27	11
14	600	-0.600	21	14
16	900	-0.900	19	16
23	1200	-1.200	13	23
100	1500	-1.500	3	100

GRAPH

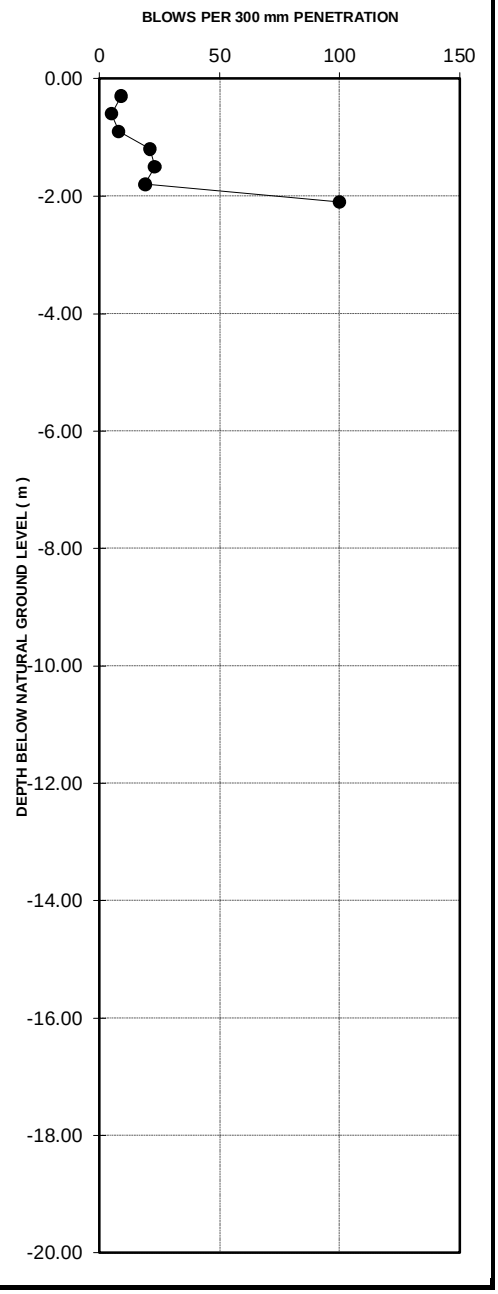


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 200
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
9	300	-0.300	33	9
5	600	-0.600	60	5
8	900	-0.900	38	8
21	1200	-1.200	14	21
23	1500	-1.500	13	23
19	1800	-1.800	16	19
100	2100	-2.100	3	100

GRAPH

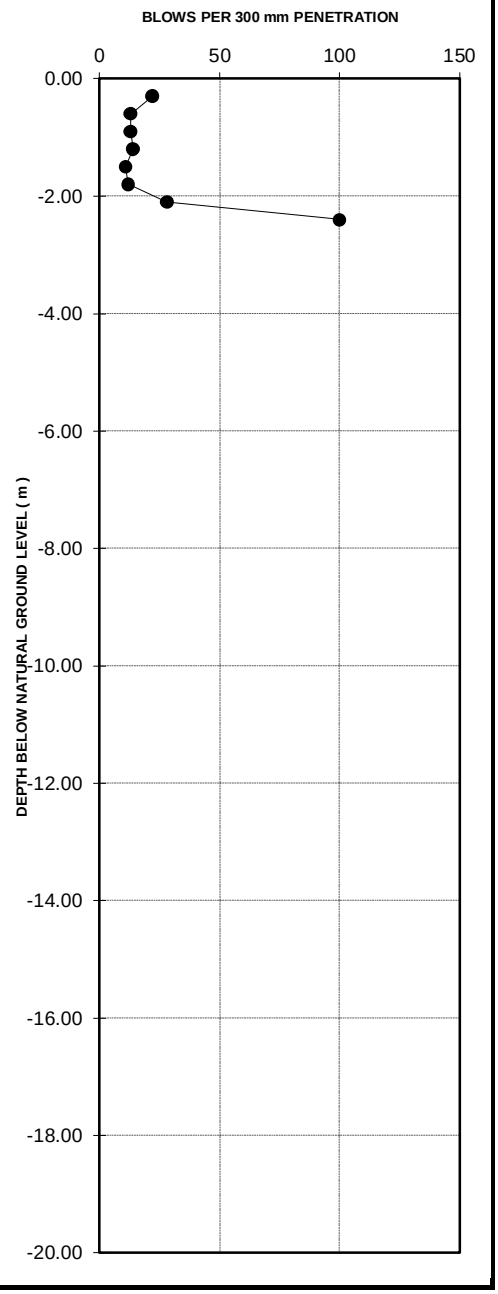


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 206
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
22	300	-0.300	14	22
13	600	-0.600	23	13
13	900	-0.900	23	13
14	1200	-1.200	21	14
11	1500	-1.500	27	11
12	1800	-1.800	25	12
28	2100	-2.100	11	28
100	2400	-2.400	3	100

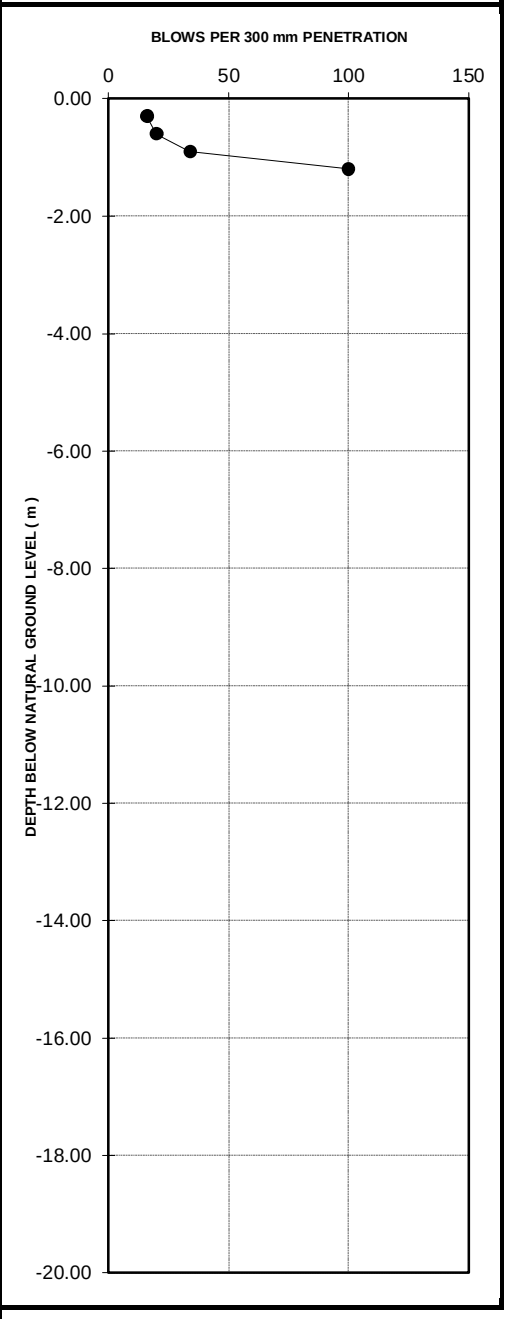
GRAPH



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 218
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

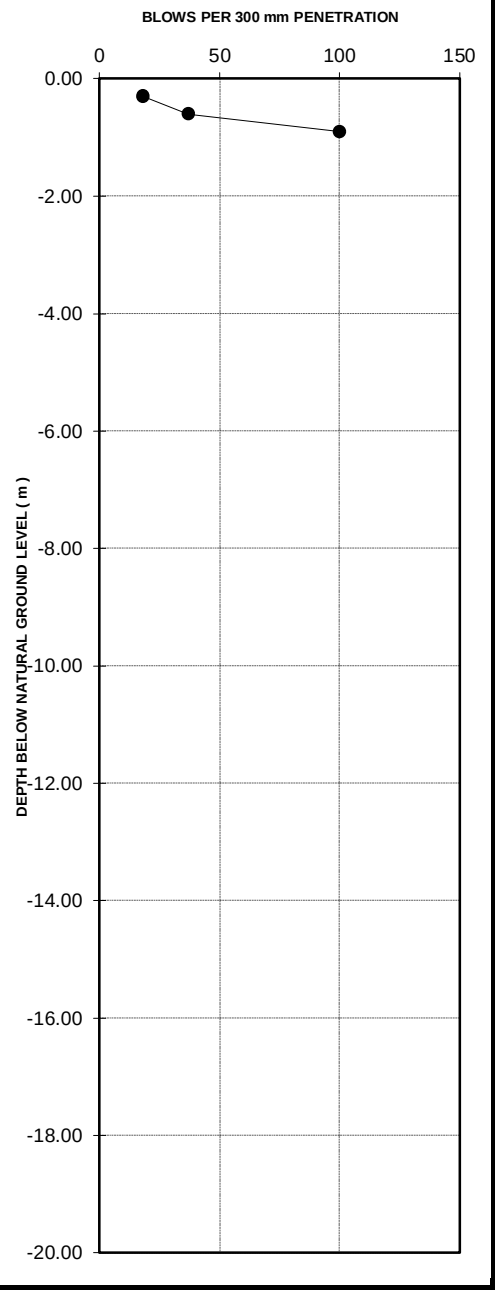
NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
16	300	-0.300	19	16	
20	600	-0.600	15	20	
34	900	-0.900	9	34	
100	1200	-1.200	3	100	



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 220
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
18	300	-0.300	17	18	
37	600	-0.600	8	37	
100	900	-0.900	3	100	

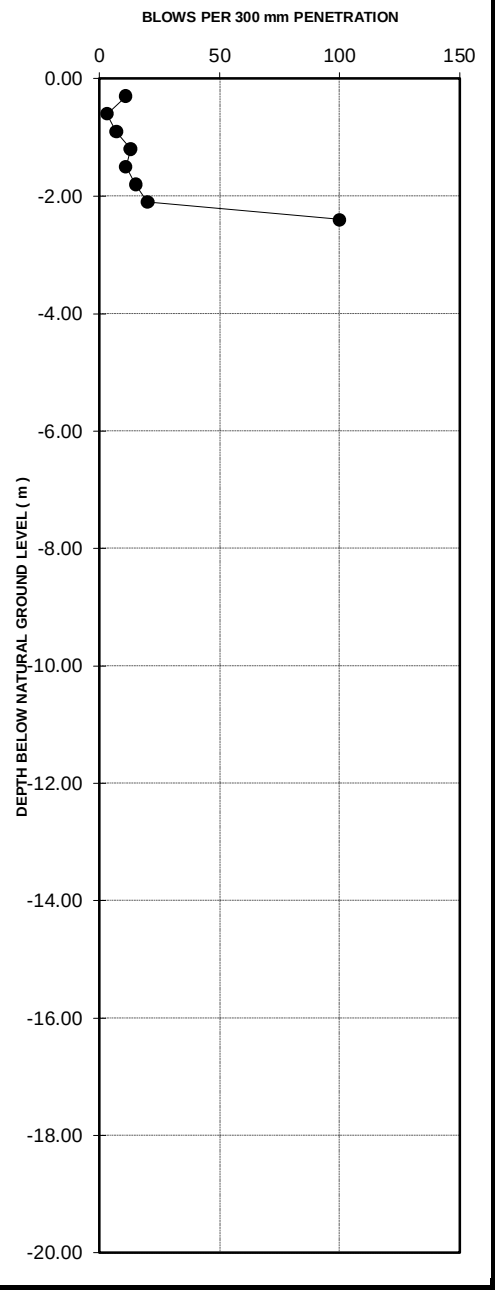


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 227
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
11	300	-0.300	27	11
3	600	-0.600	100	3
7	900	-0.900	43	7
13	1200	-1.200	23	13
11	1500	-1.500	27	11
15	1800	-1.800	20	15
20	2100	-2.100	15	20
100	2400	-2.400	3	100

GRAPH

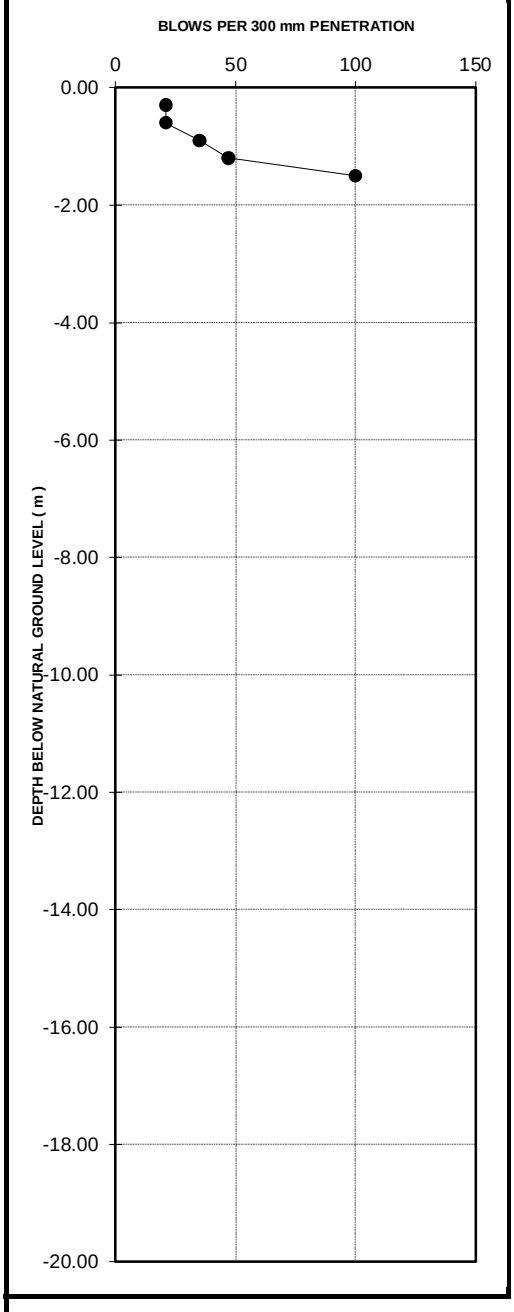


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 244
STARTING DEPTH FROM N.G.L. (m)	0
DATE	06/02/2025 - 07/02/2025

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
21	300	-0.300	14	21
21	600	-0.600	14	21
35	900	-0.900	9	35
47	1200	-1.200	6	47
100	1500	-1.500	3	100

GRAPH

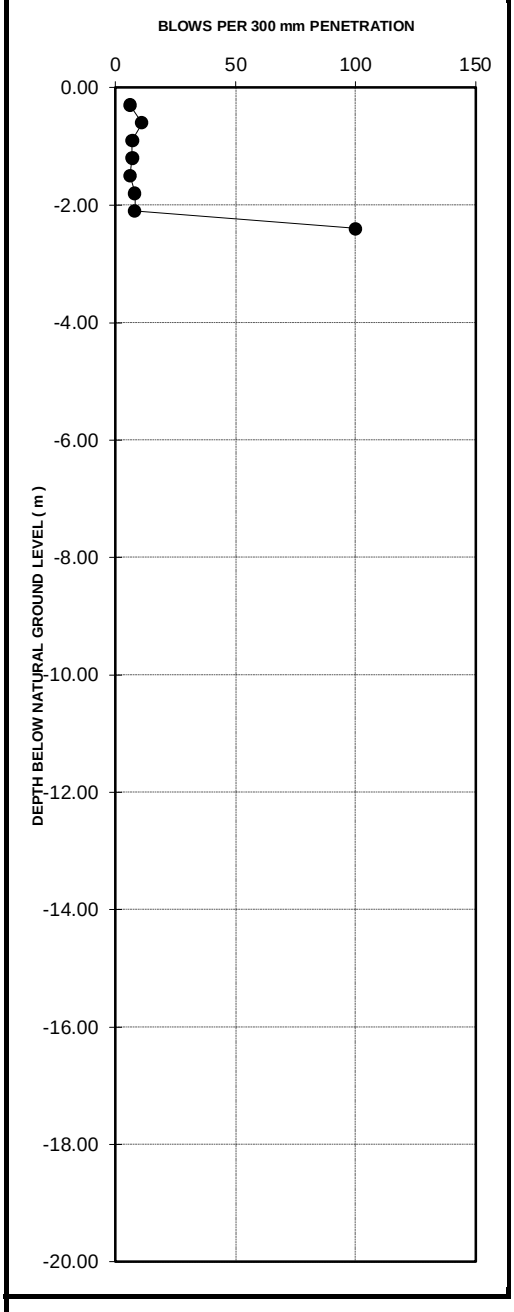


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 247
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
6	300	-0.300	50	6
11	600	-0.600	27	11
7	900	-0.900	43	7
7	1200	-1.200	43	7
6	1500	-1.500	50	6
8	1800	-1.800	38	8
8	2100	-2.100	38	8
100	2400	-2.400	3	100

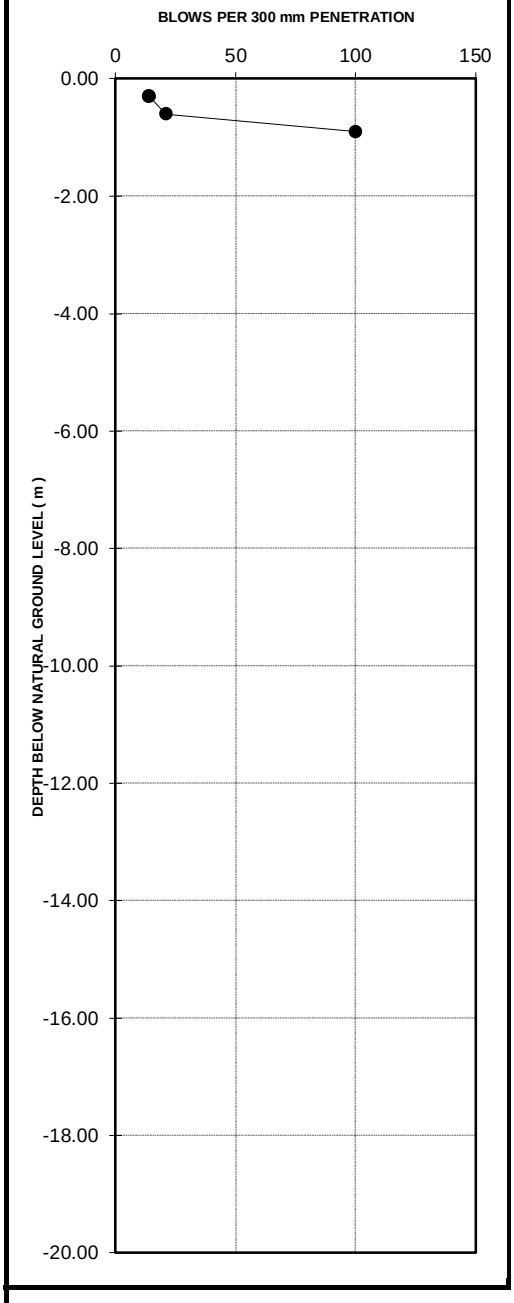
GRAPH



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 249
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
14	300	-0.300	21	14	
21	600	-0.600	14	21	
100	900	-0.900	3	100	

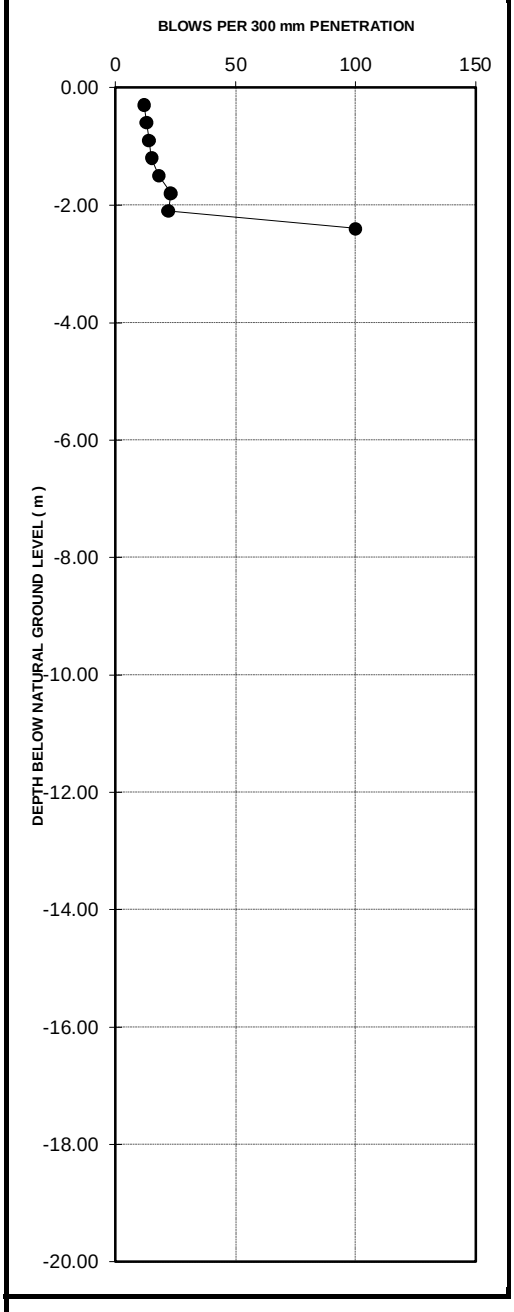


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 251
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
12	300	-0.300	25	12
13	600	-0.600	23	13
14	900	-0.900	21	14
15	1200	-1.200	20	15
18	1500	-1.500	17	18
23	1800	-1.800	13	23
22	2100	-2.100	14	22
100	2400	-2.400	3	100

GRAPH

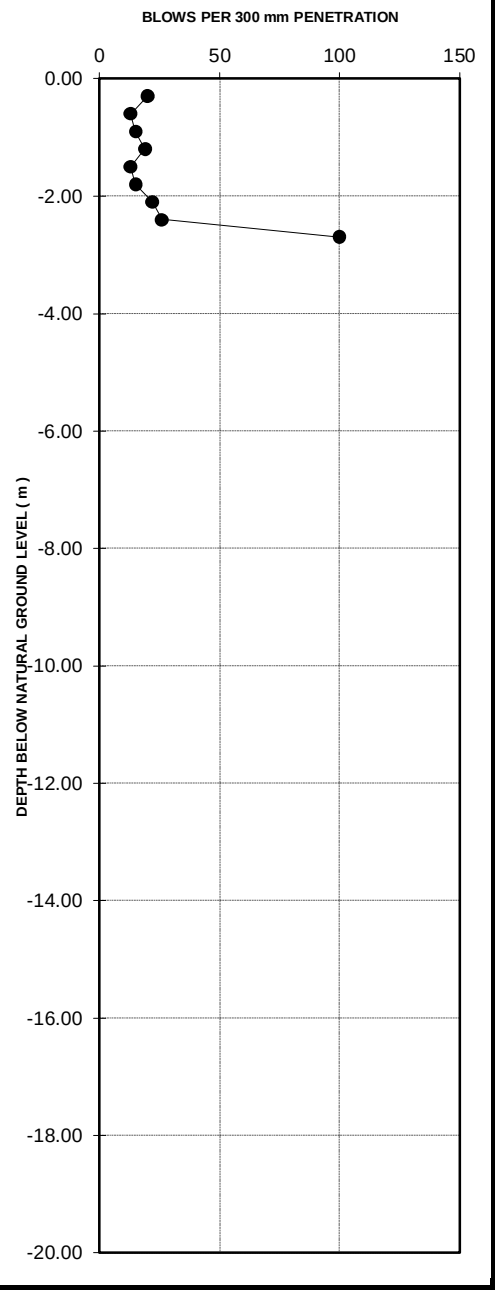


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 254
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
20	300	-0.300	15	20
13	600	-0.600	23	13
15	900	-0.900	20	15
19	1200	-1.200	16	19
13	1500	-1.500	23	13
15	1800	-1.800	20	15
22	2100	-2.100	14	22
26	2400	-2.400	12	26
100	2700	-2.700	3	100

GRAPH

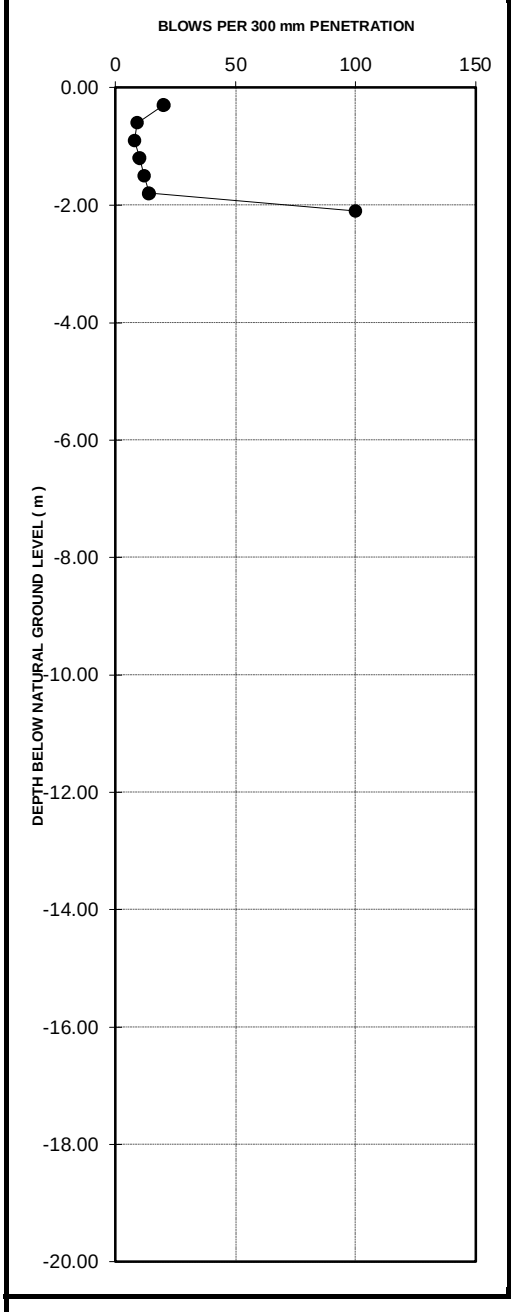


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 256
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
20	300	-0.300	15	20
9	600	-0.600	33	9
8	900	-0.900	38	8
10	1200	-1.200	30	10
12	1500	-1.500	25	12
14	1800	-1.800	21	14
100	2100	-2.100	3	100

GRAPH

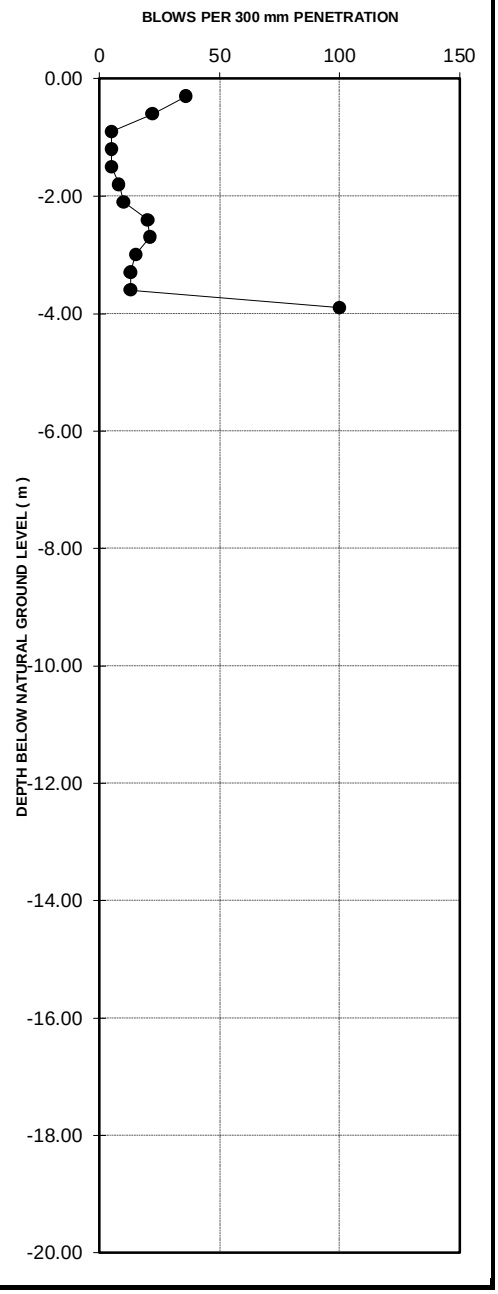


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 271
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
36	300	-0.300	8	36
22	600	-0.600	14	22
5	900	-0.900	60	5
5	1200	-1.200	60	5
5	1500	-1.500	60	5
8	1800	-1.800	38	8
10	2100	-2.100	30	10
20	2400	-2.400	15	20
21	2700	-2.700	14	21
15	3000	-3.000	20	15
13	3300	-3.300	23	13
13	3600	-3.600	23	13
100	3900	-3.900	3	100

GRAPH

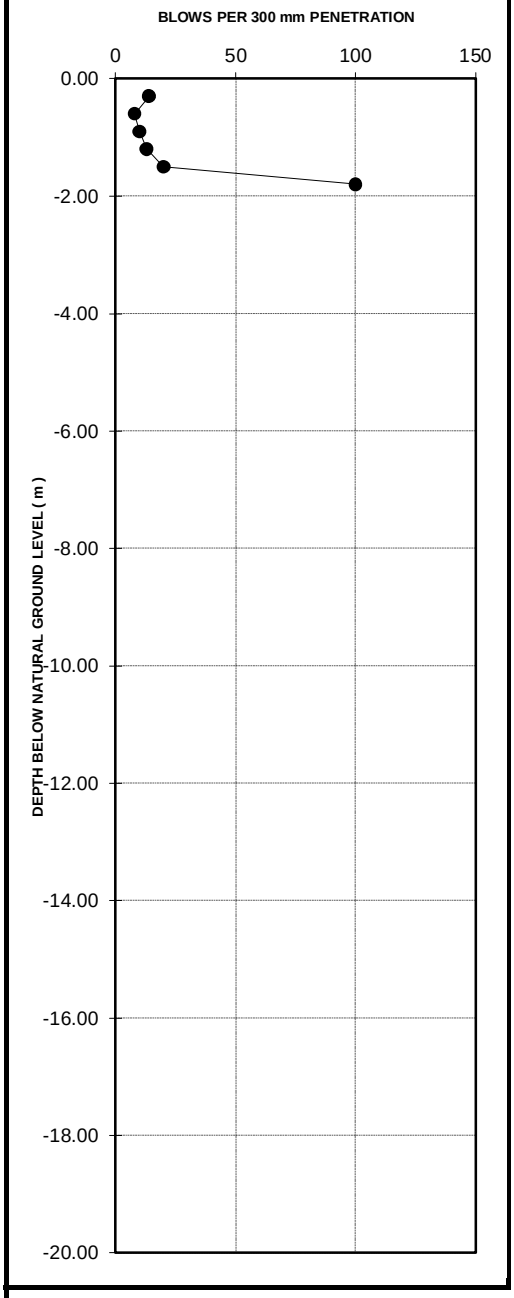


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 276
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
14	300	-0.300	21	14
8	600	-0.600	38	8
10	900	-0.900	30	10
13	1200	-1.200	23	13
20	1500	-1.500	15	20
100	1800	-1.800	3	100

GRAPH

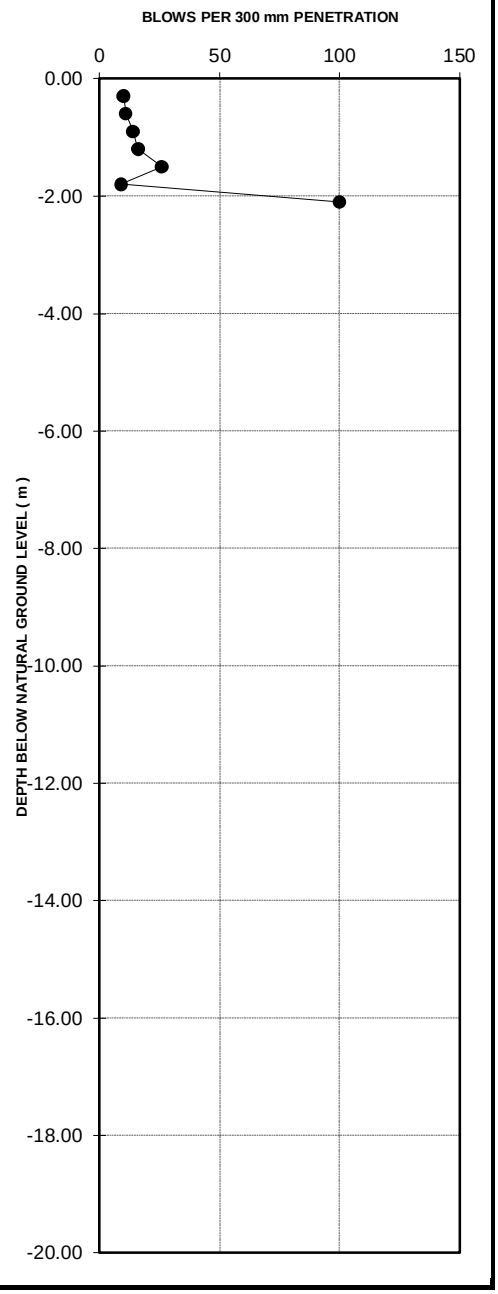


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 278
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
10	300	-0.300	30	10
11	600	-0.600	27	11
14	900	-0.900	21	14
16	1200	-1.200	19	16
26	1500	-1.500	12	26
9	1800	-1.800	33	9
100	2100	-2.100	3	100

GRAPH

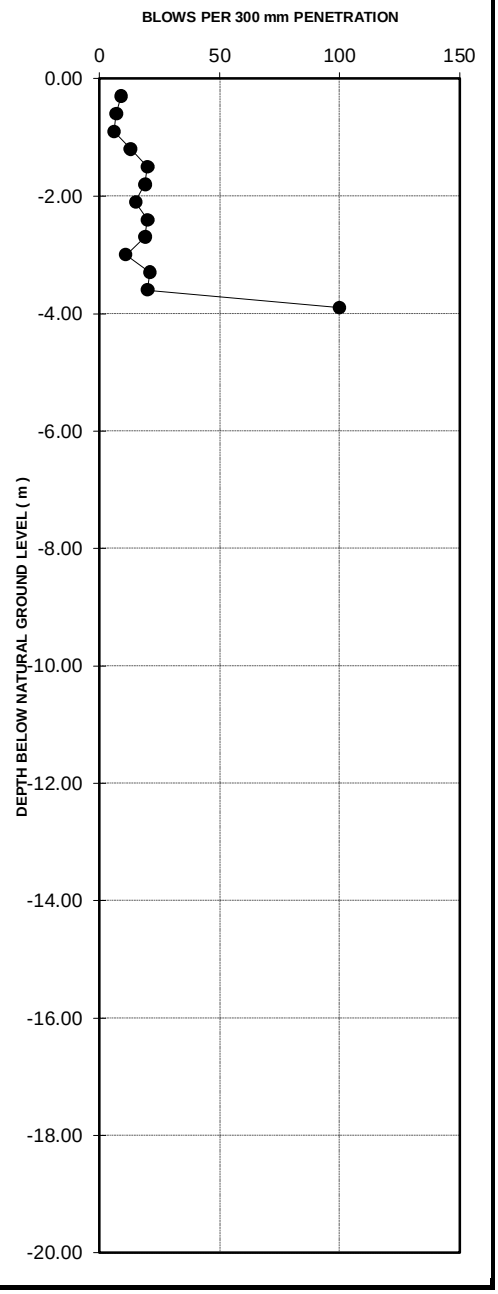


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 365
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
9	300	-0.300	33	9
7	600	-0.600	43	7
6	900	-0.900	50	6
13	1200	-1.200	23	13
20	1500	-1.500	15	20
19	1800	-1.800	16	19
15	2100	-2.100	20	15
20	2400	-2.400	15	20
19	2700	-2.700	16	19
11	3000	-3.000	27	11
21	3300	-3.300	14	21
20	3600	-3.600	15	20
100	3900	-3.900	3	100

GRAPH

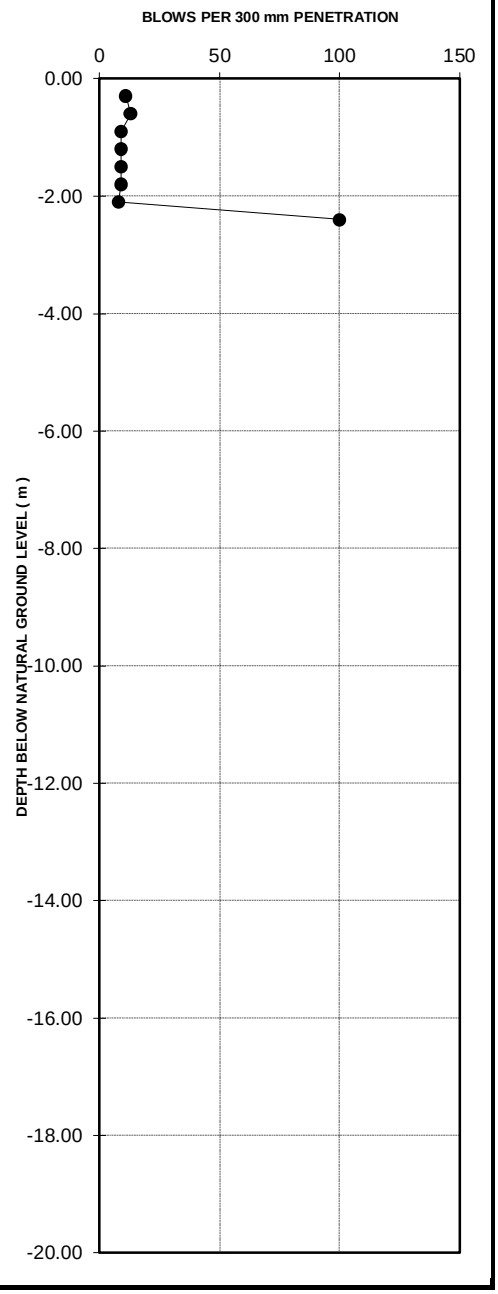


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 366
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
11	300	-0.300	27	11
13	600	-0.600	23	13
9	900	-0.900	33	9
9	1200	-1.200	33	9
9	1500	-1.500	33	9
9	1800	-1.800	33	9
8	2100	-2.100	38	8
100	2400	-2.400	3	100

GRAPH

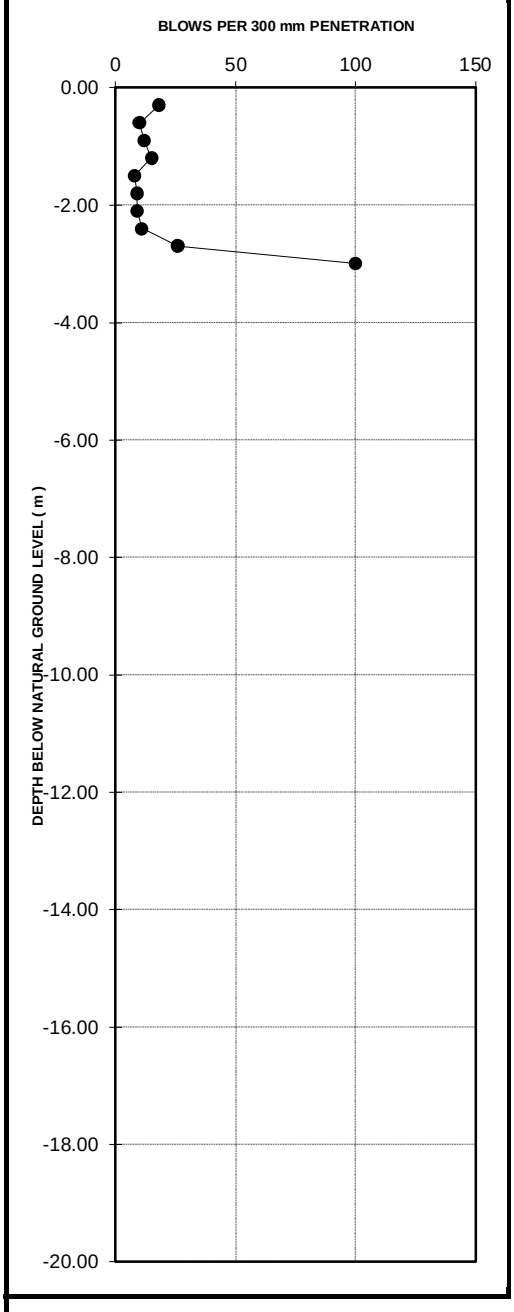


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 367
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
18	300	-0.300	17	18
10	600	-0.600	30	10
12	900	-0.900	25	12
15	1200	-1.200	20	15
8	1500	-1.500	38	8
9	1800	-1.800	33	9
9	2100	-2.100	33	9
11	2400	-2.400	27	11
26	2700	-2.700	12	26
100	3000	-3.000	3	100

GRAPH

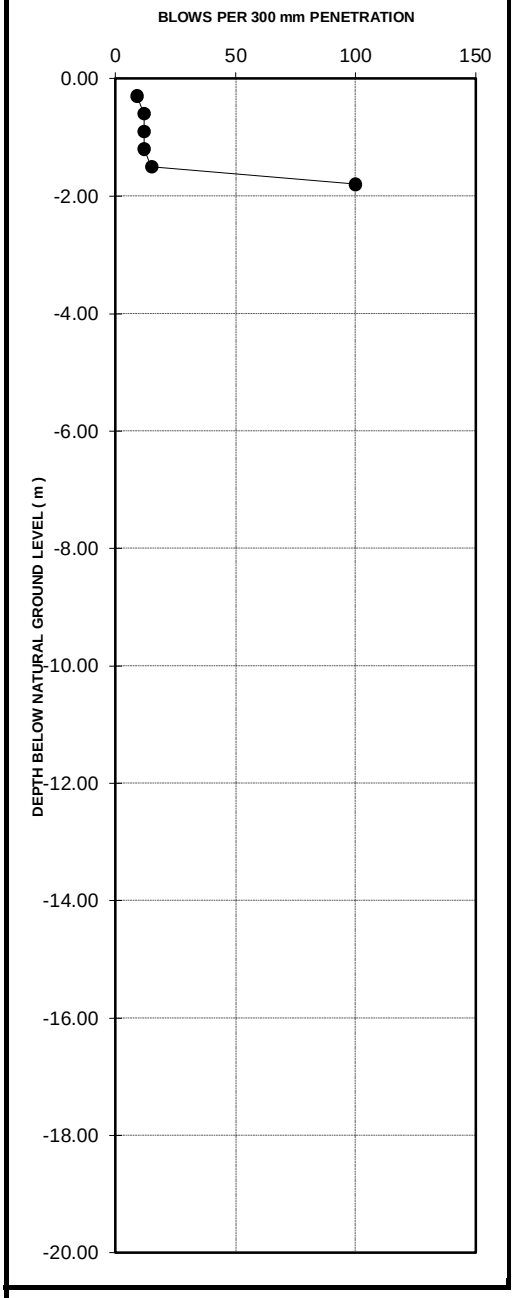


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 329
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
9	300	-0.300	33	9
12	600	-0.600	25	12
12	900	-0.900	25	12
12	1200	-1.200	25	12
15	1500	-1.500	20	15
100	1800	-1.800	3	100

GRAPH

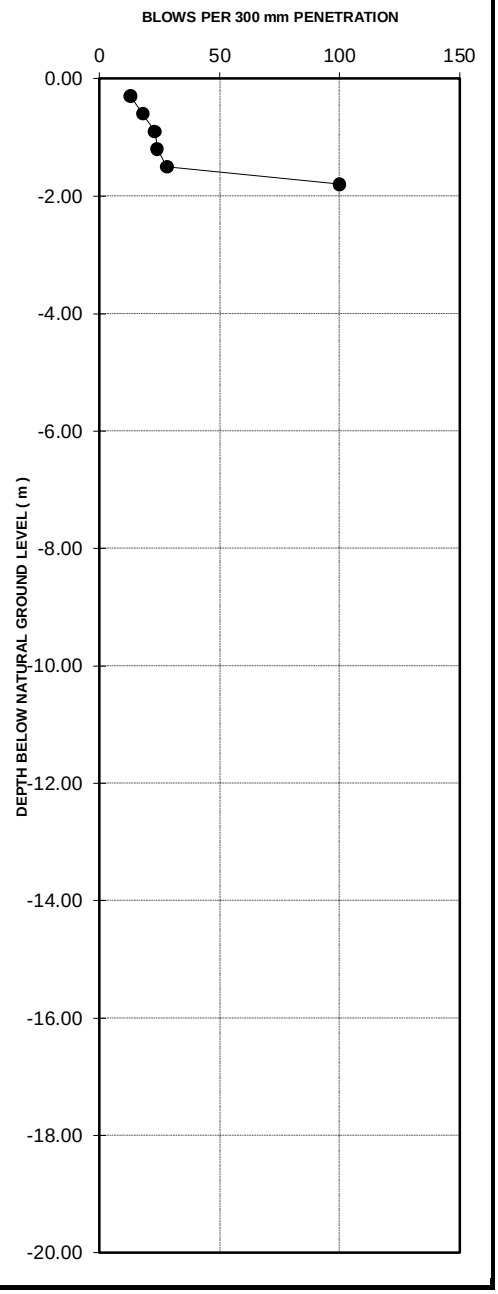


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 344
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
13	300	-0.300	23	13
18	600	-0.600	17	18
23	900	-0.900	13	23
24	1200	-1.200	13	24
28	1500	-1.500	11	28
100	1800	-1.800	3	100

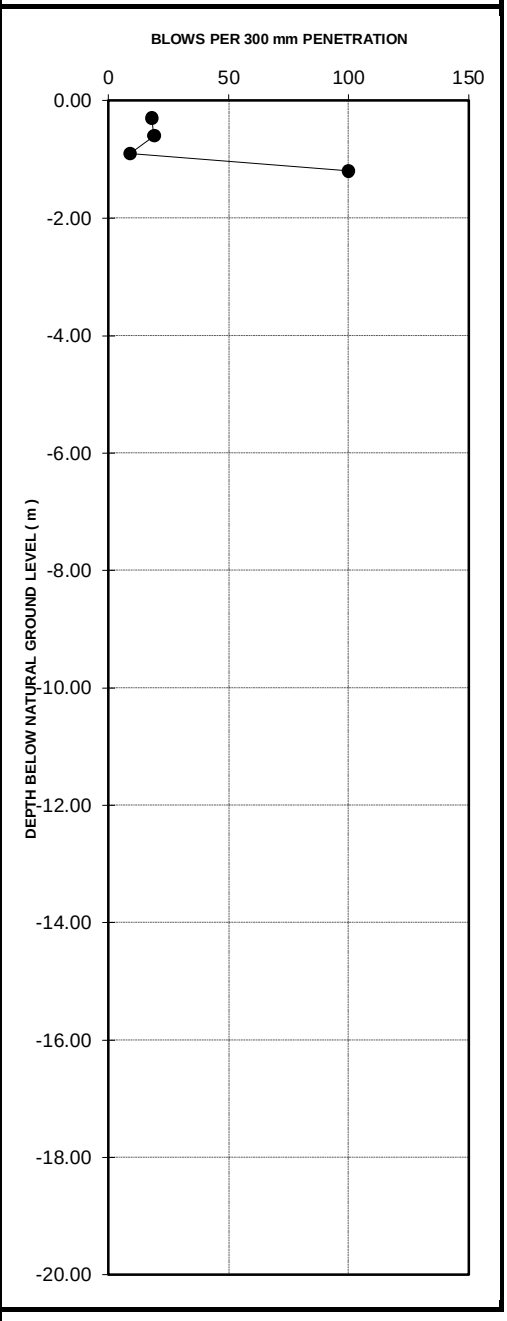
GRAPH



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 358
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
18	300	-0.300	17	18	
19	600	-0.600	16	19	
9	900	-0.900	33	9	
100	1200	-1.200	3	100	

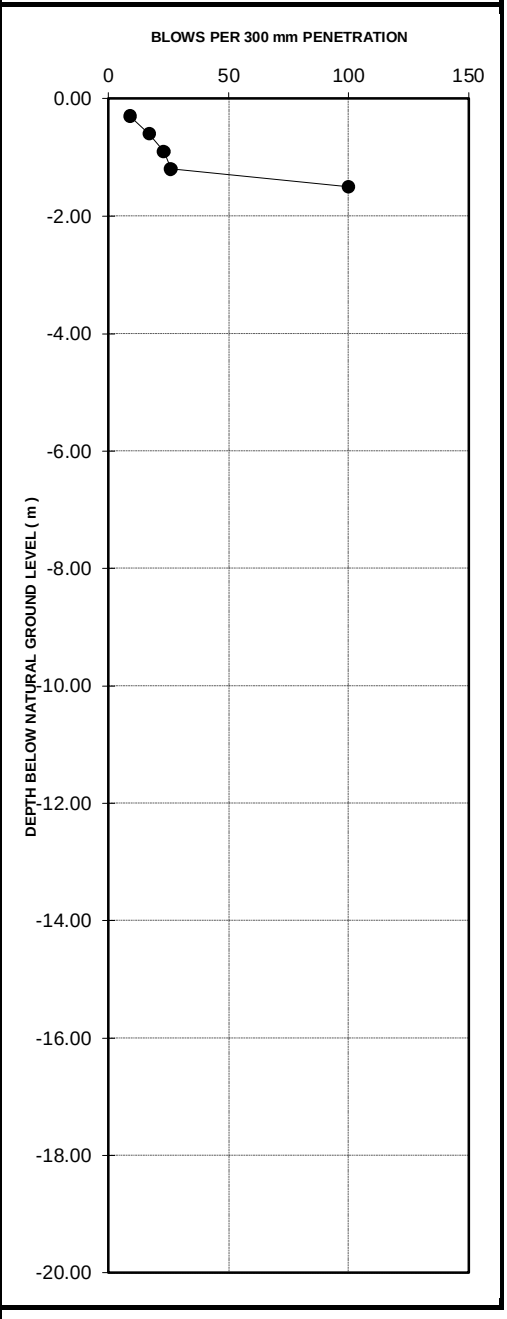


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 311
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
9	300	-0.300	33	9
17	600	-0.600	18	17
23	900	-0.900	13	23
26	1200	-1.200	12	26
100	1500	-1.500	3	100

GRAPH

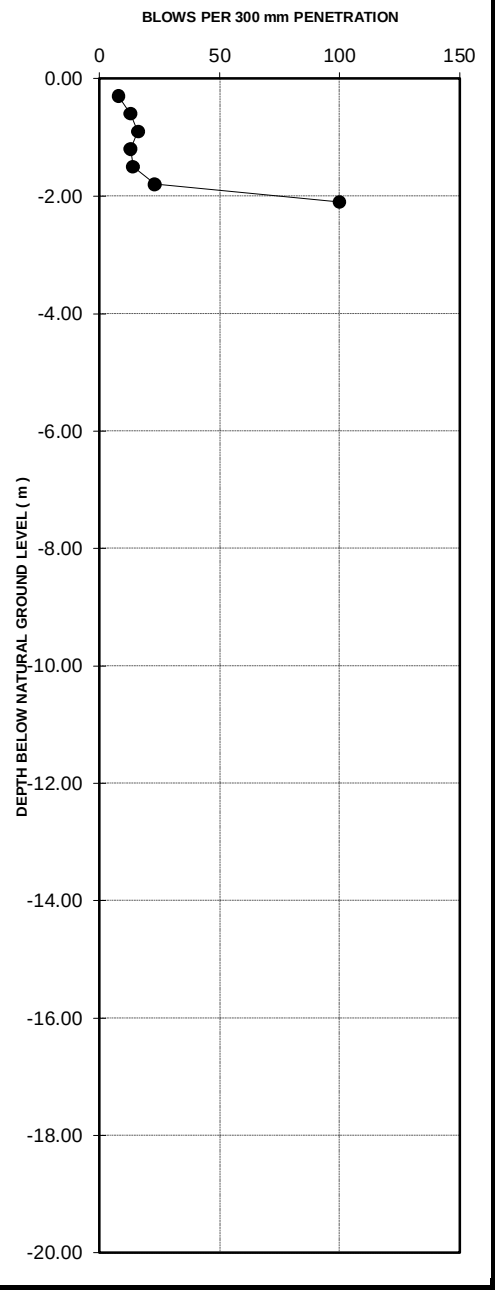


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 314
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
8	300	-0.300	38	8
13	600	-0.600	23	13
16	900	-0.900	19	16
13	1200	-1.200	23	13
14	1500	-1.500	21	14
23	1800	-1.800	13	23
100	2100	-2.100	3	100

GRAPH

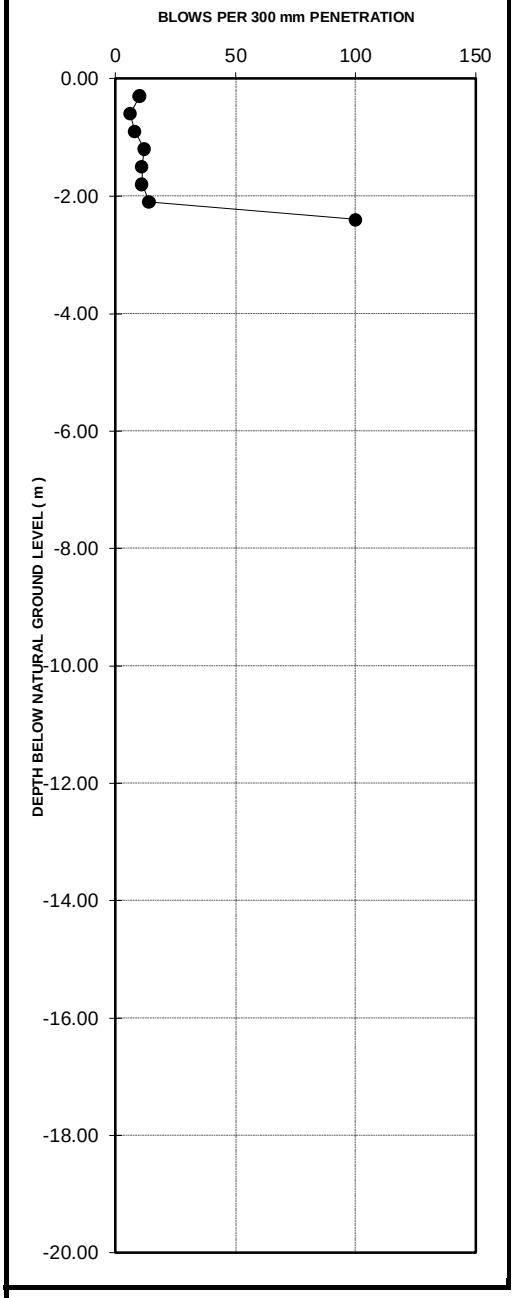


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 316
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
10	300	-0.300	30	10
6	600	-0.600	50	6
8	900	-0.900	38	8
12	1200	-1.200	25	12
11	1500	-1.500	27	11
11	1800	-1.800	27	11
14	2100	-2.100	21	14
100	2400	-2.400	3	100

GRAPH

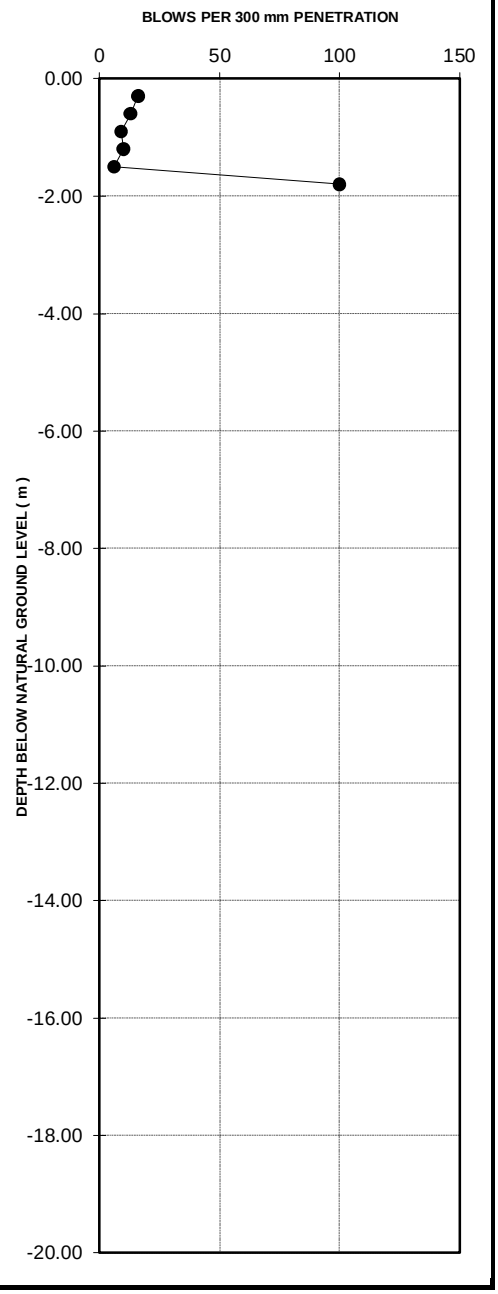


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 665
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
16	300	-0.300	19	16
13	600	-0.600	23	13
9	900	-0.900	33	9
10	1200	-1.200	30	10
6	1500	-1.500	50	6
100	1800	-1.800	3	100

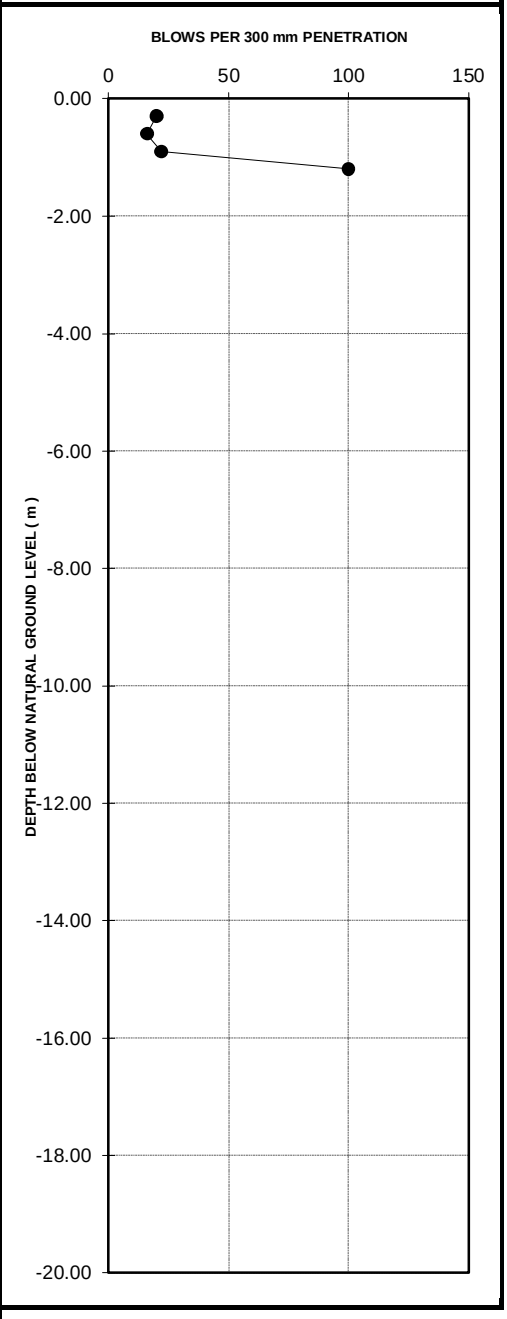
GRAPH



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 285
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
20	300	-0.300	15	20	
16	600	-0.600	19	16	
22	900	-0.900	14	22	
100	1200	-1.200	3	100	

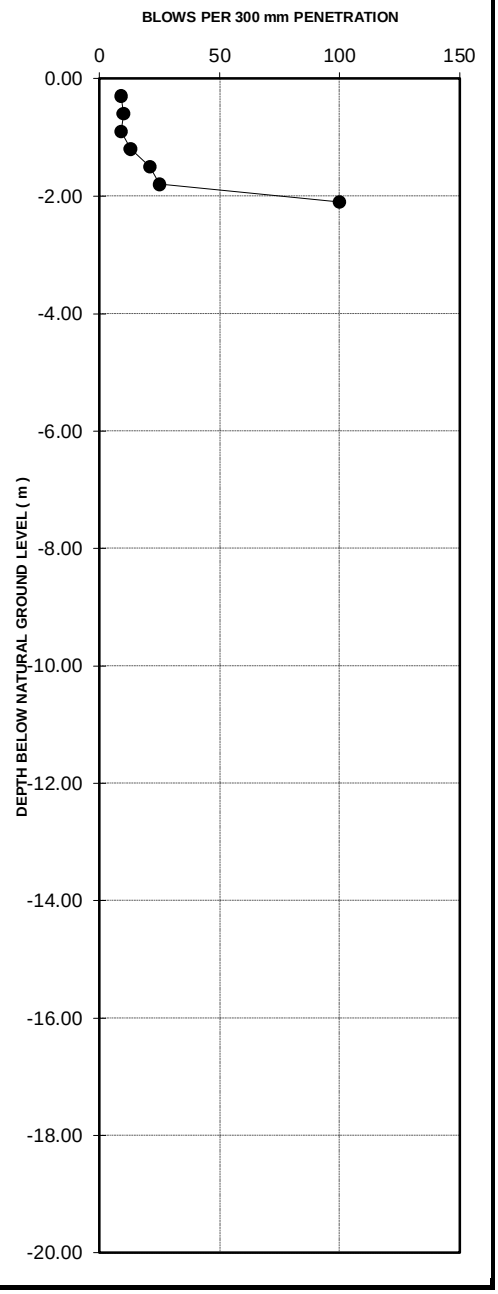


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 307
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
9	300	-0.300	33	9
10	600	-0.600	30	10
9	900	-0.900	33	9
13	1200	-1.200	23	13
21	1500	-1.500	14	21
25	1800	-1.800	12	25
100	2100	-2.100	3	100

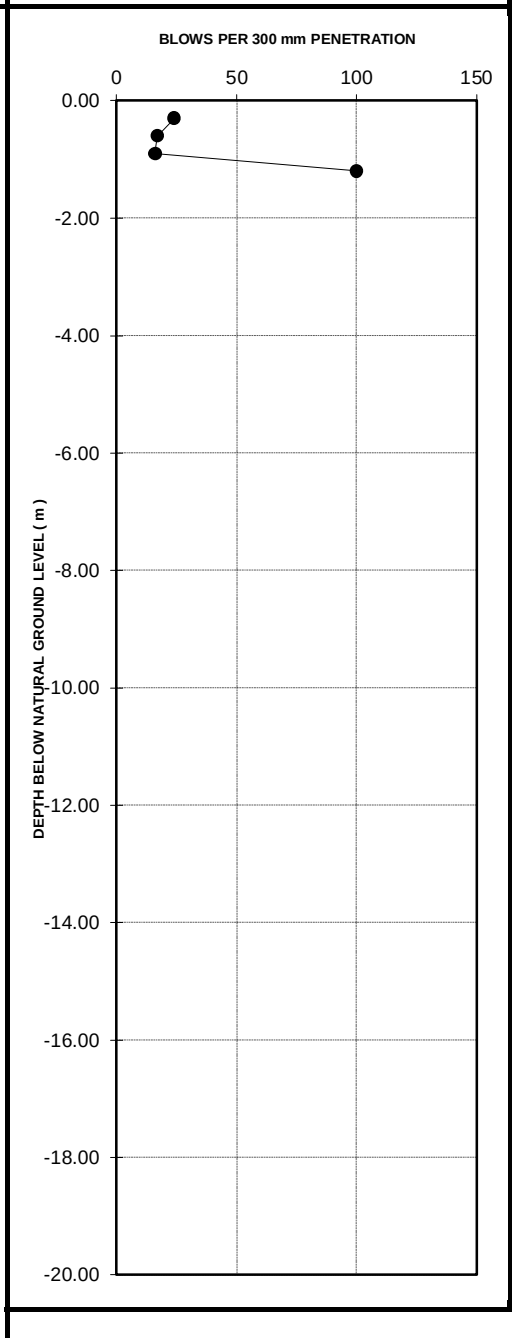
GRAPH



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 372
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

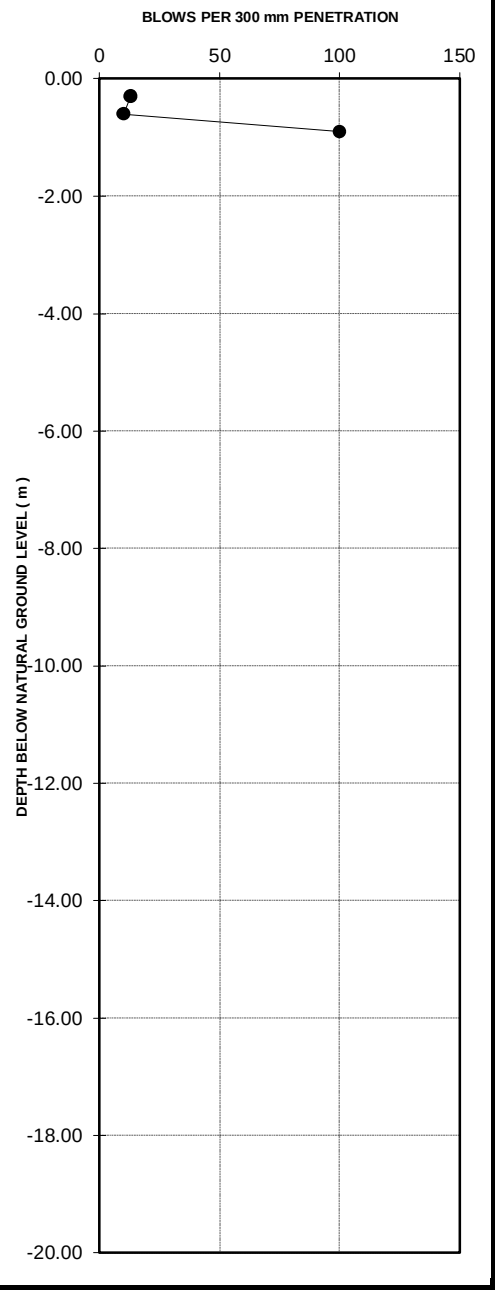
NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
24	300	-0.300	13	24	
17	600	-0.600	18	17	
16	900	-0.900	19	16	
100	1200	-1.200	3	100	



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 390
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
13	300	-0.300	23	13	
10	600	-0.600	30	10	
100	900	-0.900	3	100	

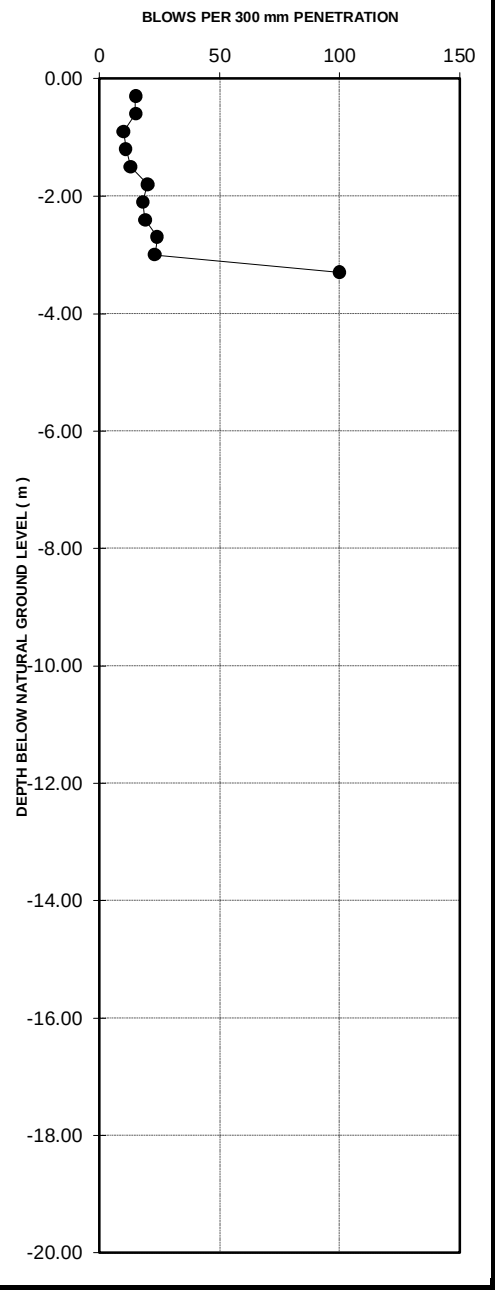


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 402
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
15	300	-0.300	20	15
15	600	-0.600	20	15
10	900	-0.900	30	10
11	1200	-1.200	27	11
13	1500	-1.500	23	13
20	1800	-1.800	15	20
18	2100	-2.100	17	18
19	2400	-2.400	16	19
24	2700	-2.700	13	24
23	3000	-3.000	13	23
100	3300	-3.300	3	100

GRAPH

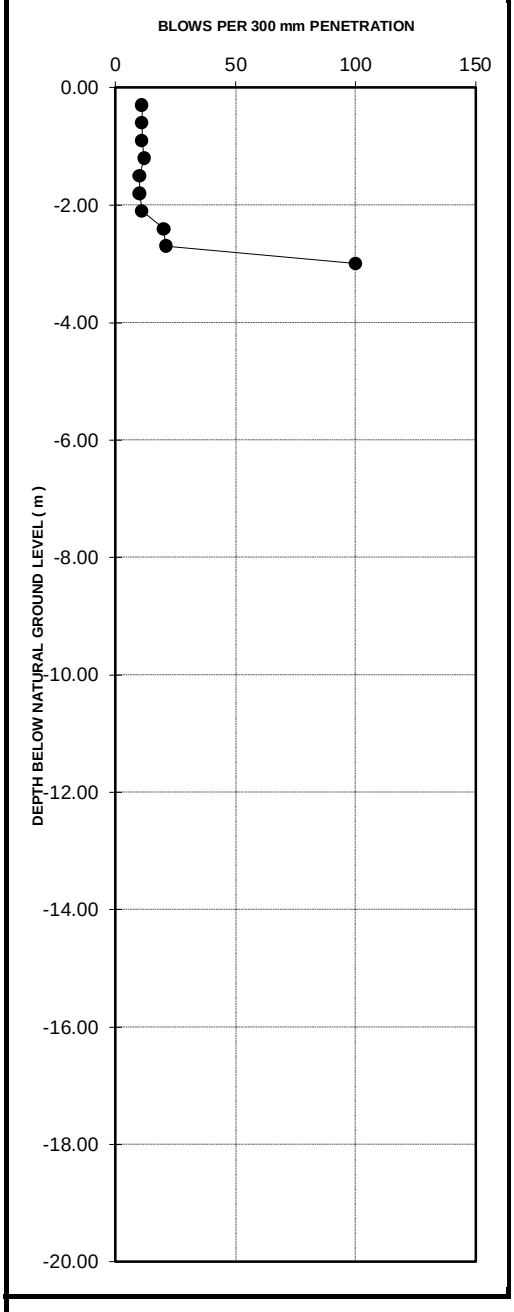


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 408
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
11	300	-0.300	27	11
11	600	-0.600	27	11
11	900	-0.900	27	11
12	1200	-1.200	25	12
10	1500	-1.500	30	10
10	1800	-1.800	30	10
11	2100	-2.100	27	11
20	2400	-2.400	15	20
21	2700	-2.700	14	21
100	3000	-3.000	3	100

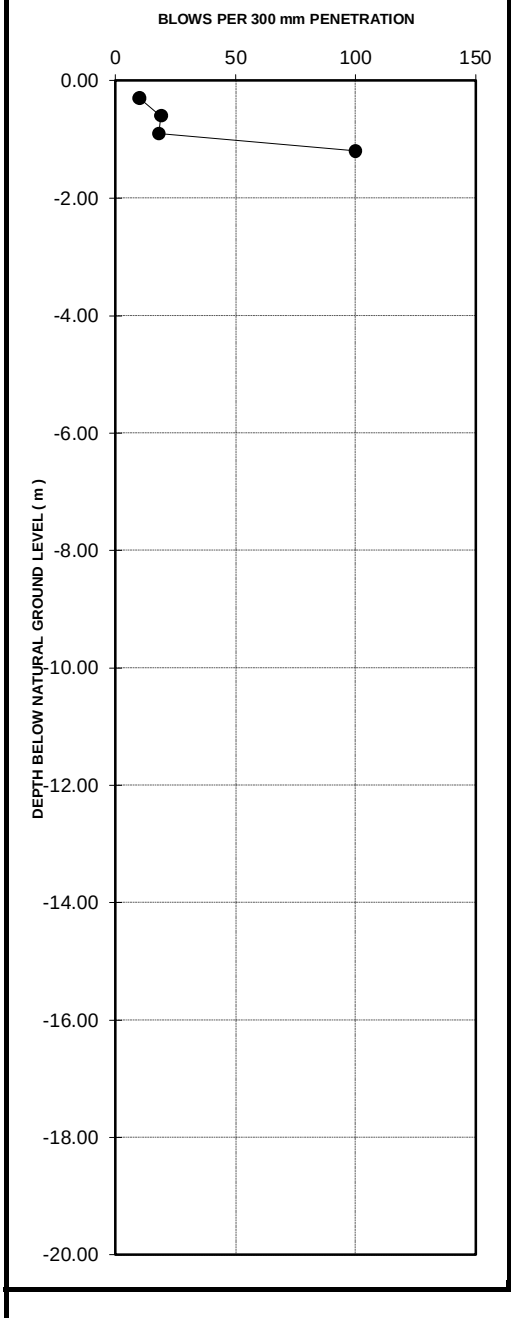
GRAPH



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 416
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
10	300	-0.300	30	10	
19	600	-0.600	16	19	
18	900	-0.900	17	18	
100	1200	-1.200	3	100	

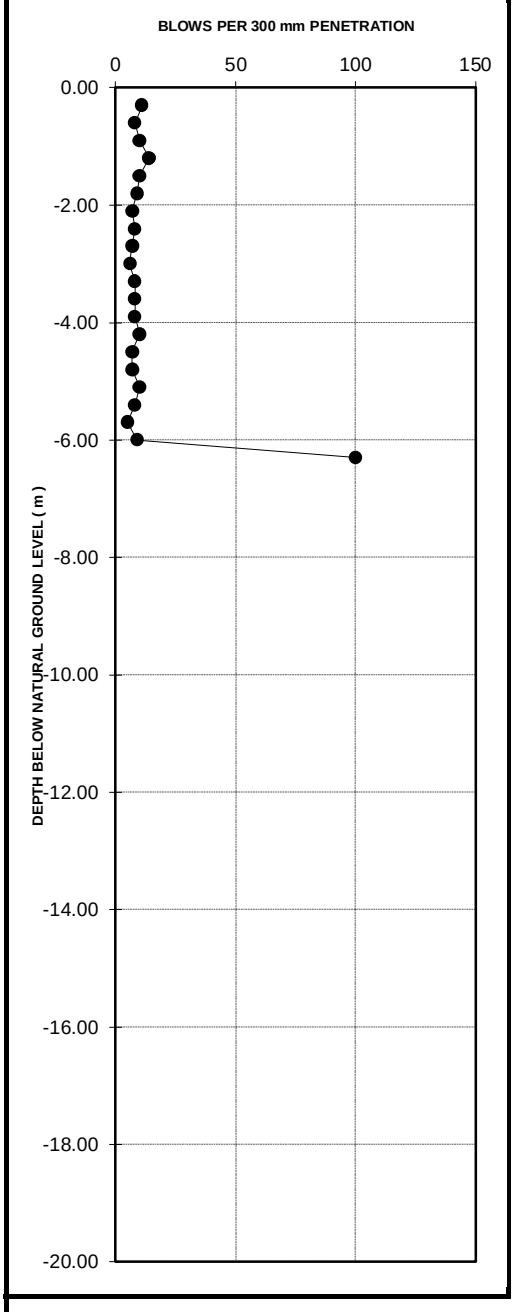


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 420
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
11	300	-0.300	27	11
8	600	-0.600	38	8
10	900	-0.900	30	10
14	1200	-1.200	21	14
10	1500	-1.500	30	10
9	1800	-1.800	33	9
7	2100	-2.100	43	7
8	2400	-2.400	38	8
7	2700	-2.700	43	7
6	3000	-3.000	50	6
8	3300	-3.300	38	8
8	3600	-3.600	38	8
8	3900	-3.900	38	8
10	4200	-4.200	30	10
7	4500	-4.500	43	7
7	4800	-4.800	43	7
10	5100	-5.100	30	10
8	5400	-5.400	38	8
5	5700	-5.700	60	5
9	6000	-6.000	33	9
100	6300	-6.300	3	100

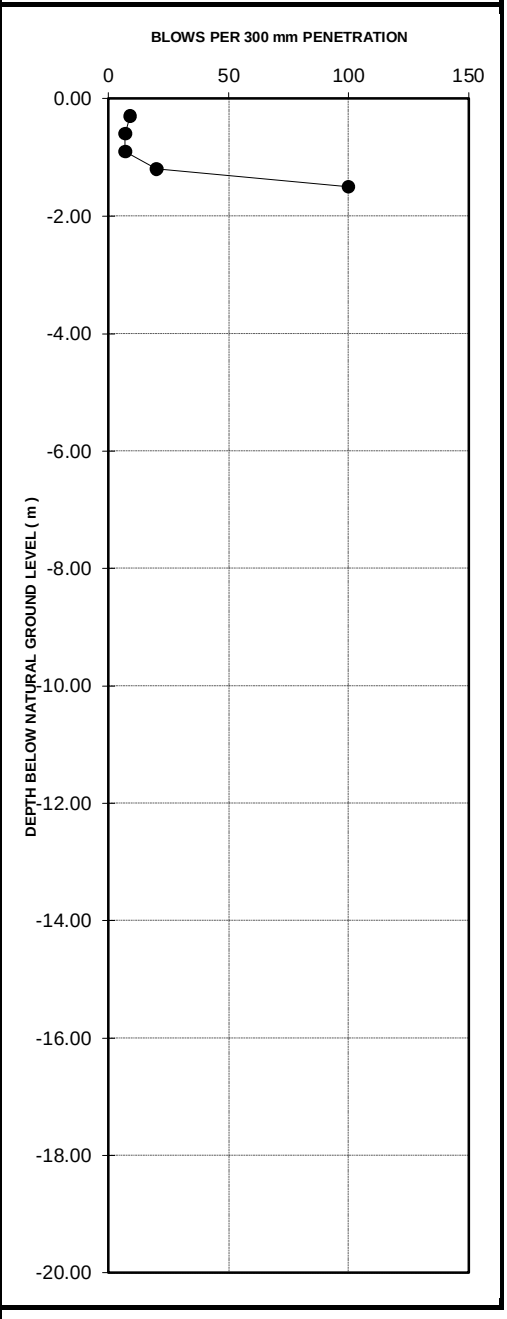
GRAPH



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 433
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
9	300	-0.300	33	9	
7	600	-0.600	43	7	
7	900	-0.900	43	7	
20	1200	-1.200	15	20	
100	1500	-1.500	3	100	

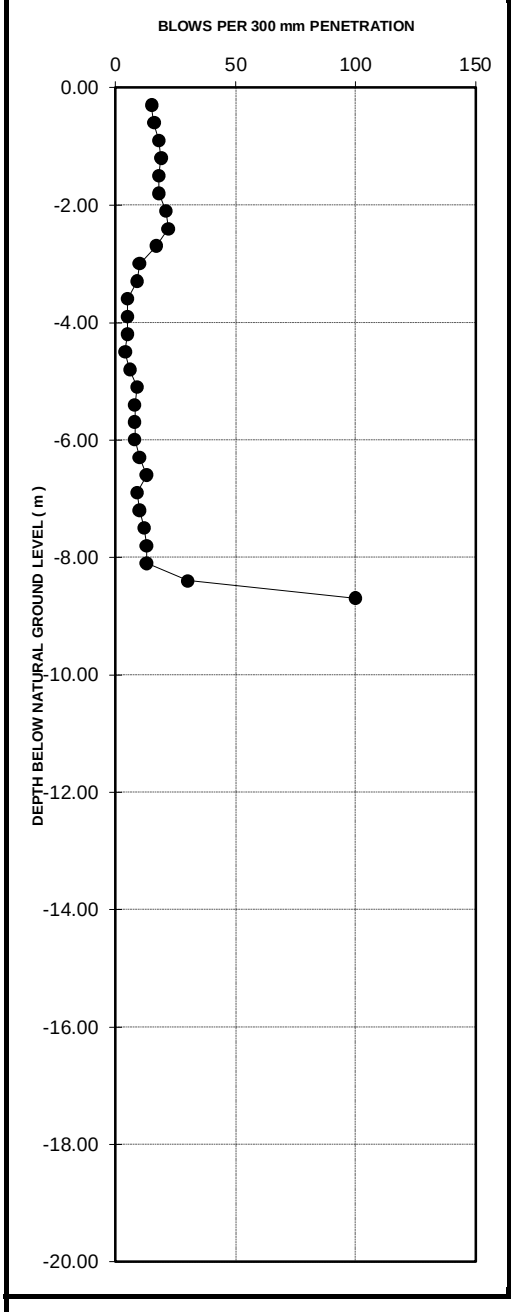


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 439
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
15	300	-0.300	20	15
16	600	-0.600	19	16
18	900	-0.900	17	18
19	1200	-1.200	16	19
18	1500	-1.500	17	18
18	1800	-1.800	17	18
21	2100	-2.100	14	21
22	2400	-2.400	14	22
17	2700	-2.700	18	17
10	3000	-3.000	30	10
9	3300	-3.300	33	9
5	3600	-3.600	60	5
5	3900	-3.900	60	5
5	4200	-4.200	60	5
4	4500	-4.500	75	4
6	4800	-4.800	50	6
9	5100	-5.100	33	9
8	5400	-5.400	38	8
8	5700	-5.700	38	8
8	6000	-6.000	38	8
10	6300	-6.300	30	10
13	6600	-6.600	23	13
9	6900	-6.900	33	9
10	7200	-7.200	30	10
12	7500	-7.500	25	12
13	7800	-7.800	23	13
13	8100	-8.100	23	13
30	8400	-8.400	10	30
100	8700	-8.700	3	100

GRAPH

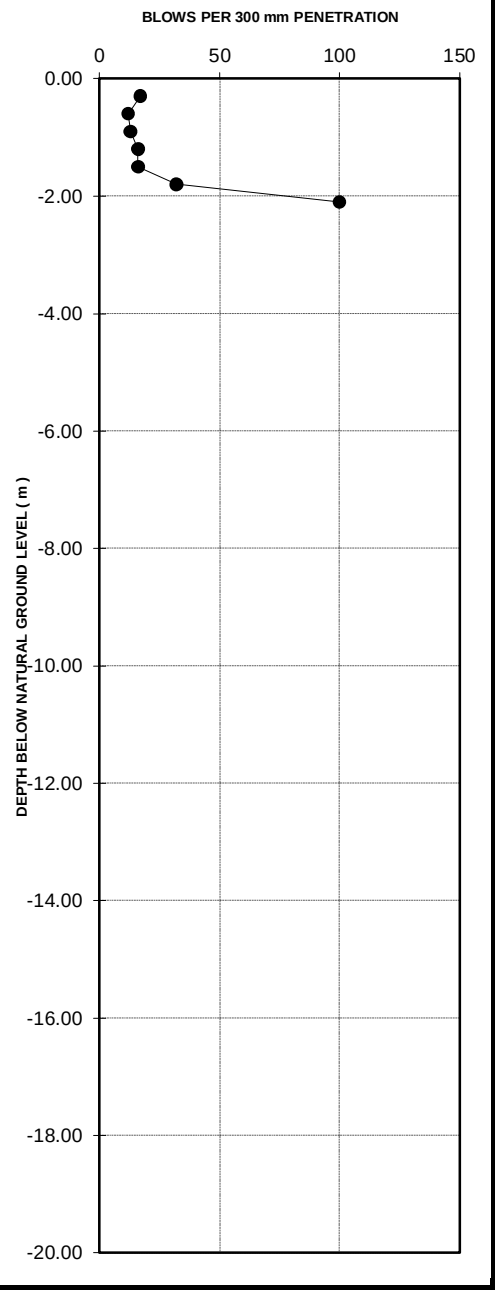


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 448
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
17	300	-0.300	18	17
12	600	-0.600	25	12
13	900	-0.900	23	13
16	1200	-1.200	19	16
16	1500	-1.500	19	16
32	1800	-1.800	9	32
100	2100	-2.100	3	100

GRAPH

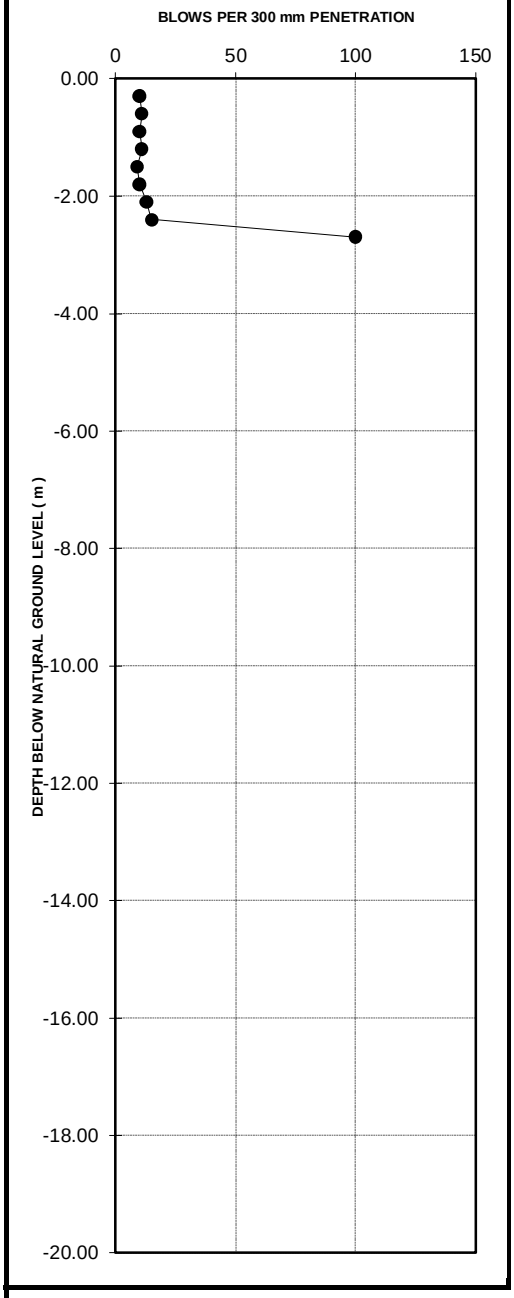


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 452
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
10	300	-0.300	30	10
11	600	-0.600	27	11
10	900	-0.900	30	10
11	1200	-1.200	27	11
9	1500	-1.500	33	9
10	1800	-1.800	30	10
13	2100	-2.100	23	13
15	2400	-2.400	20	15
100	2700	-2.700	3	100

GRAPH

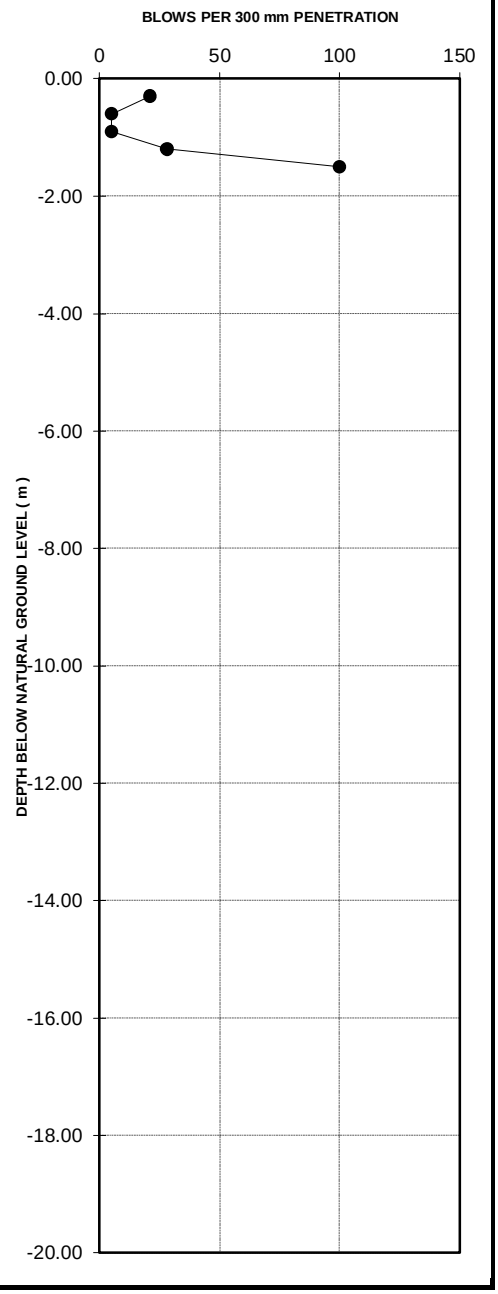


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 456
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
21	300	-0.300	14	21
5	600	-0.600	60	5
5	900	-0.900	60	5
28	1200	-1.200	11	28
100	1500	-1.500	3	100

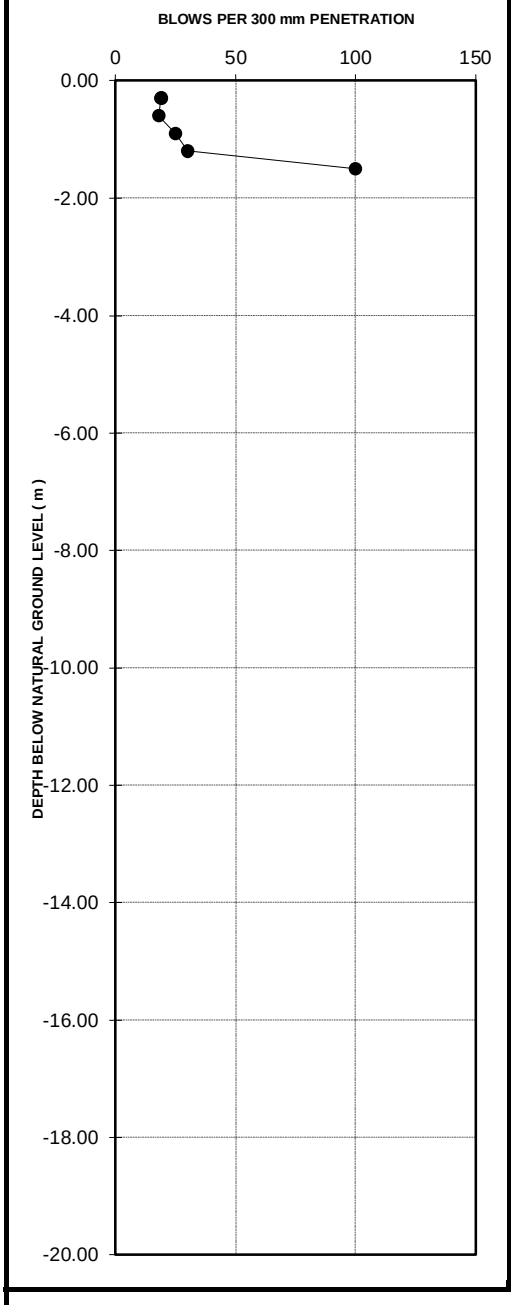
GRAPH



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 491
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
19	300	-0.300	16	19	
18	600	-0.600	17	18	
25	900	-0.900	12	25	
30	1200	-1.200	10	30	
100	1500	-1.500	3	100	

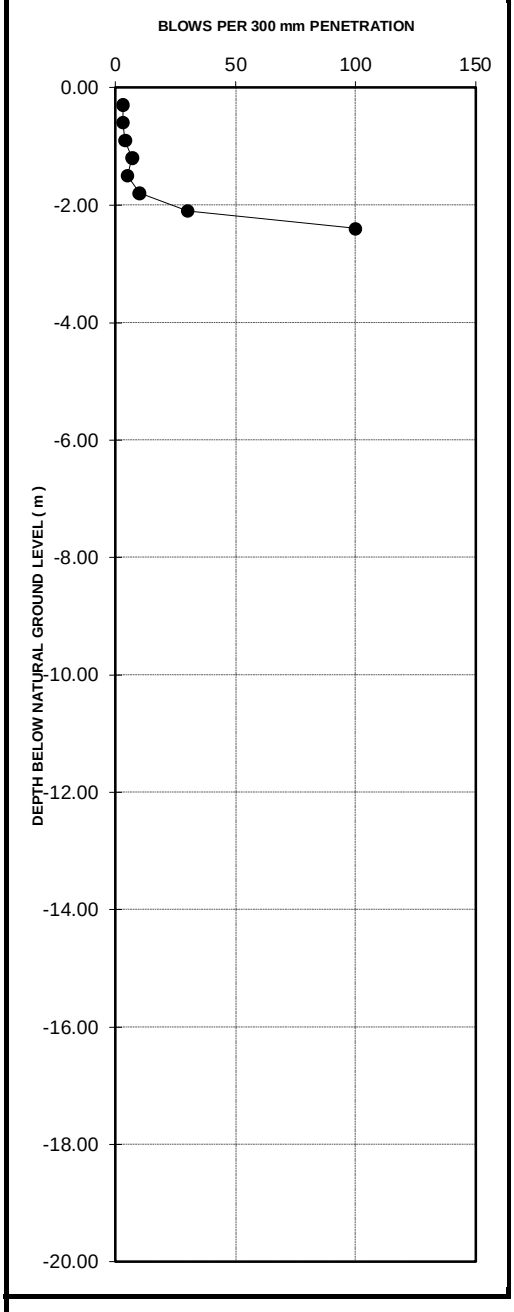


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 498
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
3	300	-0.300	100	3
3	600	-0.600	100	3
4	900	-0.900	75	4
7	1200	-1.200	43	7
5	1500	-1.500	60	5
10	1800	-1.800	30	10
30	2100	-2.100	10	30
100	2400	-2.400	3	100

GRAPH

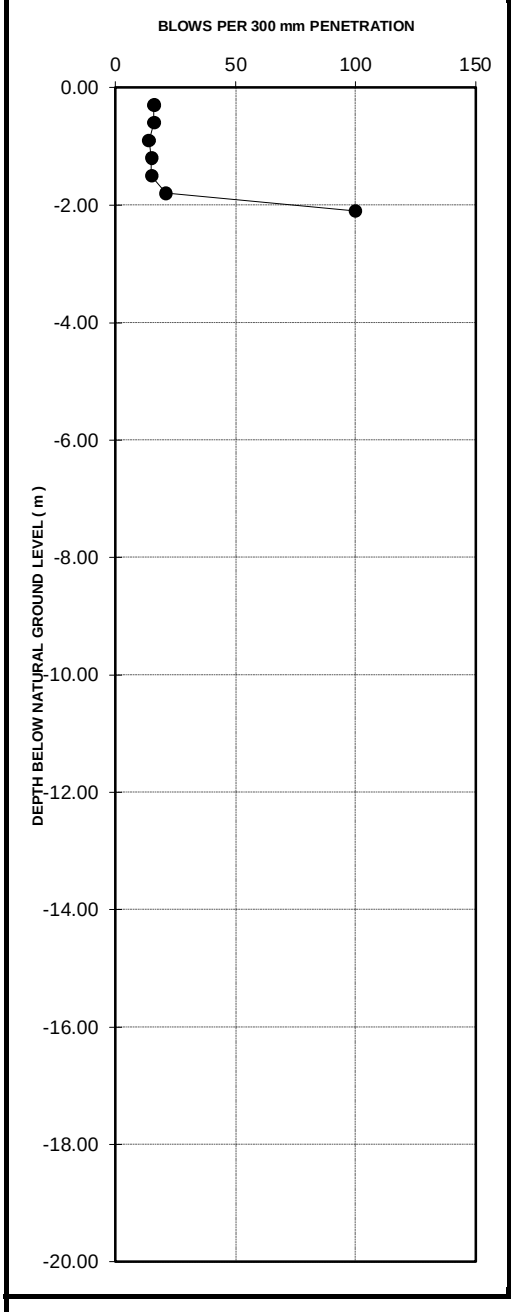


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 506
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
16	300	-0.300	19	16
16	600	-0.600	19	16
14	900	-0.900	21	14
15	1200	-1.200	20	15
15	1500	-1.500	20	15
21	1800	-1.800	14	21
100	2100	-2.100	3	100

GRAPH

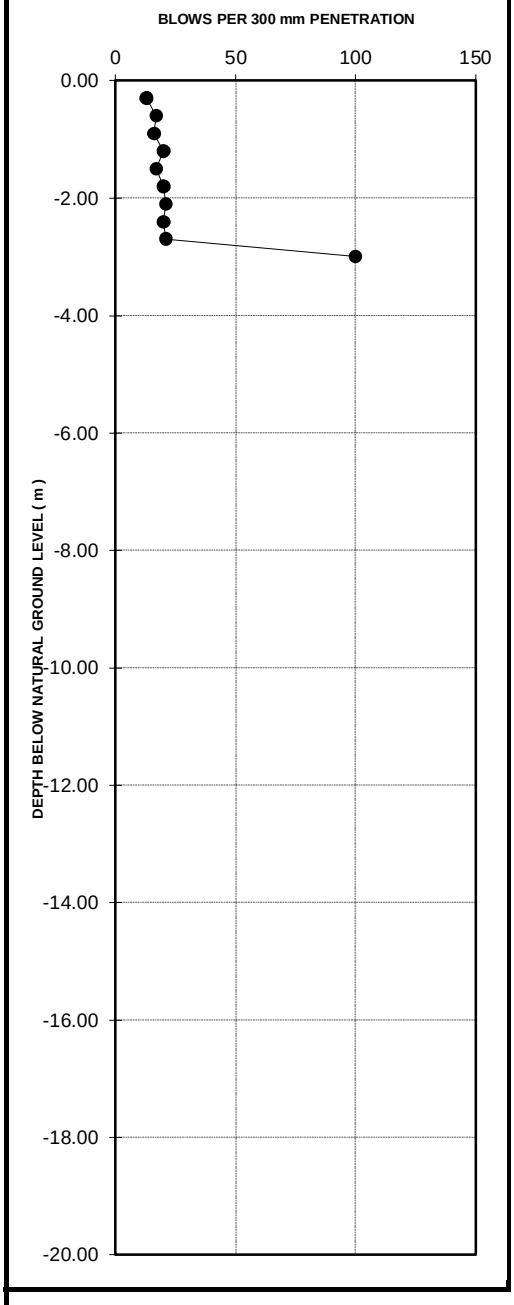


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 508
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
13	300	-0.300	23	13
17	600	-0.600	18	17
16	900	-0.900	19	16
20	1200	-1.200	15	20
17	1500	-1.500	18	17
20	1800	-1.800	15	20
21	2100	-2.100	14	21
20	2400	-2.400	15	20
21	2700	-2.700	14	21
100	3000	-3.000	3	100

GRAPH

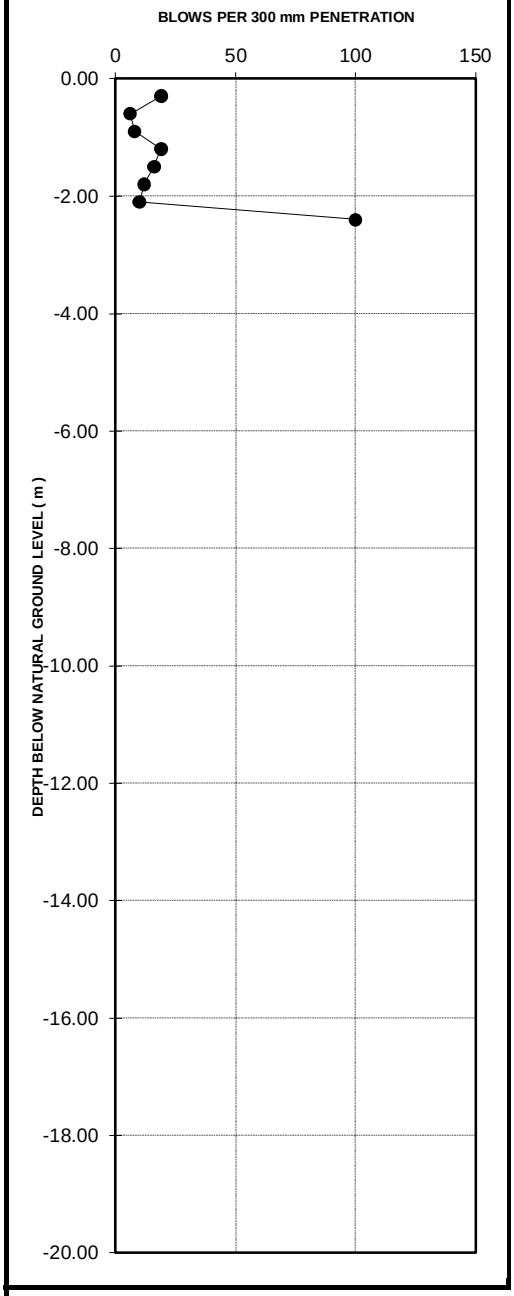


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 511
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
19	300	-0.300	16	19
6	600	-0.600	50	6
8	900	-0.900	38	8
19	1200	-1.200	16	19
16	1500	-1.500	19	16
12	1800	-1.800	25	12
10	2100	-2.100	30	10
100	2400	-2.400	3	100

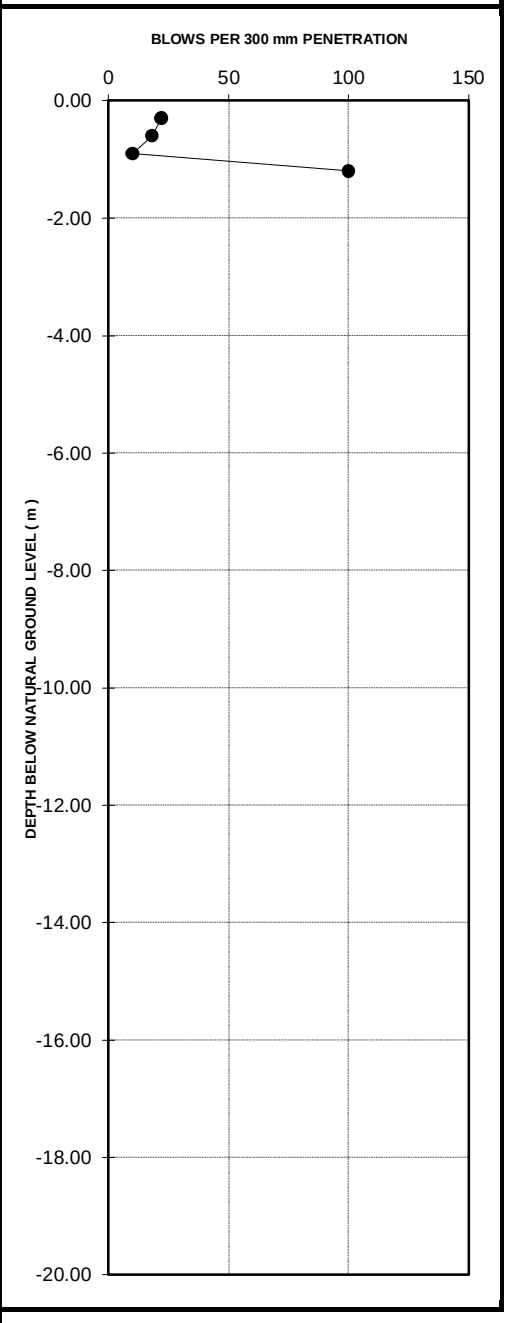
GRAPH



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 514
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
22	300	-0.300	14	22	
18	600	-0.600	17	18	
10	900	-0.900	30	10	
100	1200	-1.200	3	100	

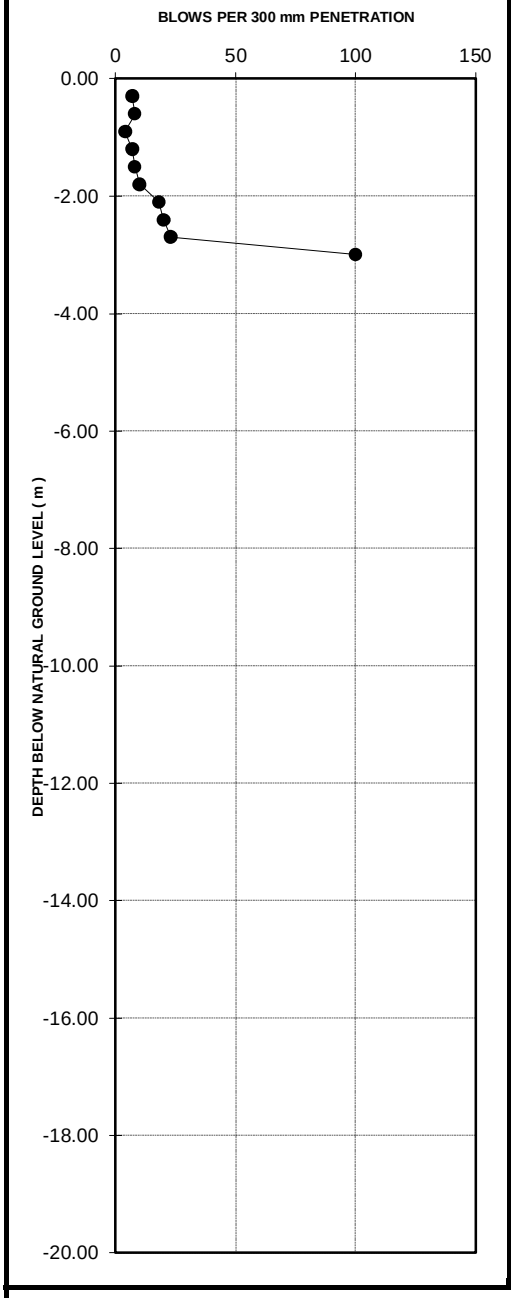


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 517
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
7	300	-0.300	43	7
8	600	-0.600	38	8
4	900	-0.900	75	4
7	1200	-1.200	43	7
8	1500	-1.500	38	8
10	1800	-1.800	30	10
18	2100	-2.100	17	18
20	2400	-2.400	15	20
23	2700	-2.700	13	23
100	3000	-3.000	3	100

GRAPH

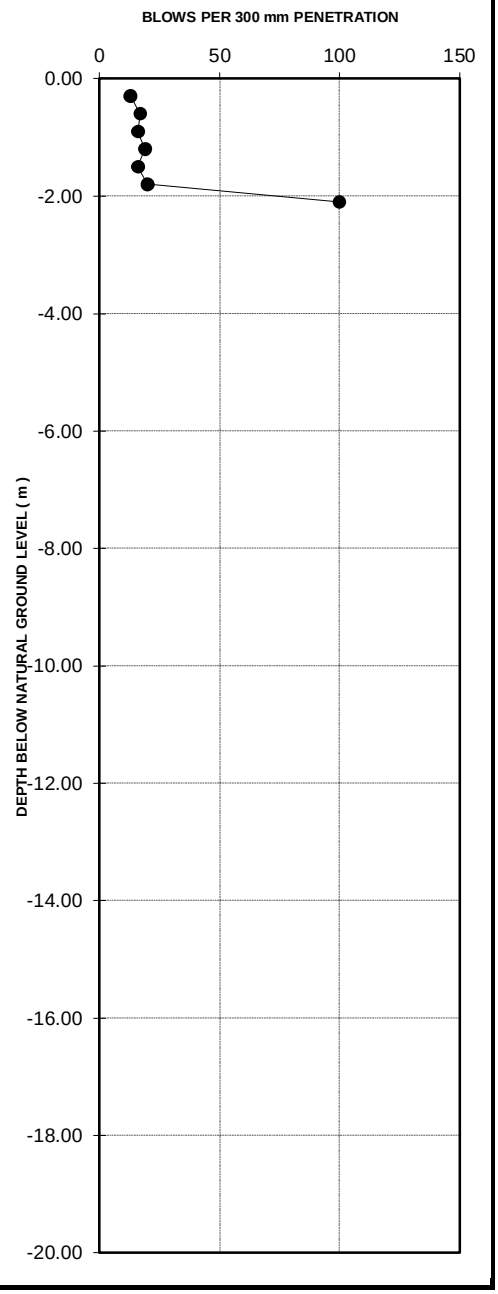


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 521
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
13	300	-0.300	23	13
17	600	-0.600	18	17
16	900	-0.900	19	16
19	1200	-1.200	16	19
16	1500	-1.500	19	16
20	1800	-1.800	15	20
100	2100	-2.100	3	100

GRAPH

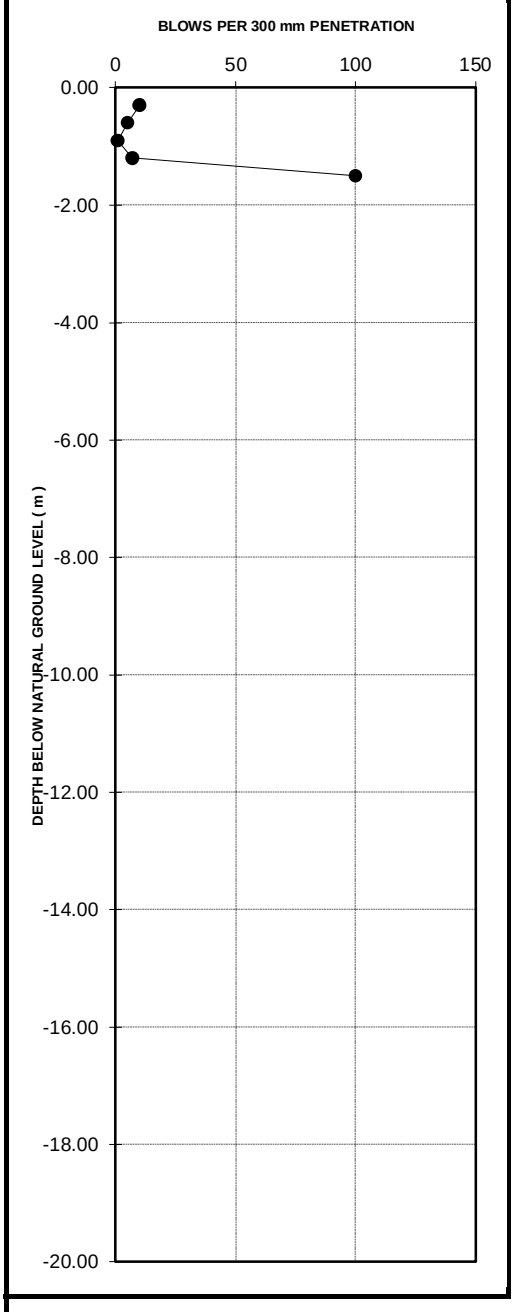


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 524
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
10	300	-0.300	30	10
5	600	-0.600	60	5
1	900	-0.900	300	1
7	1200	-1.200	43	7
100	1500	-1.500	3	100

GRAPH

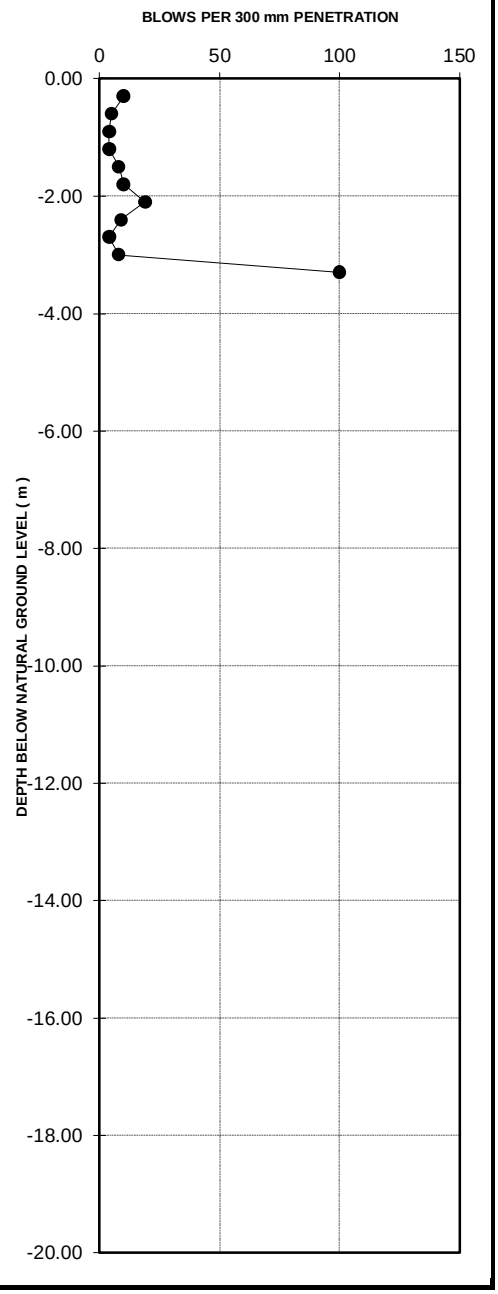


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 527
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
10	300	-0.300	30	10
5	600	-0.600	60	5
4	900	-0.900	75	4
4	1200	-1.200	75	4
8	1500	-1.500	38	8
10	1800	-1.800	30	10
19	2100	-2.100	16	19
9	2400	-2.400	33	9
4	2700	-2.700	75	4
8	3000	-3.000	38	8
100	3300	-3.300	3	100

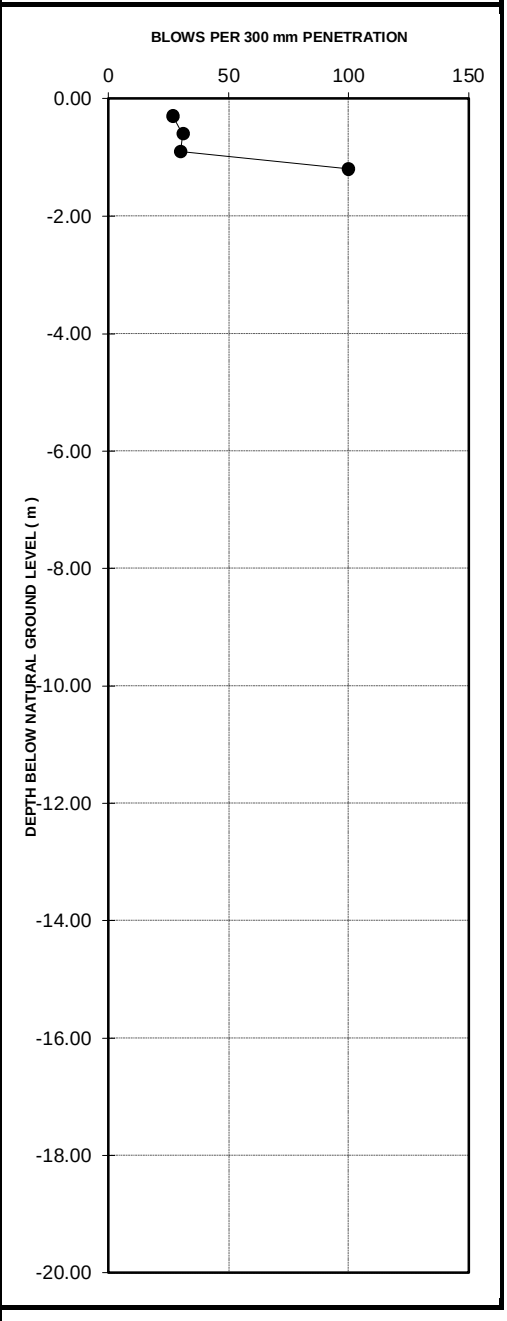
GRAPH



DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 531
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION	GRAPH
27	300	-0.300	11	27	
31	600	-0.600	10	31	
30	900	-0.900	10	30	
100	1200	-1.200	3	100	

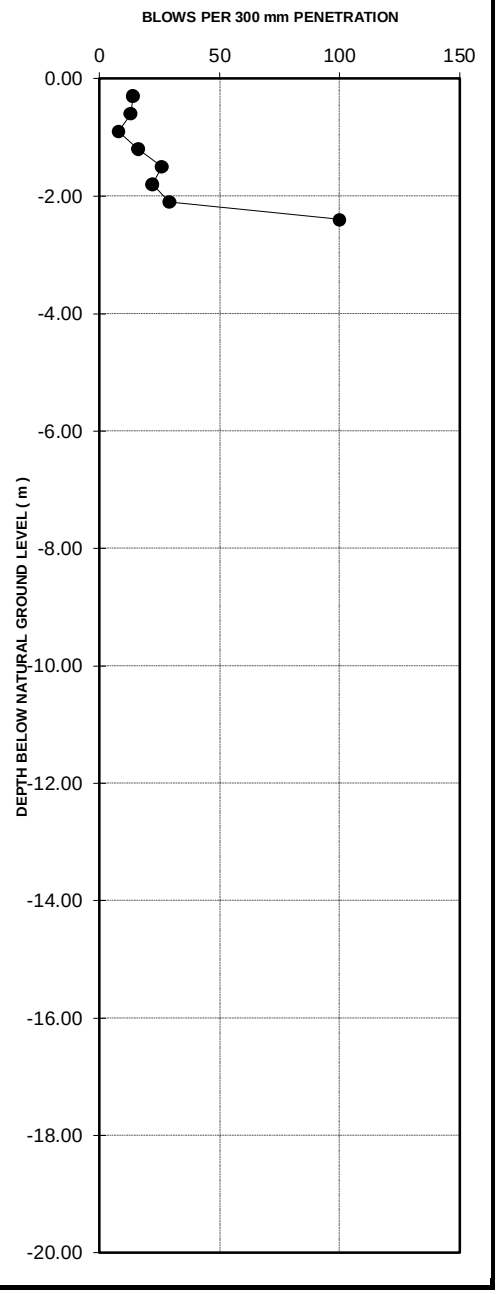


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 537
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
14	300	-0.300	21	14
13	600	-0.600	23	13
8	900	-0.900	38	8
16	1200	-1.200	19	16
26	1500	-1.500	12	26
22	1800	-1.800	14	22
29	2100	-2.100	10	29
100	2400	-2.400	3	100

GRAPH

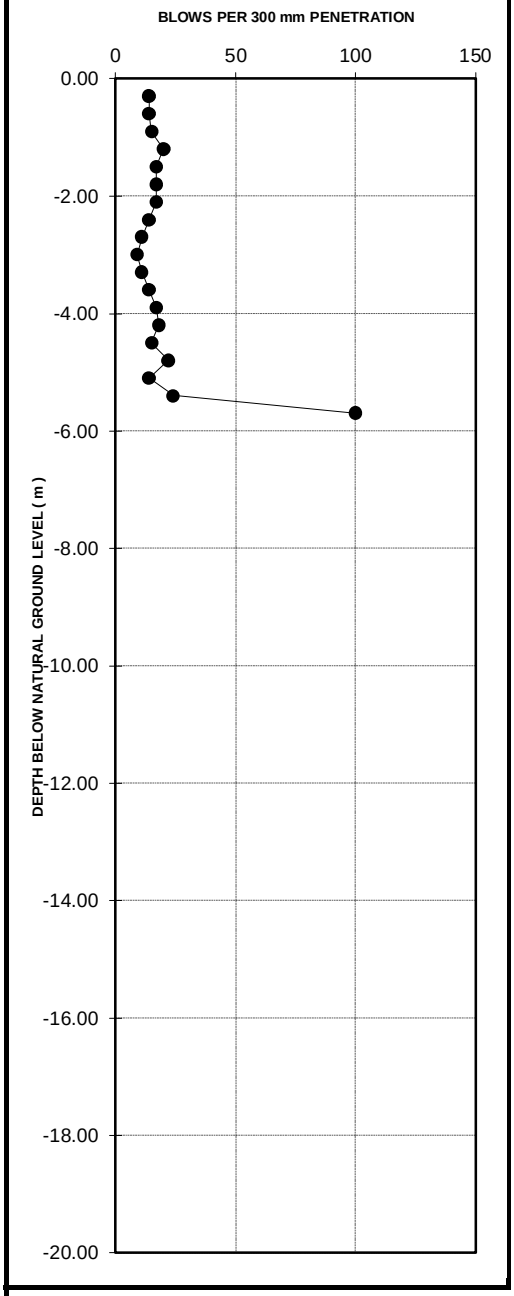


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 542
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
14	300	-0.300	21	14
14	600	-0.600	21	14
15	900	-0.900	20	15
20	1200	-1.200	15	20
17	1500	-1.500	18	17
17	1800	-1.800	18	17
17	2100	-2.100	18	17
14	2400	-2.400	21	14
11	2700	-2.700	27	11
9	3000	-3.000	33	9
11	3300	-3.300	27	11
14	3600	-3.600	21	14
17	3900	-3.900	18	17
18	4200	-4.200	17	18
15	4500	-4.500	20	15
22	4800	-4.800	14	22
14	5100	-5.100	21	14
24	5400	-5.400	13	24
100	5700	-5.700	3	100

GRAPH

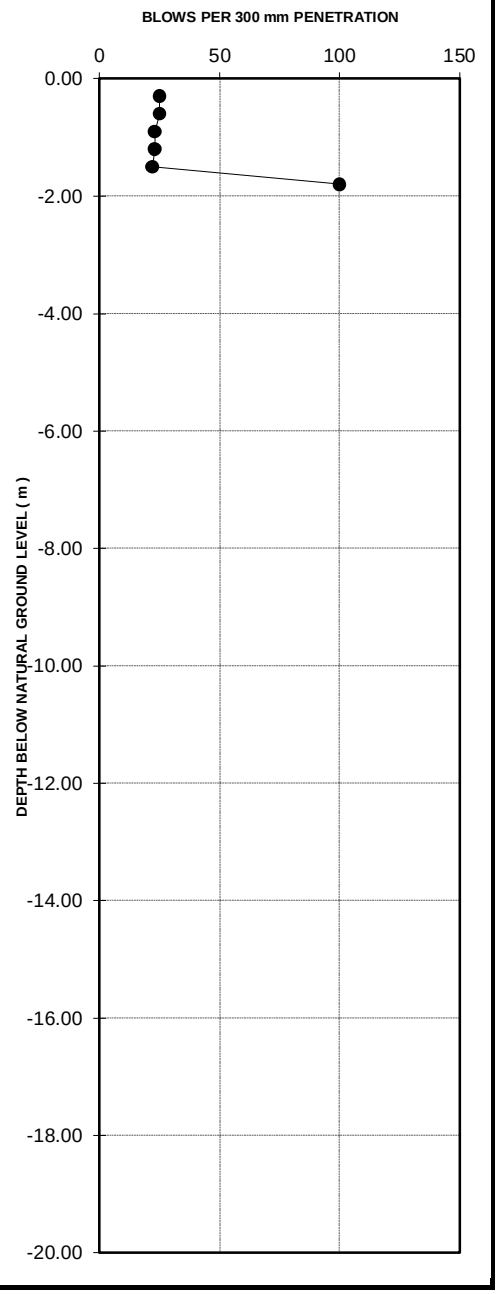


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 547
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
25	300	-0.300	12	25
25	600	-0.600	12	25
23	900	-0.900	13	23
23	1200	-1.200	13	23
22	1500	-1.500	14	22
100	1800	-1.800	3	100

GRAPH

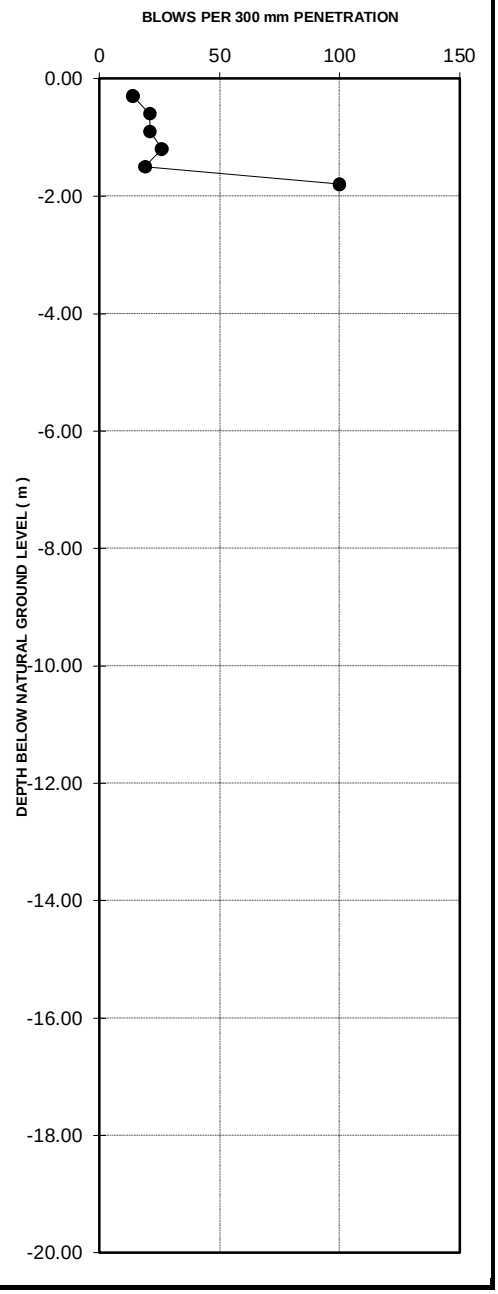


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 550
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
14	300	-0.300	21	14
21	600	-0.600	14	21
21	900	-0.900	14	21
26	1200	-1.200	12	26
19	1500	-1.500	16	19
100	1800	-1.800	3	100

GRAPH

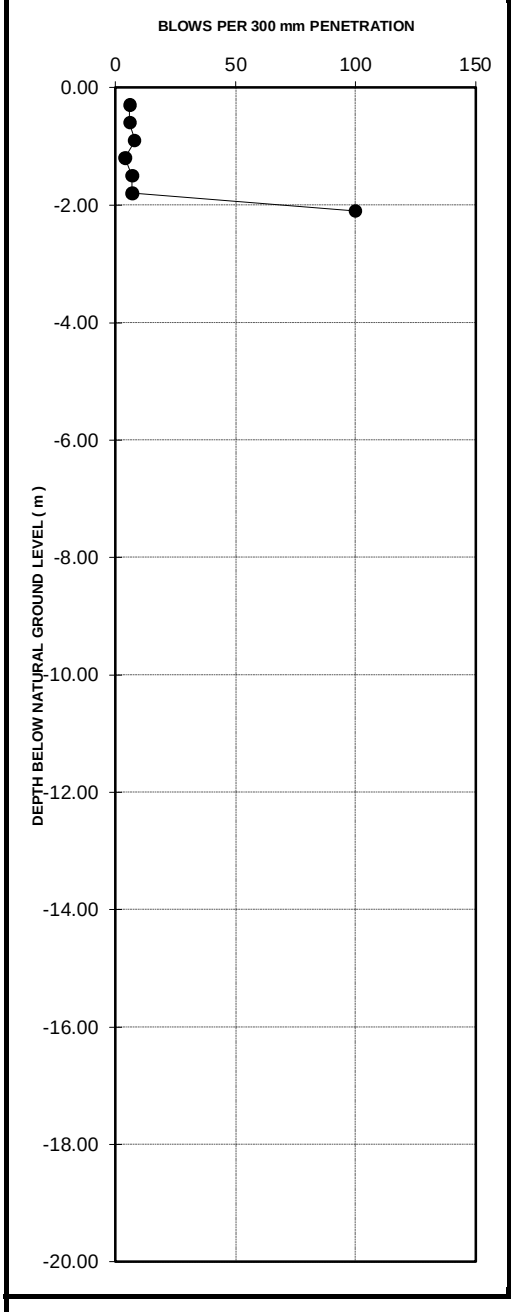


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 660
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
6	300	-0.300	50	6
6	600	-0.600	50	6
8	900	-0.900	38	8
4	1200	-1.200	75	4
7	1500	-1.500	43	7
7	1800	-1.800	43	7
100	2100	-2.100	3	100

GRAPH

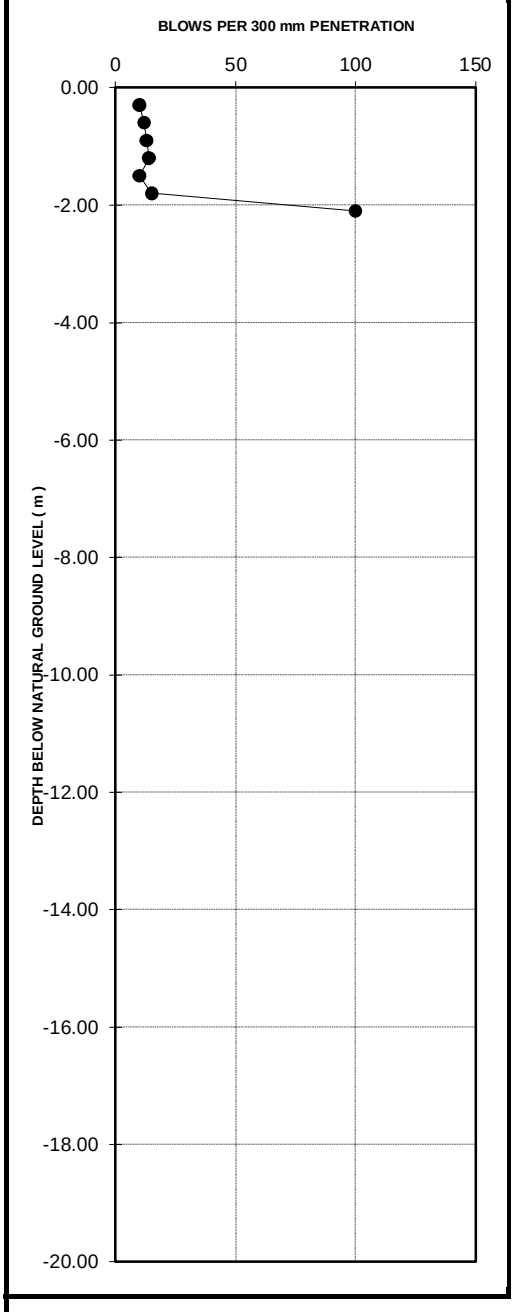


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 661
STARTING DEPTH FROM N.G.L. (m)	0
DATE	26/10/2024 - 12/12/2024

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
10	300	-0.300	30	10
12	600	-0.600	25	12
13	900	-0.900	23	13
14	1200	-1.200	21	14
10	1500	-1.500	30	10
15	1800	-1.800	20	15
100	2100	-2.100	3	100

GRAPH

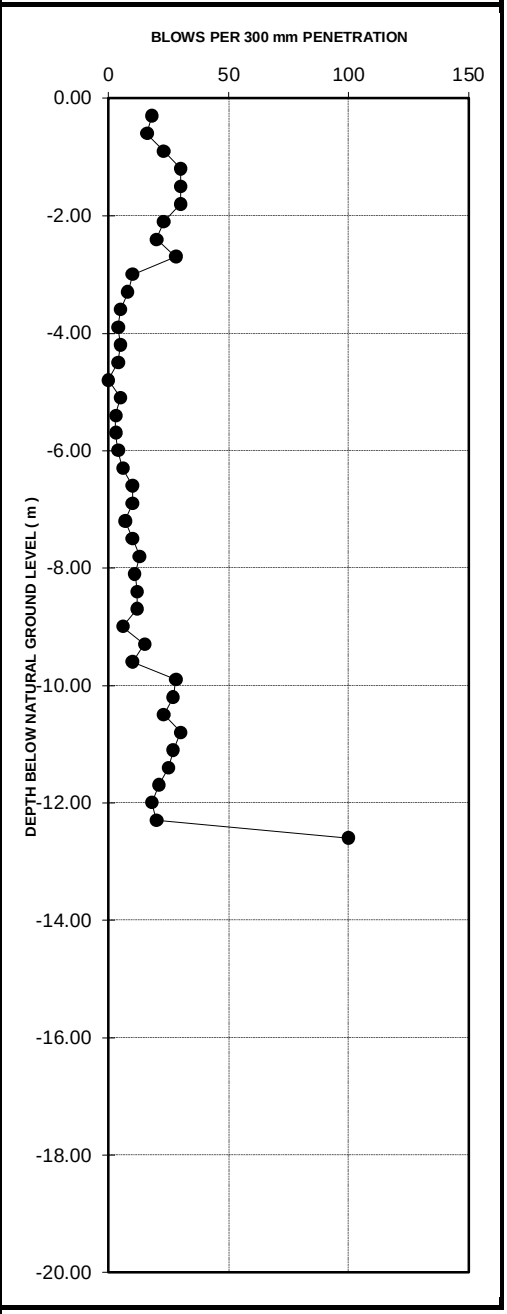


DYNAMIC PROBE SUPER HEAVY TEST

PROJECT	Xhariep pipeline
PROJECT NUMBER	1002533
TEST LOCATION	DSPH 668
STARTING DEPTH FROM N.G.L. (m)	0
DATE	06/02/2025 - 07/02/2025

NUMBER OF BLOWS	PENETRATION DEPTH [mm]	DEPTH FROM N.G.L. [m]	PENETRATION RATE [mm / blow]	BLOWS/ 300 mm PENETRATION
18	300	-0.300	17	18
16	600	-0.600	19	16
23	900	-0.900	13	23
30	1200	-1.200	10	30
30	1500	-1.500	10	30
30	1800	-1.800	10	30
23	2100	-2.100	13	23
20	2400	-2.400	15	20
28	2700	-2.700	11	28
10	3000	-3.000	30	10
8	3300	-3.300	38	8
5	3600	-3.600	60	5
4	3900	-3.900	75	4
5	4200	-4.200	60	5
4	4500	-4.500	75	4
0	4800	-4.800	0	0
5	5100	-5.100	60	5
3	5400	-5.400	100	3
3	5700	-5.700	100	3
4	6000	-6.000	75	4
6	6300	-6.300	50	6
10	6600	-6.600	30	10
10	6900	-6.900	30	10
7	7200	-7.200	43	7
10	7500	-7.500	30	10
13	7800	-7.800	23	13
11	8100	-8.100	27	11
12	8400	-8.400	25	12
12	8700	-8.700	25	12
6	9000	-9.000	50	6
15	9300	-9.300	20	15
10	9600	-9.600	30	10
28	9900	-9.900	11	28
27	10200	-10.200	11	27
23	10500	-10.500	13	23
30	10800	-10.800	10	30
27	11100	-11.100	11	27
25	11400	-11.400	12	25
21	11700	-11.700	14	21
18	12000	-12.000	17	18
20	12300	-12.300	15	20
100	12600	-12.600	3	100

GRAPH



Appendix H - Laboratory Test Results

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

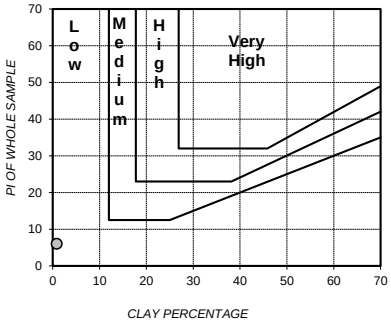
DATE RECEIVED : 11.11.2024
POSITION : TP 5
LAYER : 0,0-1,2
SAMPLE No. : B15839
SAMPLE DESCRIPTION : Silty Sand (Sandy Gravel . Fill

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

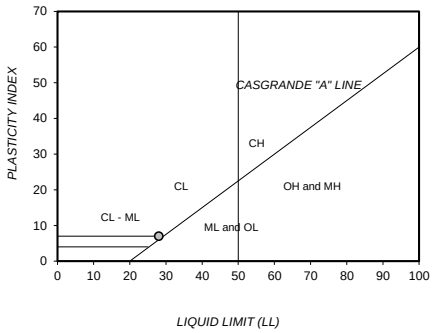
Weighted PI	**6,0**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	98
5,00	97
2,000	94
0,425	86
0,250	82
0,150	75
0,075	55
50 µm	4
5 µm	3
2 µm	0,9

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	8
0.425 - 0.250	4
0.250 - 0.150	8
0.150 - 0.075	20
< 0.075	59

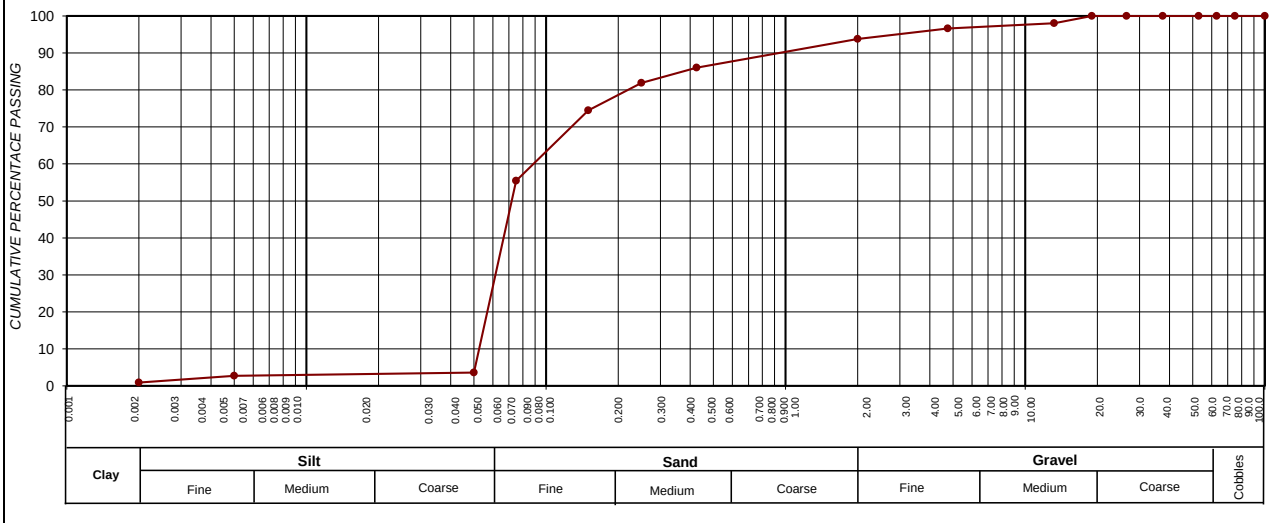
Effective size	0,053
Uniformity Coefficient	1,8
Curvature Coefficient	0,8
Oversize Index	0,0
Shrinkage Product	352,7
Grading Coefficient	6,0
Grading modulus	0,65

Atter-berg Limits	
Liquid Limit	28
Plasticity Index	7
Linear Shrinkage	4,1
PI < 0.075	-

Unified Soil Classification	CL & ML
U.S. Highway Classification	A-4 (2)

PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
0,9	14,2	78,7	6,2

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

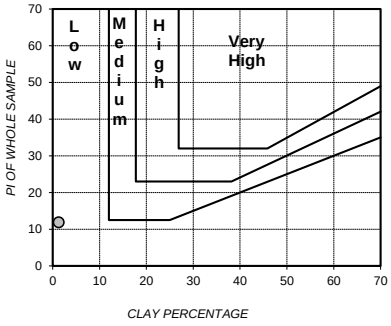
DATE RECEIVED : 11.11.2024
POSITION : TP 07
LAYER : 0.0-0.8
SAMPLE No. : B15192
SAMPLE DESCRIPTION : Sand Colluvium

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

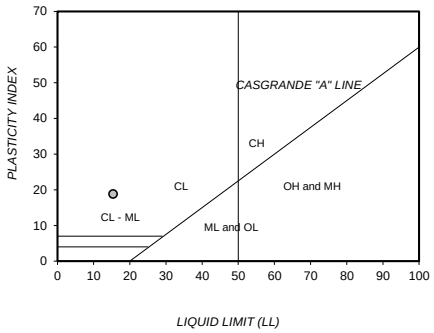
Weighted PI	**11,8**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	96
5,00	85
2,000	77
0,425	63
0,250	53
0,150	41
0,075	28
50 µm	2
5 µm	2
2 µm	1,3

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	18
0.425 - 0.250	13
0.250 - 0.150	15
0.150 - 0.075	18
< 0.075	36

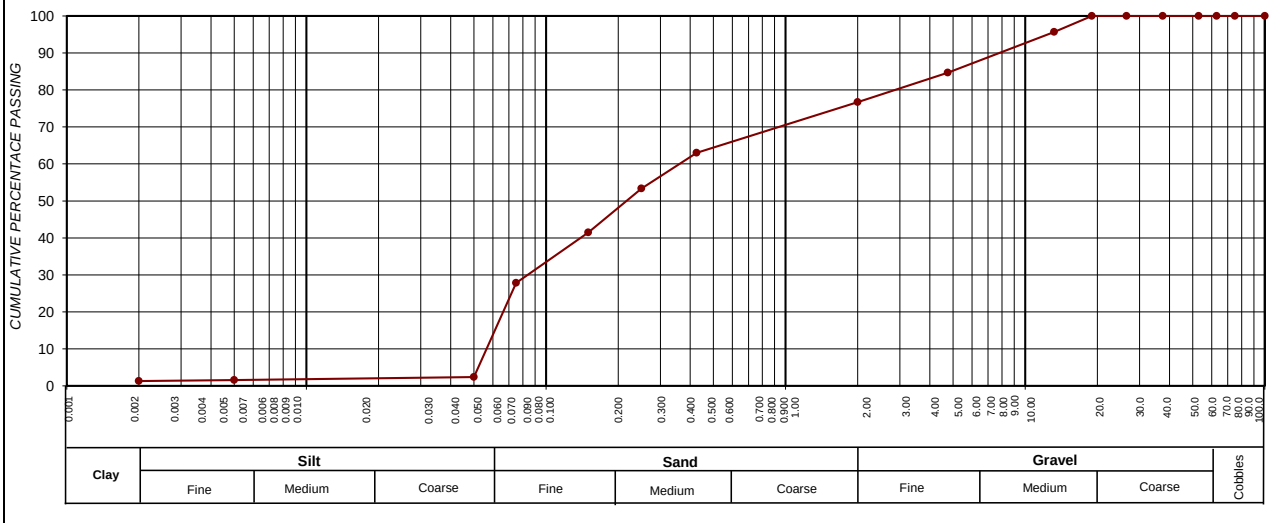
Effective size	0,057
Uniformity Coefficient	6,4
Curvature Coefficient	0,4
Oversize Index	0,0
Shrinkage Product	1361,5
Grading Coefficient	19,8
Grading modulus	1,32

Atter-berg Limits	
Liquid Limit	15
Plasticity Index	19
Linear Shrinkage	21,6
PI < 0.075	-

Unified Soil Classification	SC
U.S. Highway Classification	A-2-6 (1)

PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
1,3	6,4	68,9	23,3

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CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 9
LAYER : 0.2-0.5
SAMPLE No. : B15231
SAMPLE DESCRIPTION : Silty Sand Colluvium

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**11,0**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	97
0,425	92
0,250	90
0,150	86
0,075	75
50 µm	6
5 µm	6
2 µm	3,5

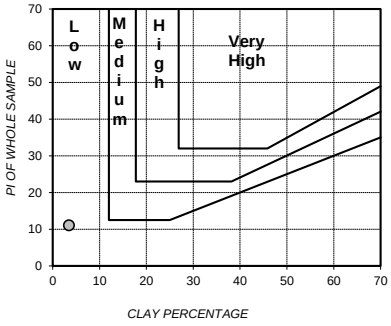
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	5
0.425 - 0.250	2
0.250 - 0.150	5
0.150 - 0.075	11
< 0.075	77

Effective size	0,051
Uniformity Coefficient	1,4
Curvature Coefficient	1,0
Oversize Index	0,0
Shrinkage Product	614,3
Grading Coefficient	2,8
Grading modulus	0,36

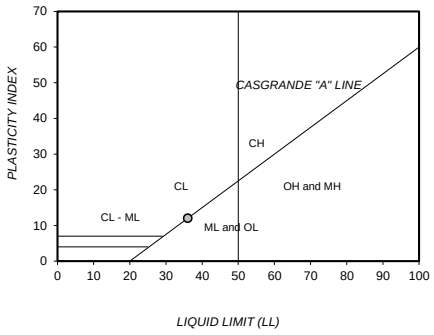
Atter-berg Limits	
Liquid Limit	36
Plasticity Index	12
Linear Shrinkage	6,7
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (8)

POTENTIAL EXPANSIVENES

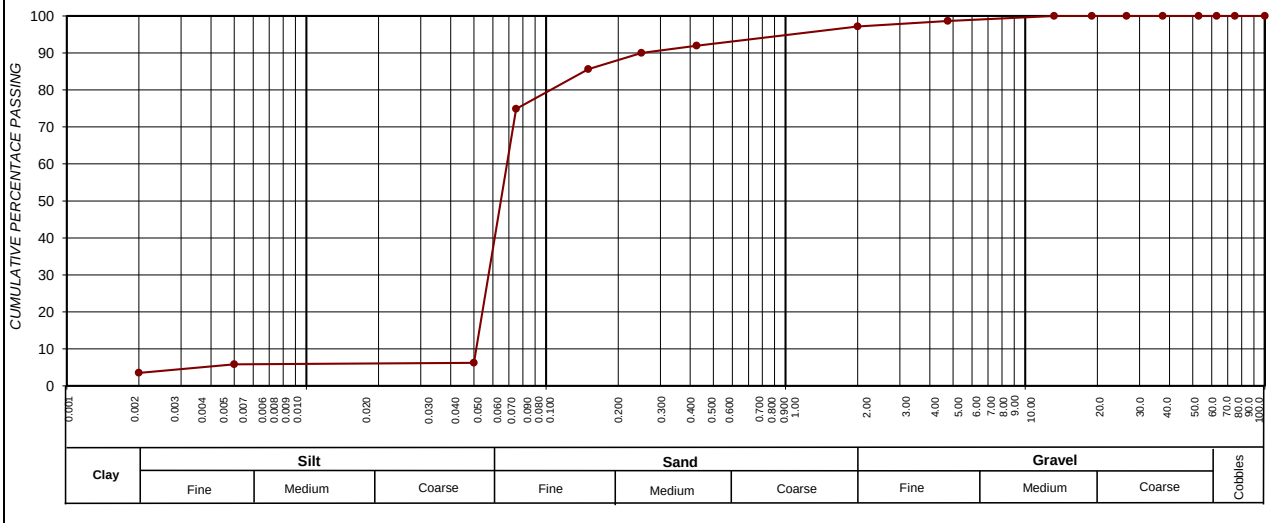


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
3,5	18,7	74,9	2,9

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DATE RECEIVED : 11.11.2024
POSITION : TP 11
LAYER : 0.70-2.00
SAMPLE No. : B15150
SAMPLE DESCRIPTION : Dark Dark Silty Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**11,6**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	100
2,000	100
0,425	97
0,250	95
0,150	82
0,075	56
50 µm	7
5 µm	6
2 µm	1,7

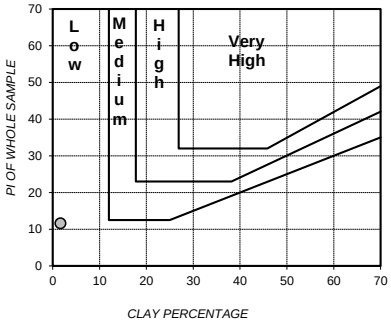
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	3
0.425 - 0.250	1
0.250 - 0.150	13
0.150 - 0.075	27
< 0.075	56

Effective size	0,052
Uniformity Coefficient	1,7
Curvature Coefficient	0,8
Oversize Index	0,0
Shrinkage Product	638,8
Grading Coefficient	0,4
Grading modulus	0,48

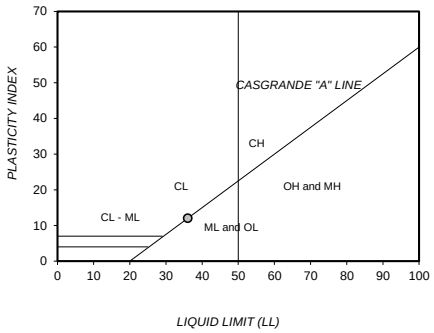
Atter-berg Limits	
Liquid Limit	36
Plasticity Index	12
Linear Shrinkage	6,6
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (5)

POTENTIAL EXPANSIVENES

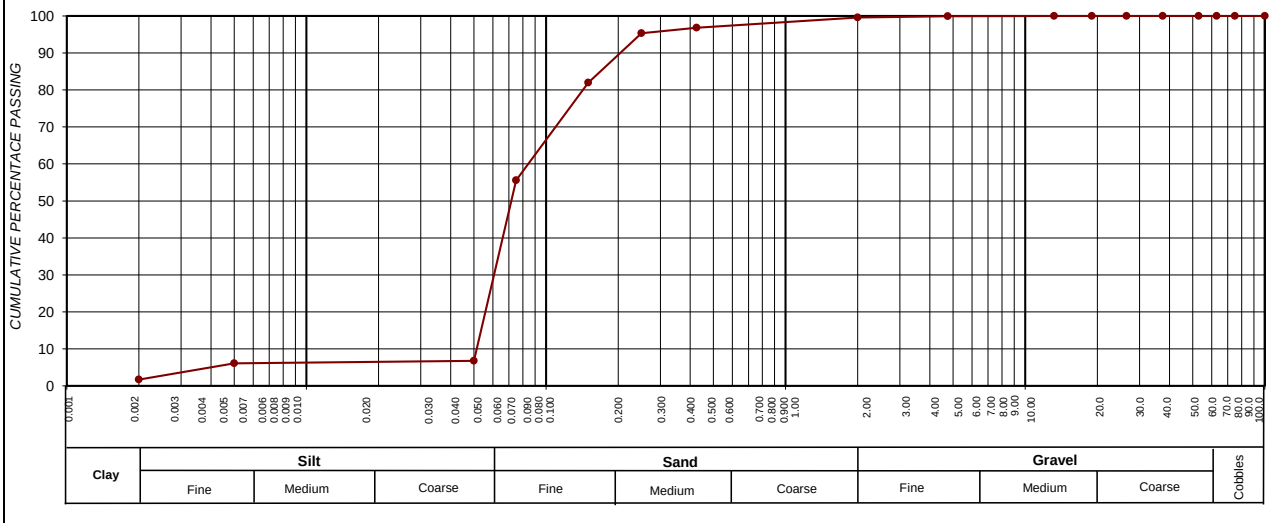


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
1,7	15,5	82,5	0,4

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 12
LAYER : 0.00-0.30
SAMPLE No. : B15847
SAMPLE DESCRIPTION : Silty Sand Colluvium

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**27,0**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	100
2,000	97
0,425	90
0,250	86
0,150	80
0,075	71
50 µm	12
5 µm	10
2 µm	5,1

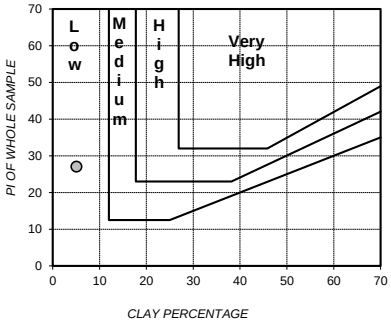
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	8
0.425 - 0.250	4
0.250 - 0.150	6
0.150 - 0.075	10
< 0.075	73

Effective size	0,005
Uniformity Coefficient	14,6
Curvature Coefficient	9,8
Oversize Index	0,0
Shrinkage Product	1312,0
Grading Coefficient	2,6
Grading modulus	0,42

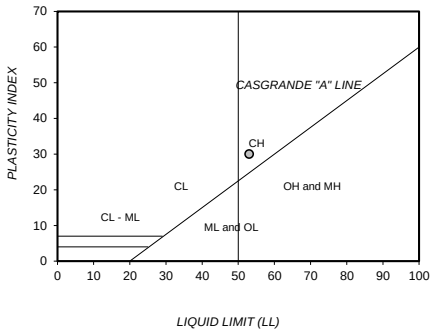
Atter-berg Limits	
Liquid Limit	53
Plasticity Index	30
Linear Shrinkage	14,6
PI < 0.075	-

Unified Soil Classification	CH
U.S. Highway Classification	A-7-6 (21)

POTENTIAL EXPANSIVENES

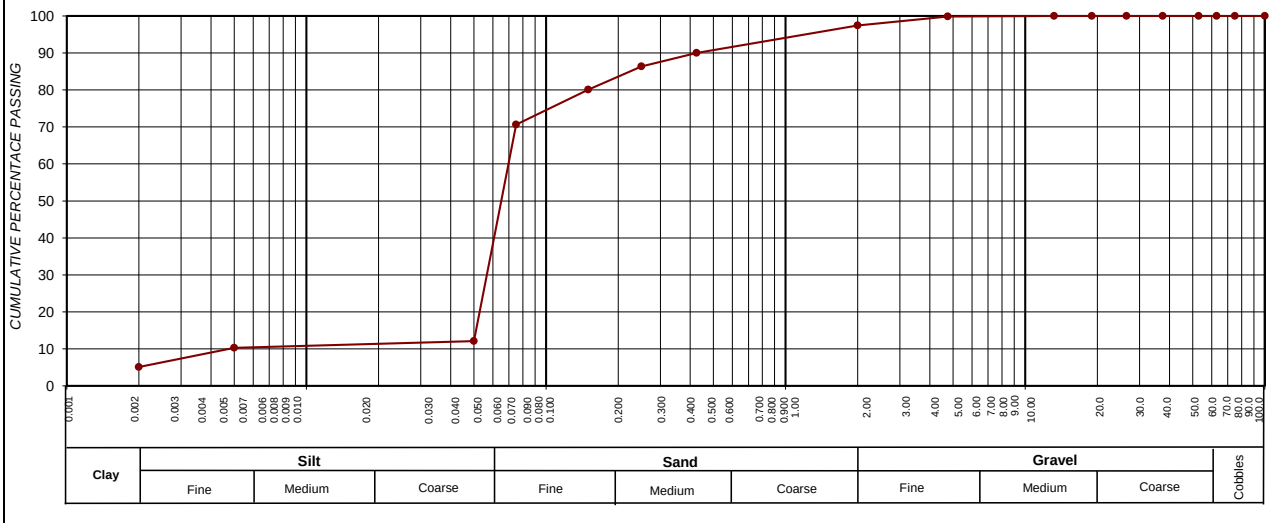


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
5,1	21,6	70,7	2,6

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 13
LAYER : 0.00-0.30
SAMPLE No. : B15379
SAMPLE DESCRIPTION : Silty Sand Colluvium

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**24,6**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	100
2,000	98
0,425	91
0,250	88
0,150	81
0,075	72
50 µm	12
5 µm	9
2 µm	4,2

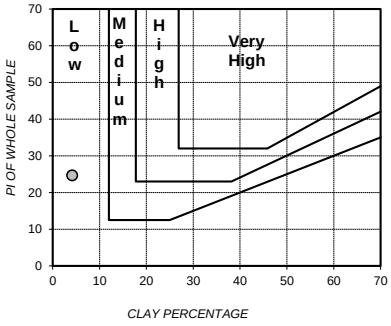
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	7
0.425 - 0.250	4
0.250 - 0.150	7
0.150 - 0.075	9
< 0.075	74

Effective size	0,022
Uniformity Coefficient	3,1
Curvature Coefficient	2,1
Oversize Index	0,0
Shrinkage Product	1136,3
Grading Coefficient	2,1
Grading modulus	0,39

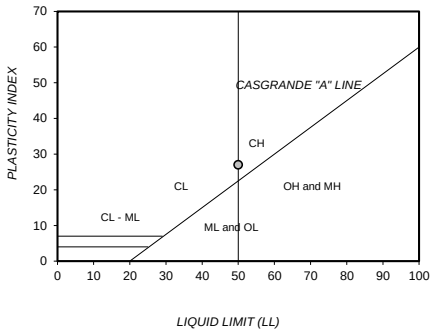
Atter-berg Limits	
Liquid Limit	50
Plasticity Index	27
Linear Shrinkage	12,5
PI < 0.075	-

Unified Soil Classification	CH
U.S. Highway Classification	A-7-6 (19)

POTENTIAL EXPANSIVENES

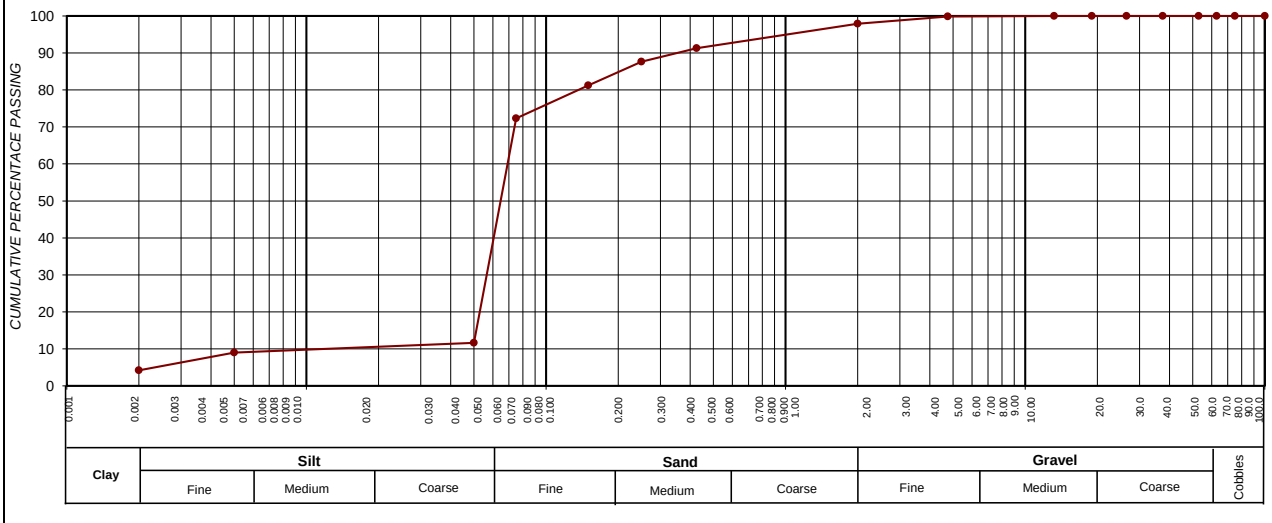


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
4,2	22,4	71,2	2,1

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PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 14
LAYER : 0.6-3.0
SAMPLE No. : B15198
SAMPLE DESCRIPTION : Silty Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**6,7**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	98
2,000	92
0,425	67
0,250	63
0,150	59
0,075	46
50 µm	3
5 µm	2
2 µm	1,4

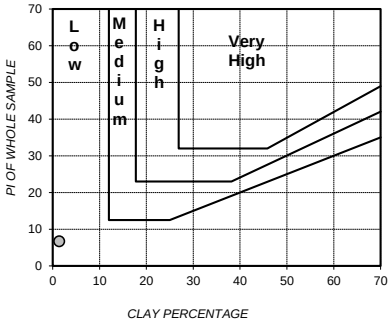
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	28
0.425 - 0.250	4
0.250 - 0.150	5
0.150 - 0.075	14
< 0.075	50

Effective size	0,054
Uniformity Coefficient	3,2
Curvature Coefficient	0,5
Oversize Index	0,0
Shrinkage Product	327,8
Grading Coefficient	7,7
Grading modulus	0,95

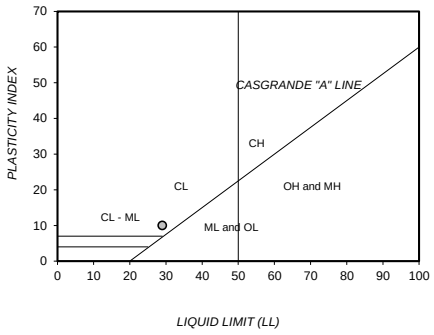
Atter-berg Limits	
Liquid Limit	29
Plasticity Index	10
Linear Shrinkage	4,9
PI < 0.075	-

Unified Soil Classification	SC
U.S. Highway Classification	A-4 (2)

POTENTIAL EXPANSIVENES

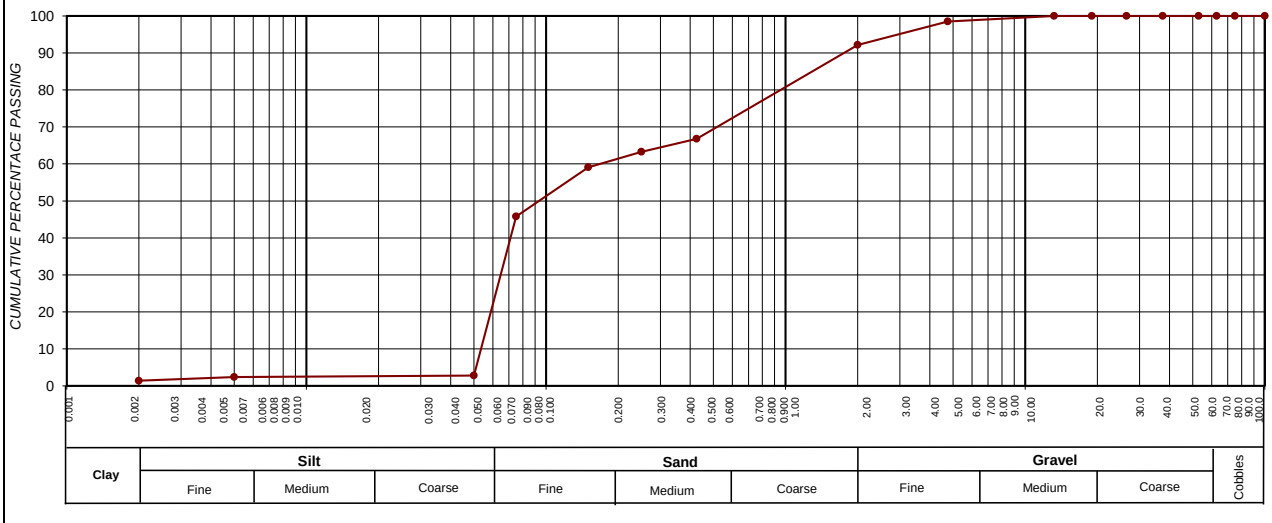


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
1,4	10,8	79,9	7,8

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 16
LAYER : 0,4-0,8
SAMPLE No. : B15852
SAMPLE DESCRIPTION : Silty Sand+Residual Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**16,0**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	100
2,000	99
0,425	94
0,250	92
0,150	87
0,075	72
50 µm	7
5 µm	6
2 µm	5,6

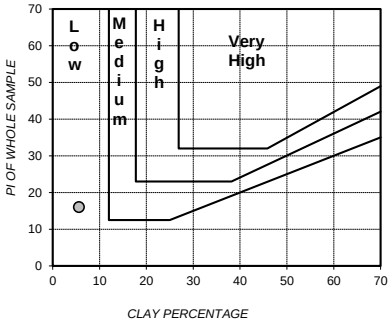
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	5
0.425 - 0.250	2
0.250 - 0.150	5
0.150 - 0.075	16
< 0.075	72

Effective size	0,051
Uniformity Coefficient	1,4
Curvature Coefficient	1,0
Oversize Index	0,0
Shrinkage Product	868,2
Grading Coefficient	1,1
Grading modulus	0,35

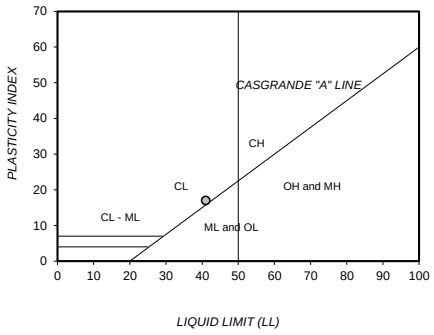
Atter-berg Limits	
Liquid Limit	41
Plasticity Index	17
Linear Shrinkage	9,2
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-7-6 (12)

POTENTIAL EXPANSIVENES

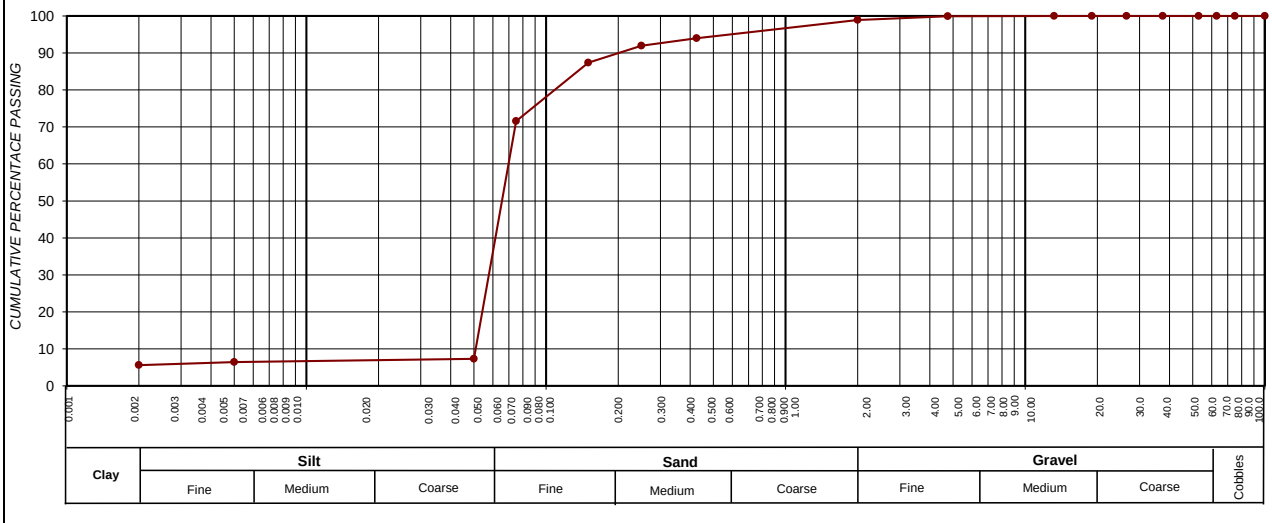


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
5,6	16,5	76,8	1,1

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CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 21
LAYER : 0.50-1.10
SAMPLE No. : B15848
SAMPLE DESCRIPTION : Dark Silty Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**23,4**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	98
2,000	94
0,425	90
0,250	87
0,150	79
0,075	65
50 µm	13
5 µm	12
2 µm	5,5

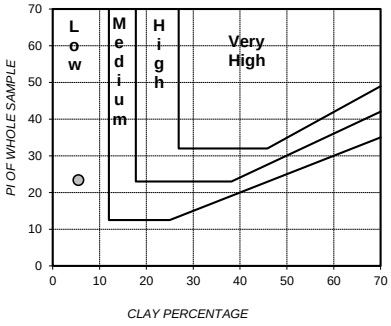
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	4
0.425 - 0.250	3
0.250 - 0.150	9
0.150 - 0.075	14
< 0.075	70

Effective size	0,004
Uniformity Coefficient	17,5
Curvature Coefficient	11,2
Oversize Index	0,0
Shrinkage Product	969,1
Grading Coefficient	6,2
Grading modulus	0,51

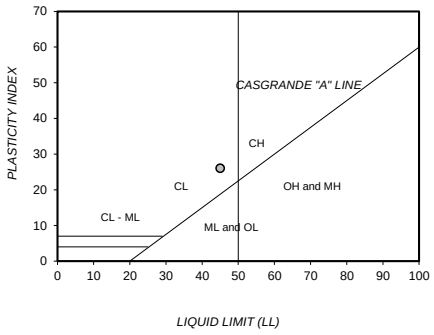
Atter-berg Limits	
Liquid Limit	45
Plasticity Index	26
Linear Shrinkage	10,8
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-7-6 (15)

POTENTIAL EXPANSIVENES

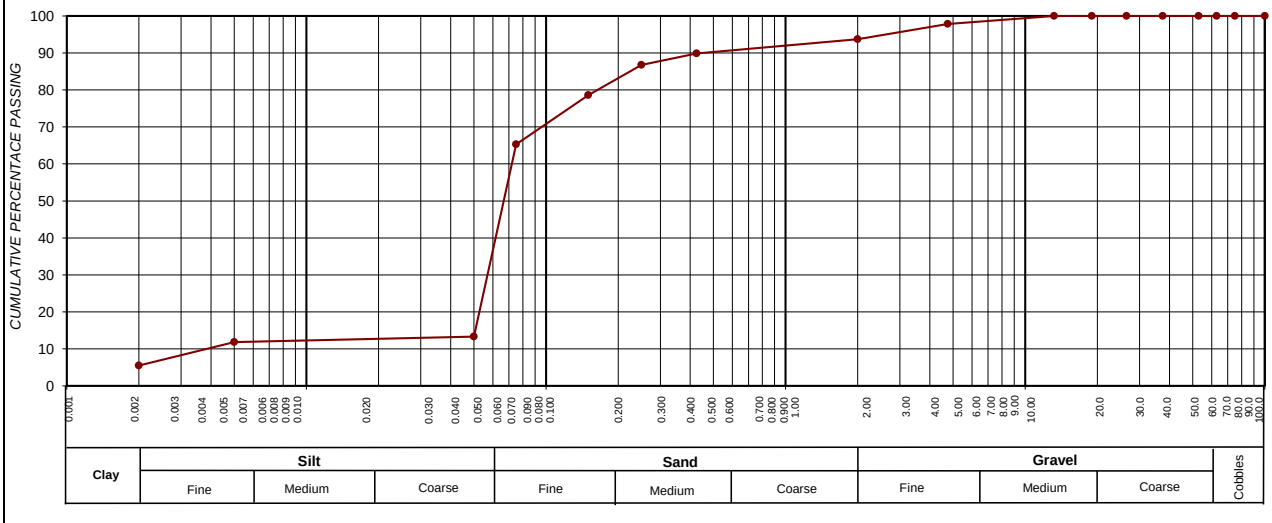


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
5,5	20,2	68,0	6,3

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CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 21
LAYER : 0,4-0,5
SAMPLE No. : B15856
SAMPLE DESCRIPTION : Silty Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**21,8**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	96
5,00	94
2,000	93
0,425	91
0,250	87
0,150	80
0,075	65
50 µm	12
5 µm	12
2 µm	8,3

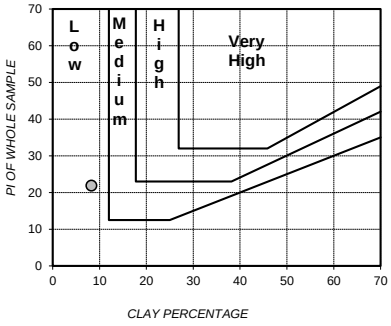
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	2
0.425 - 0.250	4
0.250 - 0.150	8
0.150 - 0.075	17
< 0.075	69

Effective size	0,004
Uniformity Coefficient	20,3
Curvature Coefficient	13,1
Oversize Index	0,0
Shrinkage Product	1237,1
Grading Coefficient	6,4
Grading modulus	0,51

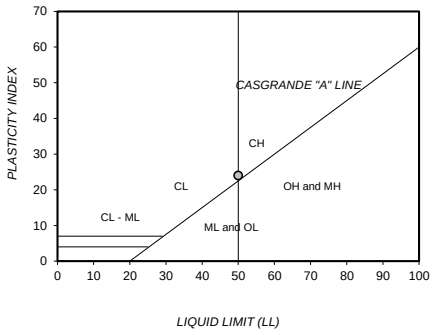
Atter-berg Limits	
Liquid Limit	50
Plasticity Index	24
Linear Shrinkage	13,6
PI < 0.075	-

Unified Soil Classification	CH
U.S. Highway Classification	A-7-6 (15)

POTENTIAL EXPANSIVENES

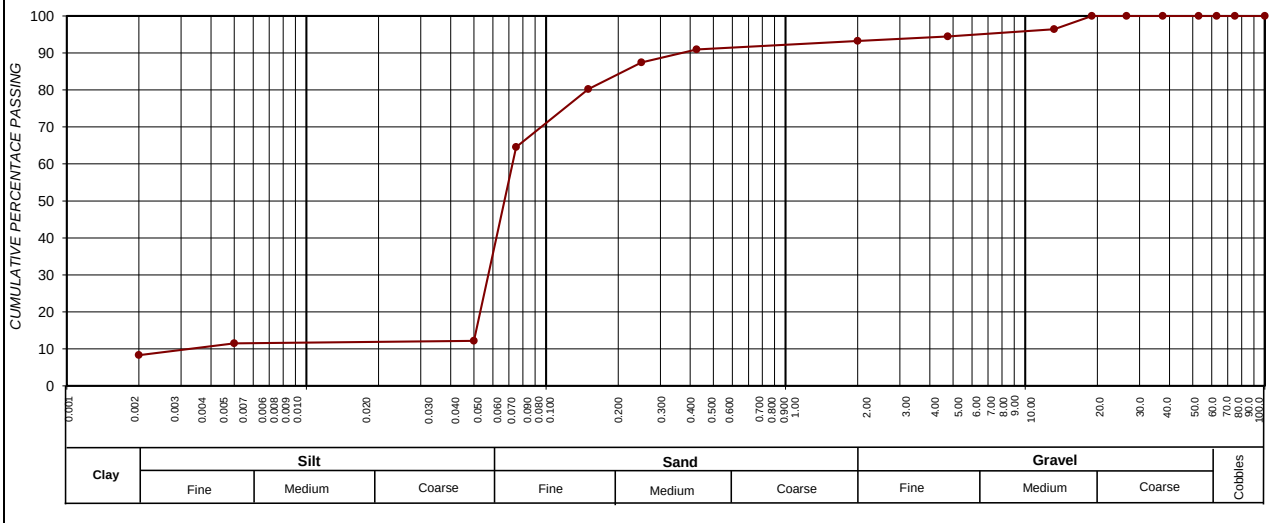


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
8,3	16,6	68,3	6,8

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CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 27
LAYER : 0.0-0.7
SAMPLE No. : B15360
SAMPLE DESCRIPTION : Sandy Gravel + Colluvium

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**4,0**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	91
5,00	75
2,000	57
0,425	34
0,250	31
0,150	27
0,075	22
50 µm	2
5 µm	2
2 µm	0,6

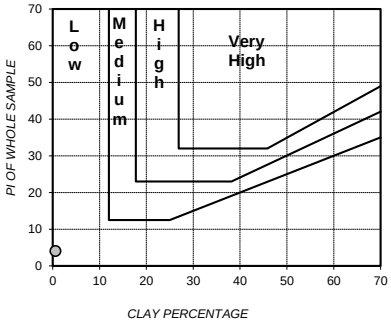
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	41
0.425 - 0.250	5
0.250 - 0.150	7
0.150 - 0.075	7
< 0.075	39

Effective size	0,059
Uniformity Coefficient	41,9
Curvature Coefficient	0,4
Oversize Index	0,0
Shrinkage Product	205,1
Grading Coefficient	31,9
Grading modulus	1,87

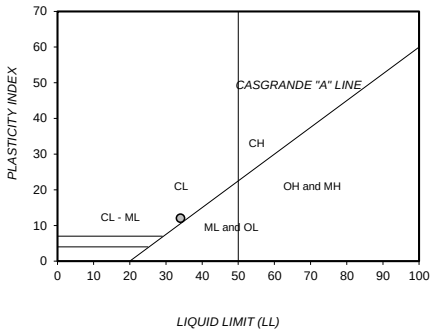
Atter-berg Limits	
Liquid Limit	34
Plasticity Index	12
Linear Shrinkage	6,1
PI < 0.075	-

Unified Soil Classification	SC
U.S. Highway Classification	A-2-6 (0)

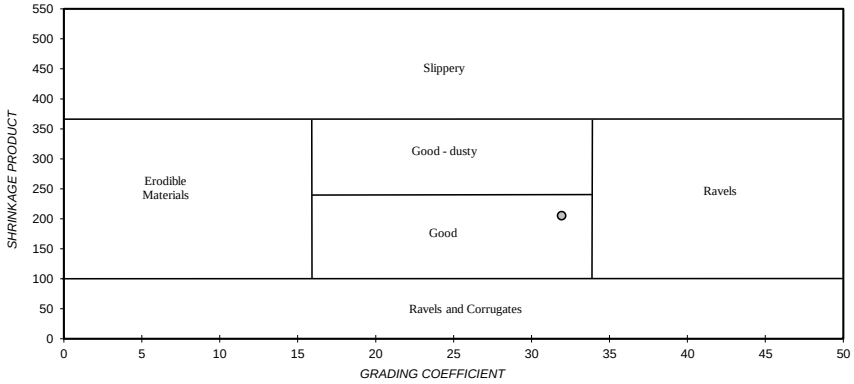
POTENTIAL EXPANSIVENES



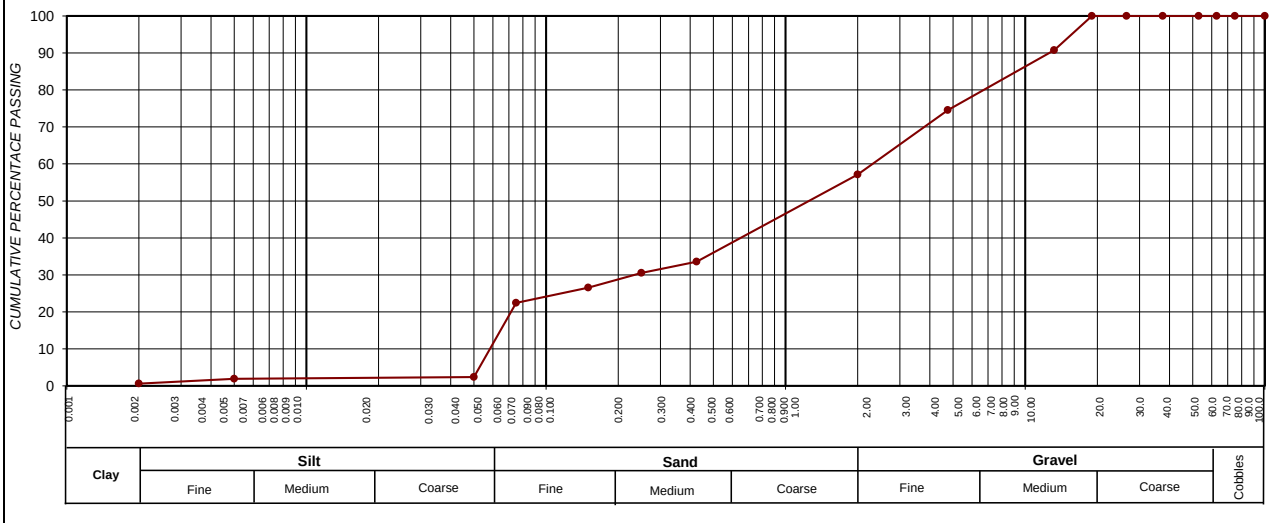
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
0,6	6,3	50,3	42,9

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 27
LAYER : 0.2-1.1
SAMPLE No. : B15361
SAMPLE DESCRIPTION : Silty Sand +Weathered Dolerite

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**20,5**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	100
2,000	99
0,425	98
0,250	96
0,150	91
0,075	82
50 µm	10
5 µm	8
2 µm	4,8

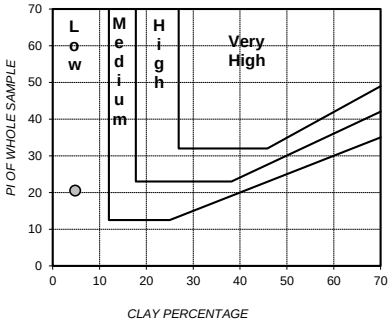
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	1
0.425 - 0.250	2
0.250 - 0.150	5
0.150 - 0.075	9
< 0.075	82

Effective size	0,050
Uniformity Coefficient	1,3
Curvature Coefficient	1,0
Oversize Index	0,0
Shrinkage Product	1063,1
Grading Coefficient	0,9
Grading modulus	0,21

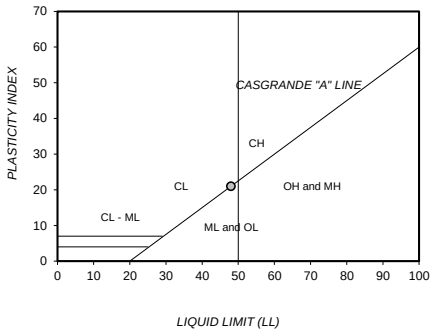
Atter-berg Limits	
Liquid Limit	48
Plasticity Index	21
Linear Shrinkage	10,9
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-7-6 (19)

POTENTIAL EXPANSIVENES

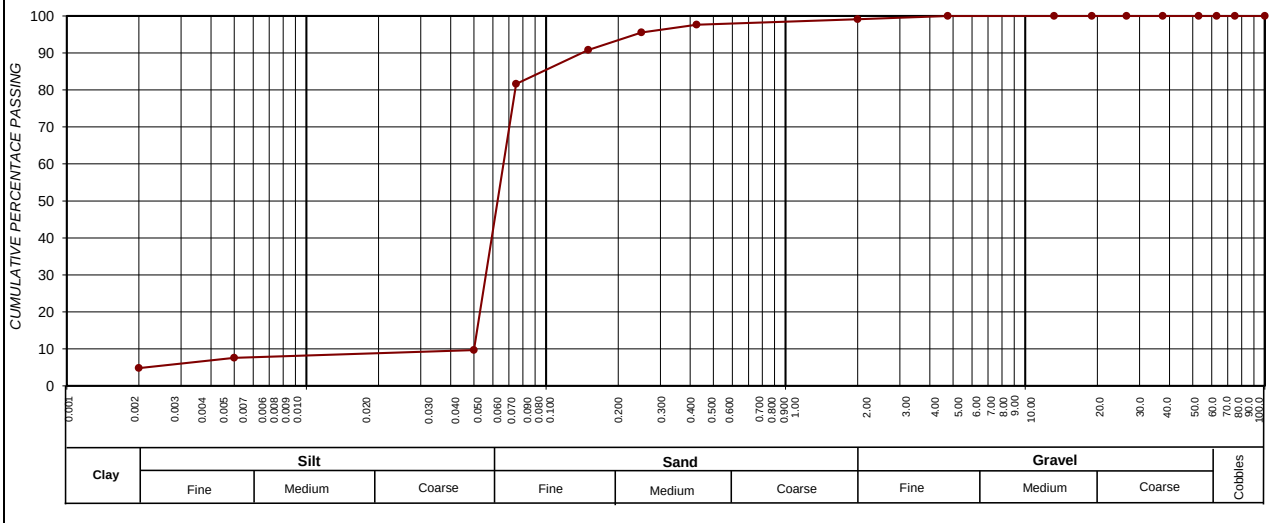


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
4,8	22,7	71,6	0,9

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 35
LAYER : 0.6-1.1
SAMPLE No. : B15859
SAMPLE DESCRIPTION : Silty Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**16,9**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	100
2,000	99
0,425	94
0,250	92
0,150	87
0,075	74
50 µm	11
5 µm	8
2 µm	6,6

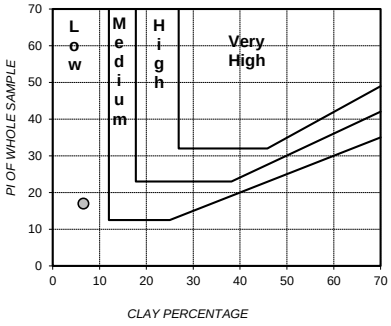
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	5
0.425 - 0.250	2
0.250 - 0.150	5
0.150 - 0.075	13
< 0.075	75

Effective size	0,033
Uniformity Coefficient	2,1
Curvature Coefficient	1,4
Oversize Index	0,0
Shrinkage Product	964,8
Grading Coefficient	1,0
Grading modulus	0,33

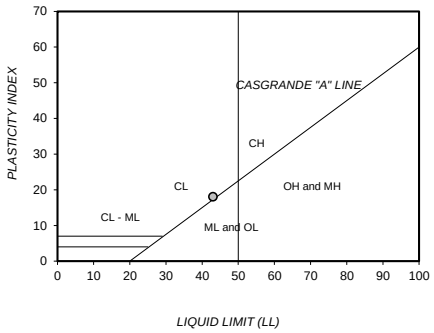
Atter-berg Limits	
Liquid Limit	43
Plasticity Index	18
Linear Shrinkage	10,3
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-7-6 (13)

POTENTIAL EXPANSIVENES

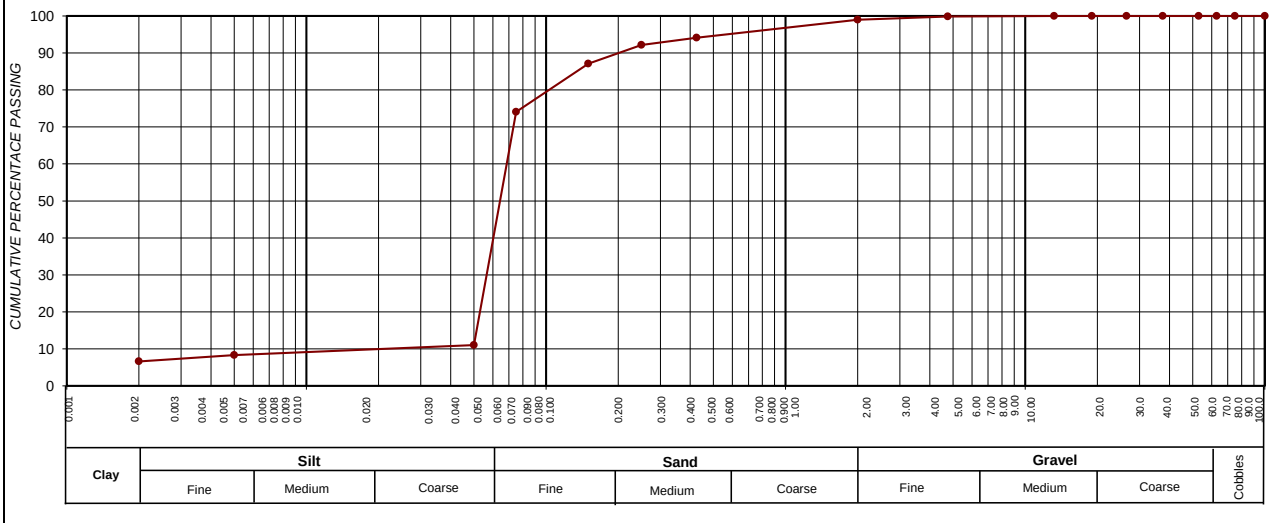


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
6,6	20,1	72,3	1,0

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PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 37
LAYER : 0.90-1.20
SAMPLE No. : B15191
SAMPLE DESCRIPTION : Sandy Gravel

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**7,0**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	96
37,5	94
28,0	92
20,0	89
14,0	88
5,00	86
2,000	55
0,425	50
0,250	49
0,150	47
0,075	38
50 µm	4
5 µm	4
2 µm	2,7

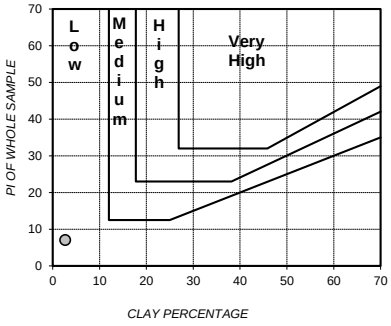
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	9
0.425 - 0.250	1
0.250 - 0.150	5
0.150 - 0.075	16
< 0.075	69

Effective size	0,054
Uniformity Coefficient	45,6
Curvature Coefficient	0,0
Oversize Index	6,4
Shrinkage Product	391,1
Grading Coefficient	31,8
Grading modulus	1,57

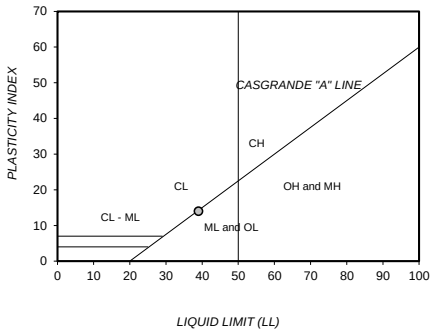
Atter-berg Limits	
Liquid Limit	39
Plasticity Index	14
Linear Shrinkage	7,8
PI < 0.075	-

Unified Soil Classification	SC
U.S. Highway Classification	A-6 (2)

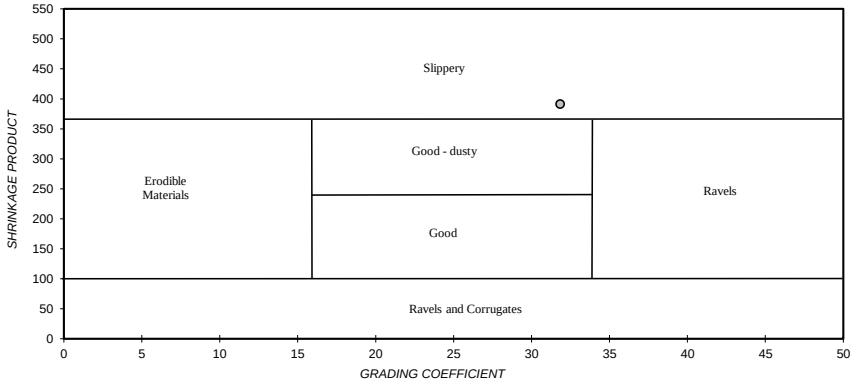
POTENTIAL EXPANSIVENES



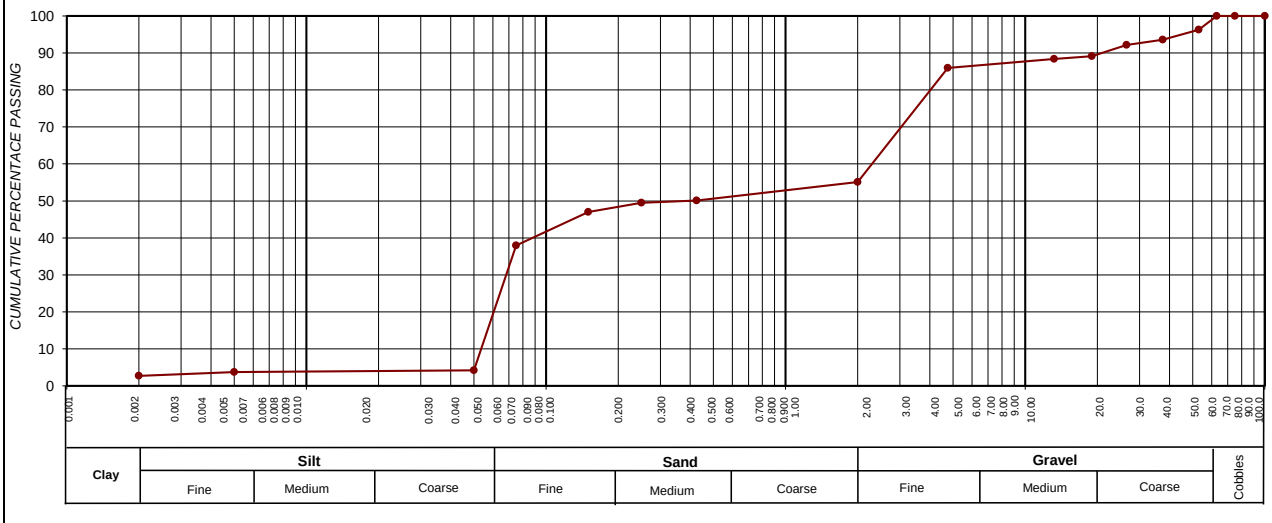
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
2,7	9,4	43,0	44,9

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 41
LAYER : 0.4-1.2
SAMPLE No. : B15226
SAMPLE DESCRIPTION : Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**7,4**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	95
0,425	82
0,250	72
0,150	58
0,075	42
50 µm	5
5 µm	5
2 µm	3,5

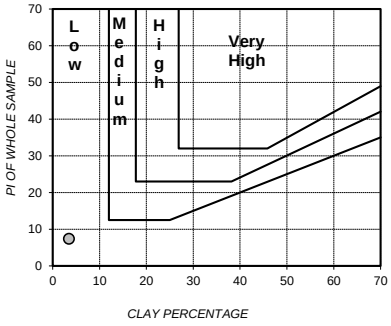
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	14
0.425 - 0.250	10
0.250 - 0.150	15
0.150 - 0.075	17
< 0.075	44

Effective size	0,053
Uniformity Coefficient	3,1
Curvature Coefficient	0,5
Oversize Index	0,0
Shrinkage Product	405,9
Grading Coefficient	5,1
Grading modulus	0,81

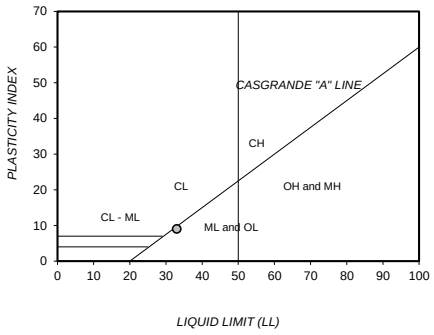
Atter-berg Limits	
Liquid Limit	33
Plasticity Index	9
Linear Shrinkage	5,0
PI < 0.075	-

Unified Soil Classification	SM
U.S. Highway Classification	A-4 (1)

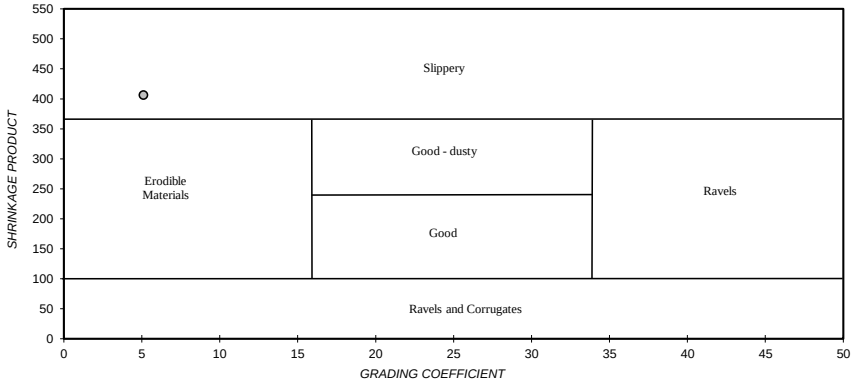
POTENTIAL EXPANSIVENES



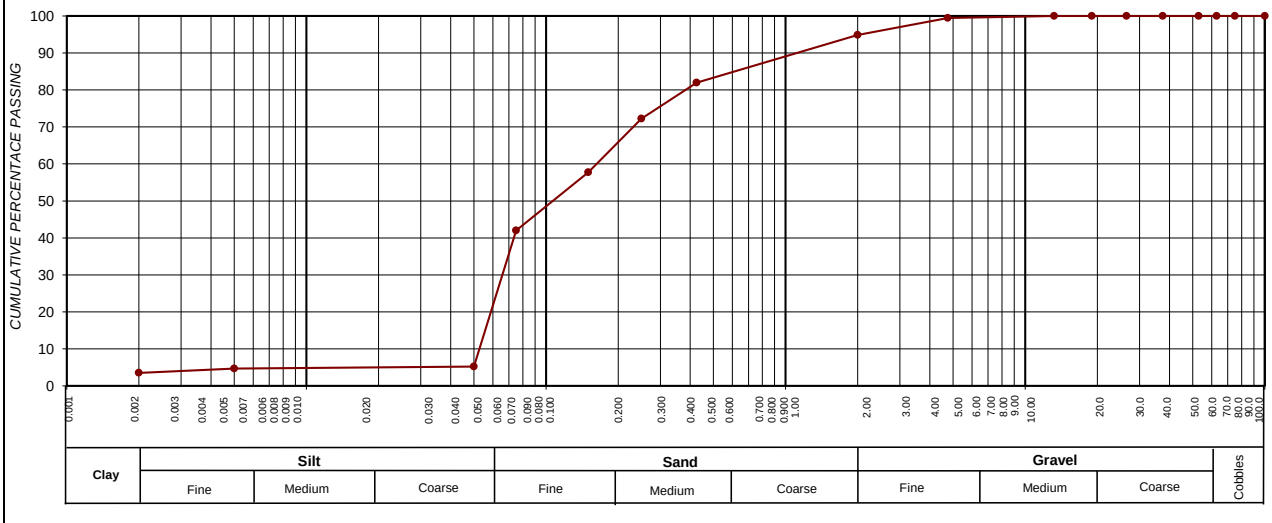
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
3,5	9,5	81,9	5,1

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 43
LAYER : 0.4-1.3
SAMPLE No. : B15147
SAMPLE DESCRIPTION : Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**3,6**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	98
2,000	88
0,425	60
0,250	51
0,150	40
0,075	30
50 µm	3
5 µm	3
2 µm	1,3

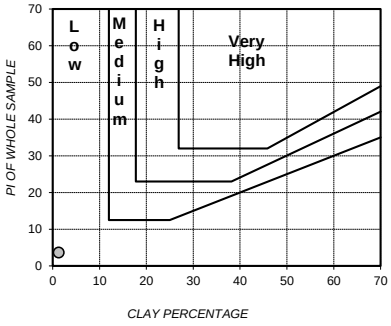
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	32
0.425 - 0.250	11
0.250 - 0.150	12
0.150 - 0.075	11
< 0.075	34

Effective size	0,056
Uniformity Coefficient	7,5
Curvature Coefficient	0,2
Oversize Index	0,0
Shrinkage Product	194,7
Grading Coefficient	11,6
Grading modulus	1,22

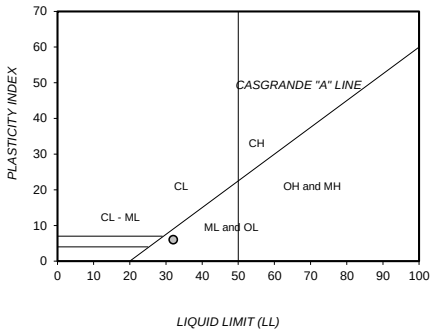
Atter-berg Limits	
Liquid Limit	32
Plasticity Index	6
Linear Shrinkage	3,2
PI < 0.075	-

Unified Soil Classification	SM
U.S. Highway Classification	A-2-4 (0)

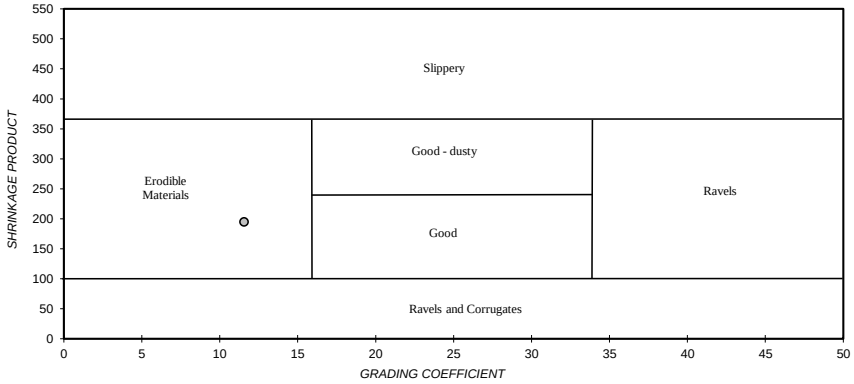
POTENTIAL EXPANSIVENES



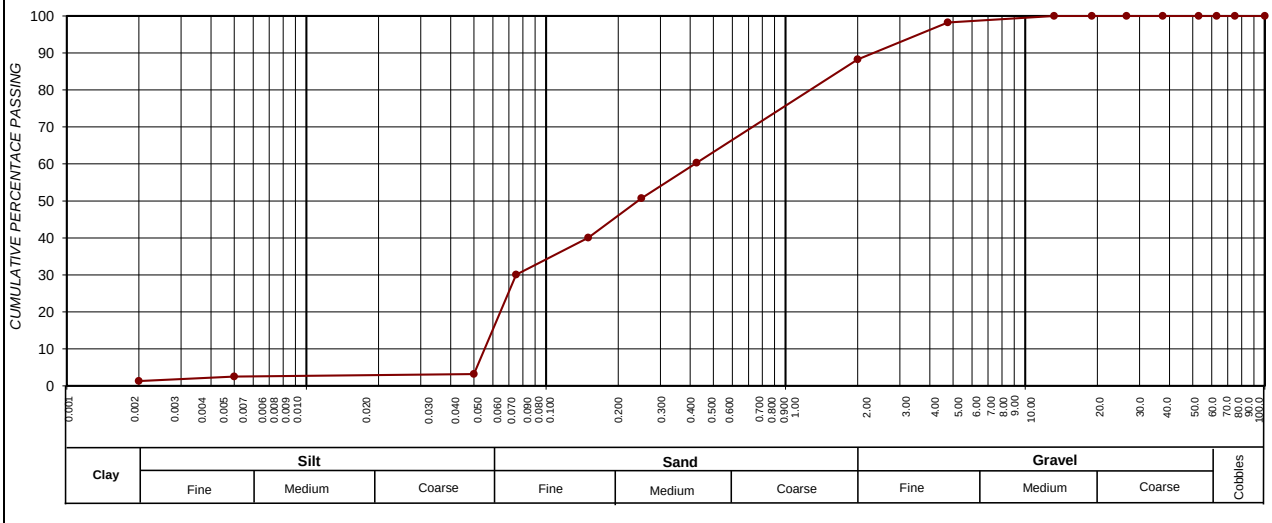
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
1,3	7,8	79,1	11,8

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OUR REF : BLO01-RBFMUK001-1-
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PROJECT : Xhariep Pipeline Feasibility Study

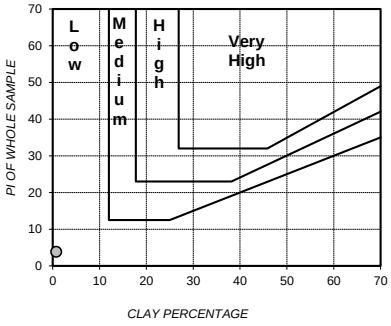
DATE RECEIVED : 11.11.2024
POSITION : TP 45
LAYER : 0.5-1.3
SAMPLE No. : B15227
SAMPLE DESCRIPTION : Sandy Clay ,Residual Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

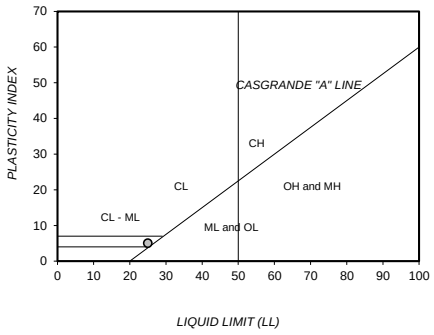
Weighted PI	**3,8**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	99
5,00	95
2,000	90
0,425	76
0,250	68
0,150	56
0,075	30
50 µm	3
5 µm	2
2 µm	0,8

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	15
0.425 - 0.250	9
0.250 - 0.150	13
0.150 - 0.075	28
< 0.075	34

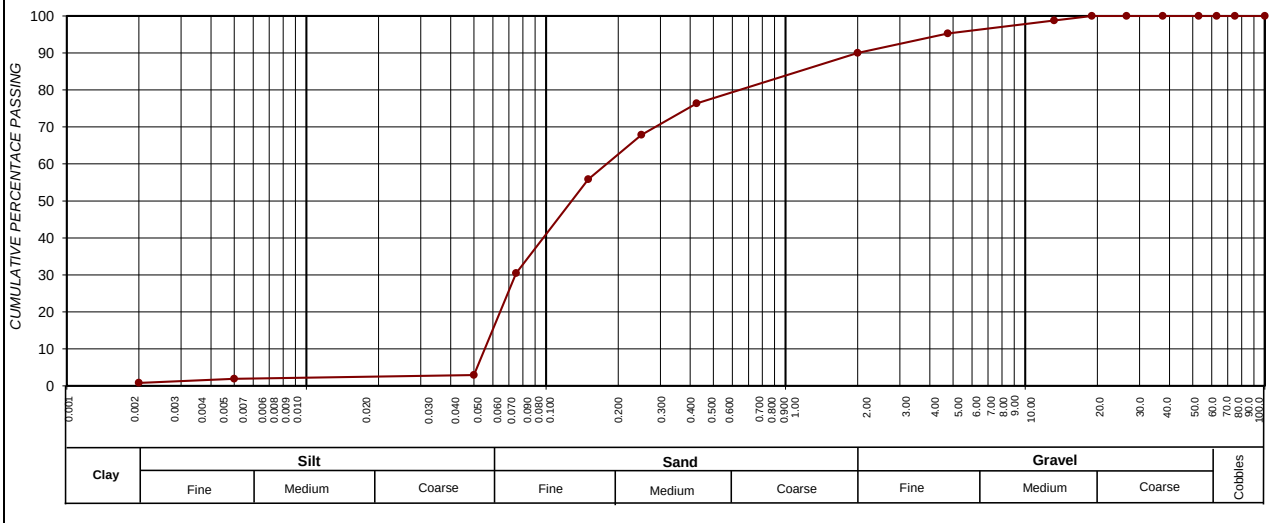
Effective size	0,056
Uniformity Coefficient	3,3
Curvature Coefficient	0,5
Oversize Index	0,0
Shrinkage Product	201,6
Grading Coefficient	9,5
Grading modulus	1,04

Atter-berg Limits	
Liquid Limit	25
Plasticity Index	5
Linear Shrinkage	2,6
PI < 0.075	-

Unified Soil Classification	SM & SC
U.S. Highway Classification	A-2-4 (0)

PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
0,8	6,8	82,4	10,0

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PROJECT : Xhariep Pipeline Feasibility Study

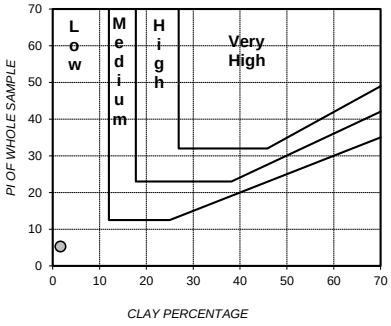
DATE RECEIVED : 11.11.2024
POSITION : TP 52
LAYER : 0.6-0.8
SAMPLE No. : B15148
SAMPLE DESCRIPTION : Dark Olive Sandy Gravel

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

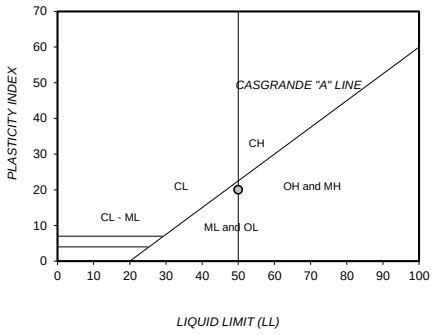
Weighted PI	**5,3**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	98
37,5	98
28,0	95
20,0	88
14,0	88
5,00	57
2,000	40
0,425	26
0,250	24
0,150	21
0,075	19
50 µm	3
5 µm	3
2 µm	1,7

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	33
0.425 - 0.250	7
0.250 - 0.150	6
0.150 - 0.075	7
< 0.075	47

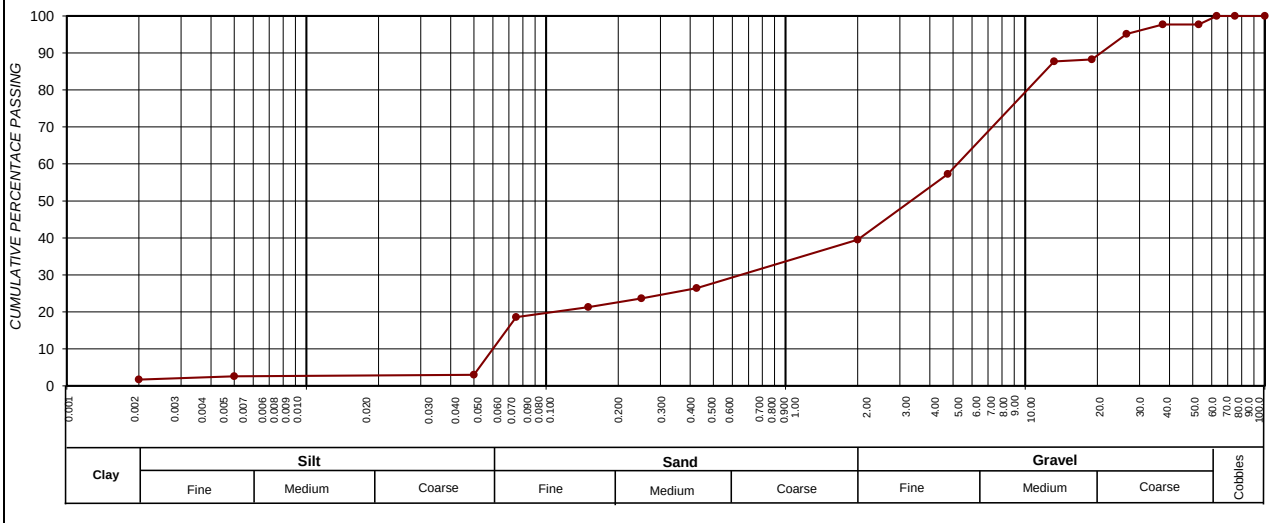
Effective size	0,061
Uniformity Coefficient	95,0
Curvature Coefficient	2,1
Oversize Index	2,3
Shrinkage Product	255,8
Grading Coefficient	31,8
Grading modulus	2,15

Atter-berg Limits	
Liquid Limit	50
Plasticity Index	20
Linear Shrinkage	9,7
PI < 0.075	-

Unified Soil Classification	SM
U.S. Highway Classification	A-2-7 (0)

PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
1,7	5,2	32,6	60,5

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PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 66
LAYER : 0.7-1.2
SAMPLE No. : B15168
SAMPLE DESCRIPTION : Silty Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**9,7**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	97
0,425	88
0,250	79
0,150	66
0,075	43
50 µm	6
5 µm	5
2 µm	2,9

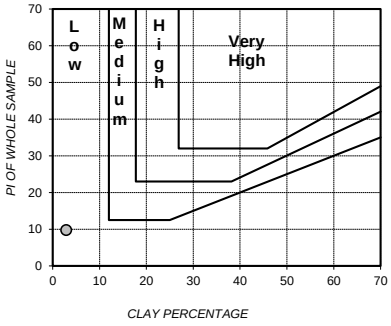
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	9
0.425 - 0.250	9
0.250 - 0.150	14
0.150 - 0.075	23
< 0.075	44

Effective size	0,053
Uniformity Coefficient	2,5
Curvature Coefficient	0,6
Oversize Index	0,0
Shrinkage Product	566,1
Grading Coefficient	2,9
Grading modulus	0,72

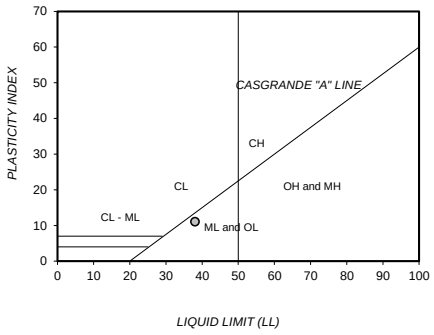
Atter-berg Limits	
Liquid Limit	38
Plasticity Index	11
Linear Shrinkage	6,4
PI < 0.075	-

Unified Soil Classification	SM
U.S. Highway Classification	A-6 (2)

POTENTIAL EXPANSIVENES

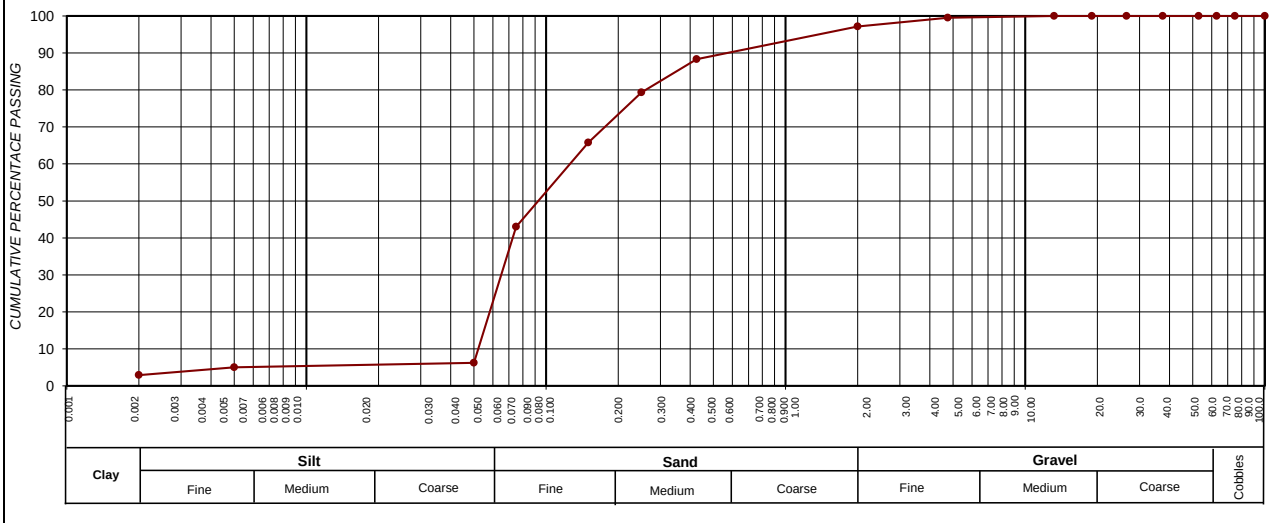


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
2,9	10,8	83,4	2,9

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CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 68
LAYER : 0.7-1.2
SAMPLE No. : B15186
SAMPLE DESCRIPTION : Silty Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**17,0**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	100
2,000	99
0,425	94
0,250	92
0,150	88
0,075	75
50 µm	10
5 µm	8
2 µm	6,0

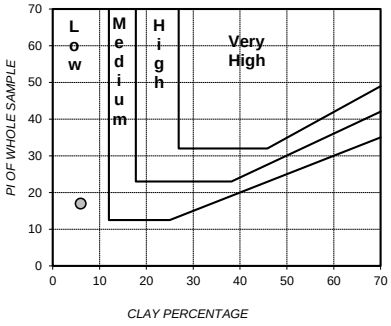
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	5
0.425 - 0.250	2
0.250 - 0.150	5
0.150 - 0.075	12
< 0.075	76

Effective size	0,041
Uniformity Coefficient	1,7
Curvature Coefficient	1,2
Oversize Index	0,0
Shrinkage Product	962,5
Grading Coefficient	1,1
Grading modulus	0,32

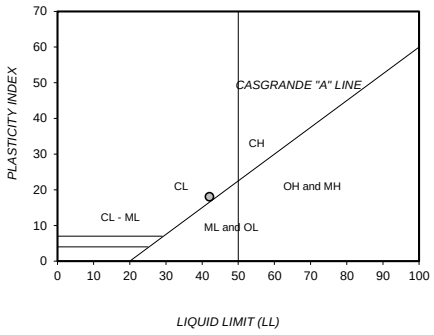
Atter-berg Limits	
Liquid Limit	42
Plasticity Index	18
Linear Shrinkage	10,2
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-7-6 (13)

POTENTIAL EXPANSIVENES

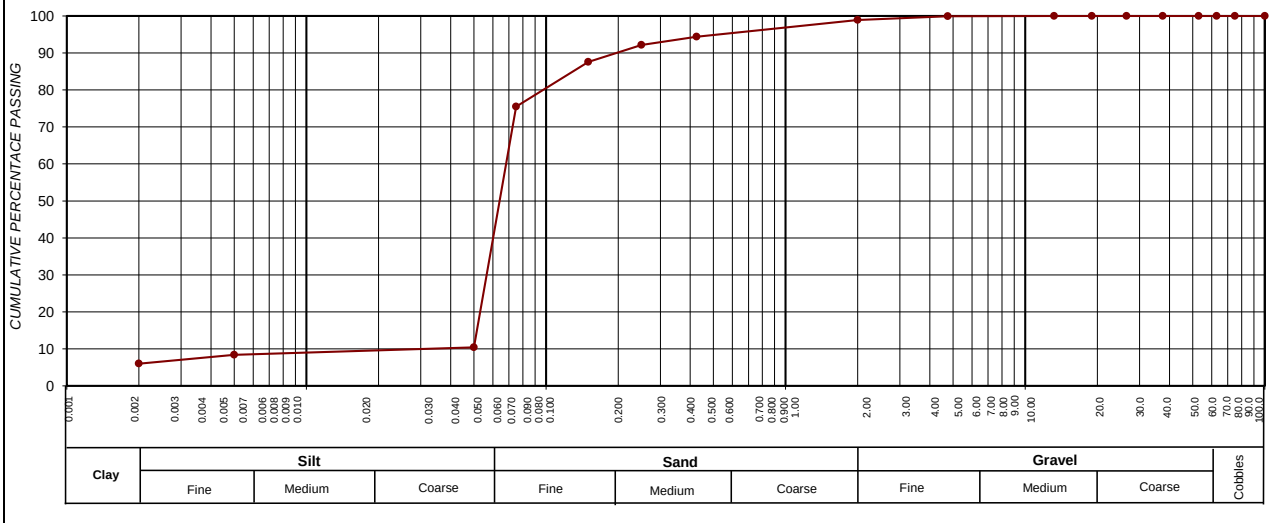


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
6,0	20,1	72,9	1,1

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

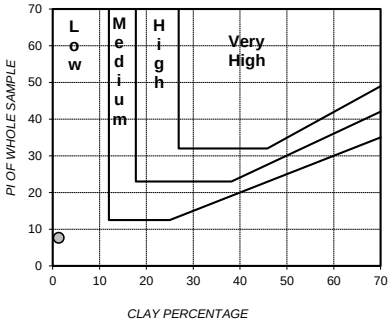
DATE RECEIVED : 11.11.2024
POSITION : TP 71
LAYER : 0.3-1.0
SAMPLE No. : B15229
SAMPLE DESCRIPTION : Gravelly Sand Residual Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

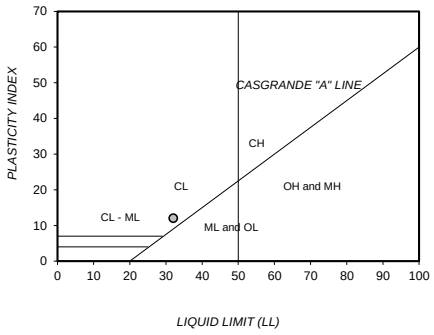
Weighted PI	**7,6**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	98
2,000	89
0,425	64
0,250	57
0,150	47
0,075	35
50 µm	4
5 µm	2
2 µm	1,3

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	29
0.425 - 0.250	8
0.250 - 0.150	10
0.150 - 0.075	14
< 0.075	39

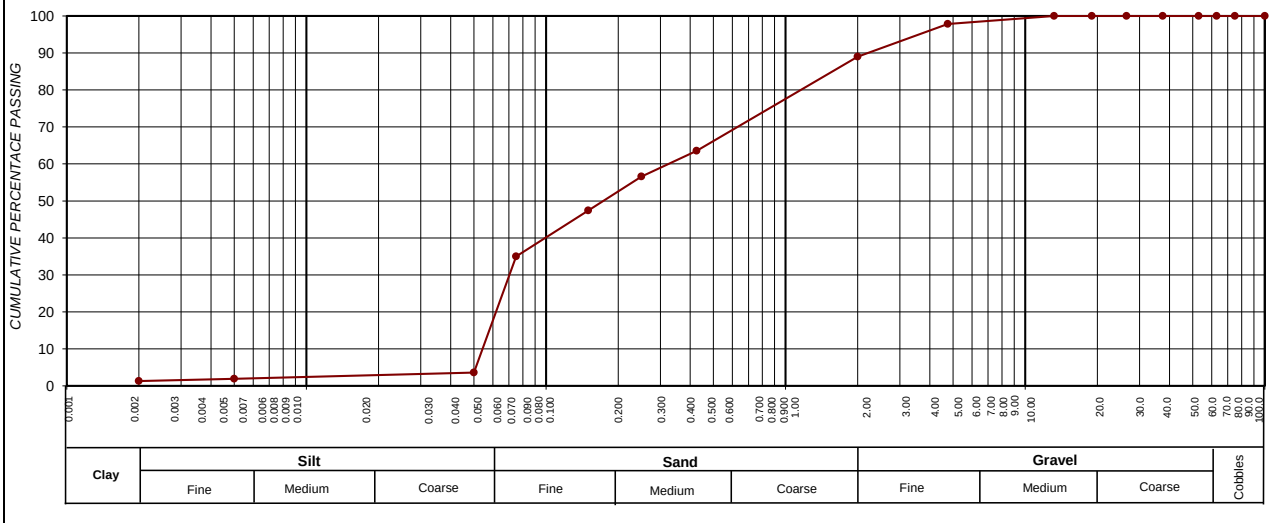
Effective size	0,055
Uniformity Coefficient	6,1
Curvature Coefficient	0,3
Oversize Index	0,0
Shrinkage Product	404,1
Grading Coefficient	10,8
Grading modulus	1,12

Atter-berg Limits	
Liquid Limit	32
Plasticity Index	12
Linear Shrinkage	6,4
PI < 0.075	-

Unified Soil Classification	SC
U.S. Highway Classification	A-2-6 (0)

PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
1,3	9,4	78,3	11,0

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 81
LAYER : 0.0-0.7
SAMPLE No. : B15230
SAMPLE DESCRIPTION : Silty Sand Colluvium

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**16,4**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	97
0,425	91
0,250	89
0,150	80
0,075	65
50 µm	9
5 µm	7
2 µm	3,9

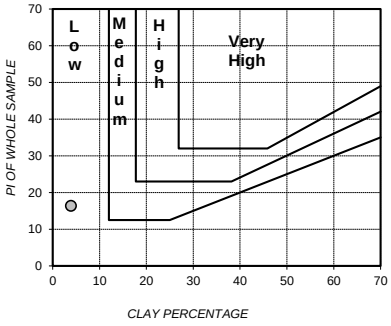
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	6
0.425 - 0.250	2
0.250 - 0.150	9
0.150 - 0.075	16
< 0.075	67

Effective size	0,051
Uniformity Coefficient	1,4
Curvature Coefficient	1,0
Oversize Index	0,0
Shrinkage Product	792,4
Grading Coefficient	3,3
Grading modulus	0,47

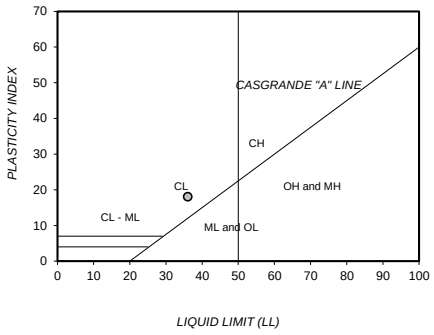
Atter-berg Limits	
Liquid Limit	36
Plasticity Index	18
Linear Shrinkage	8,7
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (9)

POTENTIAL EXPANSIVENES

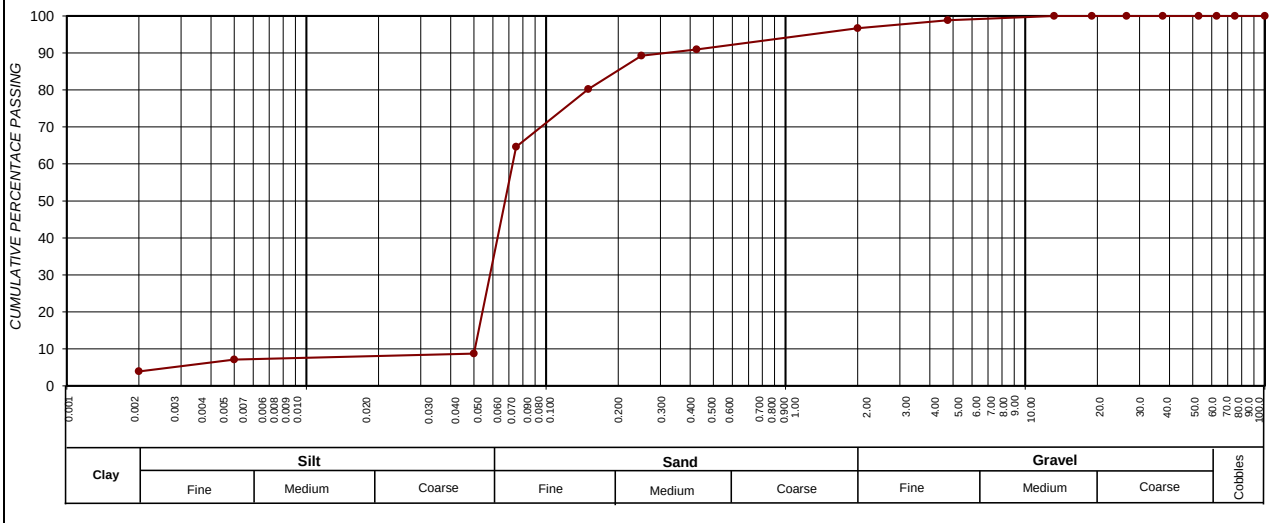


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
3,9	18,0	74,7	3,3

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 81
LAYER : 0.7-0.9
SAMPLE No. : B15365
SAMPLE DESCRIPTION : Silty Sand + Residual Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**5,3**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	99
5,00	97
2,000	94
0,425	88
0,250	85
0,150	75
0,075	49
50 µm	4
5 µm	3
2 µm	0,9

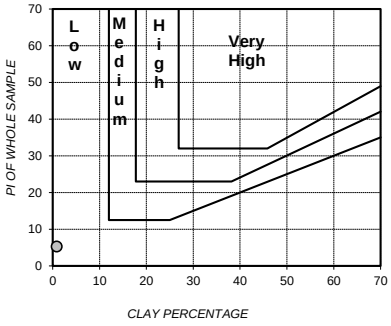
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	7
0.425 - 0.250	3
0.250 - 0.150	11
0.150 - 0.075	27
< 0.075	53

Effective size	0,053
Uniformity Coefficient	2,0
Curvature Coefficient	0,7
Oversize Index	0,0
Shrinkage Product	242,7
Grading Coefficient	6,1
Grading modulus	0,70

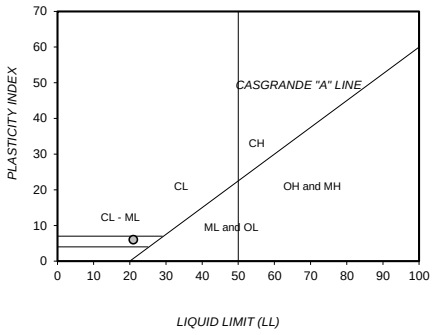
Atter-berg Limits	
Liquid Limit	21
Plasticity Index	6
Linear Shrinkage	2,8
PI < 0.075	-

Unified Soil Classification	SM & SC
U.S. Highway Classification	A-4 (0)

POTENTIAL EXPANSIVENES

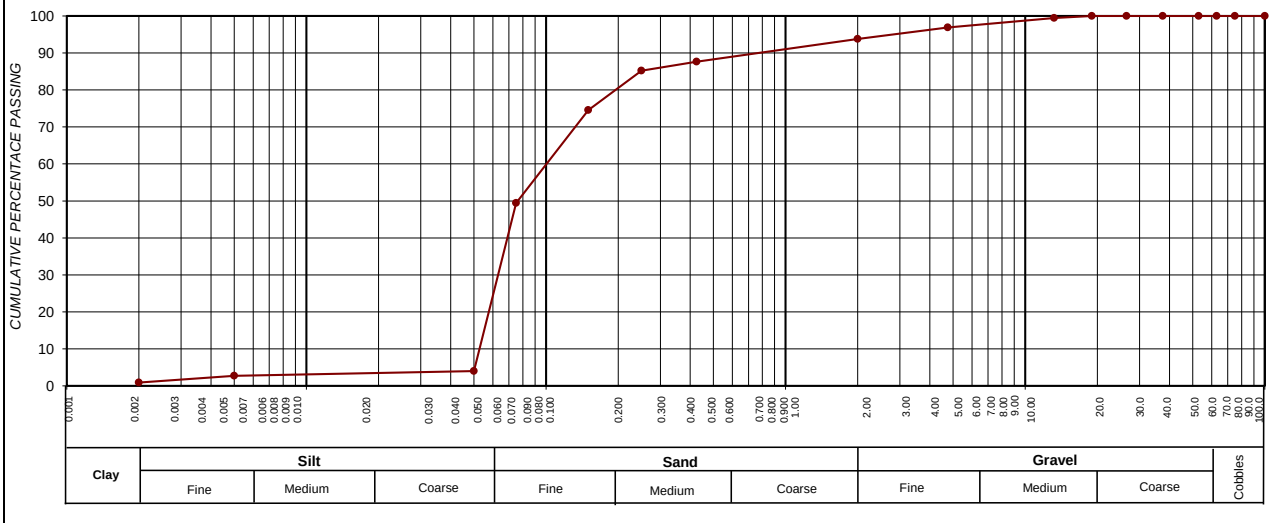


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
0,9	11,9	80,9	6,2

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 92
LAYER : 0.10-0.70
SAMPLE No. : B15385
SAMPLE DESCRIPTION : Silty Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**12,5**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	97
0,425	89
0,250	86
0,150	81
0,075	71
50 µm	6
5 µm	5
2 µm	2,9

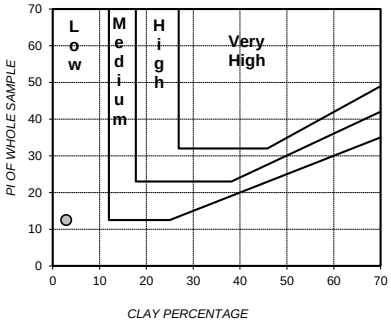
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	8
0.425 - 0.250	4
0.250 - 0.150	5
0.150 - 0.075	10
< 0.075	73

Effective size	0,052
Uniformity Coefficient	1,4
Curvature Coefficient	1,0
Oversize Index	0,0
Shrinkage Product	712,7
Grading Coefficient	3,2
Grading modulus	0,43

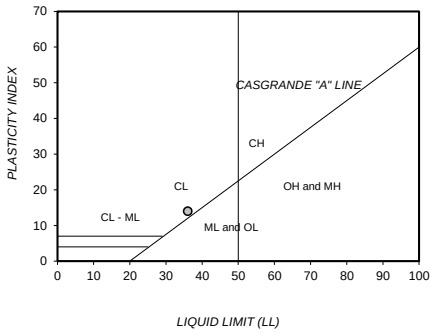
Atter-berg Limits	
Liquid Limit	36
Plasticity Index	14
Linear Shrinkage	8,0
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (9)

POTENTIAL EXPANSIVENES

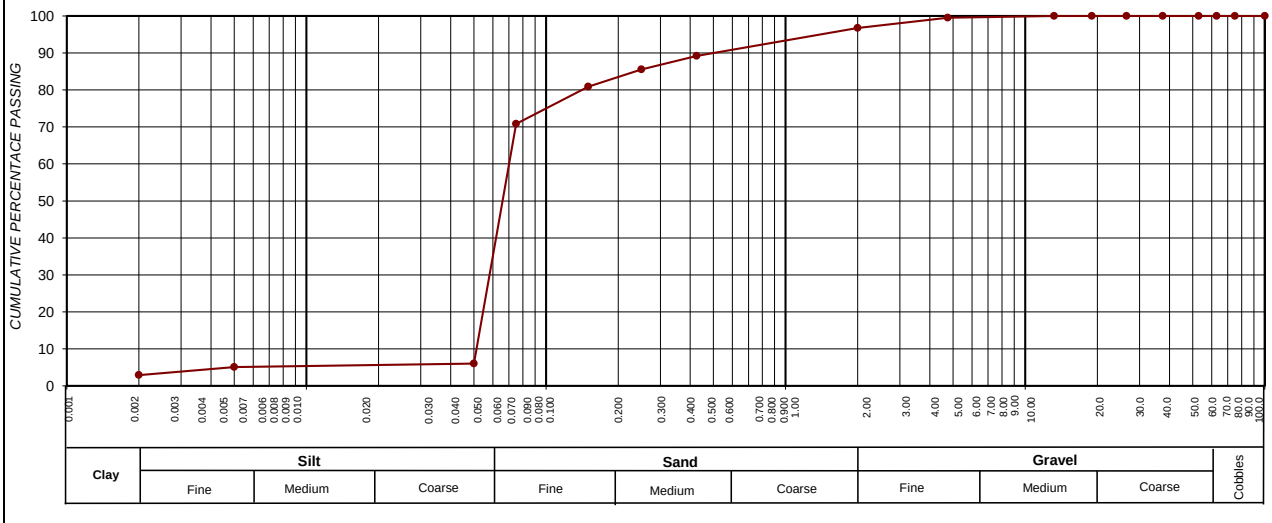


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
2,9	18,3	75,6	3,3

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 103
LAYER : 1.1-1.4
SAMPLE No. : B15143
SAMPLE DESCRIPTION : Reddish Sand Clay Residual Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**10,1**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	98
5,00	94
2,000	89
0,425	72
0,250	66
0,150	55
0,075	45
50 µm	6
5 µm	5
2 µm	2,3

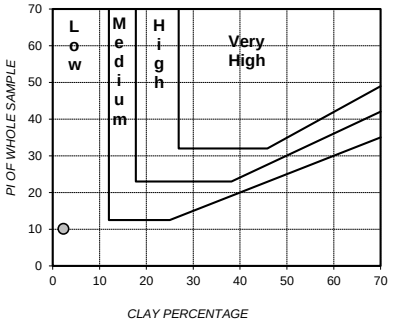
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	19
0.425 - 0.250	6
0.250 - 0.150	12
0.150 - 0.075	11
< 0.075	51

Effective size	0,053
Uniformity Coefficient	3,7
Curvature Coefficient	0,4
Oversize Index	0,0
Shrinkage Product	554,5
Grading Coefficient	10,3
Grading modulus	0,94

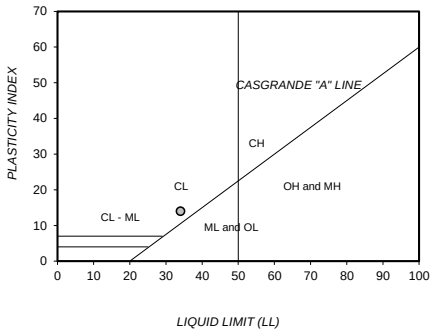
Atter-berg Limits	
Liquid Limit	34
Plasticity Index	14
Linear Shrinkage	7,7
PI < 0.075	-

Unified Soil Classification	SC
U.S. Highway Classification	A-6 (3)

POTENTIAL EXPANSIVENES

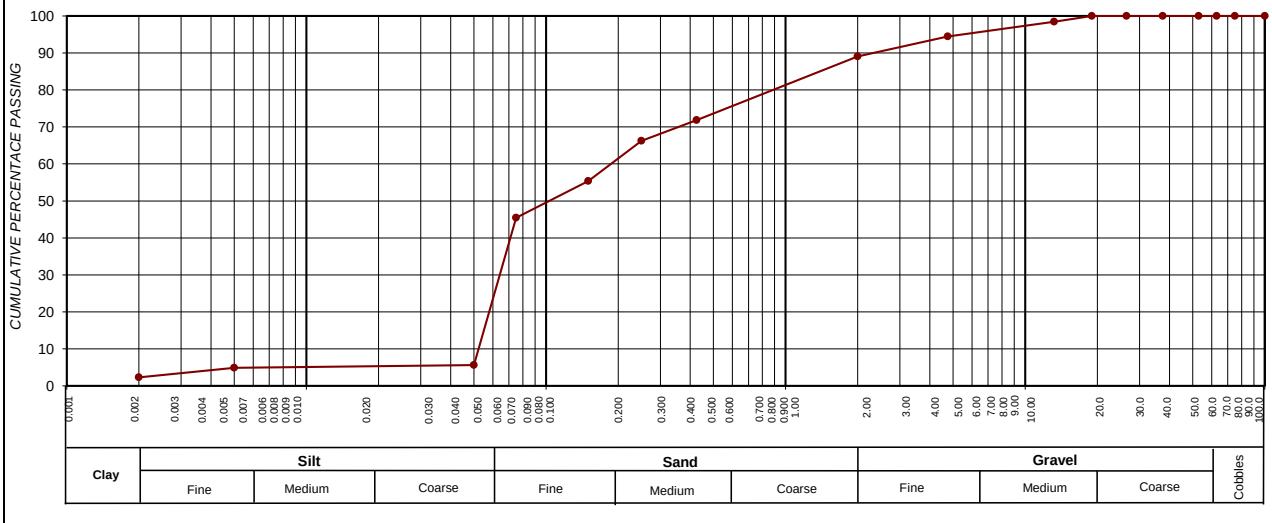


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
2,3	12,3	74,5	10,9

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 105
LAYER : 1.2-1.4
SAMPLE No. : B15144
SAMPLE DESCRIPTION : Reddish Silty Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**18,9**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	97
0,425	90
0,250	87
0,150	81
0,075	72
50 µm	11
5 µm	9
2 µm	6,7

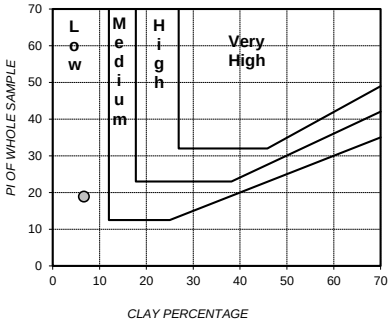
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	7
0.425 - 0.250	3
0.250 - 0.150	6
0.150 - 0.075	9
< 0.075	75

Effective size	0,031
Uniformity Coefficient	2,3
Curvature Coefficient	1,5
Oversize Index	0,0
Shrinkage Product	948,7
Grading Coefficient	3,3
Grading modulus	0,42

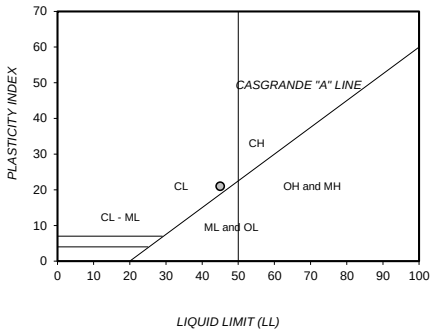
Atter-berg Limits	
Liquid Limit	45
Plasticity Index	21
Linear Shrinkage	10,6
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-7-6 (15)

POTENTIAL EXPANSIVENES

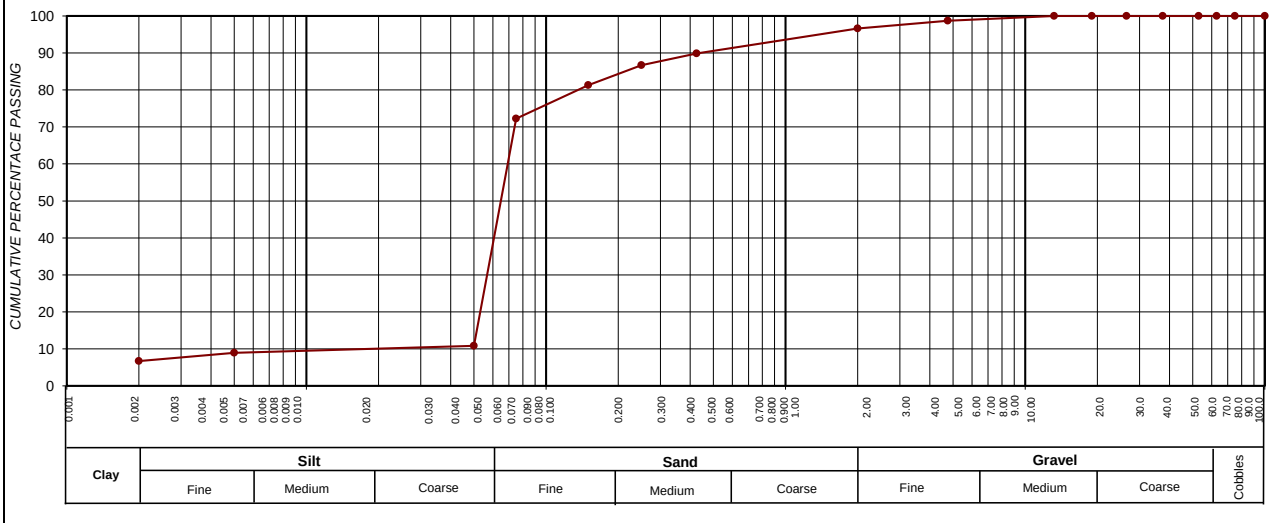


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
6,7	19,4	70,5	3,4

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CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 112
LAYER : 1.4-2.9
SAMPLE No. : B15193
SAMPLE DESCRIPTION : Silty Sand+Residual Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**16,0**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	100
2,000	99
0,425	94
0,250	93
0,150	88
0,075	77
50 µm	9
5 µm	7
2 µm	5,6

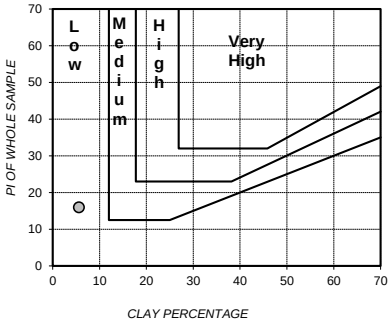
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	5
0.425 - 0.250	1
0.250 - 0.150	4
0.150 - 0.075	11
< 0.075	78

Effective size	0,050
Uniformity Coefficient	1,4
Curvature Coefficient	1,0
Oversize Index	0,0
Shrinkage Product	867,4
Grading Coefficient	1,1
Grading modulus	0,30

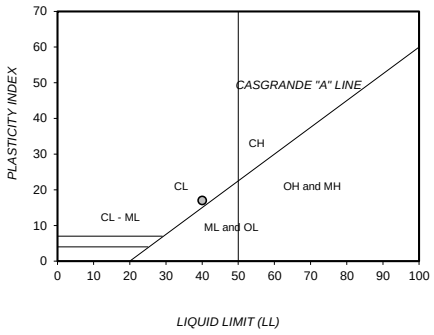
Atter-berg Limits	
Liquid Limit	40
Plasticity Index	17
Linear Shrinkage	9,2
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (13)

POTENTIAL EXPANSIVENES

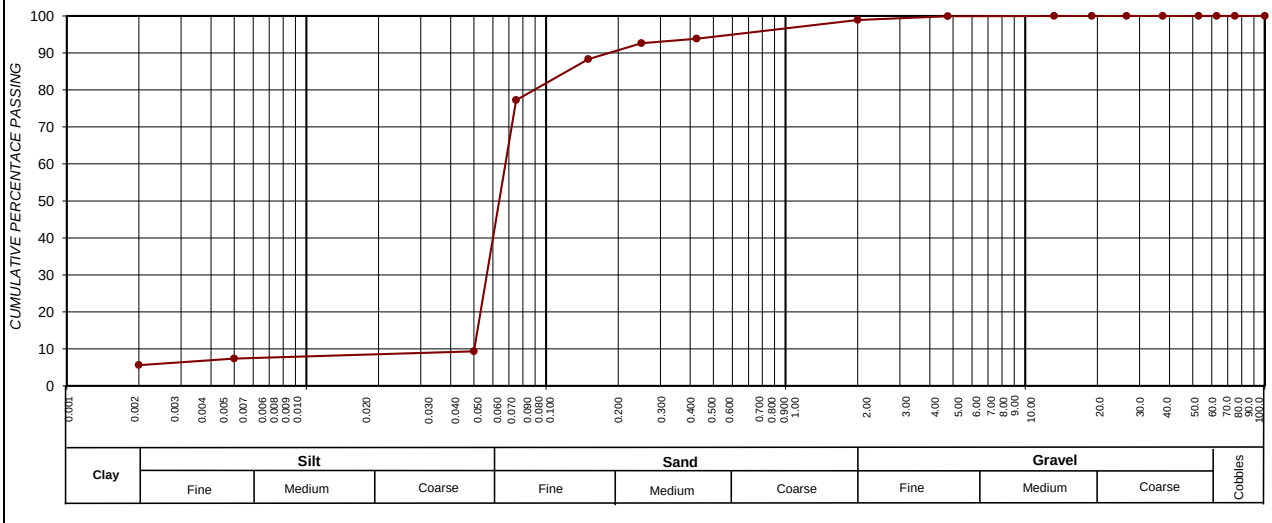


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
5,6	20,2	73,1	1,1

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP114
LAYER : 0.8-1.6
SAMPLE No. : B15182
SAMPLE DESCRIPTION : Silty Sand Colluvium

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**8,6**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	98
2,000	94
0,425	79
0,250	73
0,150	70
0,075	61
50 µm	2
5 µm	2
2 µm	0,8

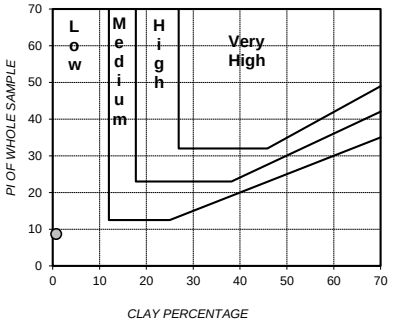
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	17
0.425 - 0.250	5
0.250 - 0.150	4
0.150 - 0.075	9
< 0.075	65

Effective size	0,053
Uniformity Coefficient	1,4
Curvature Coefficient	1,0
Oversize Index	0,0
Shrinkage Product	462,6
Grading Coefficient	5,7
Grading modulus	0,66

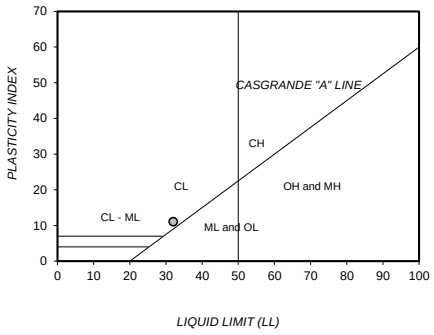
Atter-berg Limits	
Liquid Limit	32
Plasticity Index	11
Linear Shrinkage	5,9
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (5)

POTENTIAL EXPANSIVENES

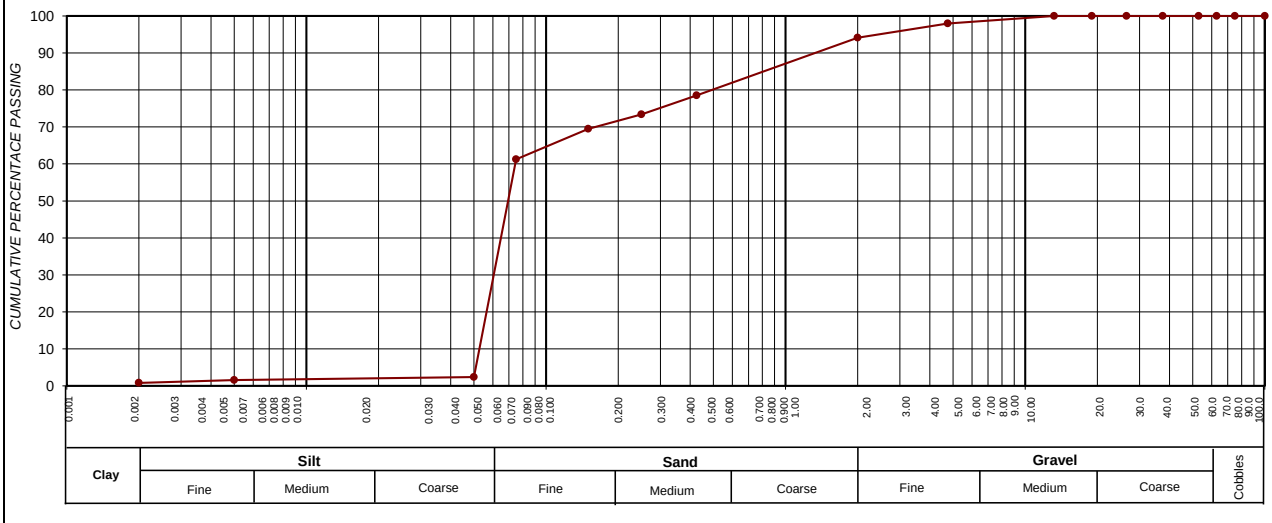


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
0,8	15,3	78,0	5,9

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 115
LAYER : 1.0-2.80
SAMPLE No. : B15442
SAMPLE DESCRIPTION : Gravelly Silty Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**4,5**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	97
2,000	90
0,425	76
0,250	71
0,150	61
0,075	47
50 µm	2
5 µm	1
2 µm	0,8

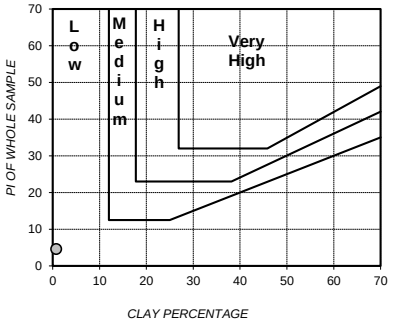
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	15
0.425 - 0.250	6
0.250 - 0.150	11
0.150 - 0.075	15
< 0.075	52

Effective size	0,055
Uniformity Coefficient	2,7
Curvature Coefficient	0,5
Oversize Index	0,0
Shrinkage Product	265,4
Grading Coefficient	10,0
Grading modulus	0,87

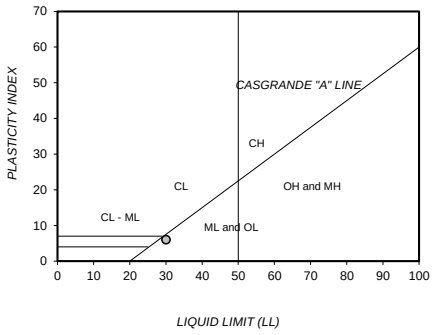
Atter-berg Limits	
Liquid Limit	30
Plasticity Index	6
Linear Shrinkage	3,5
PI < 0.075	-

Unified Soil Classification	SM
U.S. Highway Classification	A-4 (1)

POTENTIAL EXPANSIVENES

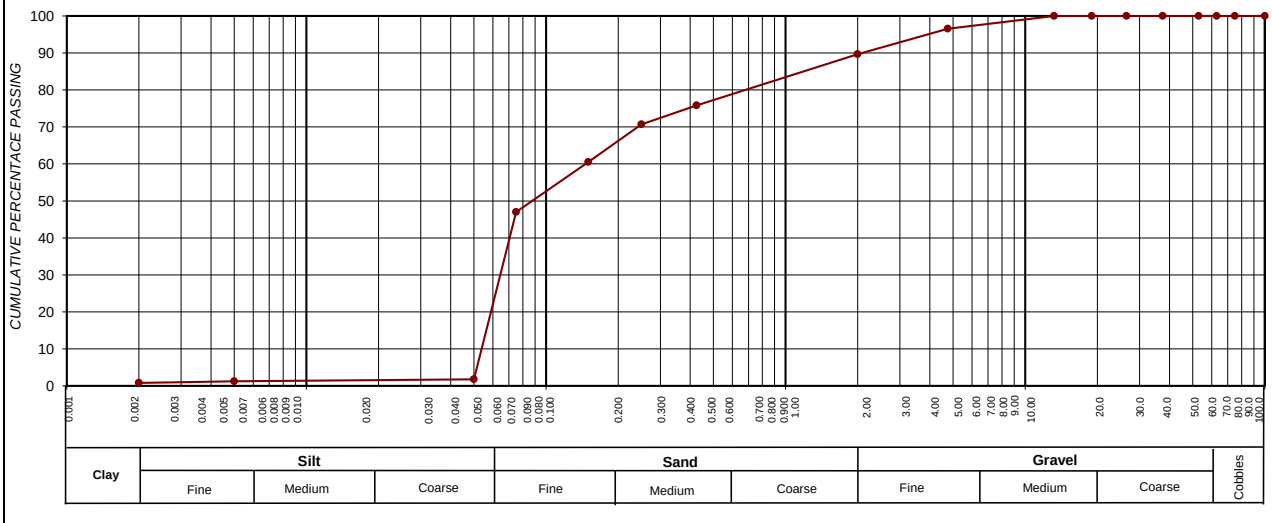


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
0,8	10,7	78,2	10,3

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CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 118
LAYER : 2.6-3.2
SAMPLE No. : B15194
SAMPLE DESCRIPTION : Silty Sand Restored Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**16.7**	**Specifc Gravity**	**2.35**

Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	98
5.00	97
2.000	94
0.425	88
0.250	85
0.150	75
0.075	59
50 µm	9
5 µm	8
2 µm	5.6

Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	7
0.425 - 0.250	3
0.250 - 0.150	10
0.150 - 0.075	17
< 0.075	62

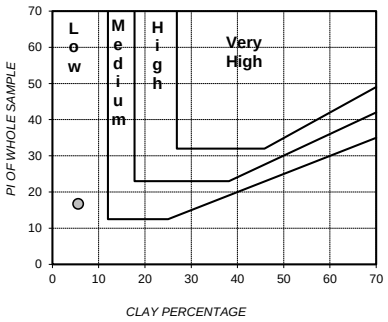
Effective size	0.050
Uniformity Coefficient	1.6
Curvature Coefficient	0.9
Oversize Index	0.0
Shrinkage Product	888.5
Grading Coefficient	5.4
Grading modulus	0.59

Atter-berg Limits

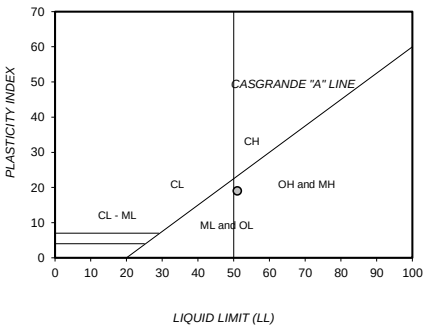
Liquid Limit	51
Plasticity Index	19
Linear Shrinkage	10.1
PI < 0.075	-

Unified Soil Classification	MH
U.S. Highway Classification	A-7-5 (10)

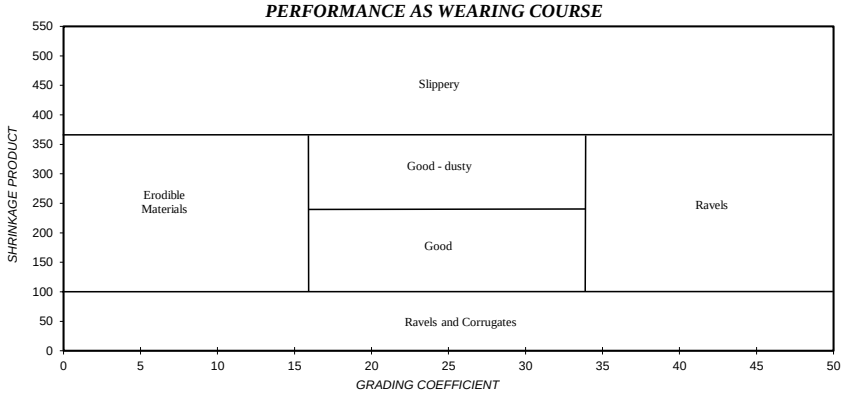
POTENTIAL EXPANSIVENES



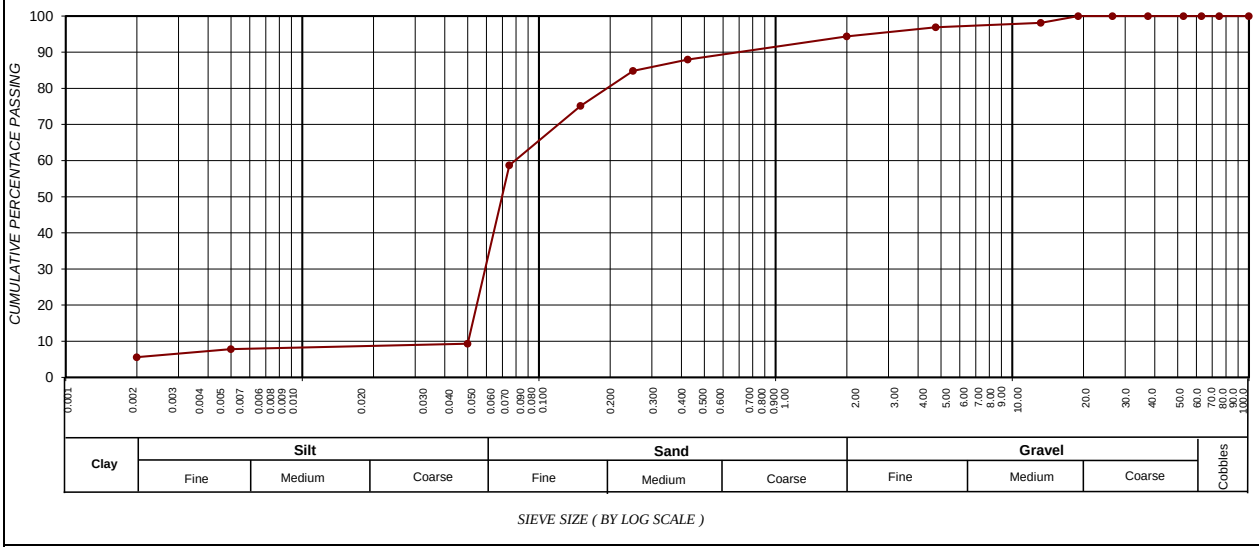
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
5.6	15.4	73.4	5.6

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

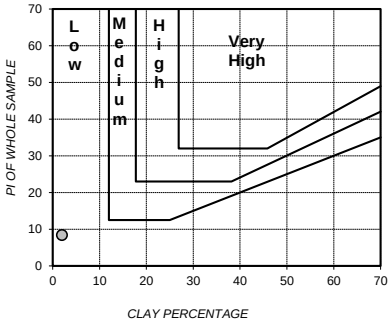
DATE RECEIVED : 11.11.2024
POSITION : TP 118
LAYER : 2.6-3.2
SAMPLE No. : B15195
SAMPLE DESCRIPTION : Silty Sand +Residual Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

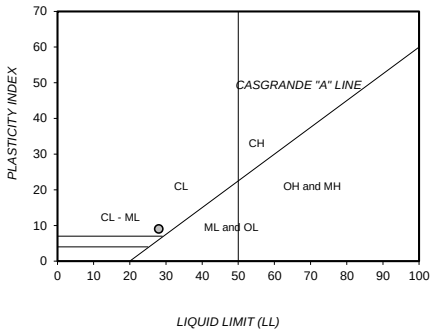
Weighted PI	**8,4**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	100
2,000	100
0,425	93
0,250	89
0,150	81
0,075	65
50 µm	6
5 µm	4
2 µm	2,0

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	6
0.425 - 0.250	4
0.250 - 0.150	8
0.150 - 0.075	16
< 0.075	65

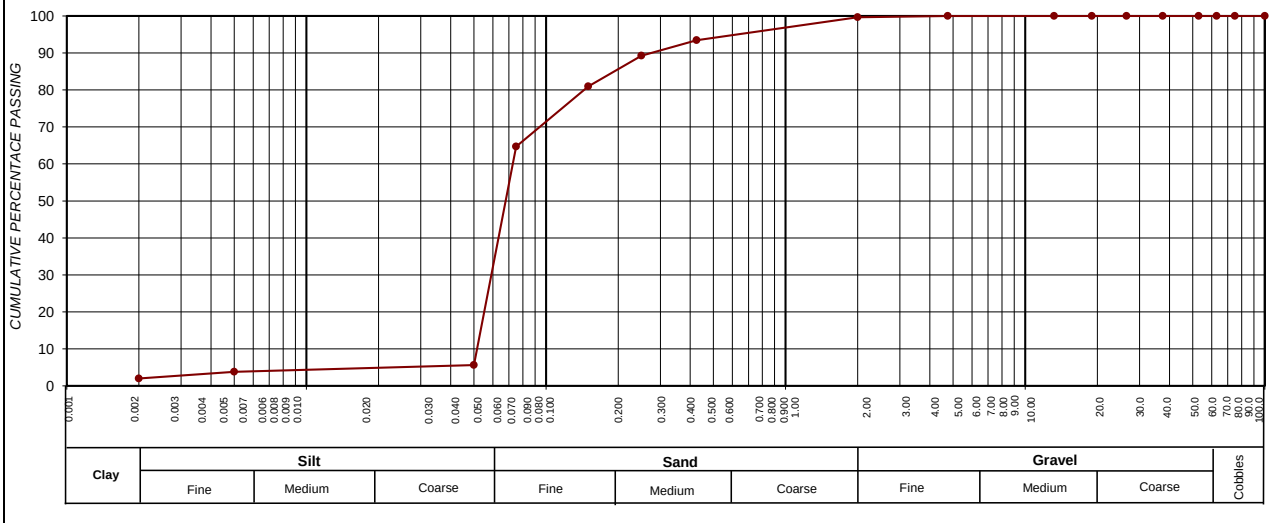
Effective size	0,052
Uniformity Coefficient	1,4
Curvature Coefficient	1,0
Oversize Index	0,0
Shrinkage Product	443,9
Grading Coefficient	0,4
Grading modulus	0,42

Atter-berg Limits	
Liquid Limit	28
Plasticity Index	9
Linear Shrinkage	4,8
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-4 (4)

PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
2,0	17,1	80,5	0,4

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

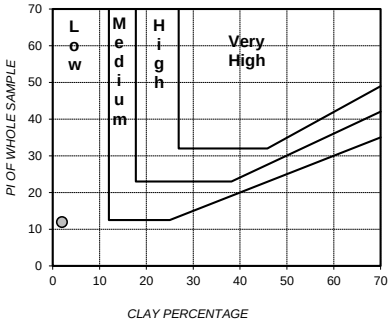
DATE RECEIVED : 11.11.2024
POSITION : TP 126
LAYER : 0.2-2.5
SAMPLE No. : B15146
SAMPLE DESCRIPTION : Silty Sand ,Colluvium

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

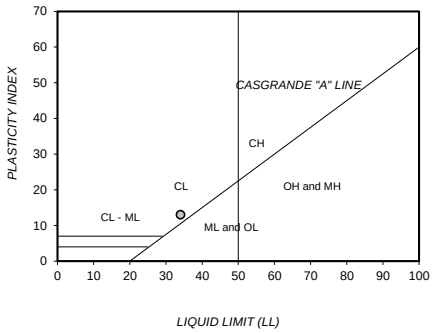
Weighted PI	**12,0**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	98
0,425	92
0,250	89
0,150	83
0,075	70
50 µm	7
5 µm	6
2 µm	2,0

POTENTIAL EXPANSIVENES



PLASTICITY CHART



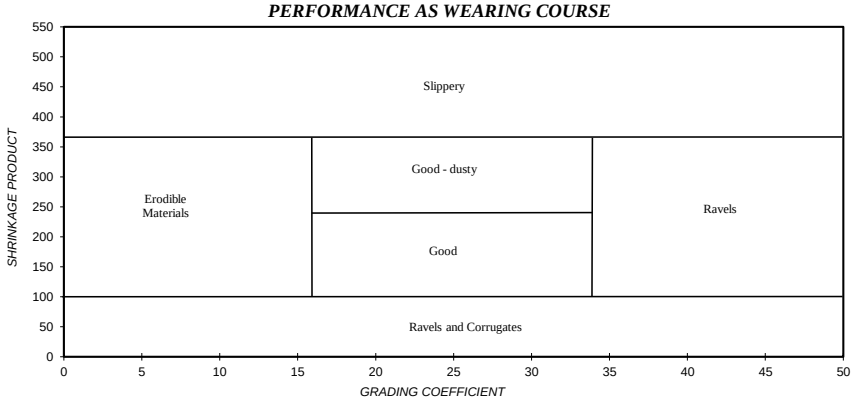
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	6
0.425 - 0.250	3
0.250 - 0.150	6
0.150 - 0.075	14
< 0.075	71

Effective size	0,051
Uniformity Coefficient	1,4
Curvature Coefficient	1,0
Oversize Index	0,0
Shrinkage Product	558,0
Grading Coefficient	1,9
Grading modulus	0,40

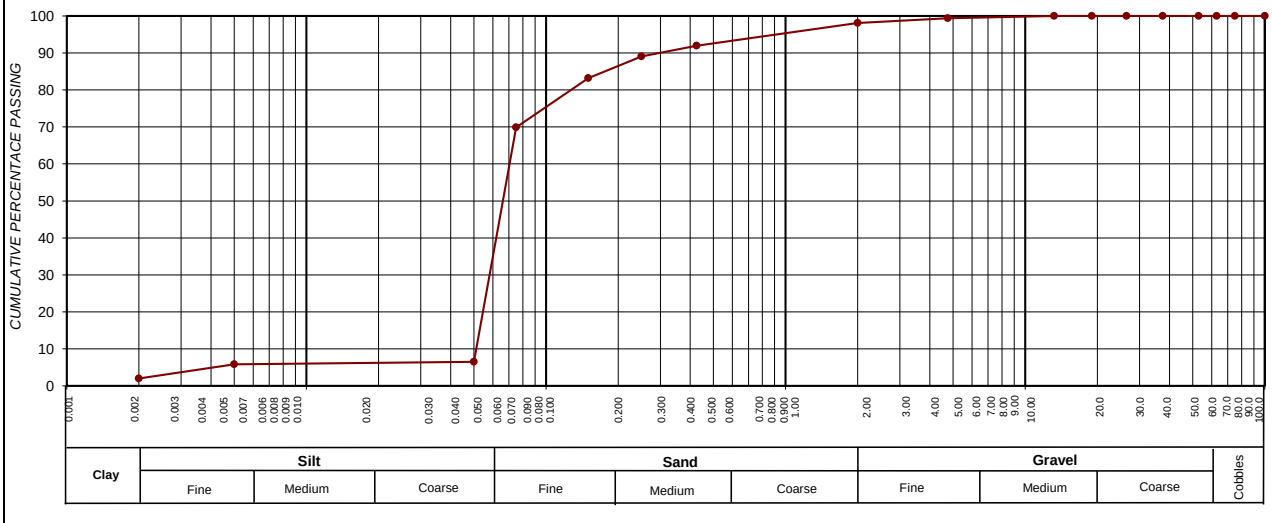
Atter-berg Limits	
Liquid Limit	34
Plasticity Index	13
Linear Shrinkage	6,1
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (8)

PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
2,0	19,3	76,8	1,9

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 128
LAYER : 0.3-0.6
SAMPLE No. : B15196
SAMPLE DESCRIPTION : Silty Sand Colluvium

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**15,1**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	100
2,000	99
0,425	94
0,250	91
0,150	86
0,075	75
50 µm	7
5 µm	6
2 µm	3,6

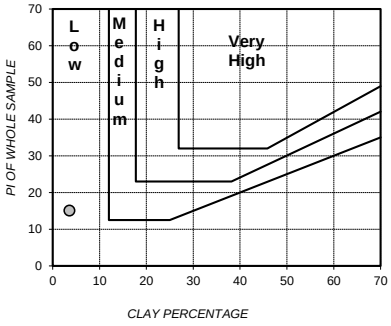
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	5
0.425 - 0.250	3
0.250 - 0.150	5
0.150 - 0.075	11
< 0.075	76

Effective size	0,051
Uniformity Coefficient	1,4
Curvature Coefficient	1,0
Oversize Index	0,0
Shrinkage Product	752,4
Grading Coefficient	1,3
Grading modulus	0,32

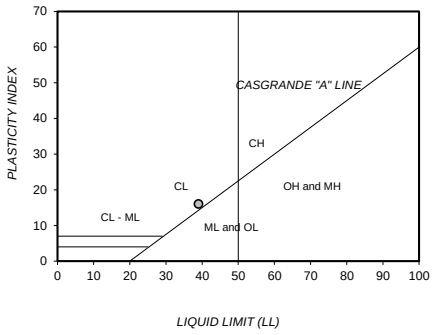
Atter-berg Limits	
Liquid Limit	39
Plasticity Index	16
Linear Shrinkage	8,0
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (11)

POTENTIAL EXPANSIVENES

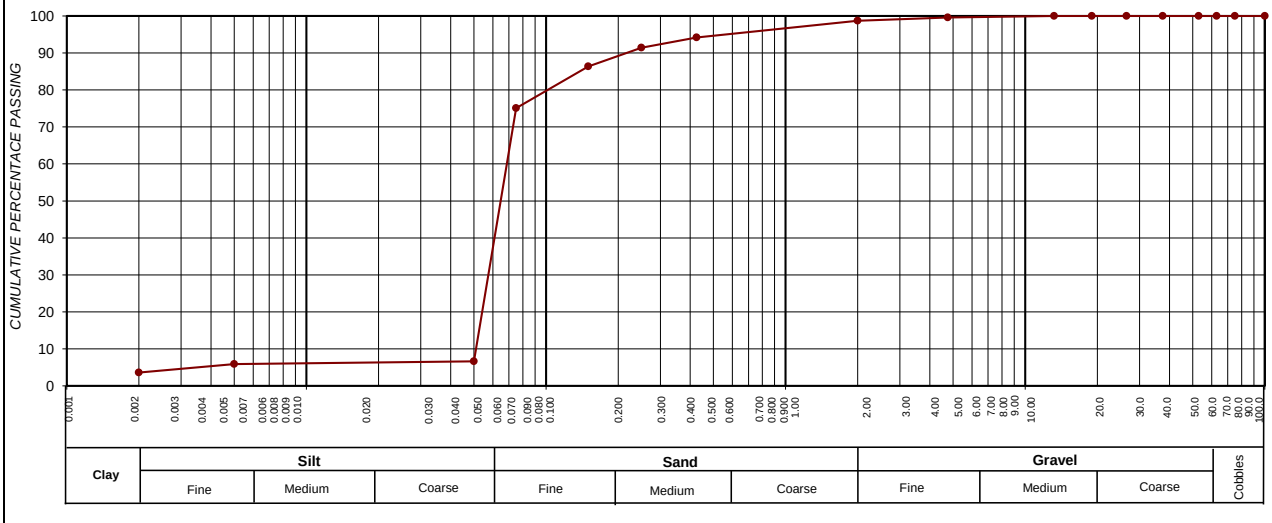


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
3,6	19,2	75,9	1,3

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CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 130
LAYER : 0,9-1,1
SAMPLE No. : B15225
SAMPLE DESCRIPTION : Gravelly Sand

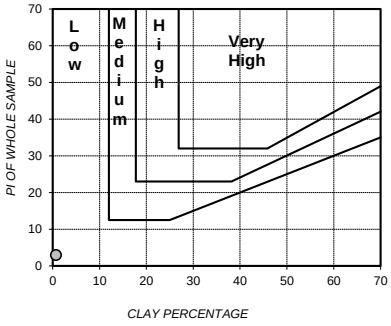
FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**3,0**	**Specifc Gravity**	**2,35**

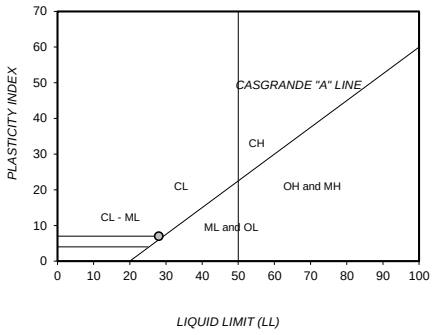
Sieve analysis Cumulative percentage passing (mm)

100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	98
5,00	89
2,000	66
0,425	42
0,250	35
0,150	26
0,075	16
50 µm	4
5 µm	3
2 µm	0,7

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2,00mm

2.000 - 0.425	35
0.425 - 0.250	11
0.250 - 0.150	15
0.150 - 0.075	15
< 0.075	24

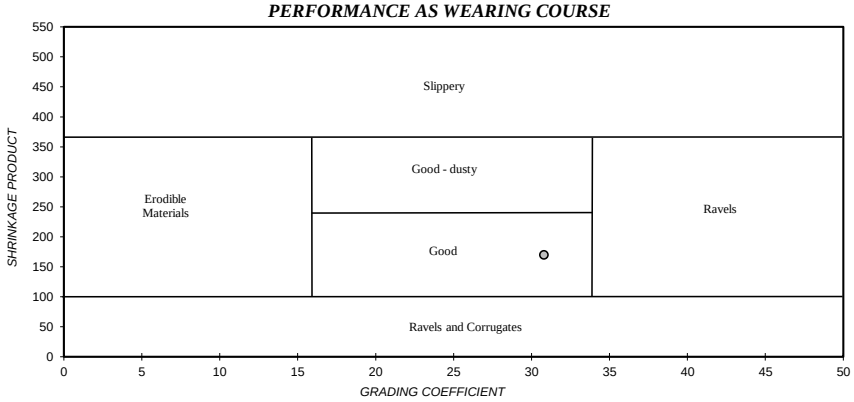
Effective size	0,063
Uniformity Coefficient	25,8
Curvature Coefficient	0,4
Oversize Index	0,0
Shrinkage Product	169,8
Grading Coefficient	30,8
Grading modulus	1,76

Atter-berg Limits

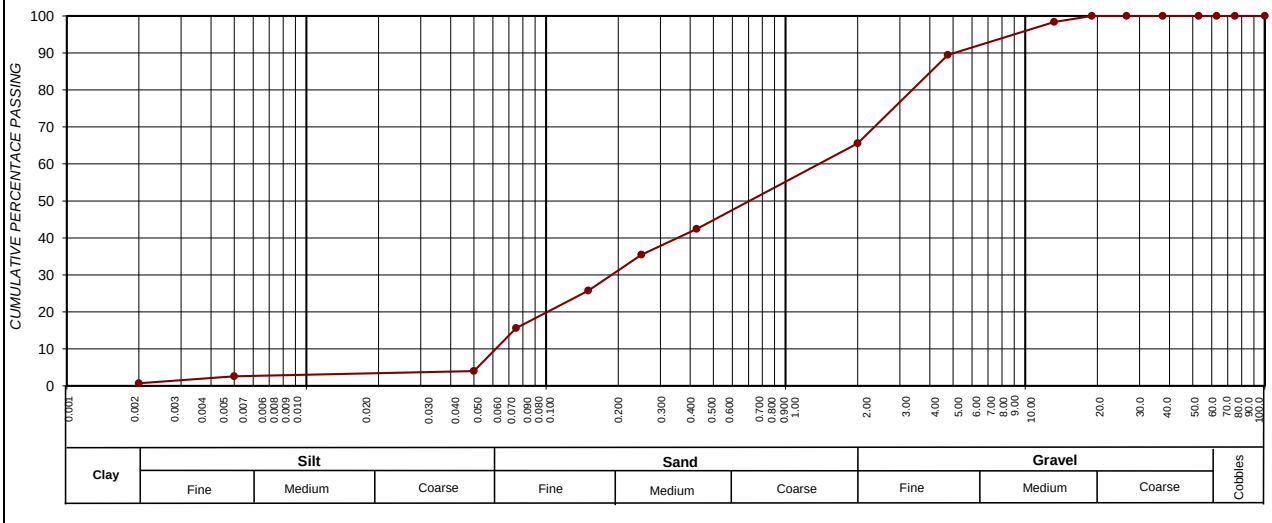
Liquid Limit	28
Plasticity Index	7
Linear Shrinkage	4,0
PI < 0.075	-

Unified Soil Classification	SM & SC
U.S. Highway Classification	A-2-4 (0)

PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
0,7	5,9	58,9	34,4

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 138
LAYER : 1.6-3.0
SAMPLE No. : B15197
SAMPLE DESCRIPTION : Gravelly Silty Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**9,6**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	96
2,000	90
0,425	74
0,250	72
0,150	67
0,075	58
50 µm	4
5 µm	3
2 µm	1,3

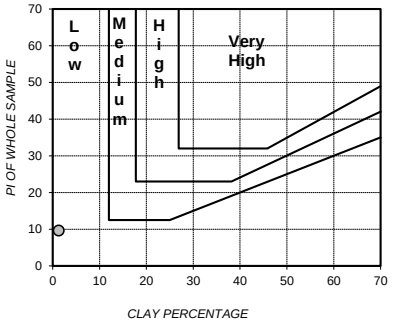
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	18
0.425 - 0.250	2
0.250 - 0.150	5
0.150 - 0.075	10
< 0.075	64

Effective size	0,053
Uniformity Coefficient	1,7
Curvature Coefficient	0,8
Oversize Index	0,0
Shrinkage Product	506,1
Grading Coefficient	9,5
Grading modulus	0,78

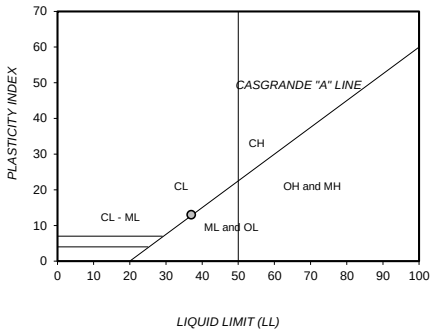
Atter-berg Limits	
Liquid Limit	37
Plasticity Index	13
Linear Shrinkage	6,9
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (6)

POTENTIAL EXPANSIVENES

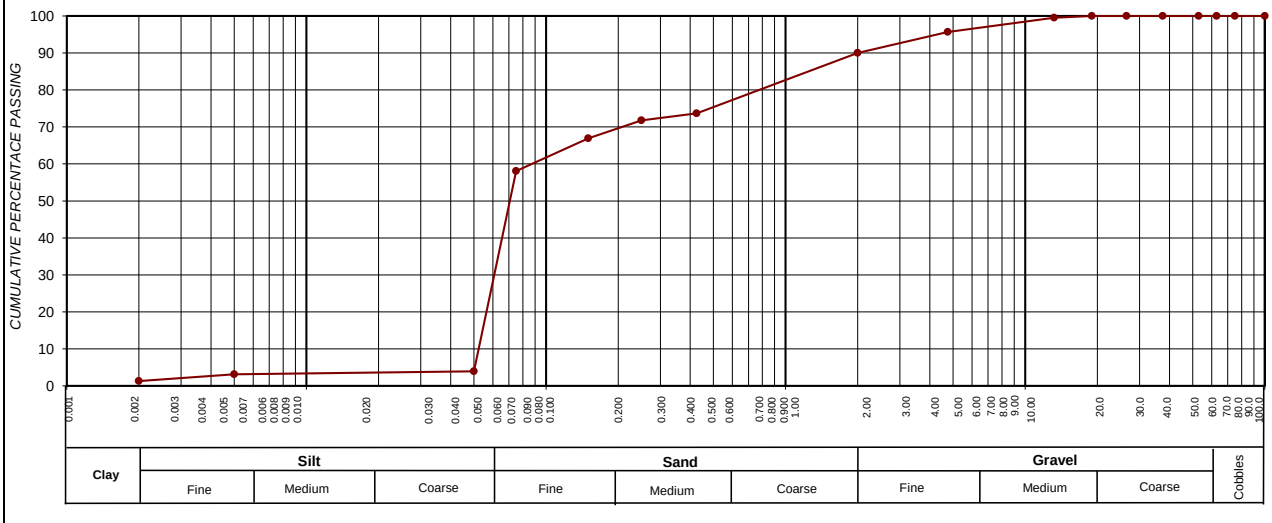


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
1,3	15,3	73,4	10,0

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

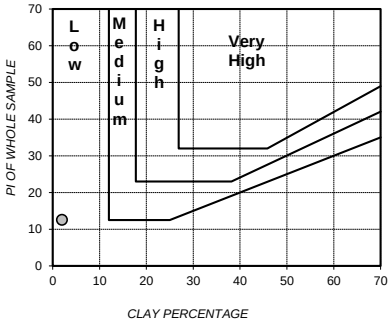
DATE RECEIVED : 11.11.2024
POSITION : TP 138
LAYER : 1.6-3.00
SAMPLE No. : B15441
SAMPLE DESCRIPTION : Silty Sand Fill

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

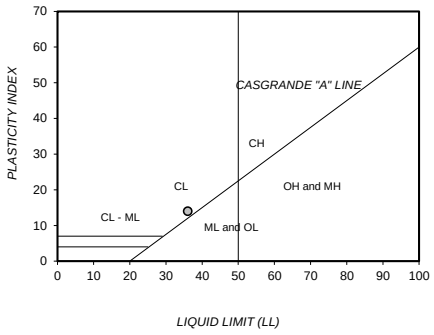
Weighted PI	**12,5**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	95
0,425	89
0,250	88
0,150	80
0,075	68
50 µm	7
5 µm	6
2 µm	2,0

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	6
0.425 - 0.250	2
0.250 - 0.150	8
0.150 - 0.075	12
< 0.075	72

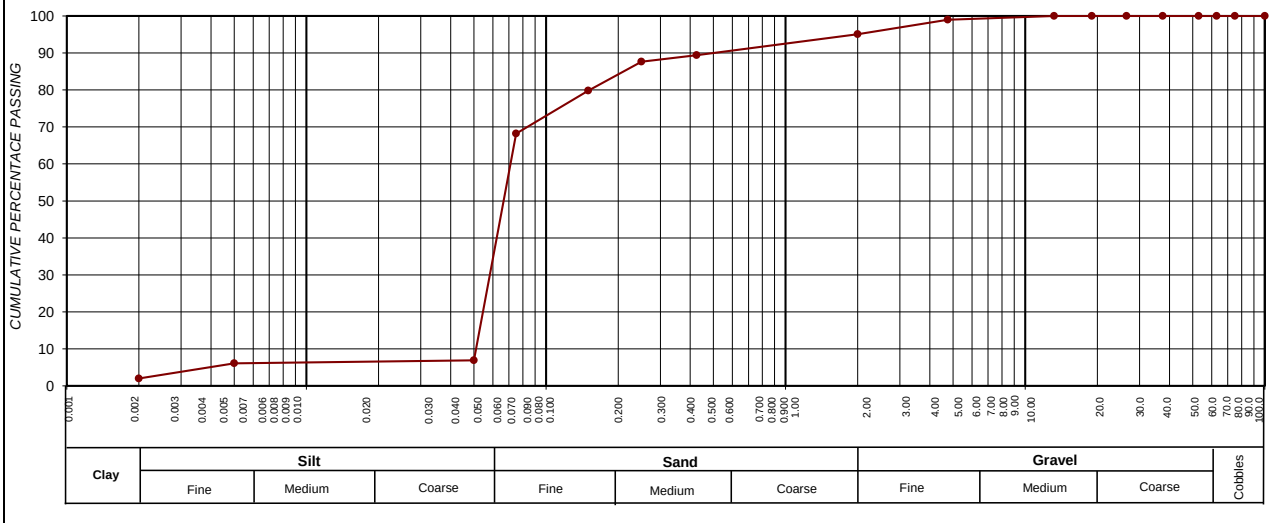
Effective size	0,051
Uniformity Coefficient	1,4
Curvature Coefficient	1,0
Oversize Index	0,0
Shrinkage Product	701,8
Grading Coefficient	4,9
Grading modulus	0,48

Atter-berg Limits	
Liquid Limit	36
Plasticity Index	14
Linear Shrinkage	7,9
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (8)

PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
2,0	19,1	74,0	4,9

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CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 154
LAYER : 0.6-1.7
SAMPLE No. : B15200
SAMPLE DESCRIPTION : Silty Sand+ Colluvium

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**3,0**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	100
2,000	100
0,425	98
0,250	95
0,150	85
0,075	61
50 µm	4
5 µm	3
2 µm	2,1

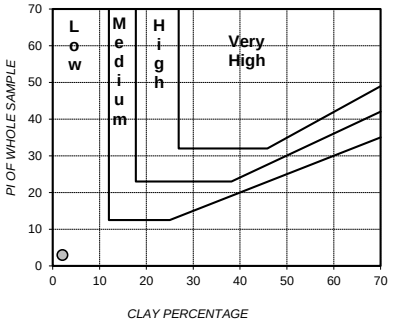
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	1
0.425 - 0.250	3
0.250 - 0.150	10
0.150 - 0.075	24
< 0.075	61

Effective size	0,053
Uniformity Coefficient	1,4
Curvature Coefficient	1,0
Oversize Index	0,0
Shrinkage Product	176,2
Grading Coefficient	0,4
Grading modulus	0,41

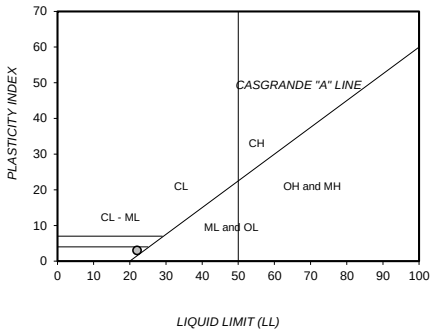
Atter-berg Limits	
Liquid Limit	22
Plasticity Index	3
Linear Shrinkage	1,8
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-4 (0)

POTENTIAL EXPANSIVENES

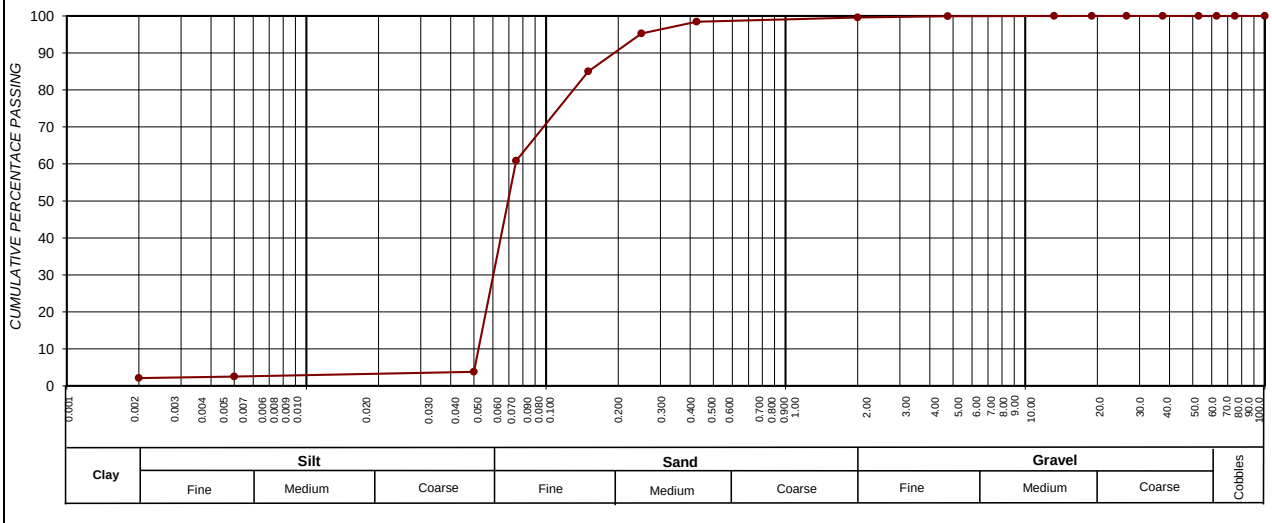


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
2,1	13,8	83,6	0,4

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CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 158
LAYER : 1,1-3,0
SAMPLE No. : B15160
SAMPLE DESCRIPTION : Dark Olive Silty Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**21,9**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	95
0,425	91
0,250	88
0,150	81
0,075	66
50 µm	12
5 µm	10
2 µm	6,4

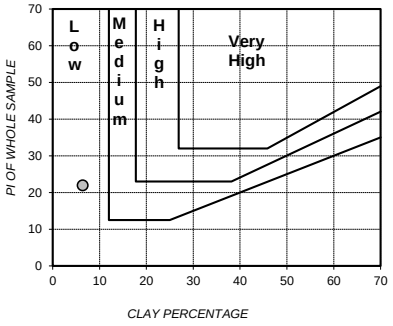
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	4
0.425 - 0.250	3
0.250 - 0.150	8
0.150 - 0.075	16
< 0.075	69

Effective size	0,013
Uniformity Coefficient	5,6
Curvature Coefficient	3,6
Oversize Index	0,0
Shrinkage Product	1049,6
Grading Coefficient	5,2
Grading modulus	0,48

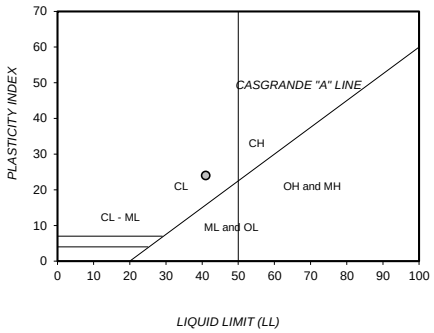
Atter-berg Limits	
Liquid Limit	41
Plasticity Index	24
Linear Shrinkage	11,5
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-7-6 (13)

POTENTIAL EXPANSIVENES

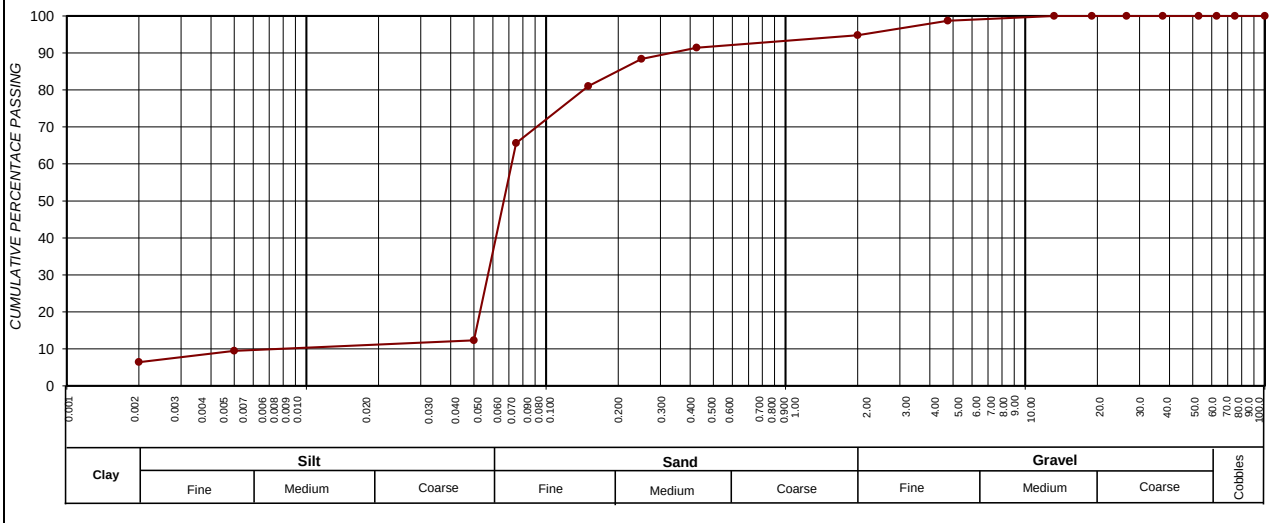


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
6,4	19,2	69,2	5,2

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PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 160
LAYER : 0.7-1.3
SAMPLE No. : B15250
SAMPLE DESCRIPTION : Silty Sand Residual Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**7,8**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	100
2,000	97
0,425	86
0,250	84
0,150	79
0,075	67
50 µm	3
5 µm	2
2 µm	0,6

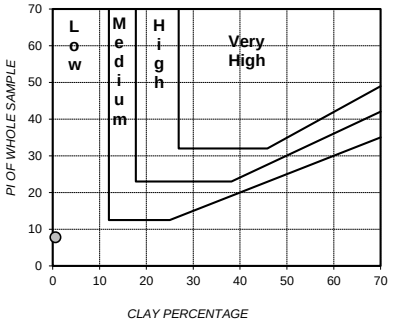
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	11
0.425 - 0.250	2
0.250 - 0.150	5
0.150 - 0.075	13
< 0.075	69

Effective size	0,053
Uniformity Coefficient	1,4
Curvature Coefficient	1,0
Oversize Index	0,0
Shrinkage Product	432,4
Grading Coefficient	3,3
Grading modulus	0,50

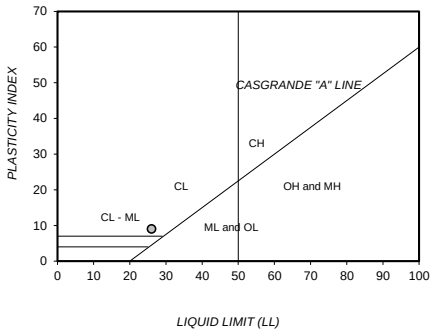
Atter-berg Limits	
Liquid Limit	26
Plasticity Index	9
Linear Shrinkage	5,0
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-4 (4)

POTENTIAL EXPANSIVENES

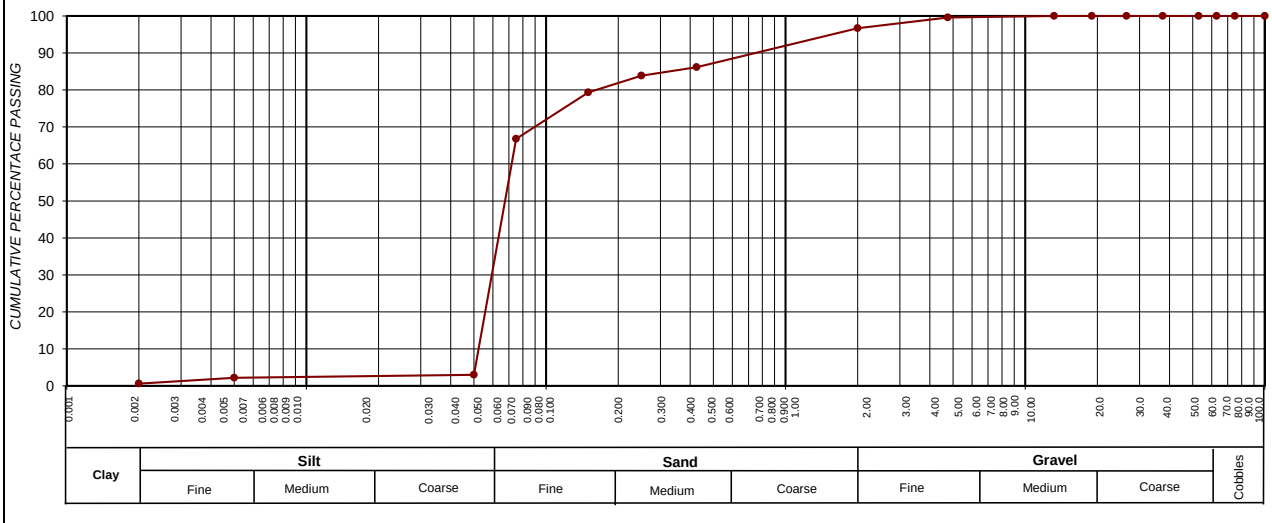


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
0,6	16,9	79,2	3,3

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CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 166
LAYER : 0,9-2,6
SAMPLE No. : B15251
SAMPLE DESCRIPTION : Silty Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**9,1**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	95
5,00	94
2,000	92
0,425	83
0,250	74
0,150	63
0,075	46
50 µm	6
5 µm	5
2 µm	1,4

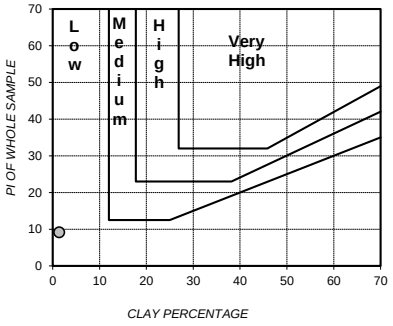
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	10
0.425 - 0.250	9
0.250 - 0.150	12
0.150 - 0.075	19
< 0.075	50

Effective size	0,053
Uniformity Coefficient	2,6
Curvature Coefficient	0,6
Oversize Index	0,0
Shrinkage Product	448,6
Grading Coefficient	7,5
Grading modulus	0,79

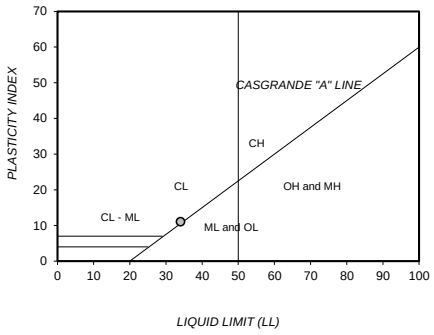
Atter-berg Limits	
Liquid Limit	34
Plasticity Index	11
Linear Shrinkage	5,4
PI < 0.075	-

Unified Soil Classification	SC
U.S. Highway Classification	A-6 (2)

POTENTIAL EXPANSIVENES

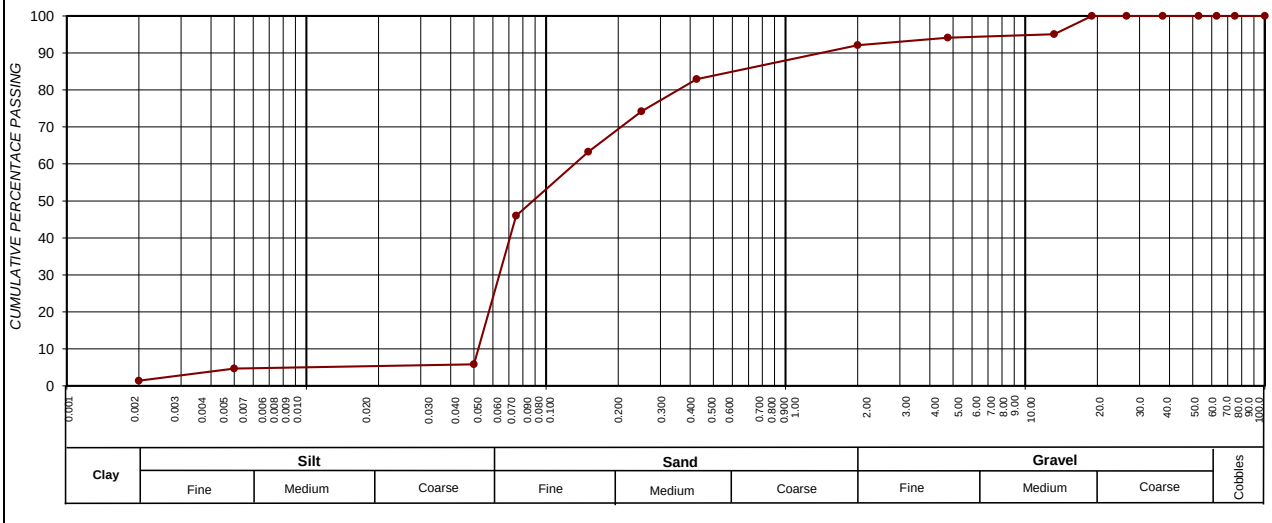


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
1,4	13,2	77,4	7,9

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CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

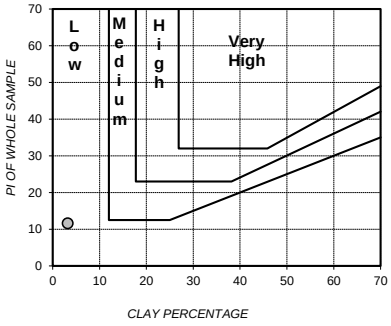
DATE RECEIVED : 11.11.2024
POSITION : TP 172
LAYER : 0,5
SAMPLE No. : B15201
SAMPLE DESCRIPTION : Silty Sand Colluvium

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

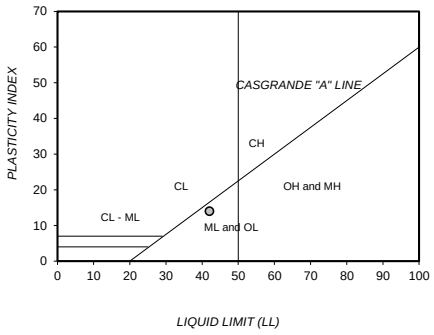
Weighted PI	**11,6**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	100
2,000	98
0,425	83
0,250	81
0,150	75
0,075	65
50 µm	6
5 µm	6
2 µm	3,2

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	16
0.425 - 0.250	2
0.250 - 0.150	6
0.150 - 0.075	11
< 0.075	66

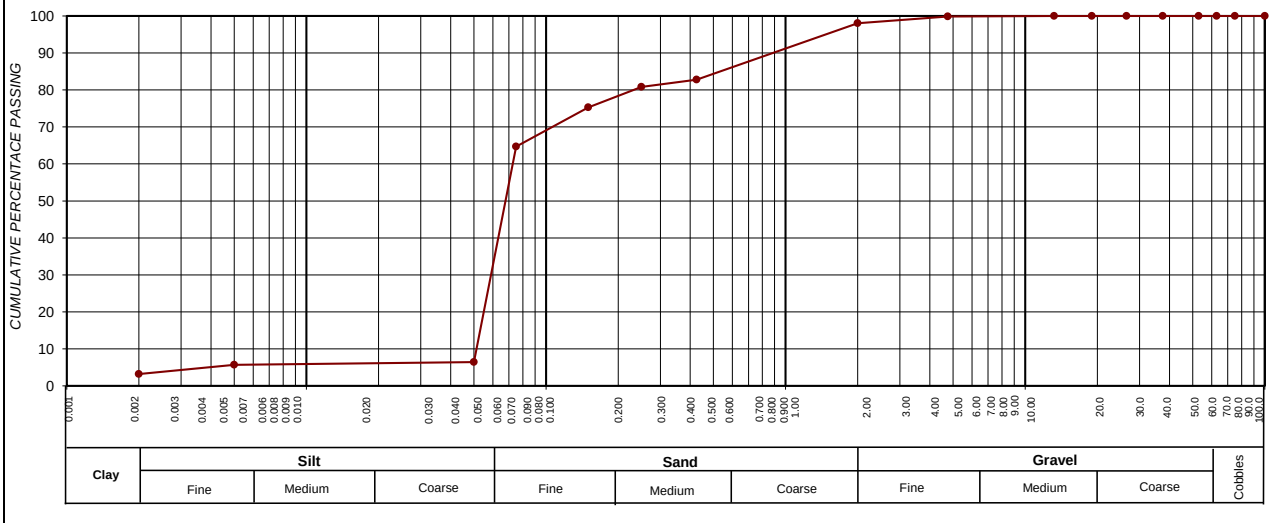
Effective size	0,052
Uniformity Coefficient	1,4
Curvature Coefficient	1,0
Oversize Index	0,0
Shrinkage Product	590,3
Grading Coefficient	2,0
Grading modulus	0,54

Atter-berg Limits	
Liquid Limit	42
Plasticity Index	14
Linear Shrinkage	7,1
PI < 0.075	-

Unified Soil Classification	ML
U.S. Highway Classification	A-7-6 (8)

PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
3,2	16,9	77,9	2,0

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : GI Xhariep Pipeline

DATE RECEIVED : 11.11.2024
POSITION : TP 177
LAYER : 1,00
SAMPLE No. : B15841
SAMPLE DESCRIPTION : Silty Sand,

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	11,3	Specifc Gravity	2,35

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	97
5,00	92
2,000	87
0,425	76
0,250	71
0,150	63
0,075	52
50 µm	6
5 µm	5
2 µm	2,9

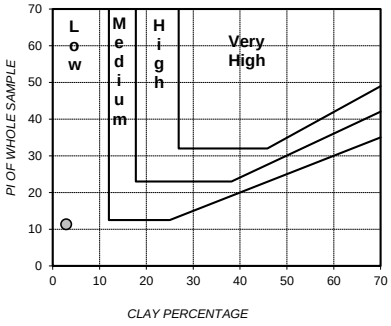
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	13
0.425 - 0.250	5
0.250 - 0.150	9
0.150 - 0.075	12
< 0.075	60

Effective size	0,052
Uniformity Coefficient	2,5
Curvature Coefficient	0,6
Oversize Index	0,0
Shrinkage Product	574,4
Grading Coefficient	11,9
Grading modulus	0,85

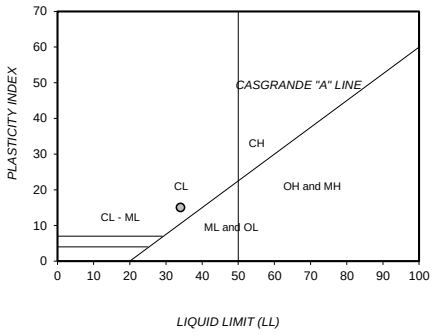
Atter-berg Limits	
Liquid Limit	34
Plasticity Index	15
Linear Shrinkage	7,6
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (5)

POTENTIAL EXPANSIVENES

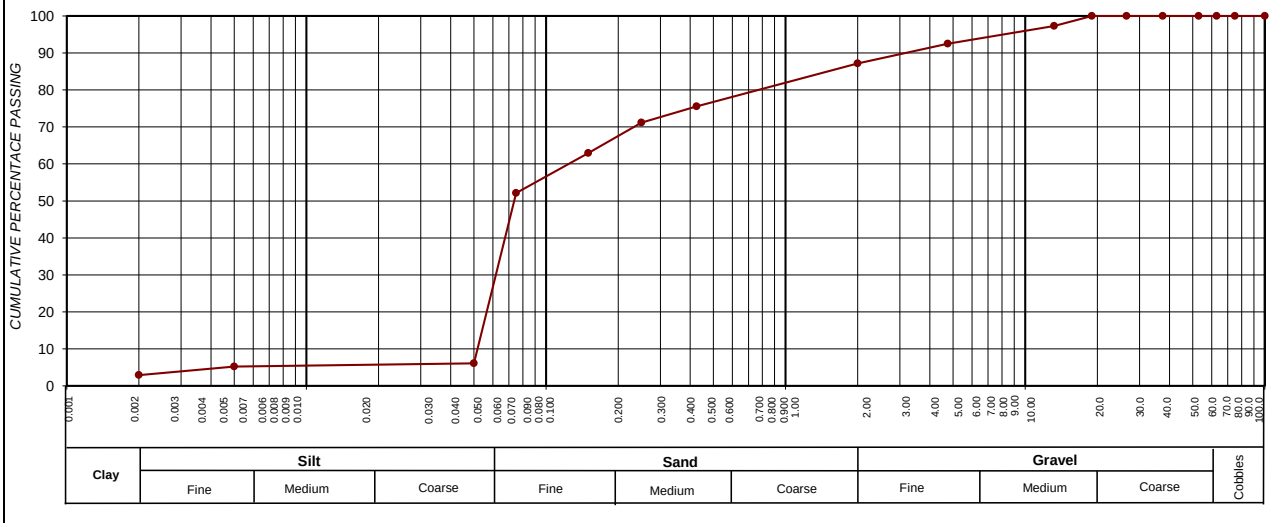


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
2,9	13,8	70,4	12,9

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 179
LAYER : 2,00
SAMPLE No. : B15389
SAMPLE DESCRIPTION : Silty Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**23,0**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	98
5,00	97
2,000	96
0,425	92
0,250	82
0,150	69
0,075	59
50 µm	11
5 µm	10
2 µm	5,9

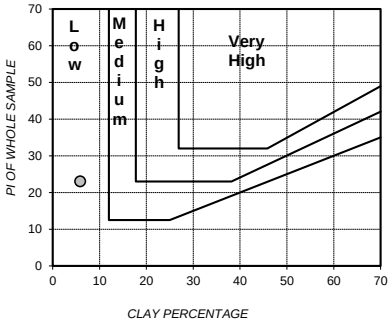
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	4
0.425 - 0.250	11
0.250 - 0.150	13
0.150 - 0.075	10
< 0.075	62

Effective size	0,015
Uniformity Coefficient	5,3
Curvature Coefficient	3,0
Oversize Index	0,0
Shrinkage Product	1286,0
Grading Coefficient	3,8
Grading modulus	0,53

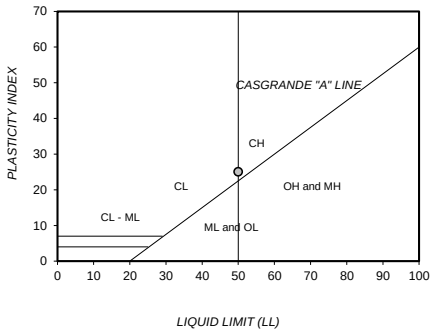
Atter-berg Limits	
Liquid Limit	50
Plasticity Index	25
Linear Shrinkage	14,0
PI < 0.075	-

Unified Soil Classification	CH
U.S. Highway Classification	A-7-6 (13)

POTENTIAL EXPANSIVENES

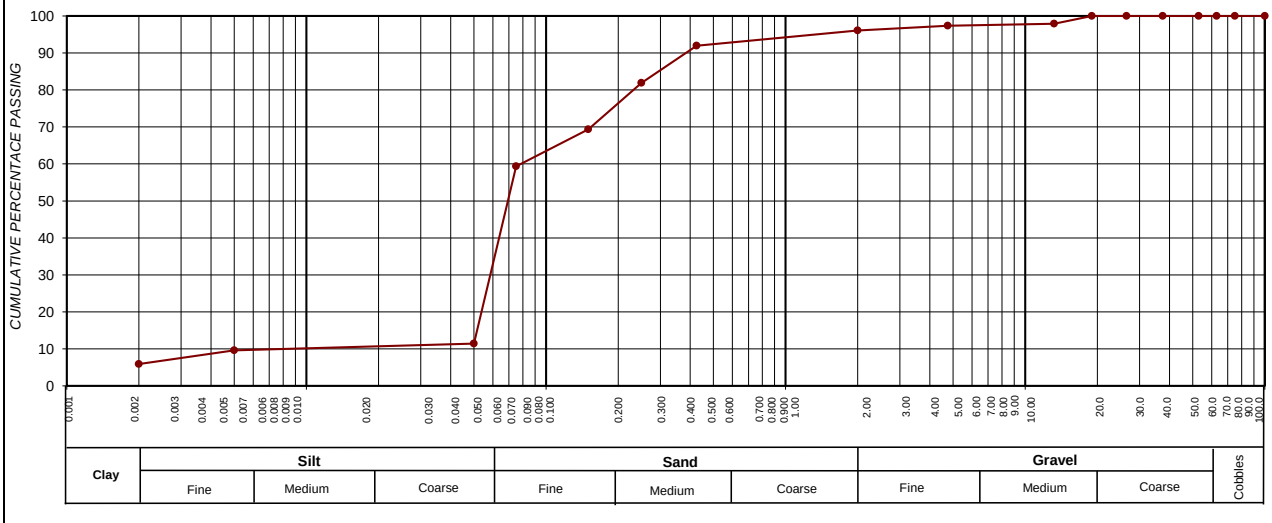


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
5,9	17,1	73,0	3,9

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 180
LAYER : 0,7-1,5
SAMPLE No. : B15202
SAMPLE DESCRIPTION : Silty Sand Residual Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**13,1**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	97
0,425	94
0,250	93
0,150	88
0,075	78
50 µm	7
5 µm	6
2 µm	4,0

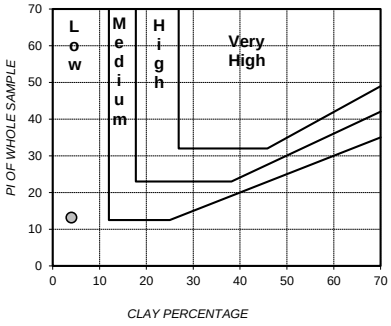
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	3
0.425 - 0.250	1
0.250 - 0.150	5
0.150 - 0.075	10
< 0.075	81

Effective size	0,051
Uniformity Coefficient	1,3
Curvature Coefficient	1,0
Oversize Index	0,0
Shrinkage Product	627,2
Grading Coefficient	2,9
Grading modulus	0,31

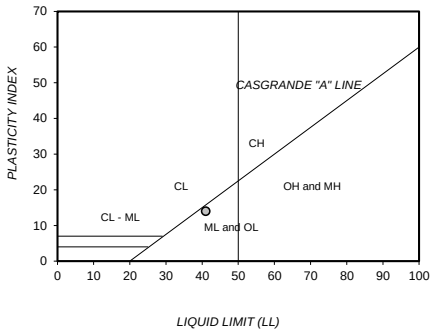
Atter-berg Limits	
Liquid Limit	41
Plasticity Index	14
Linear Shrinkage	6,7
PI < 0.075	-

Unified Soil Classification	ML
U.S. Highway Classification	A-7-6 (11)

POTENTIAL EXPANSIVENES

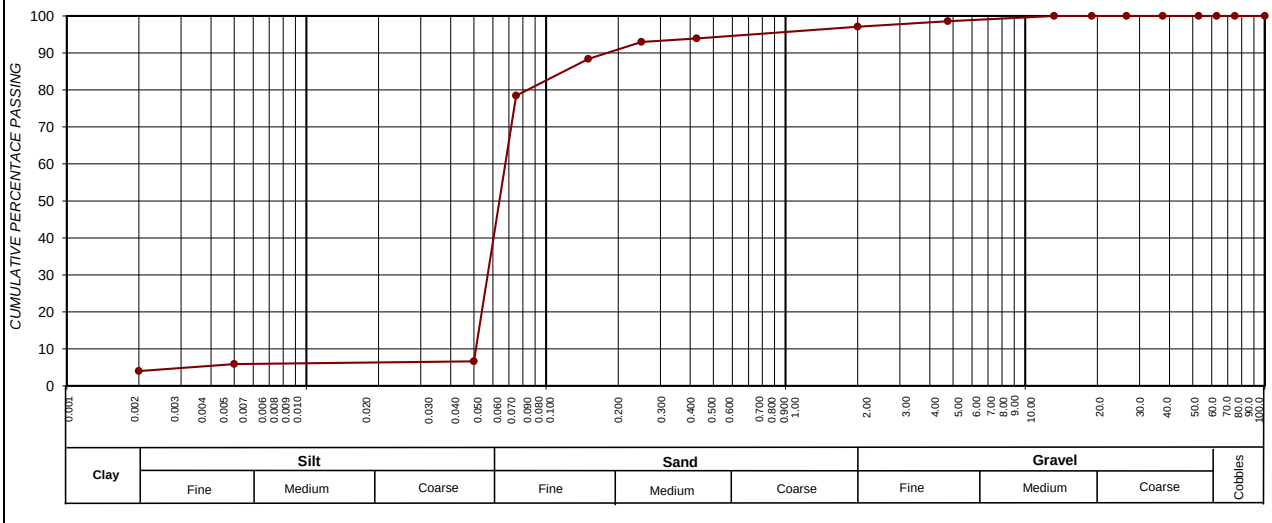


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
4,0	19,6	73,5	2,9

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 184
LAYER : 02-Jan-00
SAMPLE No. : B15388
SAMPLE DESCRIPTION : Gravelly Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**8,7**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	96
2,000	83
0,425	54
0,250	51
0,150	42
0,075	32
50 µm	4
5 µm	4
2 µm	0,7

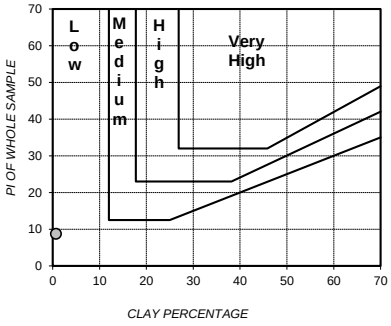
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	35
0.425 - 0.250	4
0.250 - 0.150	10
0.150 - 0.075	12
< 0.075	38

Effective size	0,055
Uniformity Coefficient	13,2
Curvature Coefficient	0,1
Oversize Index	0,0
Shrinkage Product	438,5
Grading Coefficient	15,9
Grading modulus	1,30

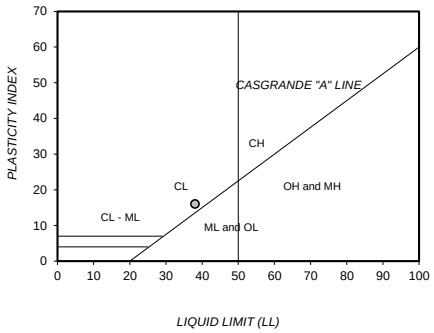
Atter-berg Limits	
Liquid Limit	38
Plasticity Index	16
Linear Shrinkage	8,1
PI < 0.075	-

Unified Soil Classification	SC
U.S. Highway Classification	A-2-6 (1)

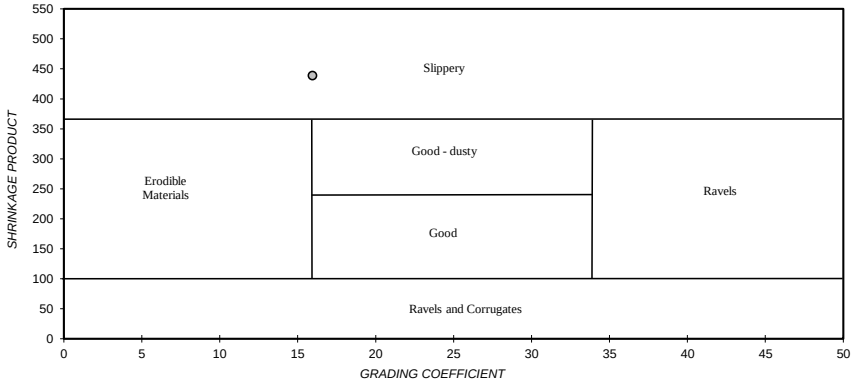
POTENTIAL EXPANSIVENES



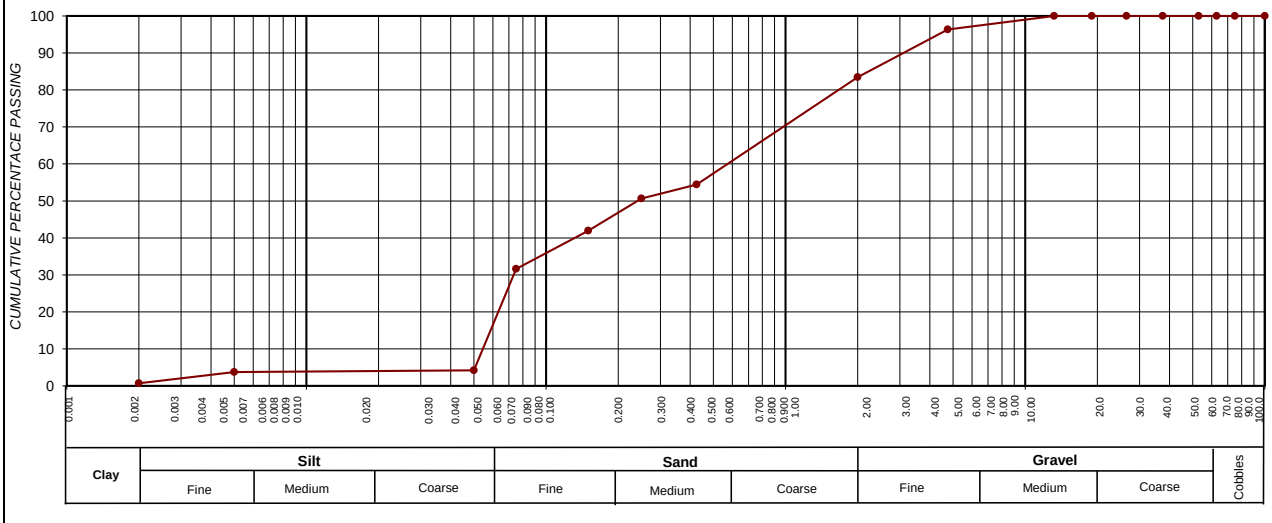
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
0,7	9,6	73,1	16,6

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

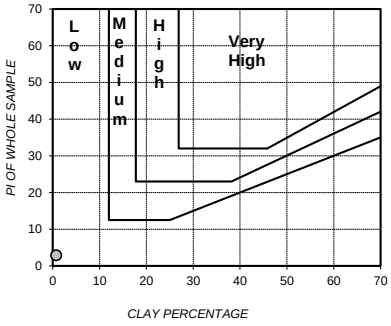
DATE RECEIVED : 11.11.2024
POSITION : TP 186
LAYER : 0,7-1,4
SAMPLE No. : B15184
SAMPLE DESCRIPTION : Gravelly Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

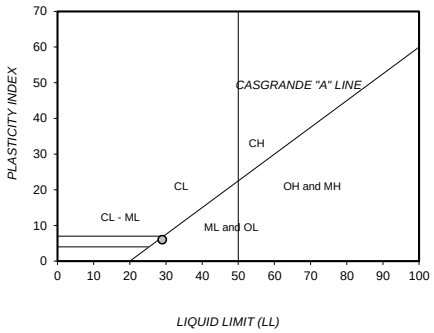
Weighted PI	**2,9**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	98
5,00	97
2,000	69
0,425	48
0,250	45
0,150	42
0,075	39
50 µm	3
5 µm	2
2 µm	0,8

POTENTIAL EXPANSIVENES



PLASTICITY CHART



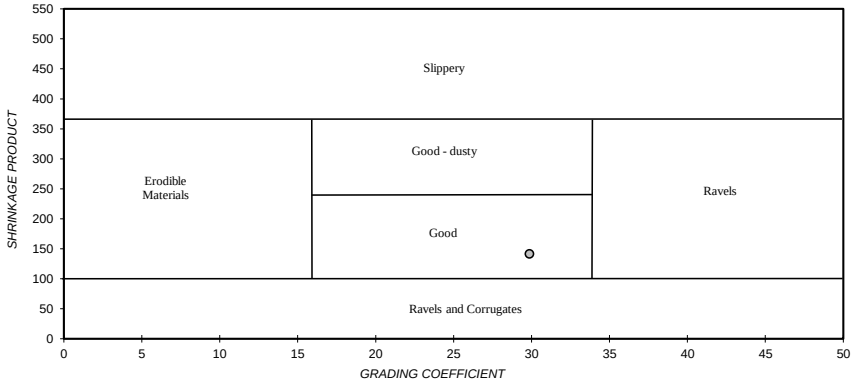
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	31
0.425 - 0.250	4
0.250 - 0.150	4
0.150 - 0.075	5
< 0.075	56

Effective size	0,055
Uniformity Coefficient	24,2
Curvature Coefficient	0,1
Oversize Index	0,0
Shrinkage Product	141,3
Grading Coefficient	29,9
Grading modulus	1,44

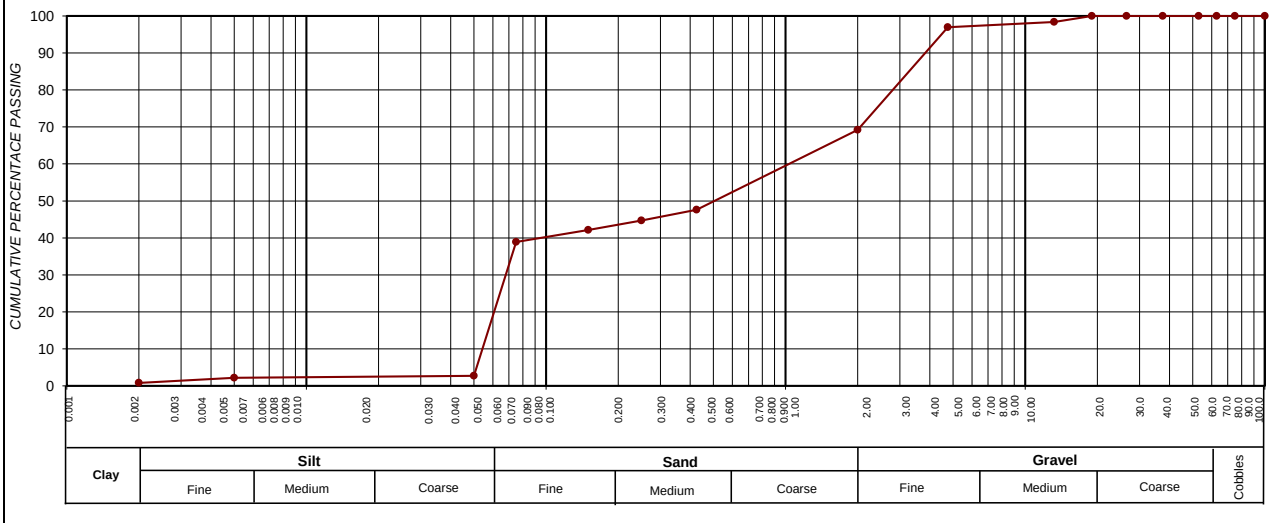
Atter-berg Limits	
Liquid Limit	29
Plasticity Index	6
Linear Shrinkage	3,0
PI < 0.075	-

Unified Soil Classification	SM
U.S. Highway Classification	A-4 (0)

PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
0,8	10,5	57,9	30,8

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 191
LAYER : 1,00
SAMPLE No. : B15193
SAMPLE DESCRIPTION : Silty Clay

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	16,6	Specifc Gravity	2,35

Sieve analysis Cumulative percentage passing (mm)

100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	98
2,000	97
0,425	92
0,250	89
0,150	83
0,075	72
50 µm	9
5 µm	7
2 µm	5,5

Soil Mortar Analysis % < 2,00mm

2.000 - 0.425	5
0.425 - 0.250	3
0.250 - 0.150	6
0.150 - 0.075	11
< 0.075	74

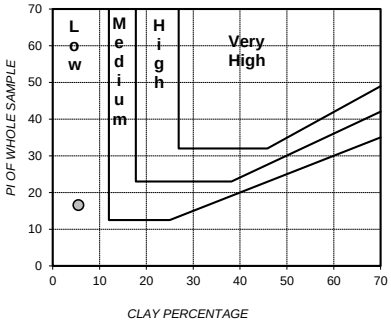
Effective size	0,050
Uniformity Coefficient	1,4
Curvature Coefficient	1,0
Oversize Index	0,0
Shrinkage Product	850,8
Grading Coefficient	2,8
Grading modulus	0,39

Atter-berg Limits

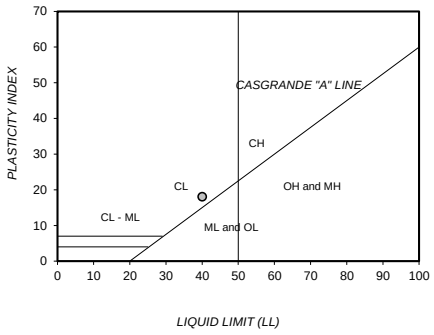
Liquid Limit	40
Plasticity Index	18
Linear Shrinkage	9,2
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (12)

POTENTIAL EXPANSIVENES

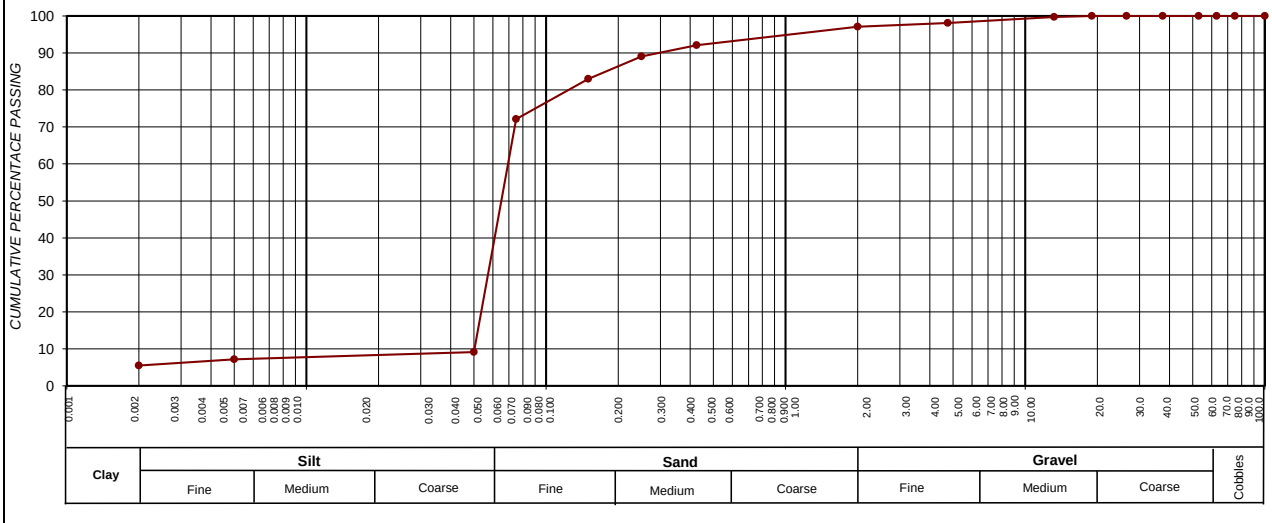


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
5,5	18,9	72,7	2,9

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 195
LAYER : 0,9-1,2
SAMPLE No. : B15854
SAMPLE DESCRIPTION : Silty Sand+ Sandstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**5,9**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	98
5,00	95
2,000	92
0,425	84
0,250	80
0,150	73
0,075	55
50 µm	3
5 µm	2
2 µm	0,9

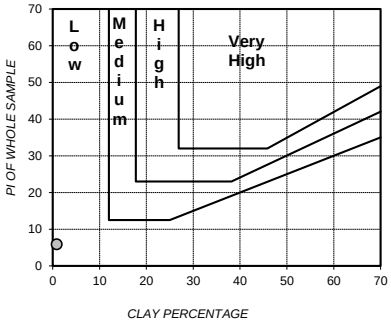
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	8
0.425 - 0.250	5
0.250 - 0.150	7
0.150 - 0.075	20
< 0.075	60

Effective size	0,053
Uniformity Coefficient	1,8
Curvature Coefficient	0,8
Oversize Index	0,0
Shrinkage Product	378,6
Grading Coefficient	7,7
Grading modulus	0,69

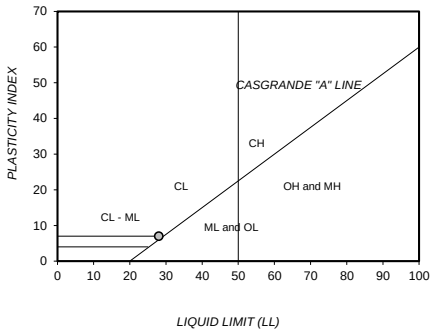
Atter-berg Limits	
Liquid Limit	28
Plasticity Index	7
Linear Shrinkage	4,5
PI < 0.075	-

Unified Soil Classification	CL & ML
U.S. Highway Classification	A-4 (2)

POTENTIAL EXPANSIVENES

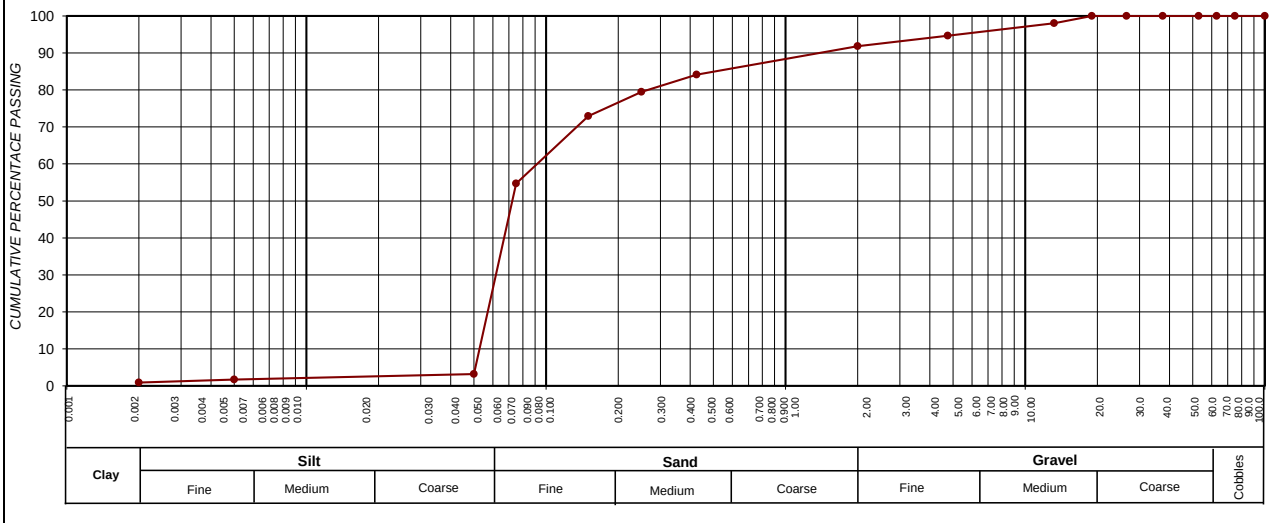


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
0,9	13,9	77,0	8,2

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 196
LAYER : 0,70
SAMPLE No. : B15844
SAMPLE DESCRIPTION : Silty Clay Colluvium

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**24,6**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	98
5,00	96
2,000	96
0,425	95
0,250	64
0,150	47
0,075	33
50 µm	13
5 µm	11
2 µm	9,1

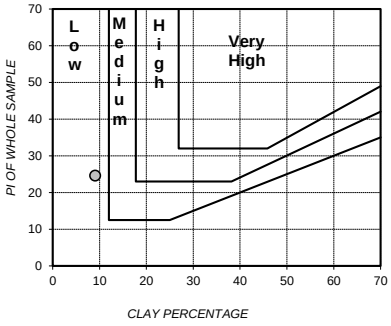
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	1
0.425 - 0.250	32
0.250 - 0.150	17
0.150 - 0.075	15
< 0.075	34

Effective size	0,003
Uniformity Coefficient	71,9
Curvature Coefficient	7,0
Oversize Index	0,0
Shrinkage Product	1304,0
Grading Coefficient	4,3
Grading modulus	0,77

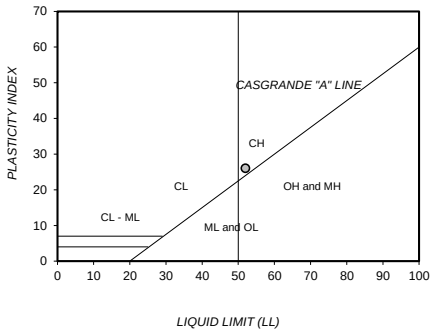
Atter-berg Limits	
Liquid Limit	52
Plasticity Index	26
Linear Shrinkage	13,8
PI < 0.075	-

Unified Soil Classification	SC
U.S. Highway Classification	A-2-7 (3)

POTENTIAL EXPANSIVENES

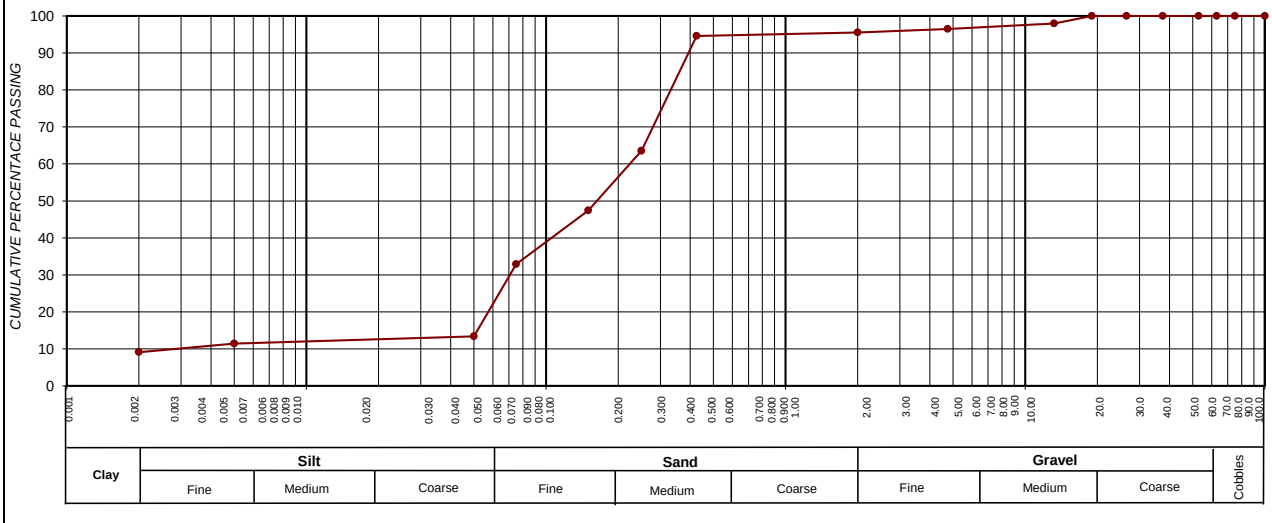


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
9,1	9,0	77,5	4,4

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CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 197
LAYER : 0,2-0,6
SAMPLE No. : B15855
SAMPLE DESCRIPTION : Silty Sand Colluvium

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**20,5**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	99
0,425	97
0,250	86
0,150	74
0,075	59
50 µm	16
5 µm	13
2 µm	9,4

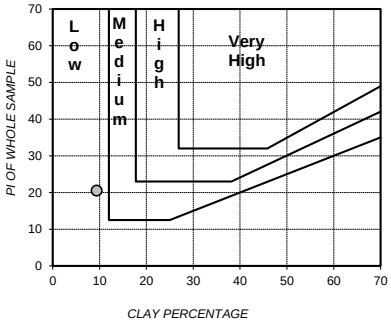
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	1
0.425 - 0.250	12
0.250 - 0.150	12
0.150 - 0.075	15
< 0.075	60

Effective size	0,003
Uniformity Coefficient	31,7
Curvature Coefficient	16,6
Oversize Index	0,0
Shrinkage Product	935,8
Grading Coefficient	1,4
Grading modulus	0,45

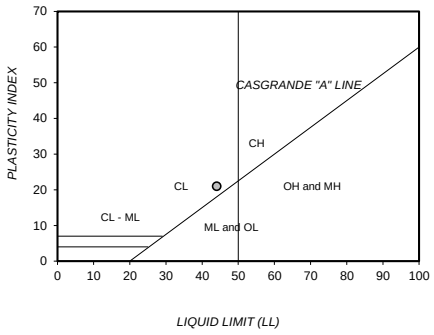
Atter-berg Limits	
Liquid Limit	44
Plasticity Index	21
Linear Shrinkage	9,6
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-7-6 (10)

POTENTIAL EXPANSIVENES

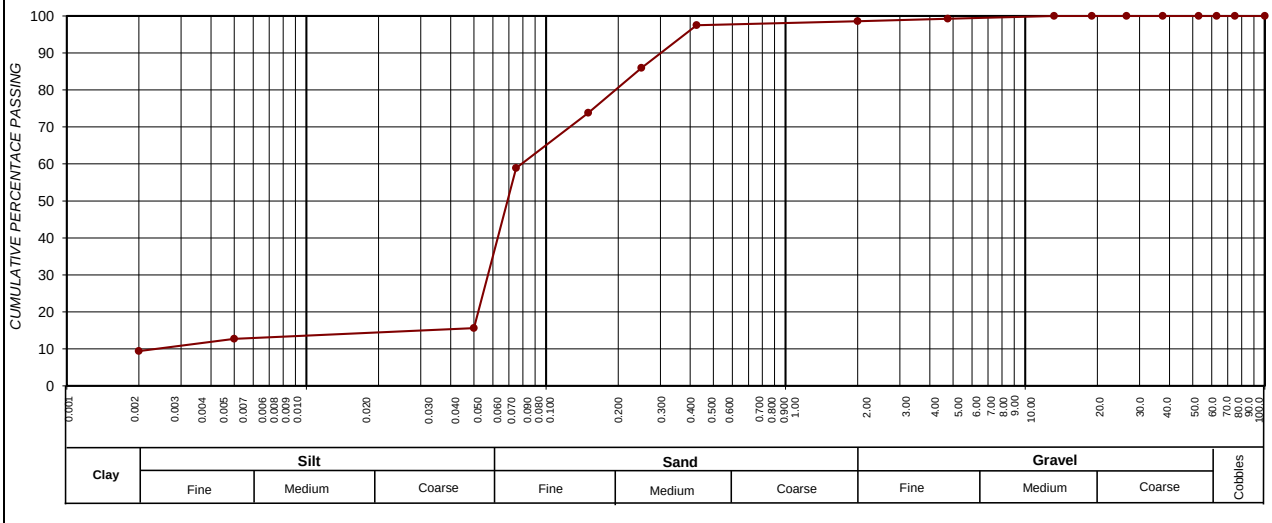


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
9,4	17,3	71,8	1,5

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DATE RECEIVED : 11.11.2024
POSITION : TP 199
LAYER : 1,20
SAMPLE No. : B15845
SAMPLE DESCRIPTION : Silty Clay +Residual Mudstone

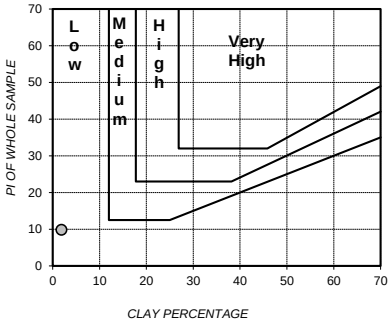
FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**9,8**	**Specifc Gravity**	**2,35**

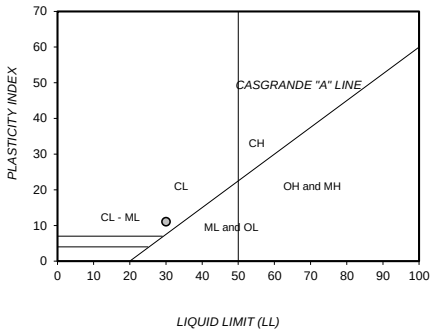
Sieve analysis Cumulative percentage passing (mm)

100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	98
5,00	97
2,000	95
0,425	89
0,250	83
0,150	75
0,075	60
50 µm	5
5 µm	4
2 µm	1,9

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2,00mm

2.000 - 0.425	6
0.425 - 0.250	6
0.250 - 0.150	8
0.150 - 0.075	16
< 0.075	63

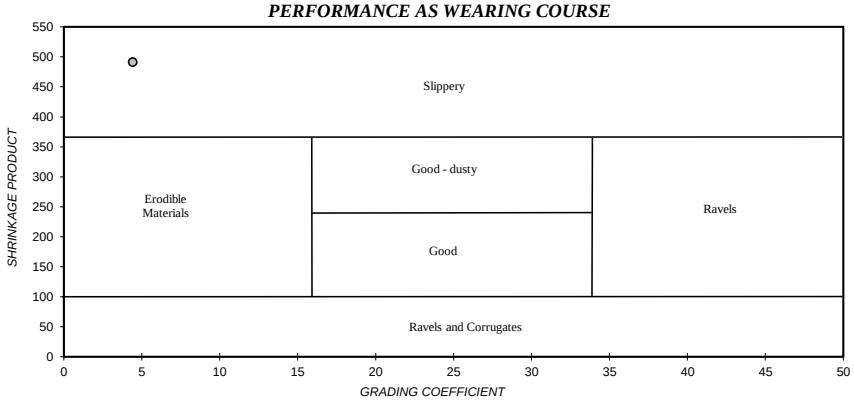
Effective size	0,052
Uniformity Coefficient	1,5
Curvature Coefficient	0,9
Oversize Index	0,0
Shrinkage Product	491,1
Grading Coefficient	4,4
Grading modulus	0,55

Atter-berg Limits

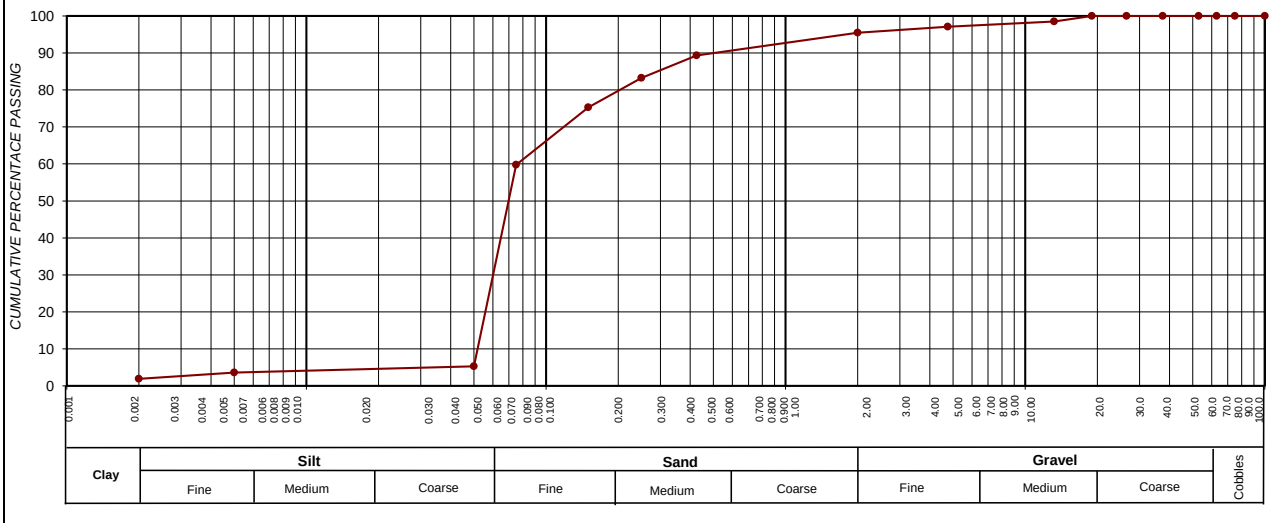
Liquid Limit	30
Plasticity Index	11
Linear Shrinkage	5,5
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (4)

PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
1,9	15,9	77,7	4,6

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 204
LAYER : 0,0-0,8
SAMPLE No. : B15203
SAMPLE DESCRIPTION : Silty Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**24,5**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	97
5,00	96
2,000	95
0,425	94
0,250	83
0,150	72
0,075	58
50 µm	16
5 µm	14
2 µm	9,1

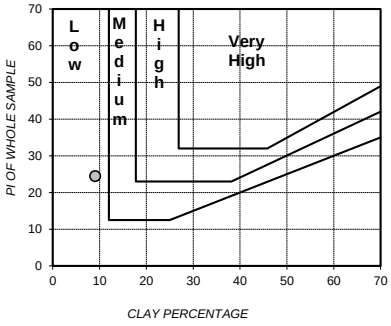
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	1
0.425 - 0.250	11
0.250 - 0.150	11
0.150 - 0.075	15
< 0.075	61

Effective size	0,003
Uniformity Coefficient	33,3
Curvature Coefficient	15,6
Oversize Index	0,0
Shrinkage Product	1269,9
Grading Coefficient	4,7
Grading modulus	0,53

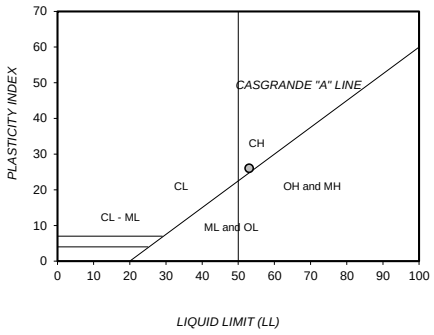
Atter-berg Limits	
Liquid Limit	53
Plasticity Index	26
Linear Shrinkage	13,5
PI < 0.075	-

Unified Soil Classification	CH
U.S. Highway Classification	A-7-6 (13)

POTENTIAL EXPANSIVENES

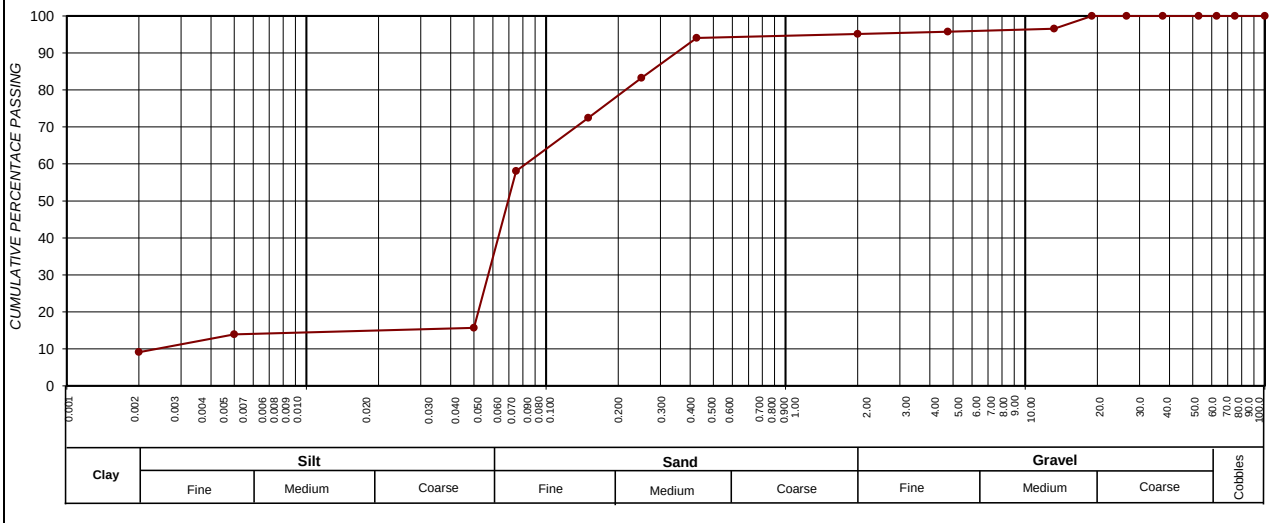


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
9,1	17,3	68,7	4,9

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 210
LAYER : 0,4-1,0
SAMPLE No. : B15149
SAMPLE DESCRIPTION : Silty Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**15,4**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	98
5,00	97
2,000	96
0,425	91
0,250	76
0,150	63
0,075	52
50 µm	9
5 µm	7
2 µm	5,4

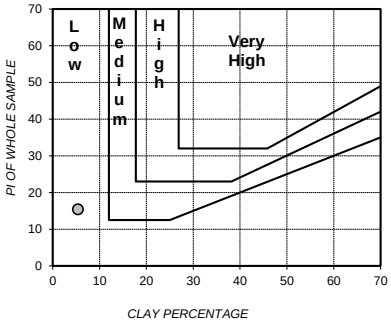
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	5
0.425 - 0.250	15
0.250 - 0.150	14
0.150 - 0.075	11
< 0.075	54

Effective size	0,051
Uniformity Coefficient	2,6
Curvature Coefficient	0,6
Oversize Index	0,0
Shrinkage Product	837,2
Grading Coefficient	4,2
Grading modulus	0,62

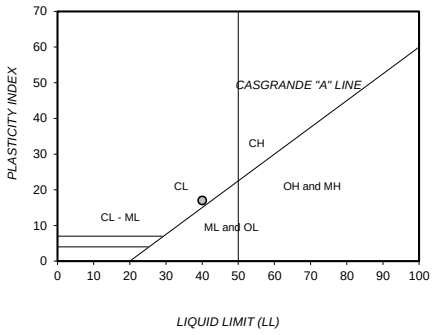
Atter-berg Limits	
Liquid Limit	40
Plasticity Index	17
Linear Shrinkage	9,2
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (6)

POTENTIAL EXPANSIVENES

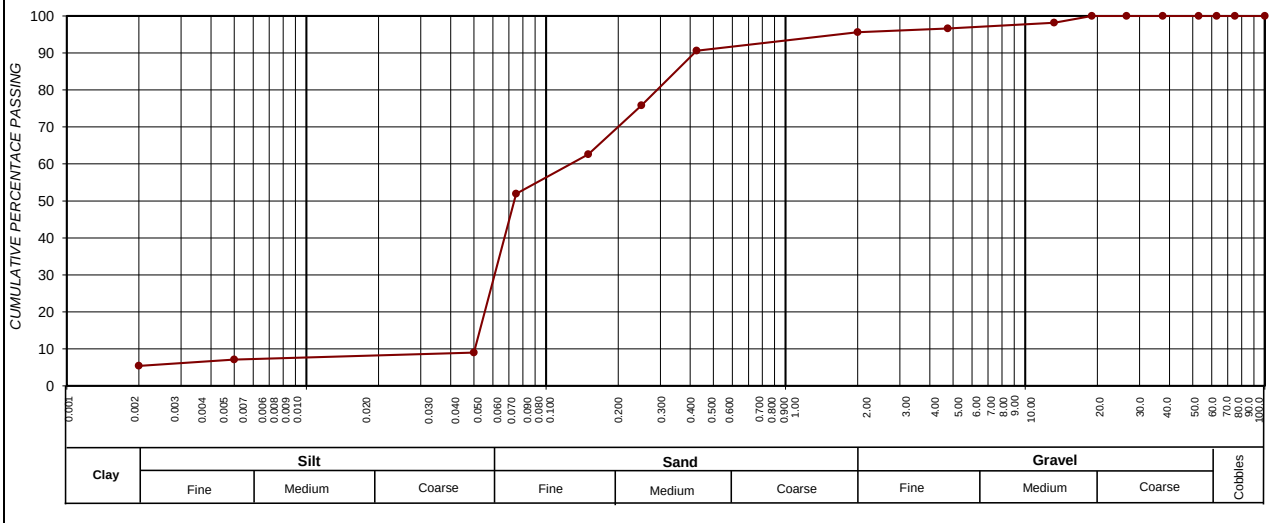


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
5,4	13,9	76,3	4,4

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PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 214
LAYER : 0.5-2.7
SAMPLE No. : B15204
SAMPLE DESCRIPTION : Silty Sand Colluvium

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**20,0**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	98
2,000	96
0,425	91
0,250	87
0,150	82
0,075	70
50 µm	10
5 µm	9
2 µm	6,4

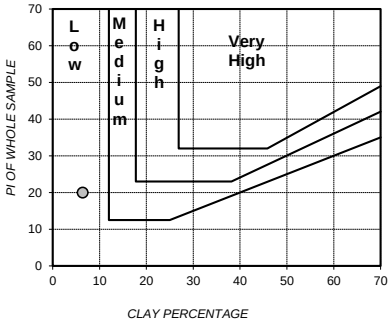
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	5
0.425 - 0.250	3
0.250 - 0.150	6
0.150 - 0.075	12
< 0.075	73

Effective size	0,042
Uniformity Coefficient	1,7
Curvature Coefficient	1,1
Oversize Index	0,0
Shrinkage Product	916,7
Grading Coefficient	4,2
Grading modulus	0,43

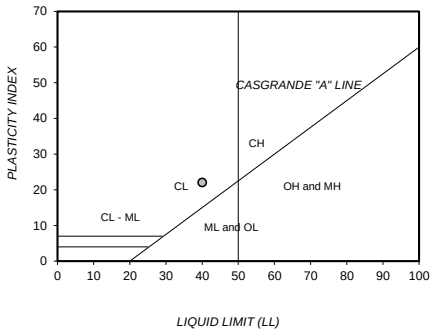
Atter-berg Limits	
Liquid Limit	40
Plasticity Index	22
Linear Shrinkage	10,1
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (14)

POTENTIAL EXPANSIVENES

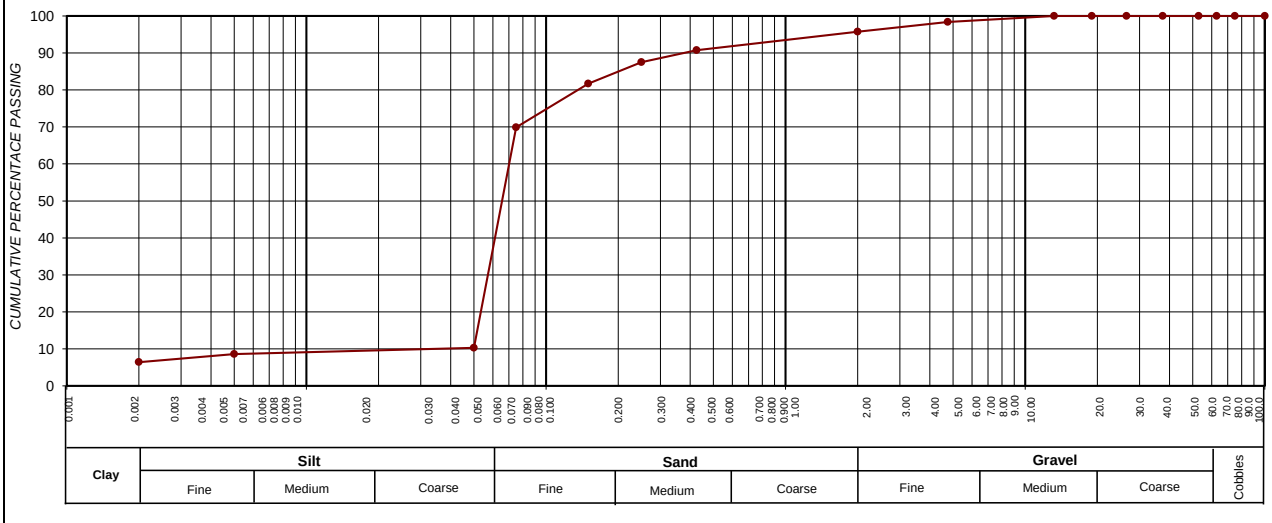


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
6,4	18,7	70,7	4,3

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DATE RECEIVED : 11.11.2024
POSITION : TP 214
LAYER : 2.7-3.5
SAMPLE No. : B15205
SAMPLE DESCRIPTION : Sandy Silty Colluvium

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**17,1**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	100
2,000	99
0,425	95
0,250	91
0,150	81
0,075	65
50 µm	9
5 µm	8
2 µm	3,3

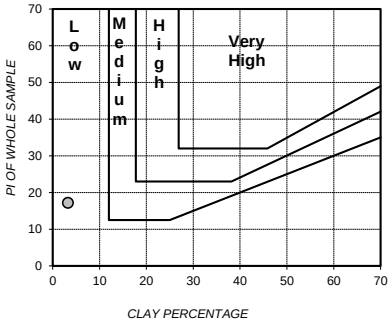
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	3
0.425 - 0.250	4
0.250 - 0.150	10
0.150 - 0.075	16
< 0.075	66

Effective size	0,050
Uniformity Coefficient	1,4
Curvature Coefficient	1,0
Oversize Index	0,0
Shrinkage Product	438,3
Grading Coefficient	1,4
Grading modulus	0,41

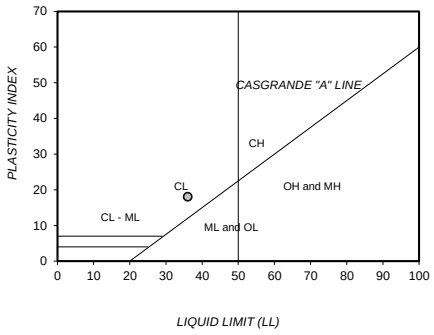
Atter-berg Limits	
Liquid Limit	36
Plasticity Index	18
Linear Shrinkage	4,6
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (9)

POTENTIAL EXPANSIVENES

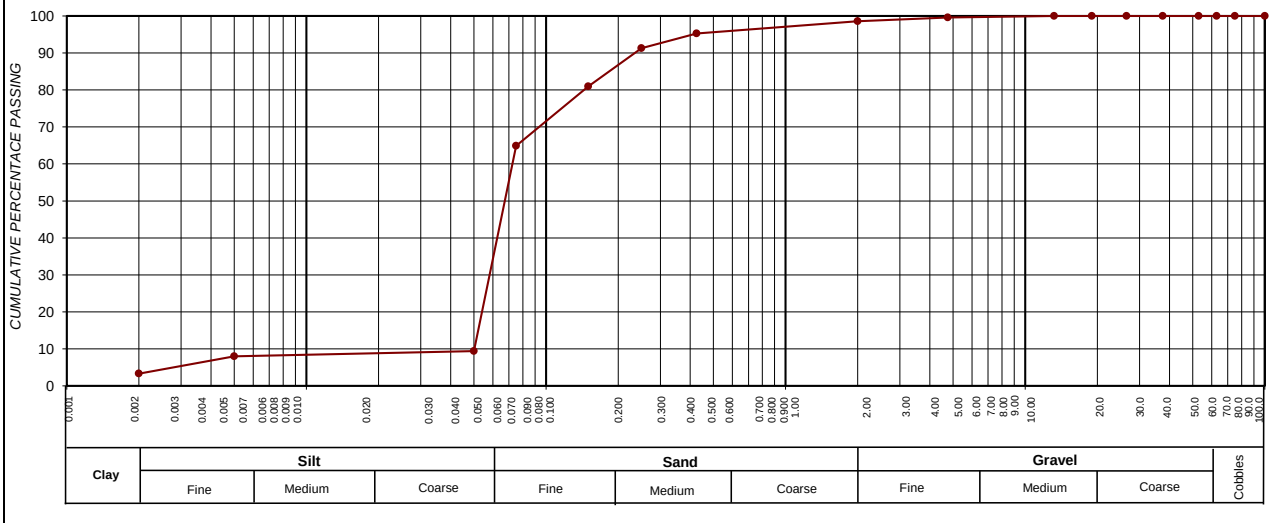


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
3,3	18,9	76,4	1,4

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 216
LAYER : 0.70-3.1
SAMPLE No. : B15384
SAMPLE DESCRIPTION : Silty Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**7,4**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	94
0,425	82
0,250	80
0,150	73
0,075	53
50 µm	4
5 µm	3
2 µm	0,9

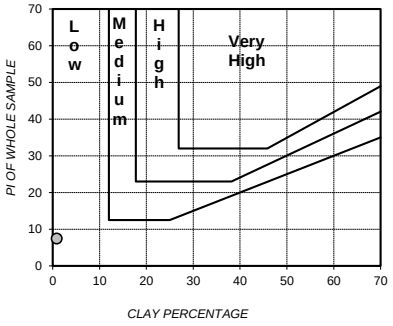
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	12
0.425 - 0.250	3
0.250 - 0.150	8
0.150 - 0.075	21
< 0.075	56

Effective size	0,053
Uniformity Coefficient	1,9
Curvature Coefficient	0,7
Oversize Index	0,0
Shrinkage Product	386,3
Grading Coefficient	5,9
Grading modulus	0,71

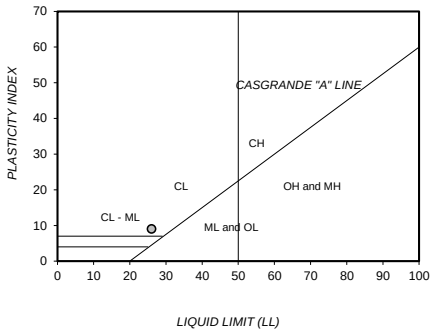
Atter-berg Limits	
Liquid Limit	26
Plasticity Index	9
Linear Shrinkage	4,7
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-4 (2)

POTENTIAL EXPANSIVENES

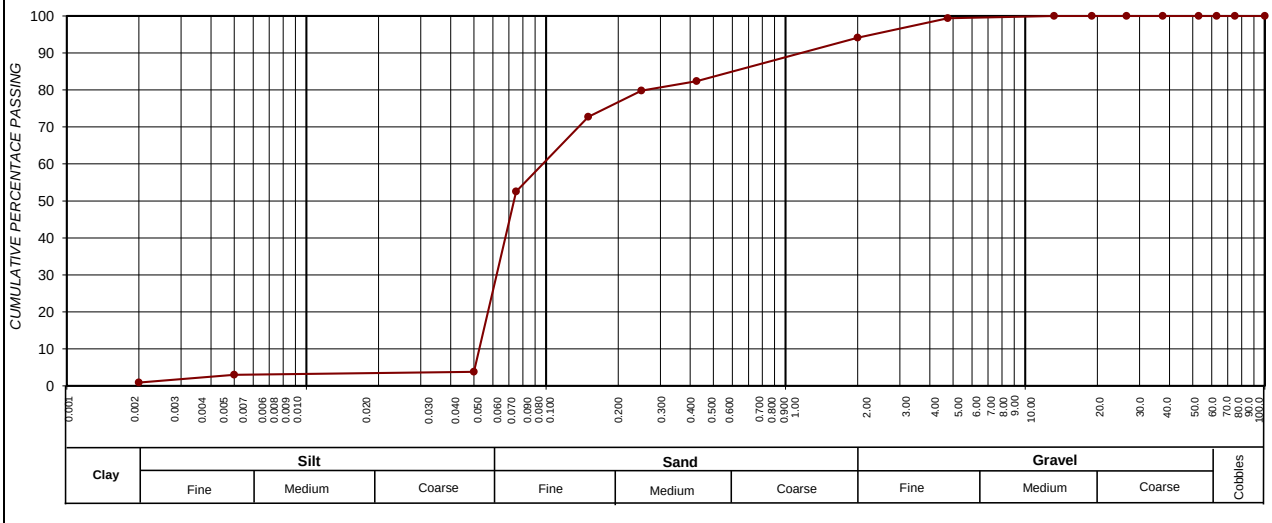


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
0,9	13,2	80,0	5,9

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 218
LAYER : 2,20
SAMPLE No. : B15208
SAMPLE DESCRIPTION : Silty Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**25,8**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)

100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	100
2,000	98
0,425	96
0,250	94
0,150	87
0,075	71
50 µm	13
5 µm	12
2 µm	8,8

Soil Mortar Analysis % < 2,00mm

2.000 - 0.425	3
0.425 - 0.250	2
0.250 - 0.150	7
0.150 - 0.075	17
< 0.075	72

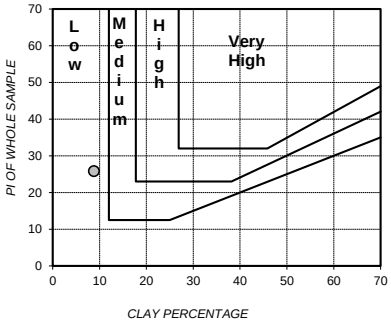
Effective size	0,003
Uniformity Coefficient	21,4
Curvature Coefficient	14,3
Oversize Index	0,0
Shrinkage Product	1299,8
Grading Coefficient	1,7
Grading modulus	0,35

Atter-berg Limits

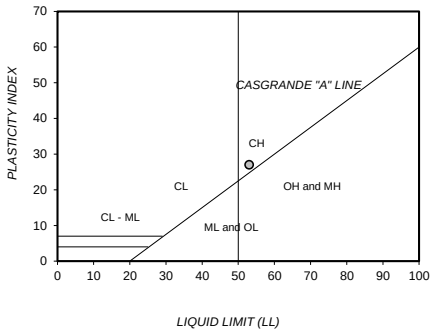
Liquid Limit	53
Plasticity Index	27
Linear Shrinkage	13,6
PI < 0.075	-

Unified Soil Classification	CH
U.S. Highway Classification	A-7-6 (19)

POTENTIAL EXPANSIVENES

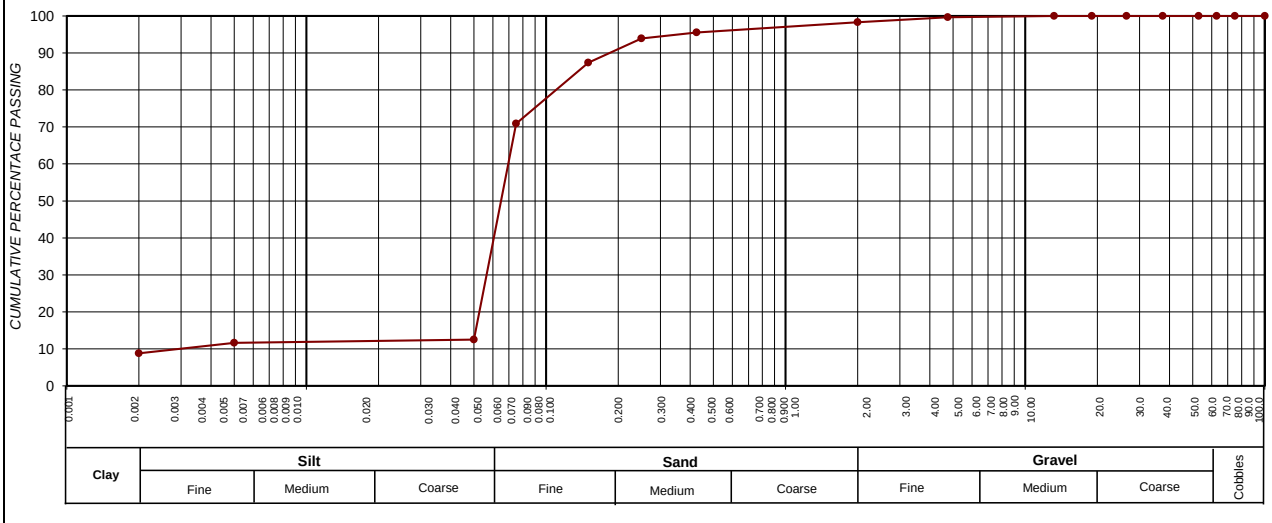


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
8,8	17,6	71,9	1,7

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

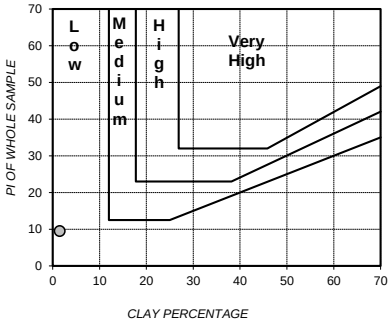
DATE RECEIVED : 11.11.2024
POSITION : TP 220
LAYER : 1,8-2,8
SAMPLE No. : B15248
SAMPLE DESCRIPTION : Silty Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

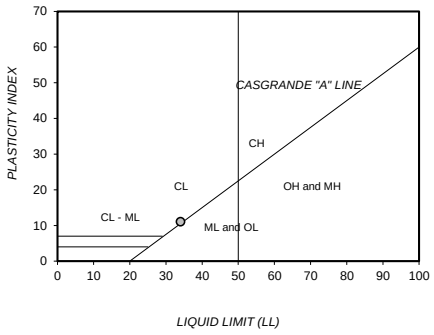
Weighted PI	**9,5**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	99
5,00	97
2,000	95
0,425	86
0,250	77
0,150	67
0,075	49
50 µm	5
5 µm	4
2 µm	1,5

POTENTIAL EXPANSIVENES



PLASTICITY CHART



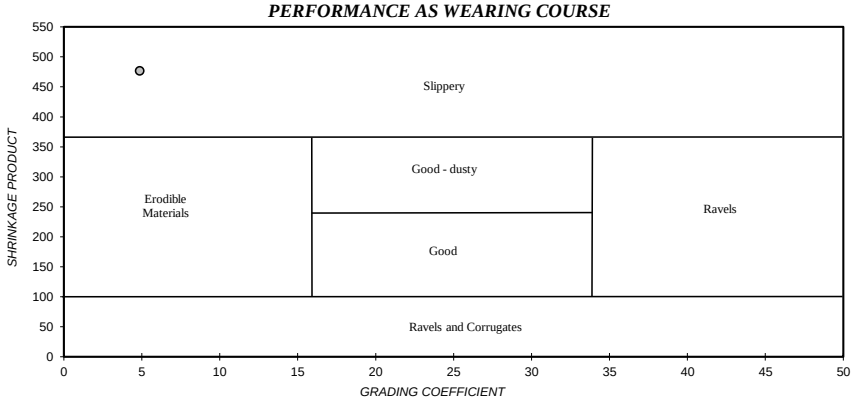
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	9
0.425 - 0.250	10
0.250 - 0.150	11
0.150 - 0.075	19
< 0.075	52

Effective size	0,053
Uniformity Coefficient	2,3
Curvature Coefficient	0,6
Oversize Index	0,0
Shrinkage Product	476,3
Grading Coefficient	4,9
Grading modulus	0,70

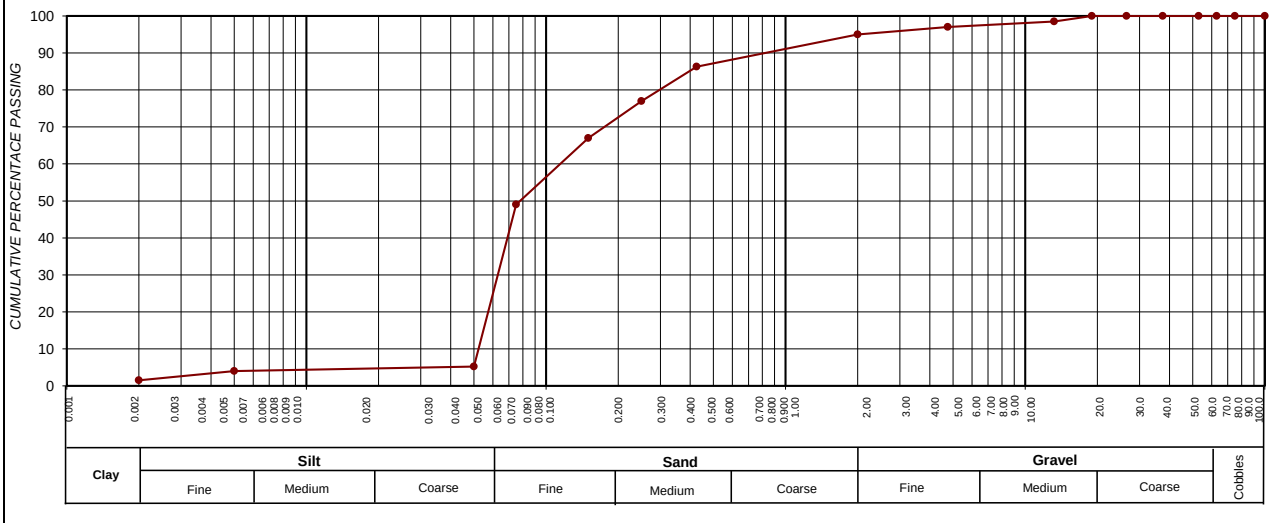
Atter-berg Limits	
Liquid Limit	34
Plasticity Index	11
Linear Shrinkage	5,5
PI < 0.075	-

Unified Soil Classification	SC
U.S. Highway Classification	A-6 (3)

PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
1,5	13,2	80,3	5,0

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

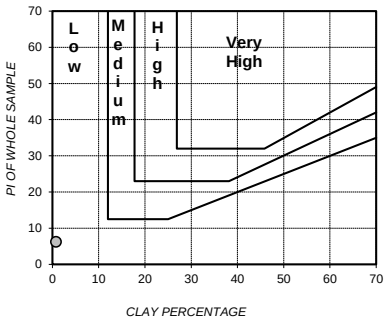
DATE RECEIVED : 11.11.2024
POSITION : TP 220
LAYER : 1-Jan-00
SAMPLE No. : B15249
SAMPLE DESCRIPTION : Silty Sand+ Colluvium

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

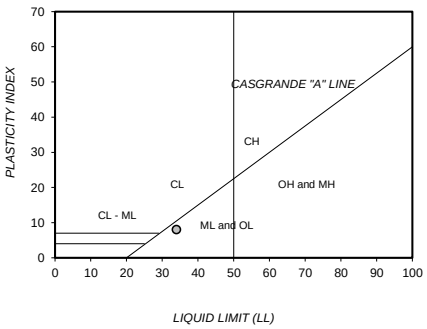
Weighted PI	**6.2**	**Specifc Gravity**	**2.35**

Sieve analysis Cumulative percentage passing (mm)	
100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	100
5.00	97
2.000	92
0.425	77
0.250	75
0.150	68
0.075	54
50 µm	4
5 µm	3
2 µm	0.8

POTENTIAL EXPANSIVENES



PLASTICITY CHART



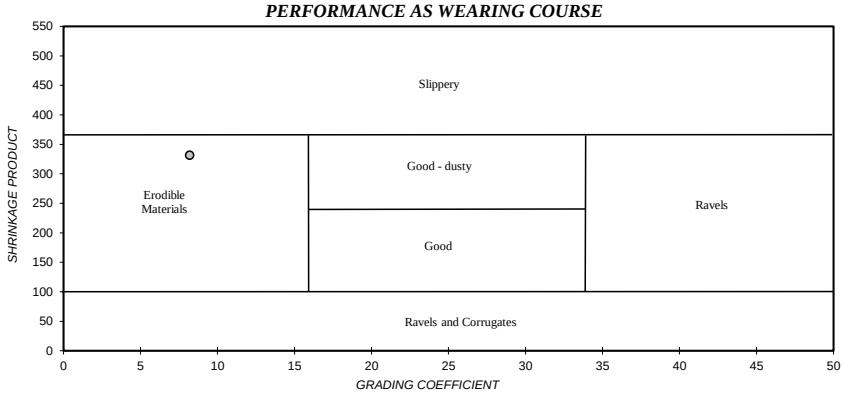
Soil Mortar Analysis % < 2.00mm	
2.000 - 0.425	16
0.425 - 0.250	3
0.250 - 0.150	8
0.150 - 0.075	15
< 0.075	60

Effective size	0.053
Uniformity Coefficient	2.0
Curvature Coefficient	0.7
Oversize Index	0.0
Shrinkage Product	331.4
Grading Coefficient	8.2
Grading modulus	0.77

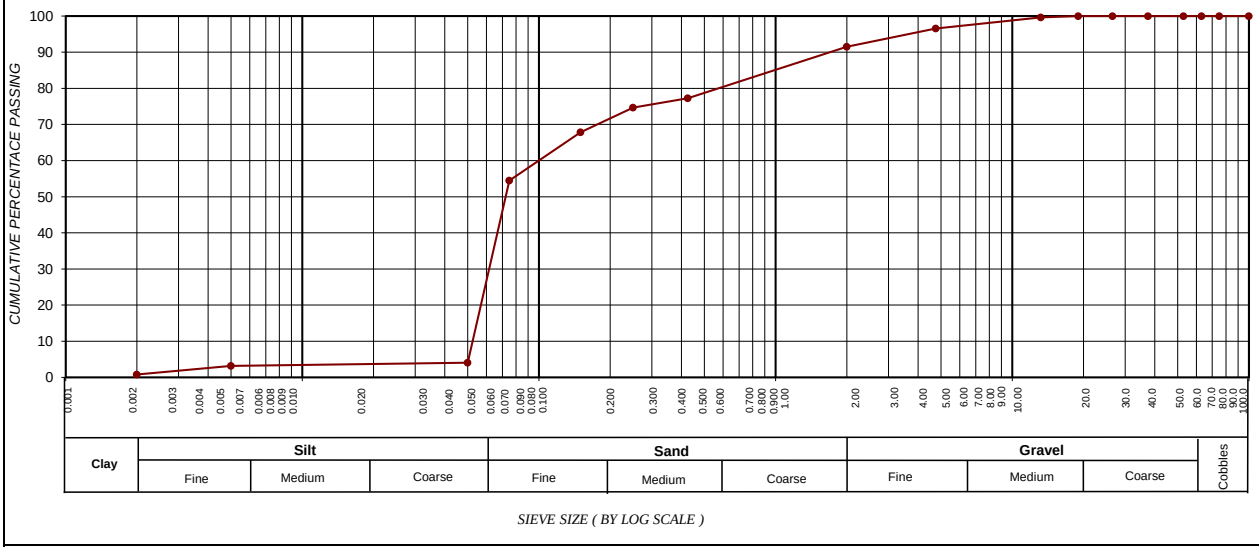
Atter-berg Limits	
Liquid Limit	34
Plasticity Index	8
Linear Shrinkage	4.3
PI < 0.075	-

Unified Soil Classification	ML
U.S. Highway Classification	A-4 (2)

PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
0.8	14.6	76.1	8.5

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 224
LAYER : 1.1-1.3
SAMPLE No. : B15150
SAMPLE DESCRIPTION : Dark Brown Weathered Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**2,4**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)

100,0	100
75,0	100
63,0	98
50,0	95
37,5	92
28,0	90
20,0	85
14,0	85
5,00	83
2,000	81
0,425	79
0,250	60
0,150	43
0,075	30
50 µm	2
5 µm	2
2 µm	0,9

Soil Mortar Analysis % < 2,00mm

2.000 - 0.425	2
0.425 - 0.250	24
0.250 - 0.150	21
0.150 - 0.075	17
< 0.075	37

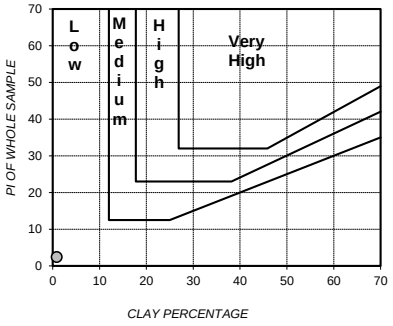
Effective size	0,057
Uniformity Coefficient	4,4
Curvature Coefficient	0,4
Oversize Index	7,5
Shrinkage Product	175,8
Grading Coefficient	7,7
Grading modulus	1,10

Atter-berg Limits

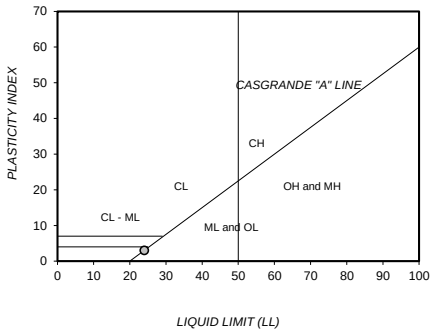
Liquid Limit	24
Plasticity Index	3
Linear Shrinkage	2,2
PI < 0.075	-

Unified Soil Classification	SM
U.S. Highway Classification	A-2-4 (0)

POTENTIAL EXPANSIVENES

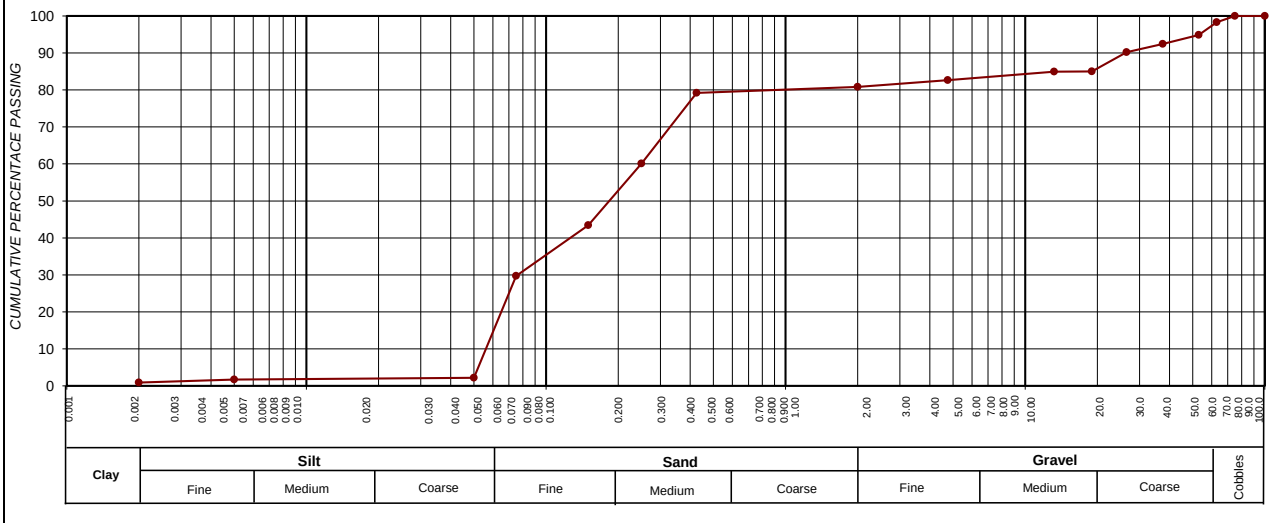


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	**SILT (%) (0.002-0.060)**	**SAND (%) (0.060-2.00)**	**GRAVEL (%) (2.00-60.0)**
0,9	**7,0**	**72,9**	**19,2**

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 233
LAYER : 0.4-0.8
SAMPLE No. : B15206
SAMPLE DESCRIPTION : Silty Sand Colluvium

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**22,1**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	96
0,425	92
0,250	81
0,150	59
0,075	41
50 µm	11
5 µm	10
2 µm	7,9

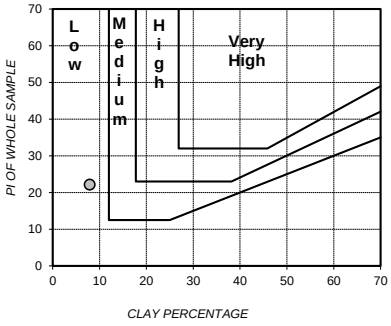
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	4
0.425 - 0.250	12
0.250 - 0.150	22
0.150 - 0.075	19
< 0.075	43

Effective size	0,005
Uniformity Coefficient	32,2
Curvature Coefficient	6,0
Oversize Index	0,0
Shrinkage Product	1186,9
Grading Coefficient	3,9
Grading modulus	0,71

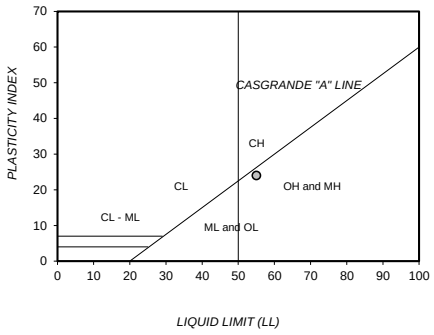
Atter-berg Limits	
Liquid Limit	55
Plasticity Index	24
Linear Shrinkage	12,9
PI < 0.075	-

Unified Soil Classification	SM
U.S. Highway Classification	A-7-5 (5)

POTENTIAL EXPANSIVENES

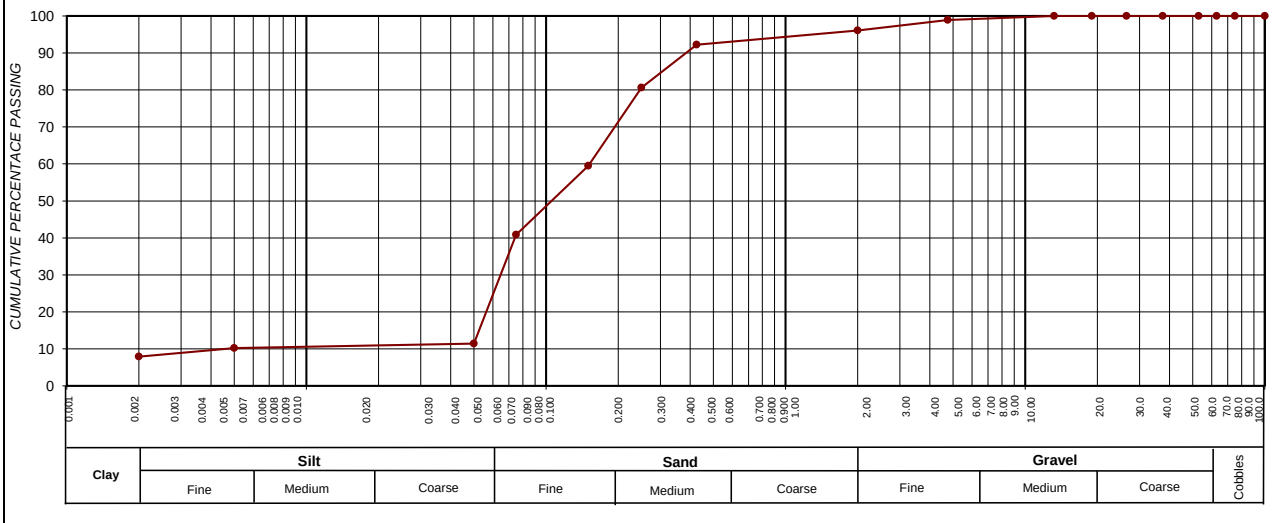


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
7,9	10,1	78,1	3,9

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PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 234
LAYER : 0.5-1.6
SAMPLE No. : B15151
SAMPLE DESCRIPTION : Dark Olive Weathered Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**1,3**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	99
28,0	96
20,0	83
14,0	82
5,00	60
2,000	43
0,425	26
0,250	17
0,150	16
0,075	15
50 µm	1
5 µm	1
2 µm	0,8

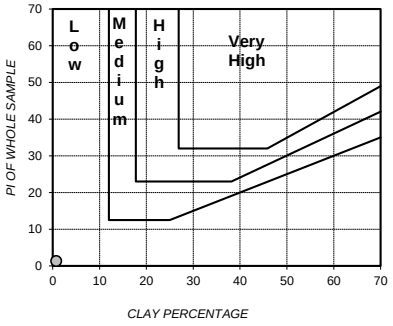
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	40
0.425 - 0.250	20
0.250 - 0.150	3
0.150 - 0.075	2
< 0.075	36

Effective size	0,065
Uniformity Coefficient	79,5
Curvature Coefficient	1,8
Oversize Index	1,1
Shrinkage Product	68,8
Grading Coefficient	31,4
Grading modulus	2,15

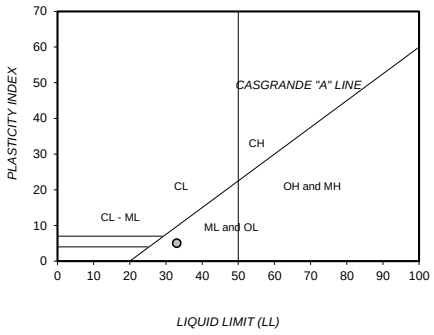
Atter-berg Limits	
Liquid Limit	33
Plasticity Index	5
Linear Shrinkage	2,6
PI < 0.075	-

Unified Soil Classification	SM
U.S. Highway Classification	A-1-a (0)

POTENTIAL EXPANSIVENES

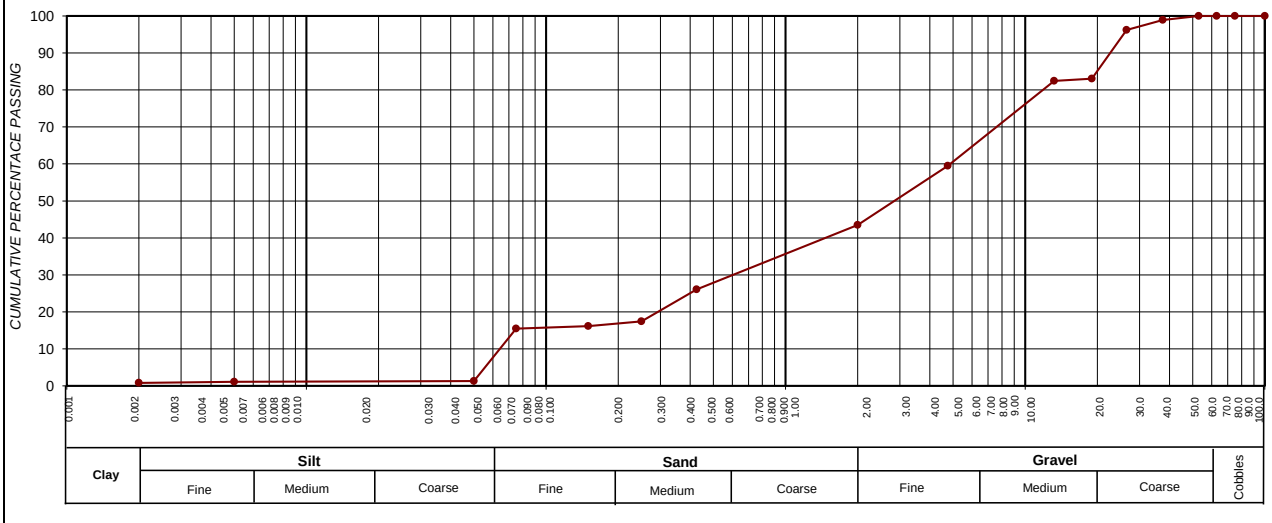


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
0,8	3,8	38,9	56,5

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 244
LAYER : 0.8-3.2
SAMPLE No. : B15152
SAMPLE DESCRIPTION : Pale Olive Gravelly Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**2,2**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)

100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	93
2,000	58
0,425	17
0,250	14
0,150	11
0,075	9
50 µm	1
5 µm	1
2 µm	0,4

Soil Mortar Analysis % < 2,00mm

2.000 - 0.425	70
0.425 - 0.250	6
0.250 - 0.150	5
0.150 - 0.075	4
< 0.075	16

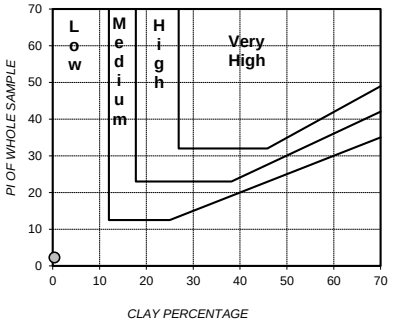
Effective size	0,109
Uniformity Coefficient	20,1
Curvature Coefficient	3,5
Oversize Index	0,0
Shrinkage Product	122,4
Grading Coefficient	39,4
Grading modulus	2,16

Atter-berg Limits

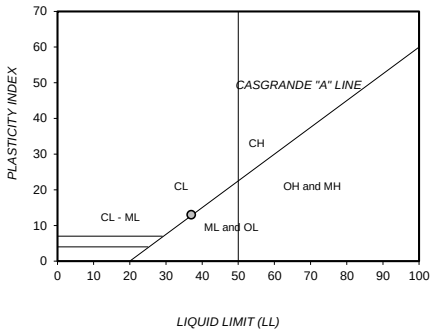
Liquid Limit	37
Plasticity Index	13
Linear Shrinkage	7,1
PI < 0.075	-

Unified Soil Classification	SC
U.S. Highway Classification	A-2-6 (0)

POTENTIAL EXPANSIVENES

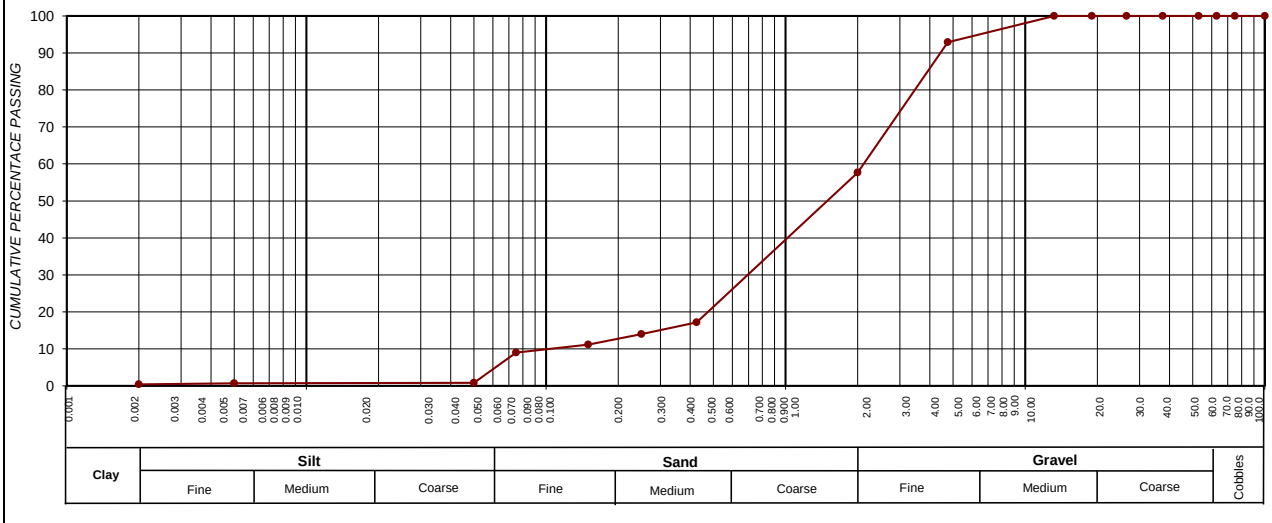


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
0,4	2,2	55,0	42,4

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 207
LAYER : 0.6-2.4
SAMPLE No. : B15207
SAMPLE DESCRIPTION : Silty Sand Colluvium

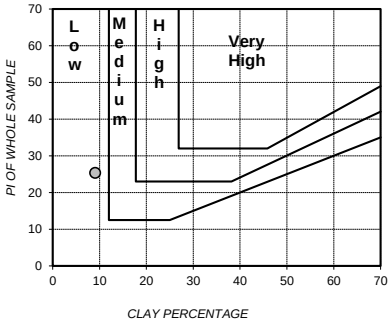
FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**25,4**	**Specifc Gravity**	**2,35**

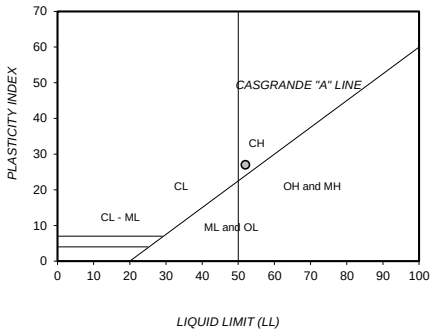
Sieve analysis Cumulative percentage passing (mm)

100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	96
5,00	96
2,000	95
0,425	94
0,250	92
0,150	86
0,075	71
50 µm	14
5 µm	12
2 µm	9,1

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2,00mm

2.000 - 0.425	1
0.425 - 0.250	2
0.250 - 0.150	7
0.150 - 0.075	15
< 0.075	75

Effective size	0,003
Uniformity Coefficient	24,6
Curvature Coefficient	16,2
Oversize Index	0,0
Shrinkage Product	1294,9
Grading Coefficient	4,8
Grading modulus	0,40

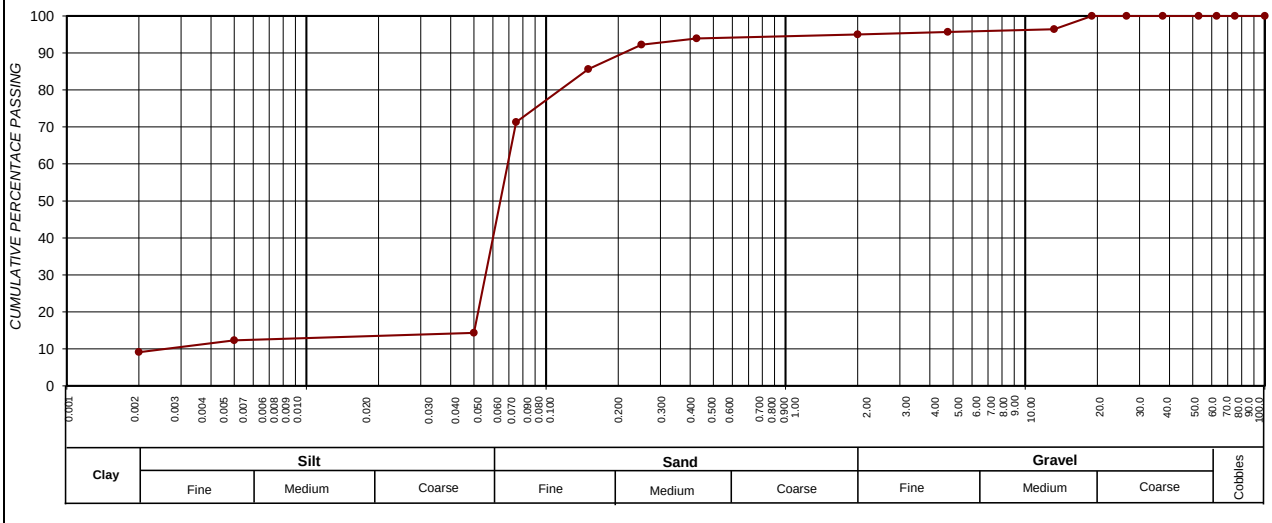
Atter-berg Limits

Liquid Limit	52
Plasticity Index	27
Linear Shrinkage	13,8
PI < 0.075	-

Unified Soil Classification	CH
U.S. Highway Classification	A-7-6 (19)

PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
9,1	19,4	66,5	5,0

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CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 254
LAYER : 0.8-3.0
SAMPLE No. : B15218
SAMPLE DESCRIPTION : Silty Clay Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**28,3**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)

100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	96
5,00	94
2,000	93
0,425	91
0,250	85
0,150	74
0,075	56
50 µm	19
5 µm	16
2 µm	14,3

Soil Mortar Analysis % < 2,00mm

2.000 - 0.425	2
0.425 - 0.250	7
0.250 - 0.150	12
0.150 - 0.075	20
< 0.075	60

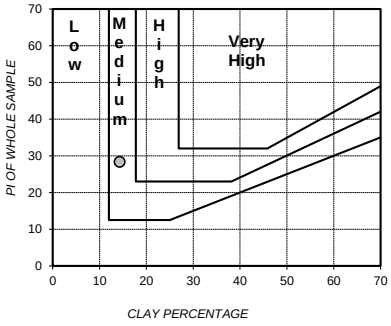
Effective size	0,002
Uniformity Coefficient	46,4
Curvature Coefficient	17,9
Oversize Index	0,0
Shrinkage Product	1510,0
Grading Coefficient	6,5
Grading modulus	0,59

Atter-berg Limits

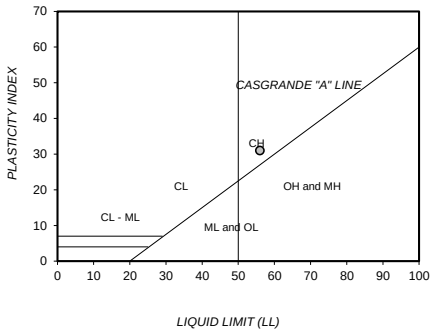
Liquid Limit	56
Plasticity Index	31
Linear Shrinkage	16,5
PI < 0.075	-

Unified Soil Classification	CH
U.S. Highway Classification	A-7-6 (14)

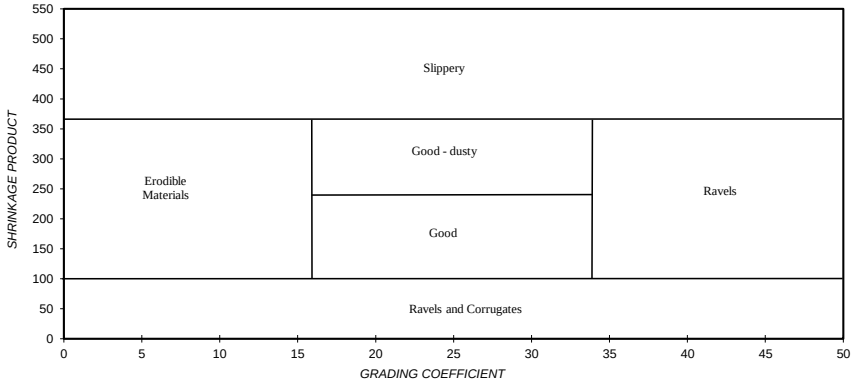
POTENTIAL EXPANSIVENES



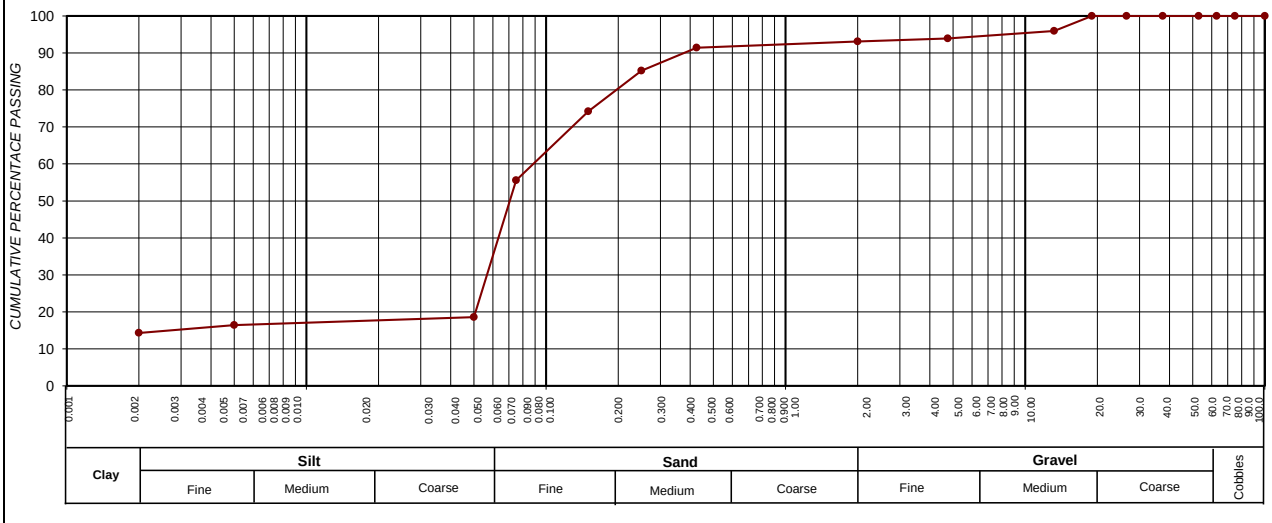
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
14,3	14,1	64,7	6,9

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

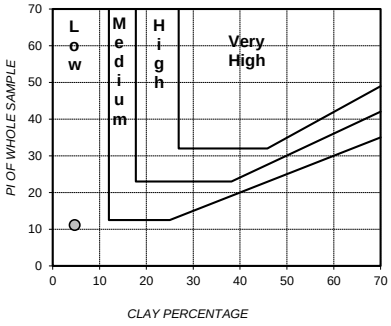
DATE RECEIVED : 11.11.2024
POSITION : TP 256
LAYER : 1.1-2.6
SAMPLE No. : B15153
SAMPLE DESCRIPTION : Light Grey Sand Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

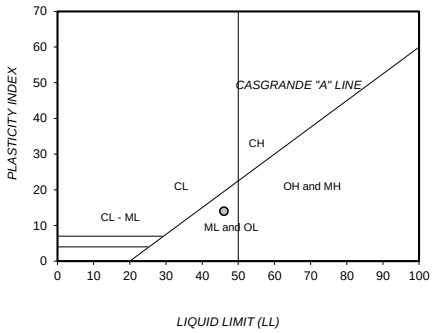
Weighted PI	**11,1**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	94
0,425	79
0,250	78
0,150	75
0,075	68
50 µm	7
5 µm	6
2 µm	4,7

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	15
0.425 - 0.250	1
0.250 - 0.150	3
0.150 - 0.075	7
< 0.075	73

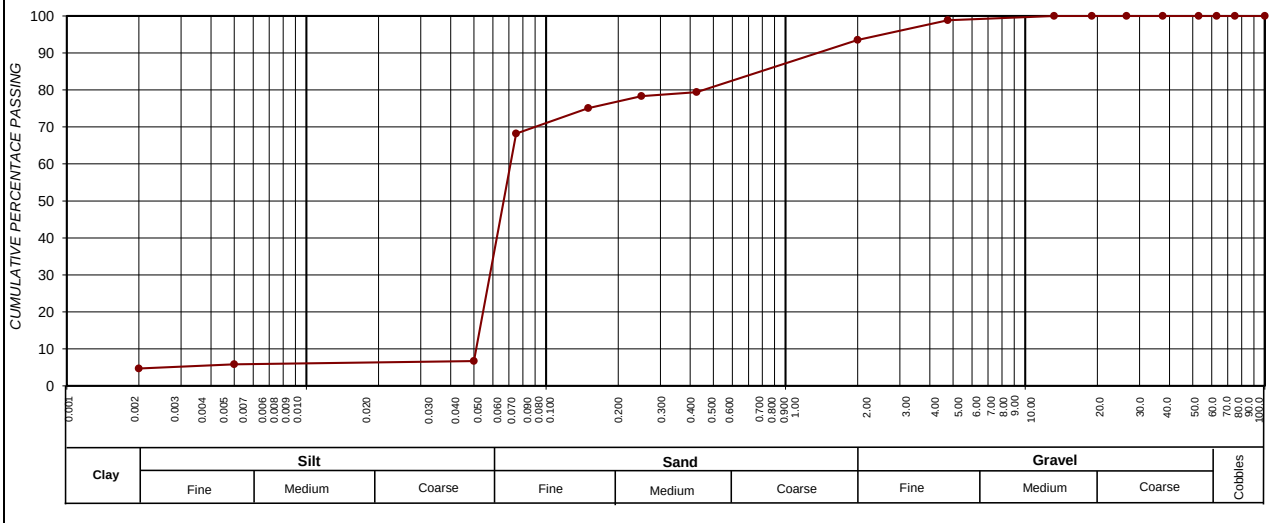
Effective size	0,051
Uniformity Coefficient	1,4
Curvature Coefficient	1,0
Oversize Index	0,0
Shrinkage Product	655,1
Grading Coefficient	6,4
Grading modulus	0,59

Atter-berg Limits	
Liquid Limit	46
Plasticity Index	14
Linear Shrinkage	8,3
PI < 0.075	-

Unified Soil Classification	ML
U.S. Highway Classification	A-7-5 (10)

PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
4,7	16,9	71,9	6,5

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP260
LAYER : 0.3-0.80
SAMPLE No. : B15383
SAMPLE DESCRIPTION : Dark Brown Clay Silty Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**29,5**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	96
0,425	92
0,250	90
0,150	77
0,075	70
50 µm	14
5 µm	12
2 µm	10,4

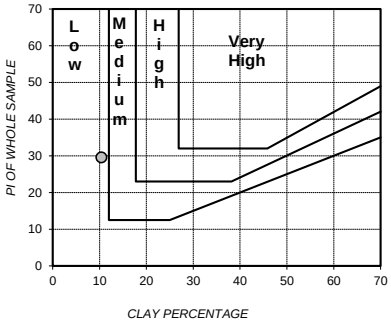
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	4
0.425 - 0.250	2
0.250 - 0.150	13
0.150 - 0.075	7
< 0.075	73

Effective size	0,002
Uniformity Coefficient	35,2
Curvature Coefficient	23,1
Oversize Index	0,0
Shrinkage Product	1540,9
Grading Coefficient	3,6
Grading modulus	0,41

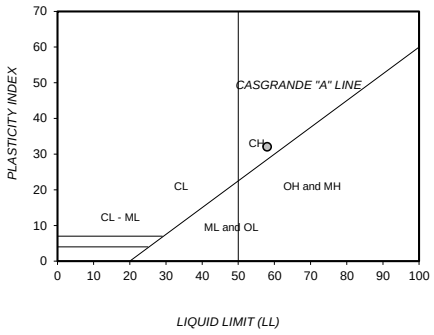
Atter-berg Limits	
Liquid Limit	58
Plasticity Index	32
Linear Shrinkage	16,7
PI < 0.075	-

Unified Soil Classification	CH
U.S. Highway Classification	A-7-6 (22)

POTENTIAL EXPANSIVENES

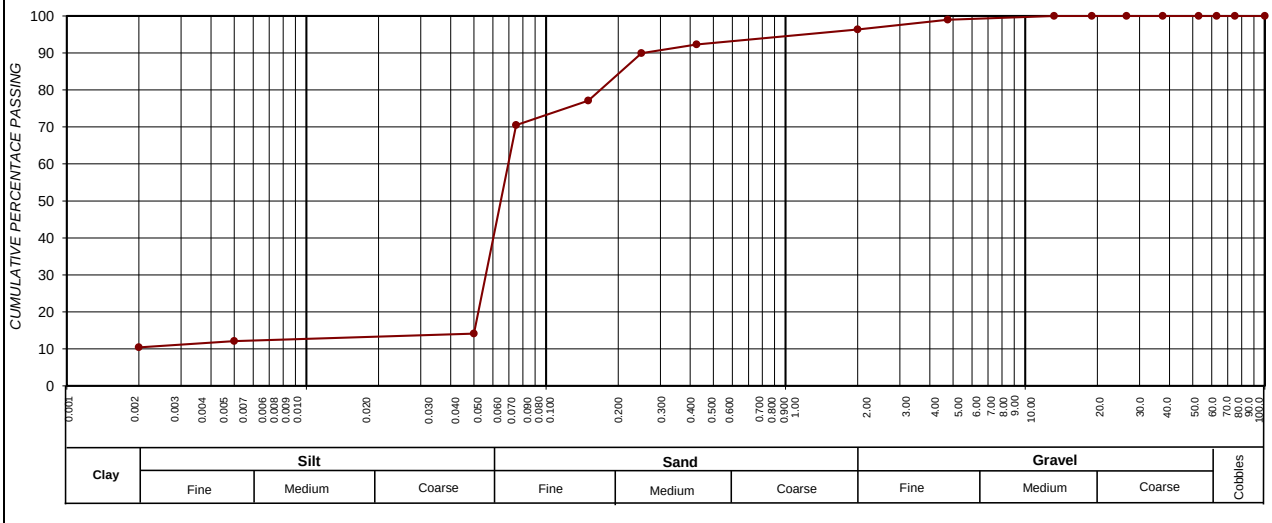


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
10,4	17,9	68,0	3,6

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PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 264
LAYER : 0.8-1.3
SAMPLE No. : B15210
SAMPLE DESCRIPTION : Silty Sand Restored Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**22,4**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	97
0,425	93
0,250	91
0,150	87
0,075	76
50 µm	11
5 µm	10
2 µm	6,6

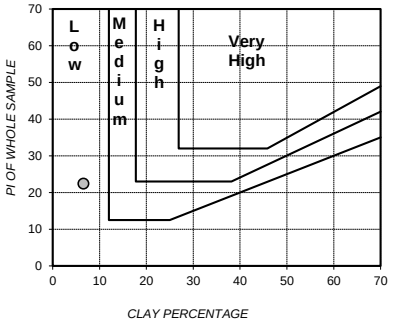
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	4
0.425 - 0.250	2
0.250 - 0.150	4
0.150 - 0.075	11
< 0.075	78

Effective size	0,011
Uniformity Coefficient	6,0
Curvature Coefficient	4,2
Oversize Index	0,0
Shrinkage Product	1089,8
Grading Coefficient	2,6
Grading modulus	0,33

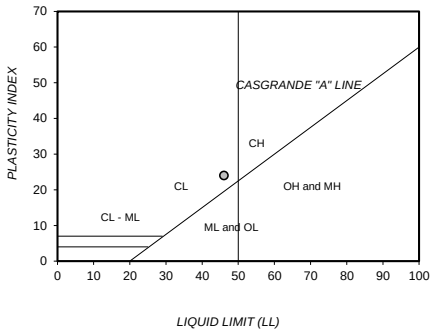
Atter-berg Limits	
Liquid Limit	46
Plasticity Index	24
Linear Shrinkage	11,7
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-7-6 (18)

POTENTIAL EXPANSIVENES

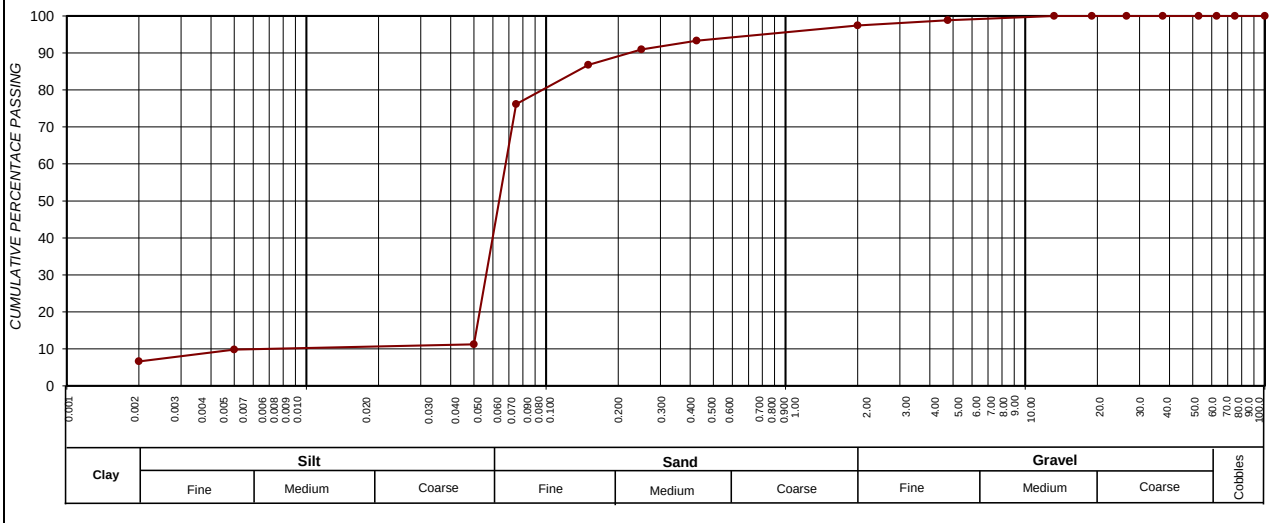


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
6,6	20,3	70,6	2,6

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CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 655
LAYER : 0.5-1.7
SAMPLE No. : B15228
SAMPLE DESCRIPTION : Silty Sand+ Residual Sandstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**5,3**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	97
0,425	89
0,250	85
0,150	78
0,075	58
50 µm	3
5 µm	2
2 µm	0,9

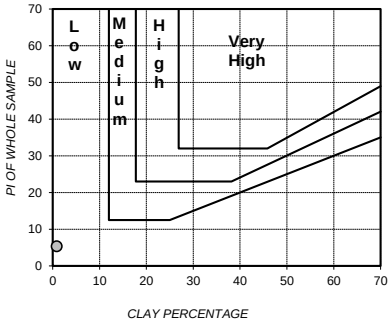
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	8
0.425 - 0.250	4
0.250 - 0.150	8
0.150 - 0.075	20
< 0.075	60

Effective size	0,053
Uniformity Coefficient	1,5
Curvature Coefficient	0,9
Oversize Index	0,0
Shrinkage Product	293,5
Grading Coefficient	3,3
Grading modulus	0,56

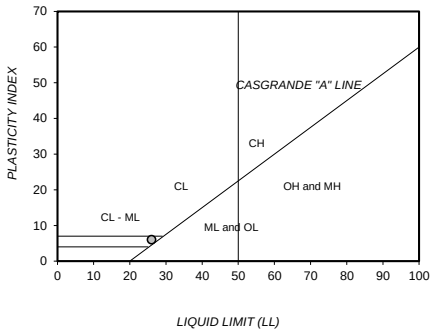
Atter-berg Limits	
Liquid Limit	26
Plasticity Index	6
Linear Shrinkage	3,3
PI < 0.075	-

Unified Soil Classification	CL & ML
U.S. Highway Classification	A-4 (1)

POTENTIAL EXPANSIVENES

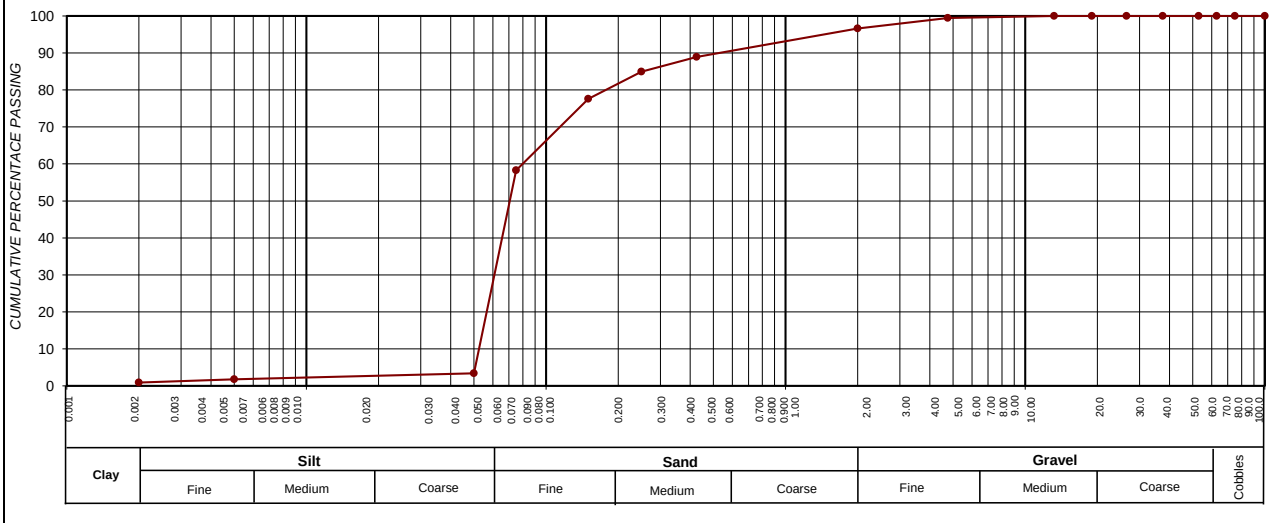


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
0,9	14,7	81,1	3,4

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 271
LAYER : 0.6-1.4
SAMPLE No. : B15857
SAMPLE DESCRIPTION : Silty Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**7,0**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	96
0,425	87
0,250	83
0,150	76
0,075	57
50 µm	4
5 µm	2
2 µm	0,9

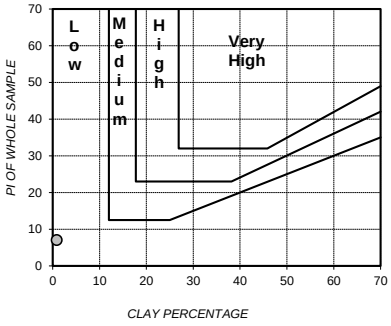
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	8
0.425 - 0.250	4
0.250 - 0.150	8
0.150 - 0.075	20
< 0.075	60

Effective size	0,053
Uniformity Coefficient	1,6
Curvature Coefficient	0,9
Oversize Index	0,0
Shrinkage Product	471,9
Grading Coefficient	4,5
Grading modulus	0,60

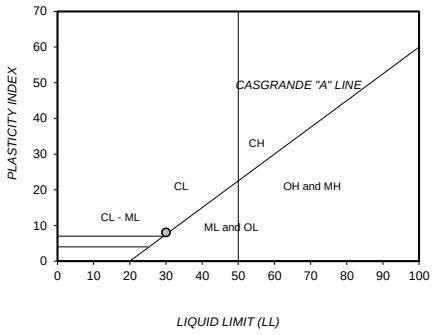
Atter-berg Limits	
Liquid Limit	30
Plasticity Index	8
Linear Shrinkage	5,4
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-4 (2)

POTENTIAL EXPANSIVENES

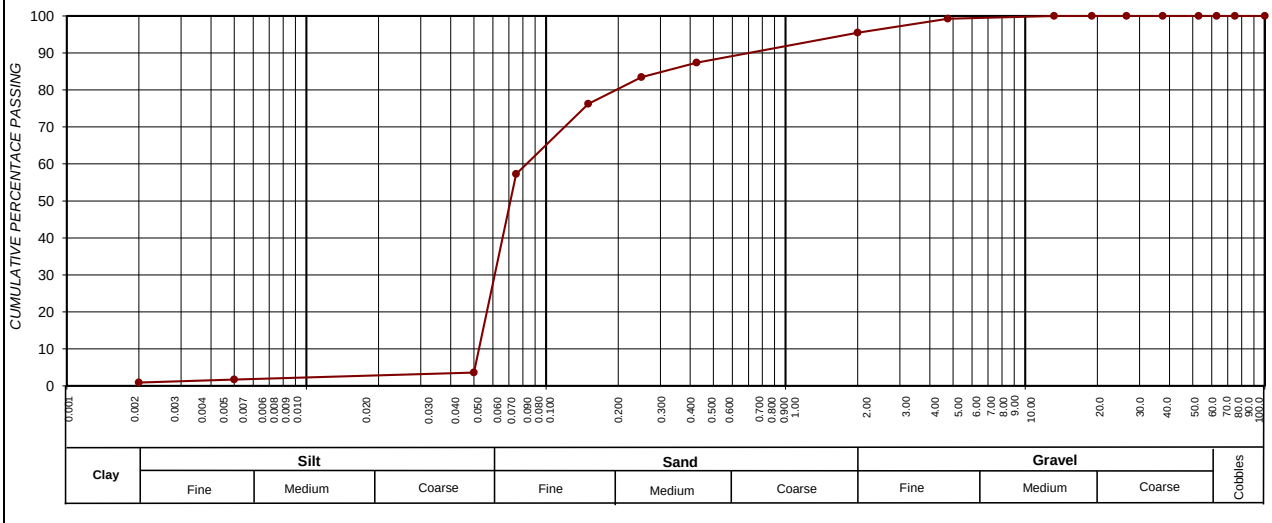


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
0,9	14,8	79,8	4,5

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PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 272
LAYER : 2.5-3.1
SAMPLE No. : B15154
SAMPLE DESCRIPTION : Clayey Sand,Residual Mudstone /Sandstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**25,2**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	100
2,000	99
0,425	97
0,250	89
0,150	78
0,075	58
50 µm	12
5 µm	10
2 µm	6,2

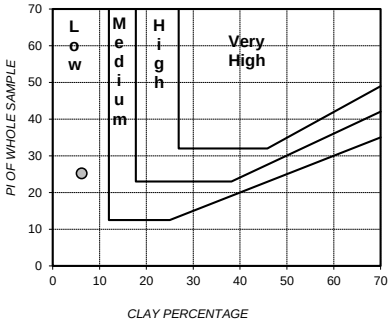
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	2
0.425 - 0.250	8
0.250 - 0.150	10
0.150 - 0.075	21
< 0.075	59

Effective size	0,005
Uniformity Coefficient	16,7
Curvature Coefficient	8,8
Oversize Index	0,0
Shrinkage Product	1245,7
Grading Coefficient	1,1
Grading modulus	0,46

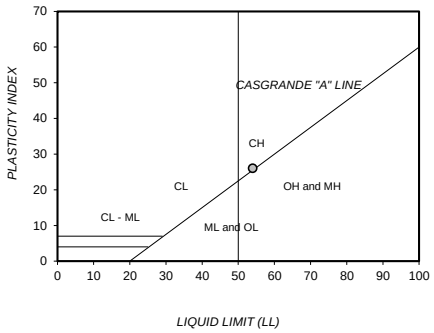
Atter-berg Limits	
Liquid Limit	54
Plasticity Index	26
Linear Shrinkage	12,9
PI < 0.075	-

Unified Soil Classification	CH
U.S. Highway Classification	A-7-6 (13)

POTENTIAL EXPANSIVENES

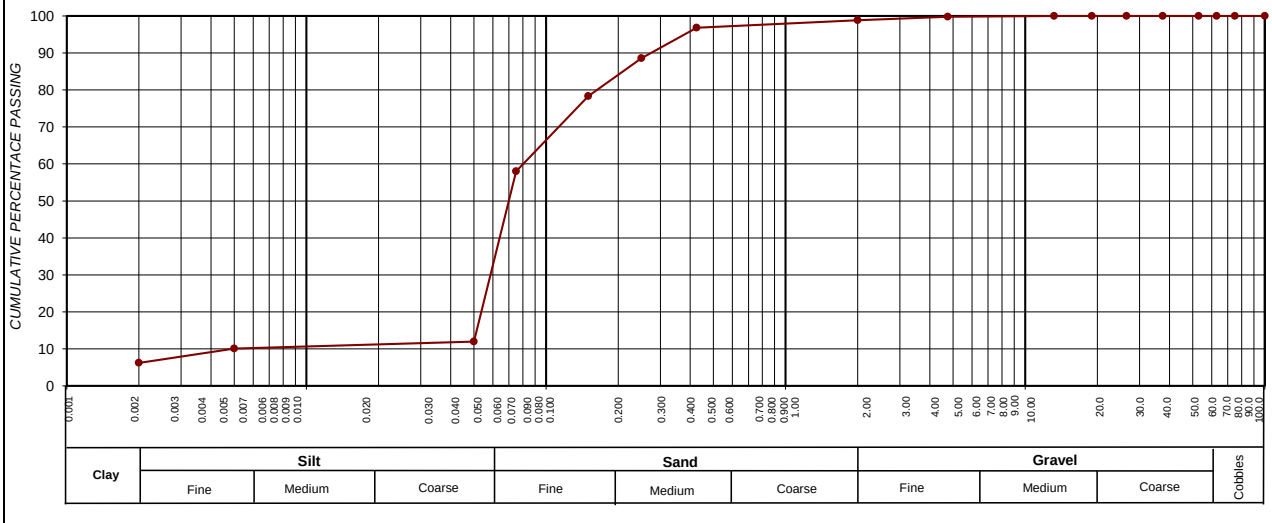


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
6,2	16,4	76,2	1,1

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DATE RECEIVED : 11.11.2024
POSITION : TP 277
LAYER : 1.4-3.2
SAMPLE No. : B15155
SAMPLE DESCRIPTION : Sandy Clay

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**16,7**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	100
2,000	99
0,425	93
0,250	91
0,150	86
0,075	72
50 µm	11
5 µm	9
2 µm	6,5

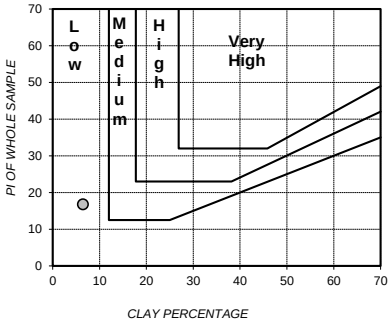
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	6
0.425 - 0.250	2
0.250 - 0.150	5
0.150 - 0.075	14
< 0.075	74

Effective size	0,025
Uniformity Coefficient	2,8
Curvature Coefficient	1,9
Oversize Index	0,0
Shrinkage Product	952,3
Grading Coefficient	1,4
Grading modulus	0,36

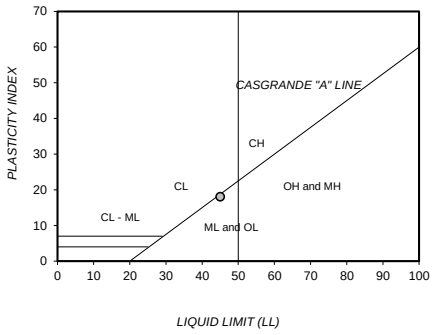
Atter-berg Limits	
Liquid Limit	45
Plasticity Index	18
Linear Shrinkage	10,2
PI < 0.075	-

Unified Soil Classification	ML
U.S. Highway Classification	A-7-6 (13)

POTENTIAL EXPANSIVENES

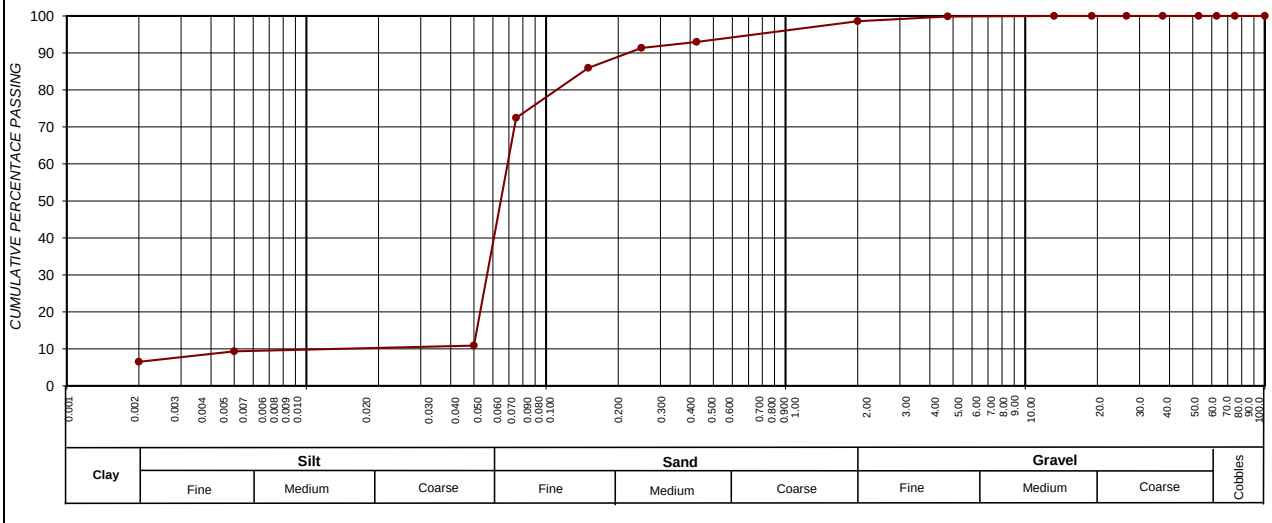


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
6,5	19,1	72,9	1,4

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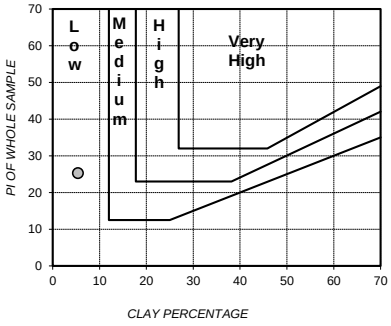
DATE RECEIVED : 11.11.2024
POSITION : TP 293
LAYER : 0.2-0.7
SAMPLE No. : B15209
SAMPLE DESCRIPTION : Silty Sand Colluvium

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

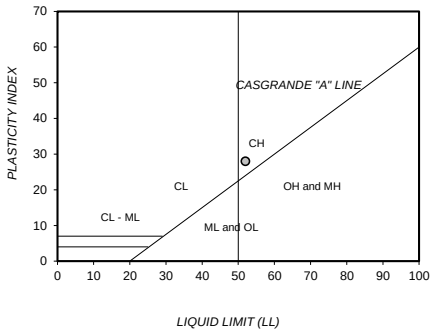
Weighted PI	**25,3**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	100
2,000	98
0,425	90
0,250	86
0,150	80
0,075	71
50 µm	11
5 µm	10
2 µm	5,4

POTENTIAL EXPANSIVENES



PLASTICITY CHART



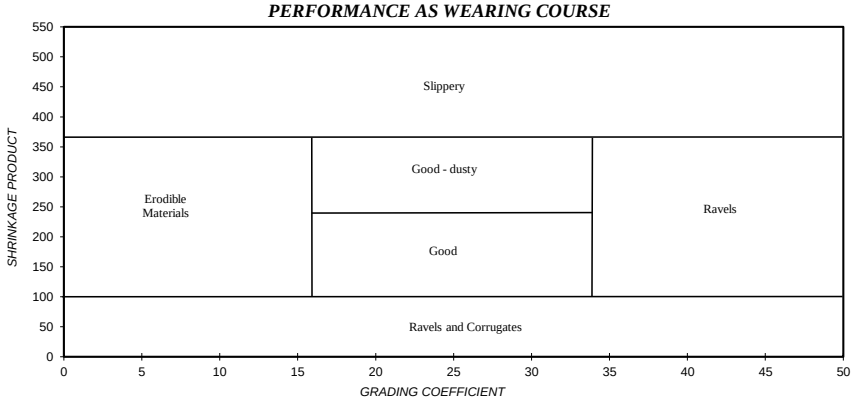
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	8
0.425 - 0.250	5
0.250 - 0.150	6
0.150 - 0.075	10
< 0.075	73

Effective size	0,022
Uniformity Coefficient	3,2
Curvature Coefficient	2,1
Oversize Index	0,0
Shrinkage Product	1220,4
Grading Coefficient	2,4
Grading modulus	0,41

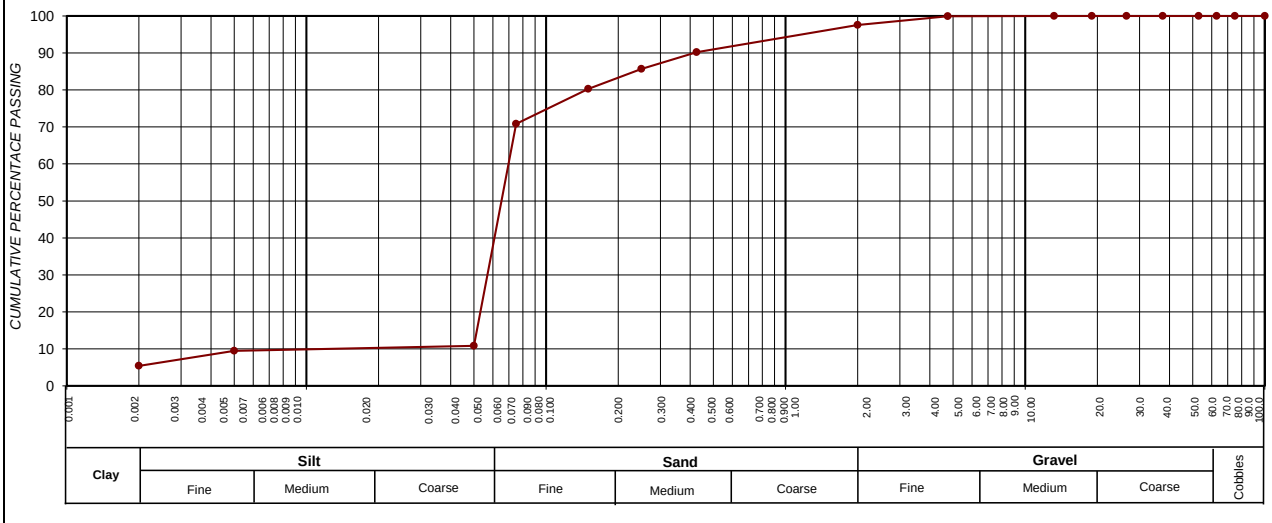
Atter-berg Limits	
Liquid Limit	52
Plasticity Index	28
Linear Shrinkage	13,5
PI < 0.075	-

Unified Soil Classification	CH
U.S. Highway Classification	A-7-6 (19)

PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
5,4	20,0	72,1	2,4

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PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 296
LAYER : 1.7-2.5
SAMPLE No. : B15858
SAMPLE DESCRIPTION : Gravelly Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**3,0**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)

100,0	100
75,0	100
63,0	98
50,0	95
37,5	92
28,0	90
20,0	84
14,0	84
5,00	82
2,000	79
0,425	76
0,250	56
0,150	35
0,075	19
50 µm	3
5 µm	2
2 µm	1,6

Soil Mortar Analysis % < 2,00mm

2.000 - 0.425	4
0.425 - 0.250	26
0.250 - 0.150	26
0.150 - 0.075	19
< 0.075	25

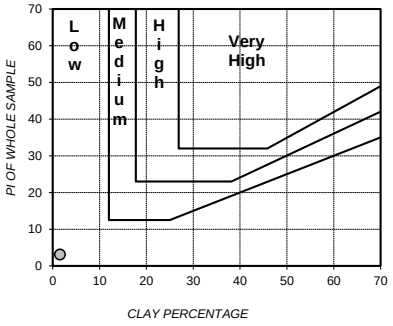
Effective size	0,061
Uniformity Coefficient	4,7
Curvature Coefficient	0,9
Oversize Index	7,9
Shrinkage Product	263,5
Grading Coefficient	8,3
Grading modulus	1,25

Atter-berg Limits

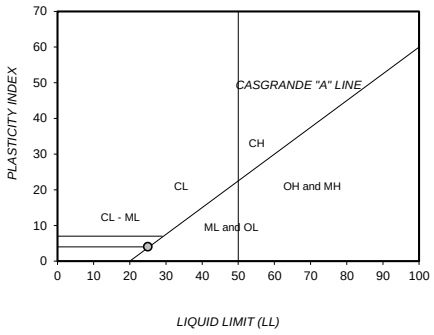
Liquid Limit	25
Plasticity Index	4
Linear Shrinkage	3,5
PI < 0.075	-

Unified Soil Classification	SM & SC
U.S. Highway Classification	A-2-4 (0)

POTENTIAL EXPANSIVENES

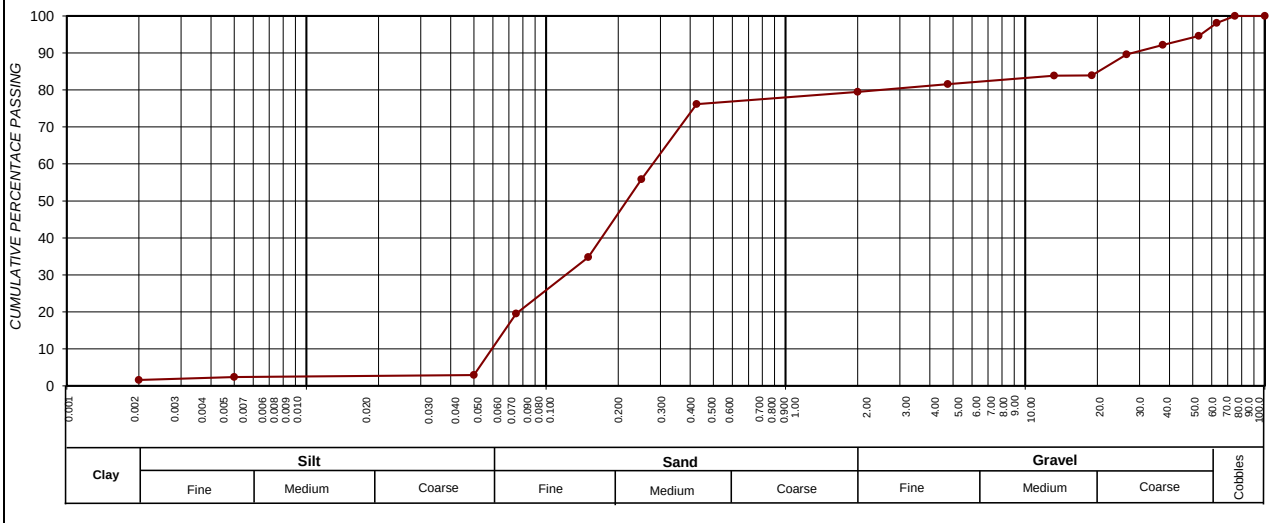


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
1,6	4,0	73,9	20,5

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DATE RECEIVED : 11.11.2024
POSITION : TP 299
LAYER : 0.80-1.70
SAMPLE No. : B15156
SAMPLE DESCRIPTION : Light Grey Mudstone Gravel

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**2,9**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	99
28,0	95
20,0	93
14,0	93
5,00	72
2,000	47
0,425	29
0,250	24
0,150	20
0,075	17
50 µm	1
5 µm	1
2 µm	0,3

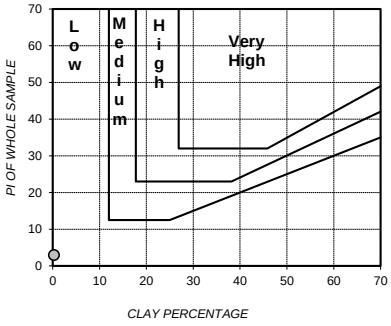
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	37
0.425 - 0.250	12
0.250 - 0.150	8
0.150 - 0.075	6
< 0.075	36

Effective size	0,064
Uniformity Coefficient	55,7
Curvature Coefficient	1,1
Oversize Index	0,6
Shrinkage Product	158,4
Grading Coefficient	35,0
Grading modulus	2,07

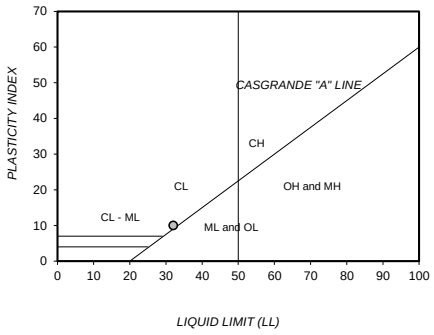
Atter-berg Limits	
Liquid Limit	32
Plasticity Index	10
Linear Shrinkage	5,4
PI < 0.075	-

Unified Soil Classification	SC
U.S. Highway Classification	A-2-4 (0)

POTENTIAL EXPANSIVENES

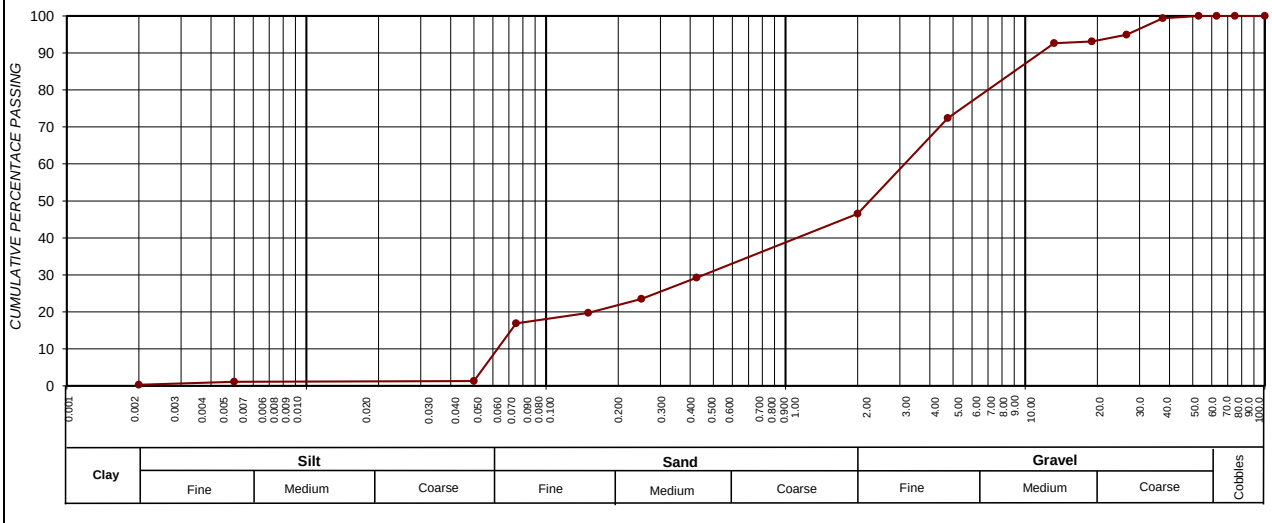


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
0,3	4,6	41,6	53,4

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PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 311
LAYER : 1.0-2.5
SAMPLE No. : B15157
SAMPLE DESCRIPTION : Dark Olive Weathered Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**0,9**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	99
28,0	95
20,0	77
14,0	75
5,00	28
2,000	13
0,425	7
0,250	6
0,150	5
0,075	4
50 µm	1
5 µm	0
2 µm	0,1

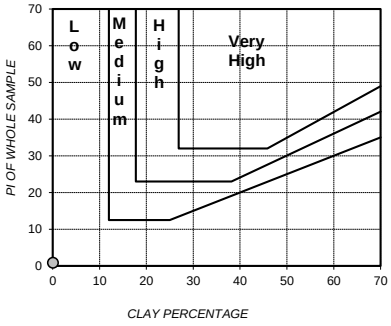
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	47
0.425 - 0.250	7
0.250 - 0.150	8
0.150 - 0.075	12
< 0.075	26

Effective size	1,139
Uniformity Coefficient	9,8
Curvature Coefficient	2,3
Oversize Index	0,9
Shrinkage Product	42,7
Grading Coefficient	22,8
Grading modulus	2,75

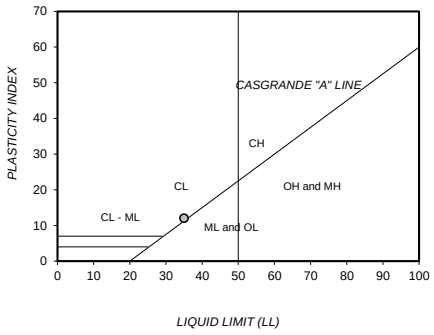
Atter-berg Limits	
Liquid Limit	35
Plasticity Index	12
Linear Shrinkage	6,0
PI < 0.075	-

Unified Soil Classification	GC
U.S. Highway Classification	A-2-6 (0)

POTENTIAL EXPANSIVENES

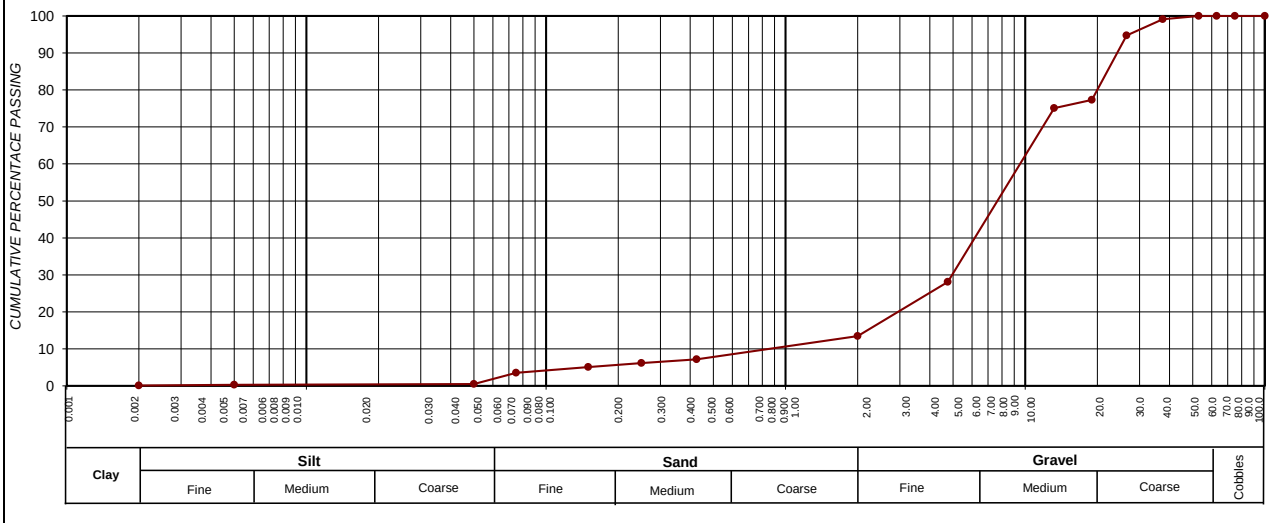


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
0,1	1,2	12,2	86,6

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

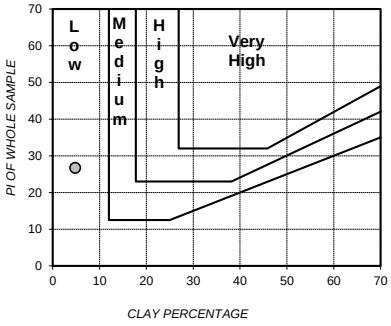
DATE RECEIVED : 11.11.2024
POSITION : TP 315
LAYER : 0.5-1.4
SAMPLE No. : B15371
SAMPLE DESCRIPTION : Silty Sand + Weathered Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

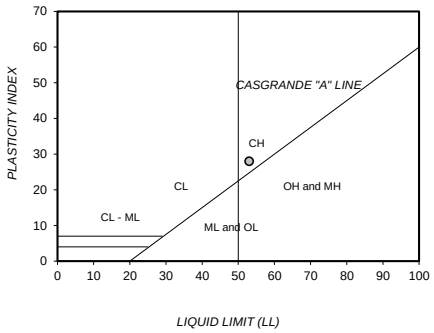
Weighted PI	**26,7**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	100
2,000	100
0,425	95
0,250	94
0,150	90
0,075	82
50 µm	12
5 µm	11
2 µm	4,8

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	4
0.425 - 0.250	2
0.250 - 0.150	4
0.150 - 0.075	8
< 0.075	83

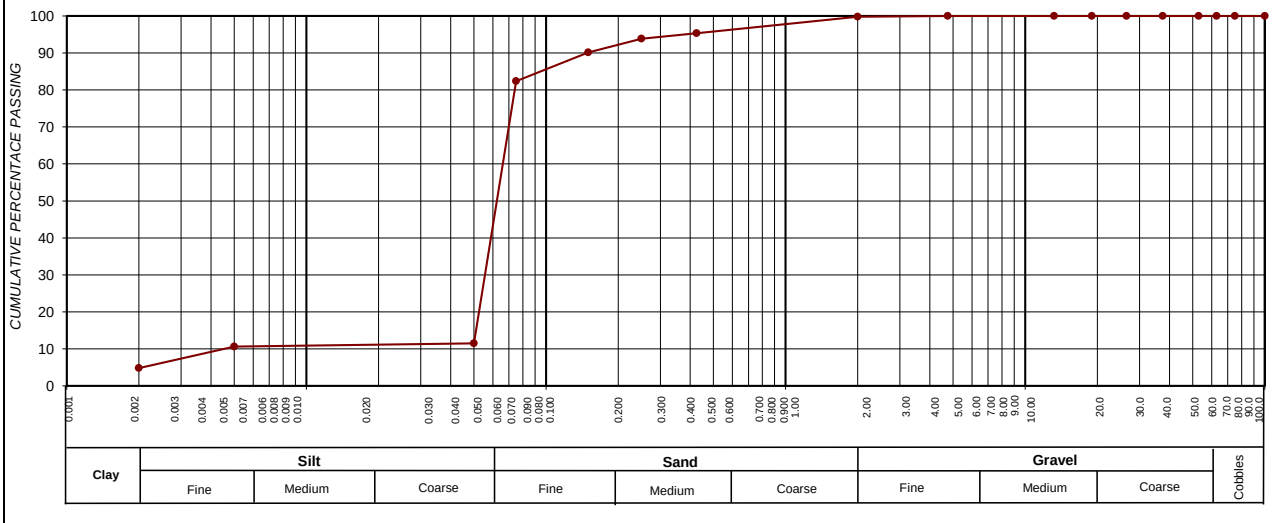
Effective size	0,005
Uniformity Coefficient	14,3
Curvature Coefficient	10,2
Oversize Index	0,0
Shrinkage Product	1264,5
Grading Coefficient	0,2
Grading modulus	0,23

Atter-berg Limits	
Liquid Limit	53
Plasticity Index	28
Linear Shrinkage	13,3
PI < 0.075	-

Unified Soil Classification	CH
U.S. Highway Classification	A-7-6 (25)

PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
4,8	23,9	71,0	0,2

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PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 318
LAYER : 1.4-2.80
SAMPLE No. : B15391
SAMPLE DESCRIPTION : Light Grey Silty Sand Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**8,3**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	97
50,0	93
37,5	92
28,0	89
20,0	81
14,0	81
5,00	80
2,000	78
0,425	76
0,250	75
0,150	72
0,075	69
50 µm	4
5 µm	3
2 µm	1,3

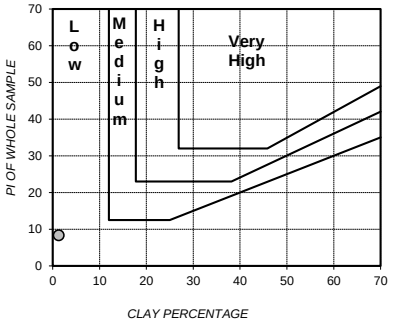
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	3
0.425 - 0.250	1
0.250 - 0.150	3
0.150 - 0.075	4
< 0.075	89

Effective size	0,052
Uniformity Coefficient	1,4
Curvature Coefficient	1,0
Oversize Index	8,0
Shrinkage Product	393,9
Grading Coefficient	8,7
Grading modulus	0,77

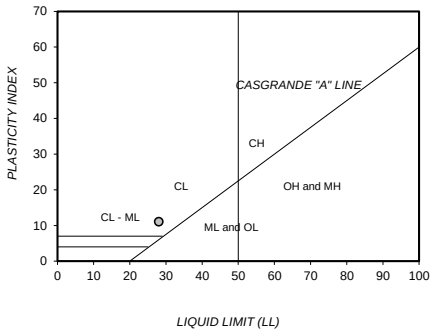
Atter-berg Limits	
Liquid Limit	28
Plasticity Index	11
Linear Shrinkage	5,2
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (5)

POTENTIAL EXPANSIVENES

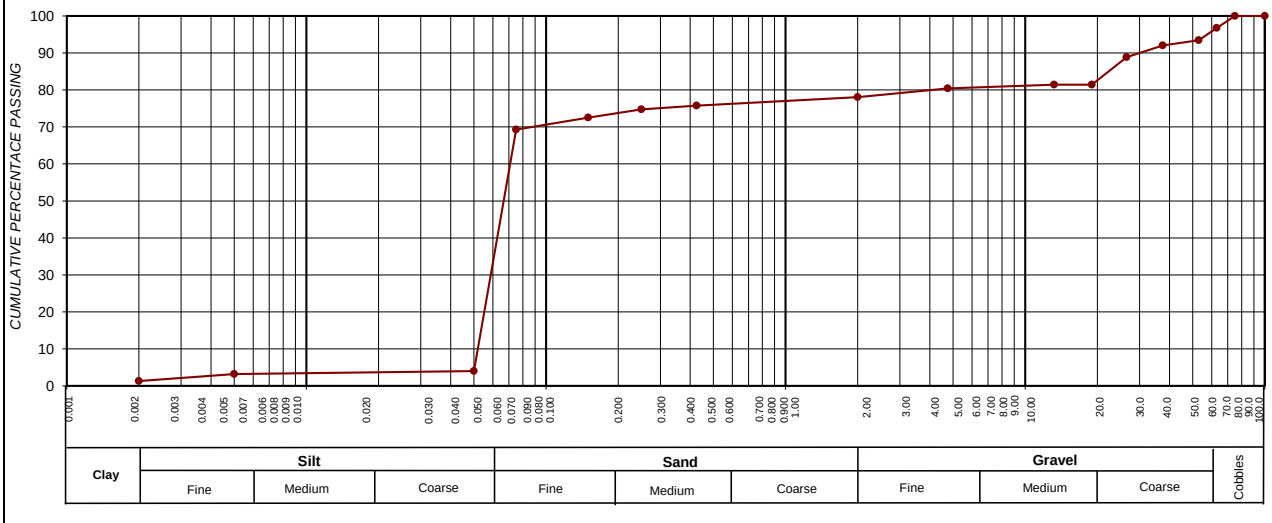


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
1,3	18,5	58,2	22,0

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PROJECT : Xhariep Pipeline Feasibility Study

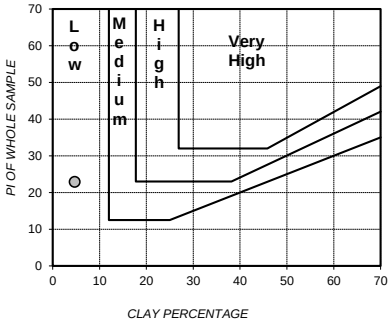
DATE RECEIVED : 11.11.2024
POSITION : TP 329
LAYER : 0.5-1.7
SAMPLE No. : B15212
SAMPLE DESCRIPTION : Silty Sand Weathered Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

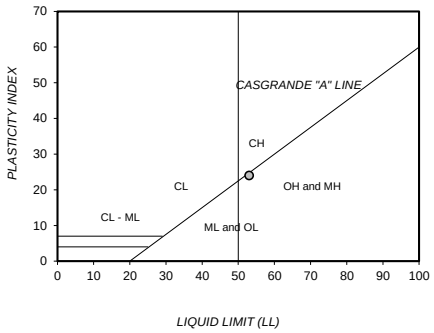
Weighted PI	**22,9**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	100
2,000	99
0,425	95
0,250	95
0,150	92
0,075	85
50 µm	12
5 µm	9
2 µm	4,7

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	3
0.425 - 0.250	1
0.250 - 0.150	2
0.150 - 0.075	8
< 0.075	86

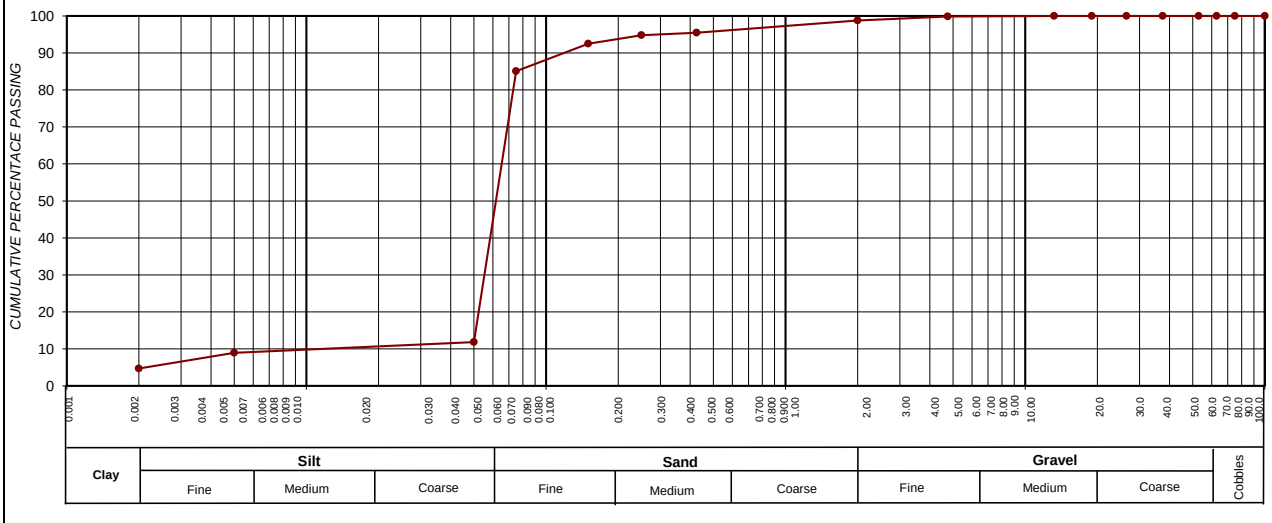
Effective size	0,022
Uniformity Coefficient	3,0
Curvature Coefficient	2,2
Oversize Index	0,0
Shrinkage Product	1235,2
Grading Coefficient	1,2
Grading modulus	0,21

Atter-berg Limits	
Liquid Limit	53
Plasticity Index	24
Linear Shrinkage	12,9
PI < 0.075	-

Unified Soil Classification	MH
U.S. Highway Classification	A-7-6 (23)

PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
4,7	25,7	68,4	1,2

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 337
LAYER : 0,5
SAMPLE No. : B15213
SAMPLE DESCRIPTION : Silty Clayey ,Residual Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**23,8**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	95
0,425	88
0,250	80
0,150	70
0,075	58
50 µm	11
5 µm	10
2 µm	6,2

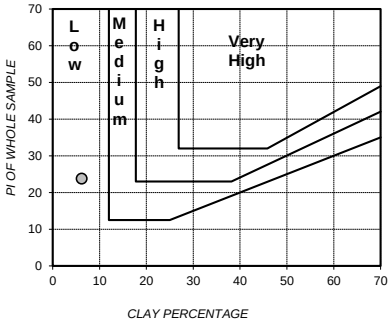
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	8
0.425 - 0.250	8
0.250 - 0.150	11
0.150 - 0.075	12
< 0.075	61

Effective size	0,016
Uniformity Coefficient	5,3
Curvature Coefficient	2,6
Oversize Index	0,0
Shrinkage Product	1156,3
Grading Coefficient	4,7
Grading modulus	0,59

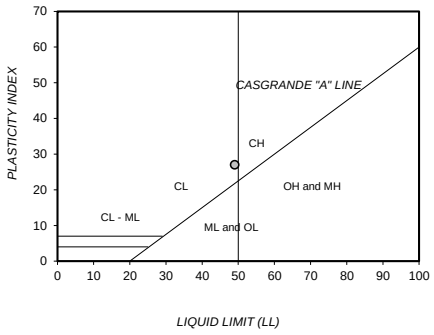
Atter-berg Limits	
Liquid Limit	49
Plasticity Index	27
Linear Shrinkage	13,1
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-7-6 (13)

POTENTIAL EXPANSIVENES

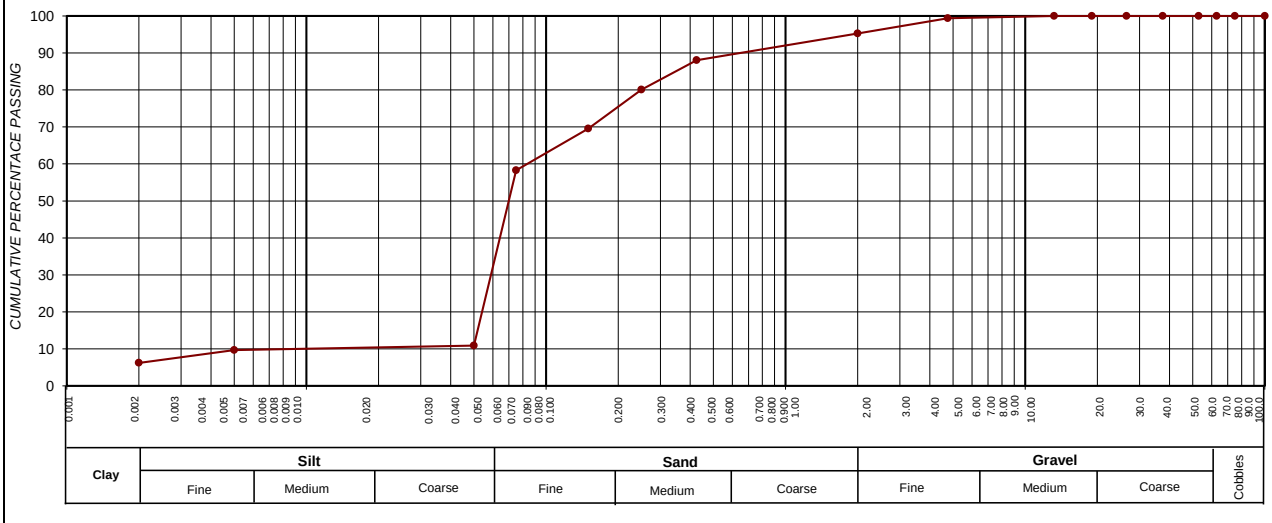


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
6,2	16,1	73,0	4,7

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : GI Xhariep Pipeline

DATE RECEIVED : 11.11.2024
POSITION : TP 343
LAYER : 0.8-1.4
SAMPLE No. : B15162
SAMPLE DESCRIPTION : Silty Clayey Sand,Residual Dolerite

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**4,0**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	95
0,425	67
0,250	59
0,150	47
0,075	34
50 µm	4
5 µm	3
2 µm	1,2

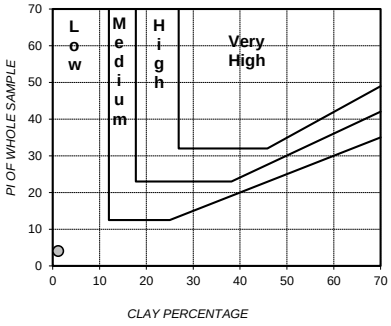
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	30
0.425 - 0.250	8
0.250 - 0.150	12
0.150 - 0.075	13
< 0.075	36

Effective size	0,055
Uniformity Coefficient	5,0
Curvature Coefficient	0,3
Oversize Index	0,0
Shrinkage Product	220,4
Grading Coefficient	4,9
Grading modulus	1,04

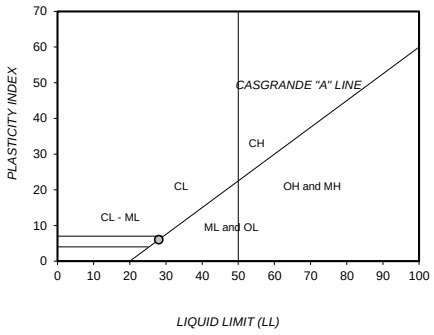
Atter-berg Limits	
Liquid Limit	28
Plasticity Index	6
Linear Shrinkage	3,3
PI < 0.075	-

Unified Soil Classification	SM & SC
U.S. Highway Classification	A-2-4 (0)

POTENTIAL EXPANSIVENES

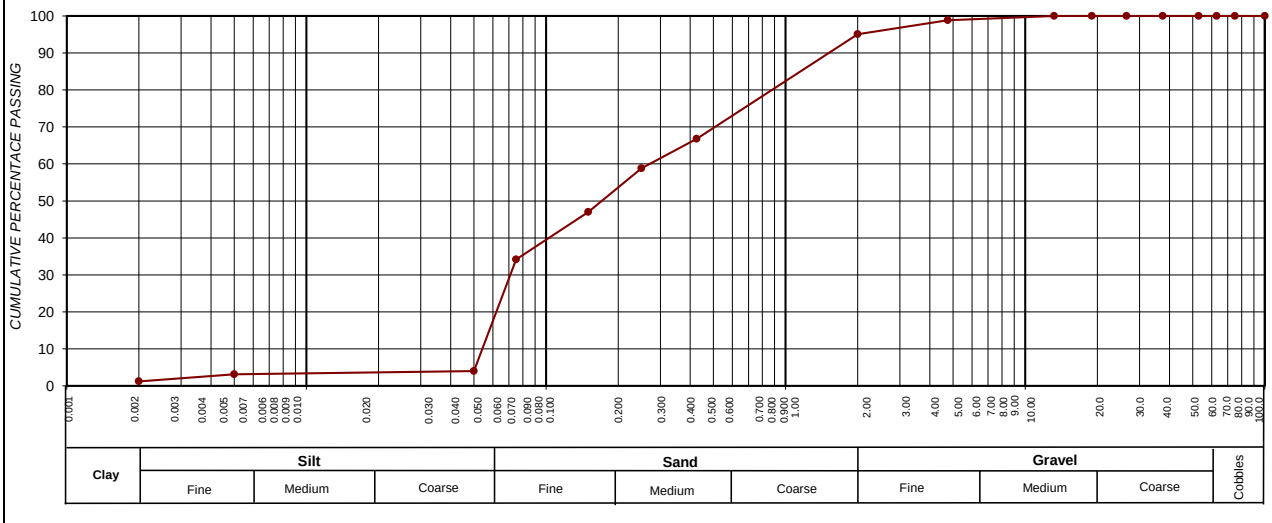


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
1,2	9,3	84,5	5,0

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : GI Xhariep Pipeline

DATE RECEIVED : 11.11.2024
POSITION : TP 344
LAYER : 1.4-2.2
SAMPLE No. : B15163
SAMPLE DESCRIPTION : Silty Sand, Dolerite

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**11,1**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	96
2,000	91
0,425	79
0,250	77
0,150	68
0,075	57
50 µm	6
5 µm	5
2 µm	3,0

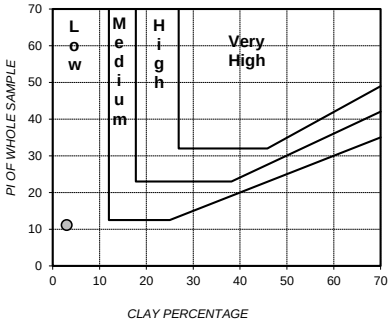
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	13
0.425 - 0.250	3
0.250 - 0.150	9
0.150 - 0.075	12
< 0.075	63

Effective size	0,052
Uniformity Coefficient	1,9
Curvature Coefficient	0,8
Oversize Index	0,0
Shrinkage Product	537,9
Grading Coefficient	8,8
Grading modulus	0,73

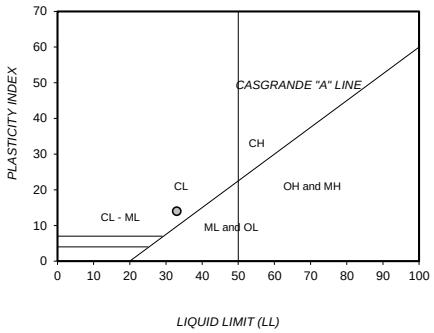
Atter-berg Limits	
Liquid Limit	33
Plasticity Index	14
Linear Shrinkage	6,8
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (5)

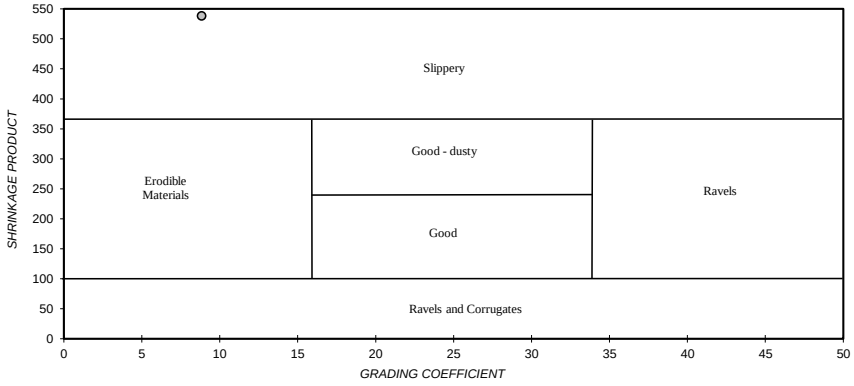
POTENTIAL EXPANSIVENES



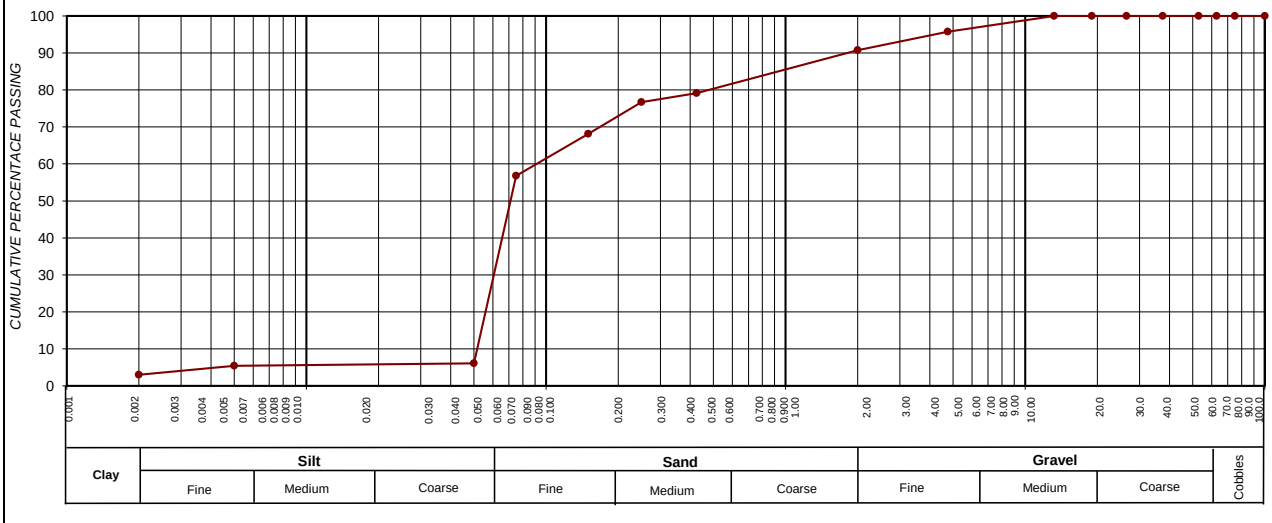
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
3,0	14,9	72,9	9,2

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 346
LAYER : 0.9-1.2
SAMPLE No. : B15164
SAMPLE DESCRIPTION : Brown Silty Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**18,9**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	100
2,000	98
0,425	94
0,250	93
0,150	88
0,075	73
50 µm	11
5 µm	9
2 µm	5,7

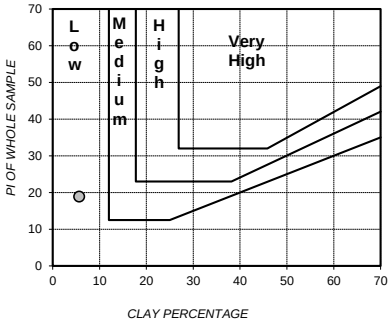
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	4
0.425 - 0.250	1
0.250 - 0.150	5
0.150 - 0.075	15
< 0.075	74

Effective size	0,026
Uniformity Coefficient	2,7
Curvature Coefficient	1,9
Oversize Index	0,0
Shrinkage Product	910,7
Grading Coefficient	2,0
Grading modulus	0,35

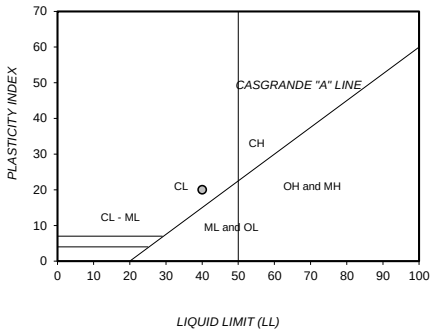
Atter-berg Limits	
Liquid Limit	40
Plasticity Index	20
Linear Shrinkage	9,6
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (13)

POTENTIAL EXPANSIVENES

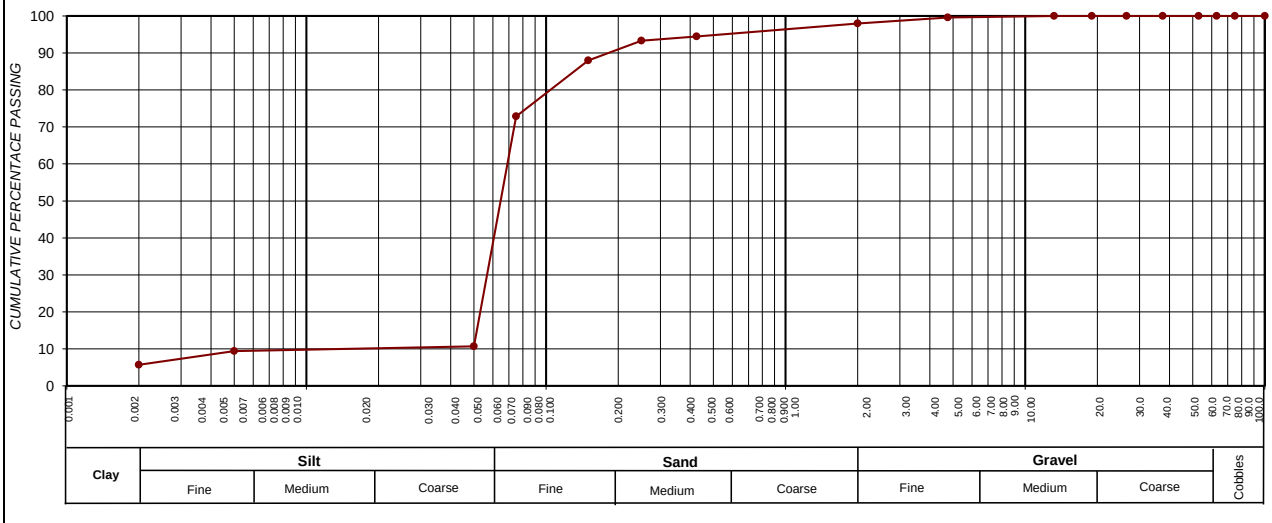


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
5,7	19,9	72,4	2,0

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 358
LAYER : 01-Jan-00
SAMPLE No. : B15387
SAMPLE DESCRIPTION : Light Brown Khaki Silty Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**13,4**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	100
2,000	93
0,425	84
0,250	79
0,150	67
0,075	51
50 µm	7
5 µm	6
2 µm	2,0

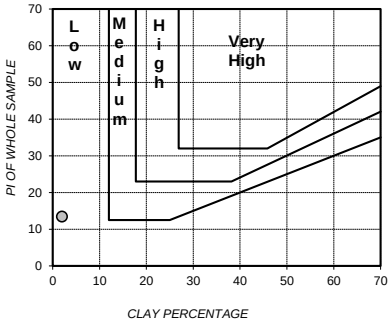
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	10
0.425 - 0.250	5
0.250 - 0.150	13
0.150 - 0.075	16
< 0.075	55

Effective size	0,052
Uniformity Coefficient	2,3
Curvature Coefficient	0,7
Oversize Index	0,0
Shrinkage Product	674,4
Grading Coefficient	6,8
Grading modulus	0,72

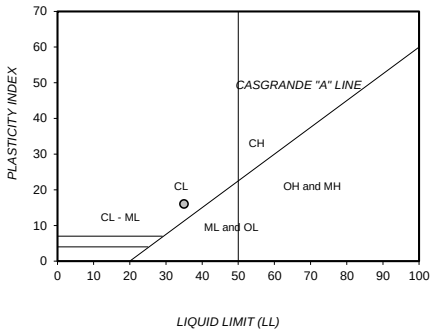
Atter-berg Limits	
Liquid Limit	35
Plasticity Index	16
Linear Shrinkage	8,1
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (5)

POTENTIAL EXPANSIVENES

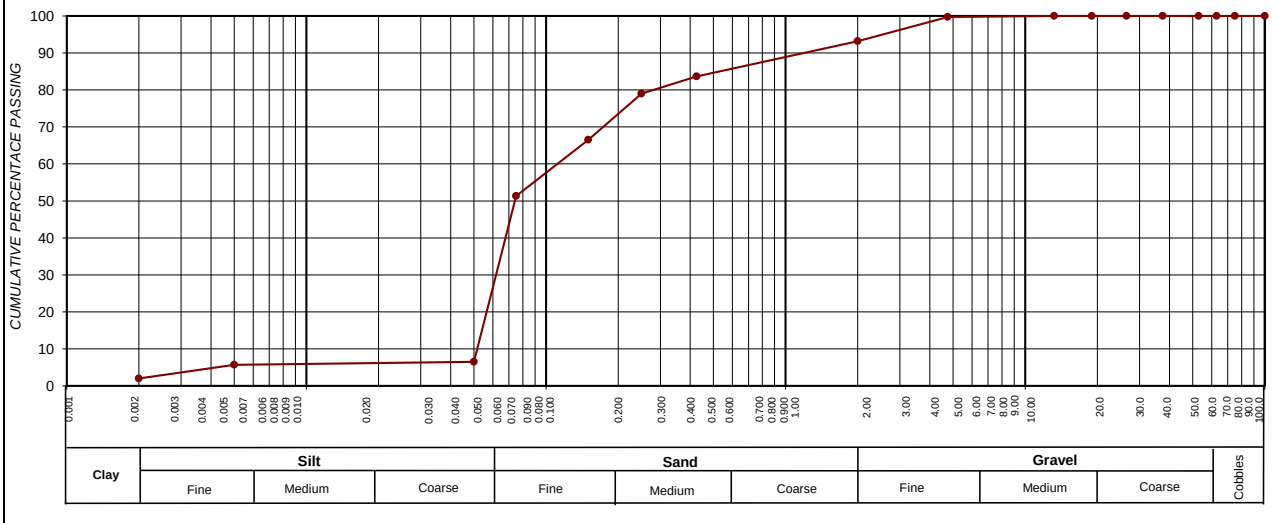


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
2,0	14,3	76,9	6,9

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 364
LAYER : 0.50
SAMPLE No. : B15221
SAMPLE DESCRIPTION : Silty Sand +Residual Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**26,4**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	98
0,425	94
0,250	92
0,150	86
0,075	75
50 µm	13
5 µm	11
2 µm	7,6

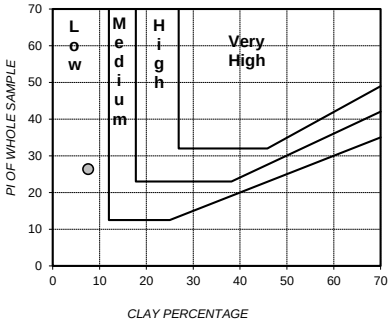
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	4
0.425 - 0.250	2
0.250 - 0.150	6
0.150 - 0.075	11
< 0.075	77

Effective size	0,004
Uniformity Coefficient	16,5
Curvature Coefficient	11,2
Oversize Index	0,0
Shrinkage Product	1503,9
Grading Coefficient	2,0
Grading modulus	0,33

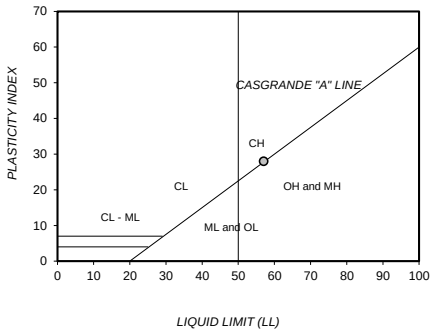
Atter-berg Limits	
Liquid Limit	57
Plasticity Index	28
Linear Shrinkage	16,0
PI < 0.075	-

Unified Soil Classification	CH
U.S. Highway Classification	A-7-6 (22)

POTENTIAL EXPANSIVENES

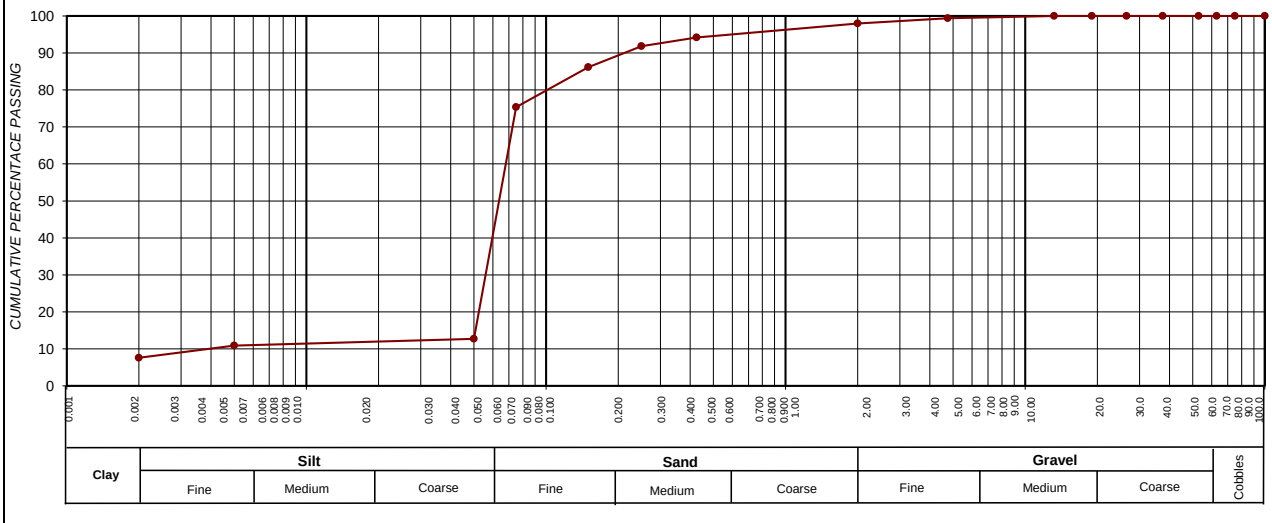


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
7,6	20,8	69,6	2,0

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 365
LAYER : 1.4-3.0
SAMPLE No. : B15165
SAMPLE DESCRIPTION : Silty Clay,Residual Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**12,1**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	97
0,425	93
0,250	91
0,150	85
0,075	70
50 µm	6
5 µm	6
2 µm	4,0

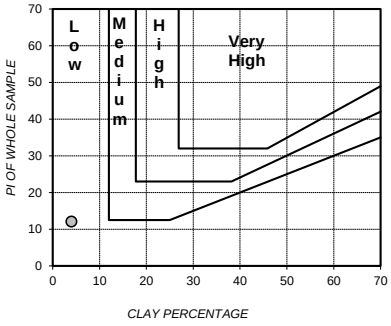
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	4
0.425 - 0.250	2
0.250 - 0.150	6
0.150 - 0.075	16
< 0.075	72

Effective size	0,051
Uniformity Coefficient	1,4
Curvature Coefficient	1,0
Oversize Index	0,0
Shrinkage Product	643,1
Grading Coefficient	3,0
Grading modulus	0,40

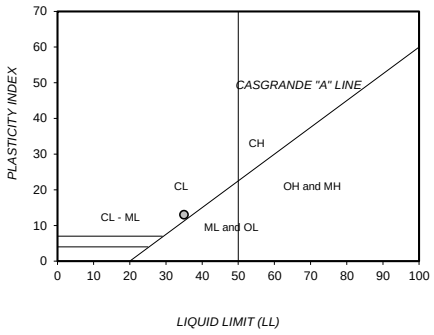
Atter-berg Limits	
Liquid Limit	35
Plasticity Index	13
Linear Shrinkage	6,9
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (8)

POTENTIAL EXPANSIVENES

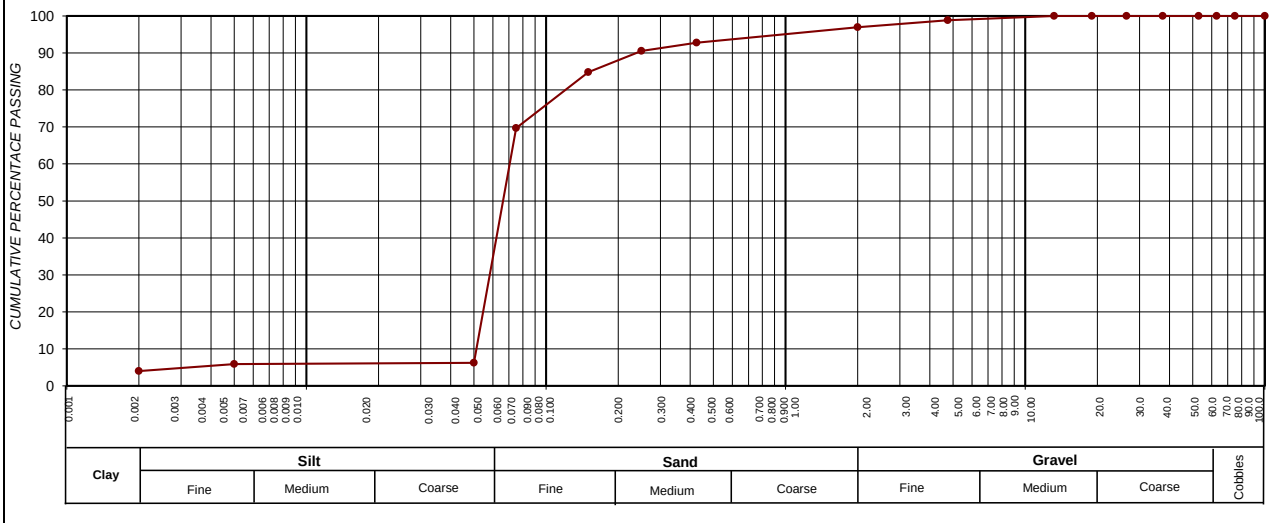


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
4,0	16,7	76,2	3,0

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 366
LAYER : 00-Jan-00
SAMPLE No. : B15221
SAMPLE DESCRIPTION : Silty Sand+ Alluvium

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**10,3**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	98
2,000	88
0,425	79
0,250	75
0,150	66
0,075	54
50 µm	4
5 µm	2
2 µm	0,9

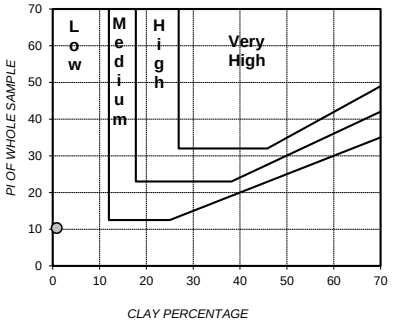
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	10
0.425 - 0.250	4
0.250 - 0.150	11
0.150 - 0.075	14
< 0.075	61

Effective size	0,053
Uniformity Coefficient	2,1
Curvature Coefficient	0,7
Oversize Index	0,0
Shrinkage Product	524,0
Grading Coefficient	11,6
Grading modulus	0,79

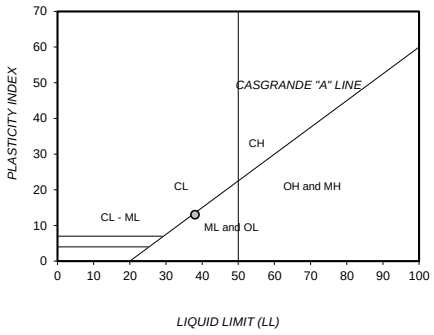
Atter-berg Limits	
Liquid Limit	38
Plasticity Index	13
Linear Shrinkage	6,6
PI < 0.075	-

Unified Soil Classification	ML
U.S. Highway Classification	A-6 (5)

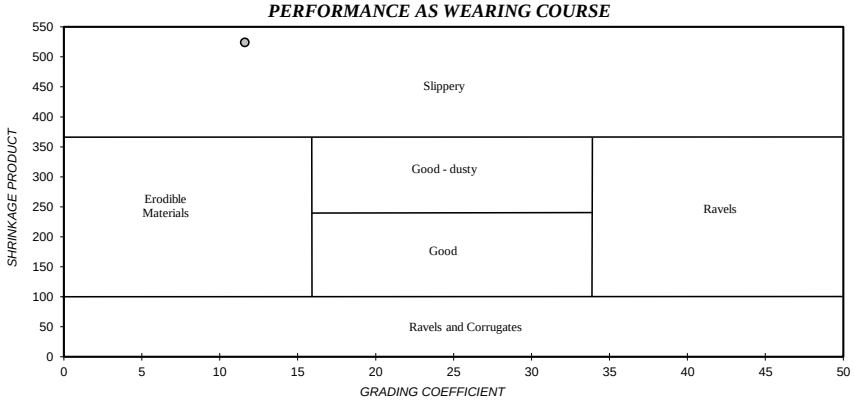
POTENTIAL EXPANSIVENES



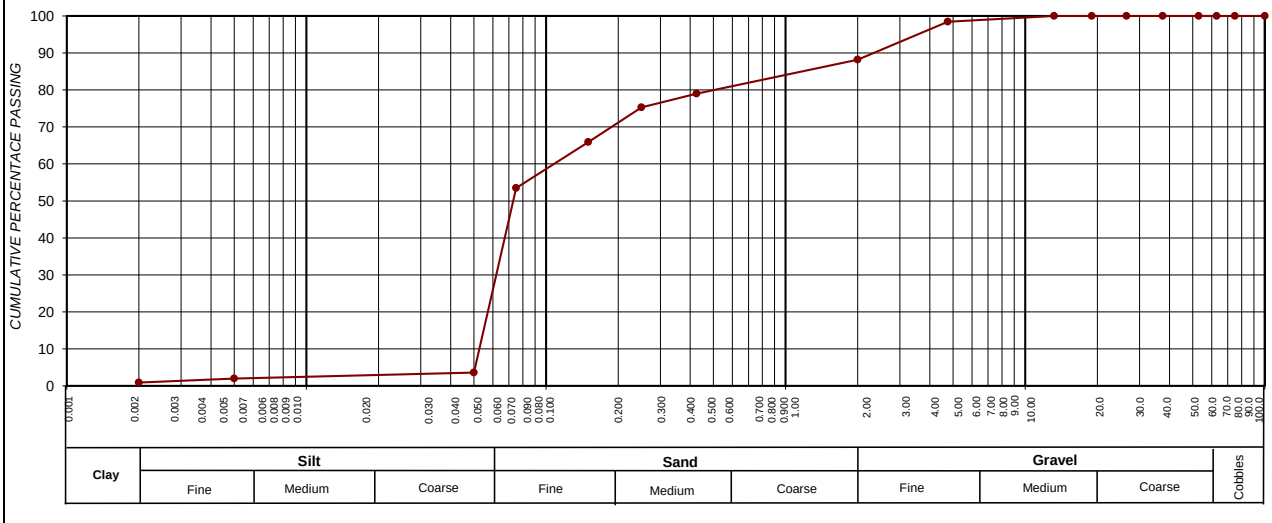
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
0,9	14,3	73,0	11,8

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 367
LAYER : 1,5
SAMPLE No. : B15222
SAMPLE DESCRIPTION : Silty Clay ,Residual Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**7,6**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	95
0,425	85
0,250	76
0,150	68
0,075	54
50 µm	5
5 µm	5
2 µm	3,6

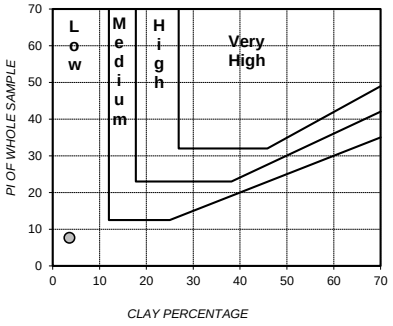
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	11
0.425 - 0.250	9
0.250 - 0.150	9
0.150 - 0.075	14
< 0.075	57

Effective size	0,052
Uniformity Coefficient	2,0
Curvature Coefficient	0,7
Oversize Index	0,0
Shrinkage Product	419,1
Grading Coefficient	4,6
Grading modulus	0,66

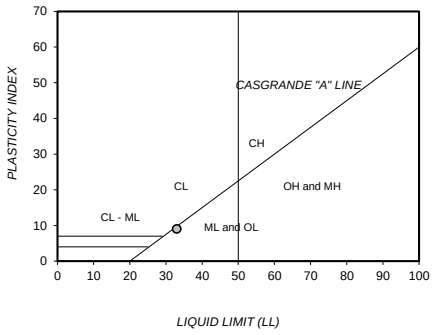
Atter-berg Limits	
Liquid Limit	33
Plasticity Index	9
Linear Shrinkage	5,0
PI < 0.075	-

Unified Soil Classification	ML
U.S. Highway Classification	A-4 (3)

POTENTIAL EXPANSIVENES

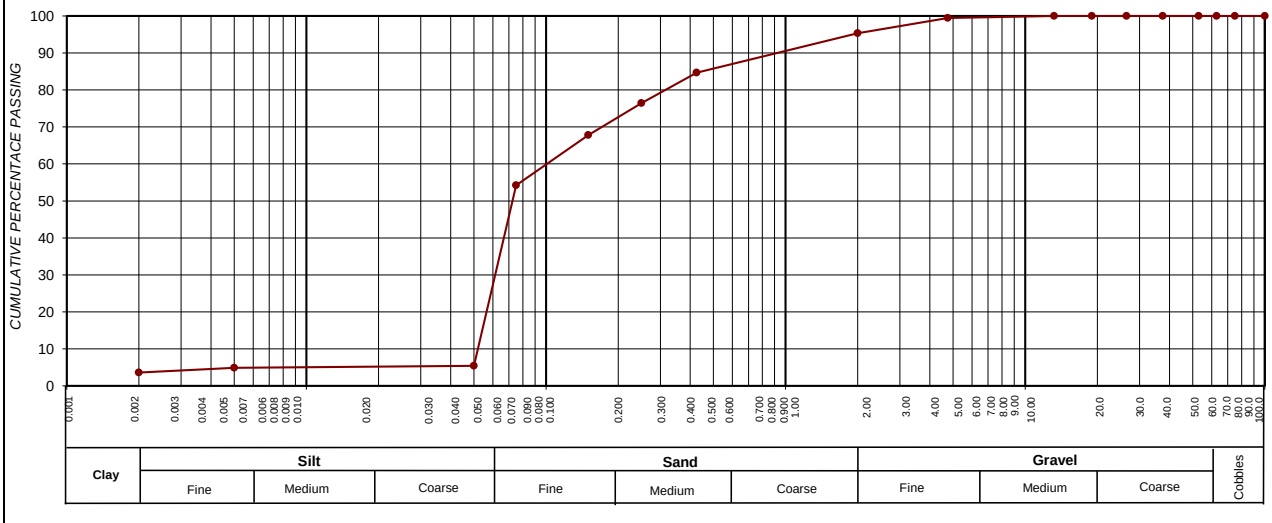


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
3,6	12,6	79,2	4,6

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 370
LAYER : 1.3-2.4
SAMPLE No. : B15392
SAMPLE DESCRIPTION : Light Olive Brown Silty Sandy Calcrete

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**18,5**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	95
2,000	92
0,425	88
0,250	86
0,150	81
0,075	71
50 µm	11
5 µm	9
2 µm	5,3

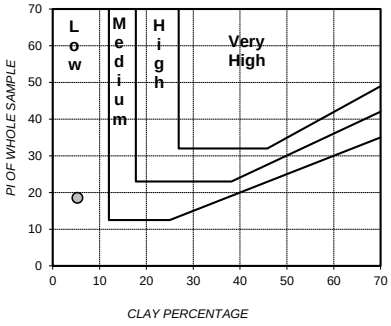
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	4
0.425 - 0.250	2
0.250 - 0.150	6
0.150 - 0.075	11
< 0.075	77

Effective size	0,031
Uniformity Coefficient	2,3
Curvature Coefficient	1,6
Oversize Index	0,0
Shrinkage Product	919,9
Grading Coefficient	7,7
Grading modulus	0,49

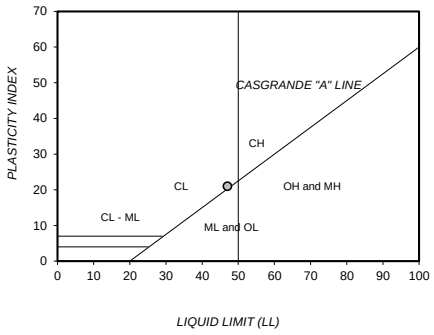
Atter-berg Limits	
Liquid Limit	47
Plasticity Index	21
Linear Shrinkage	10,4
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-7-6 (15)

POTENTIAL EXPANSIVENES

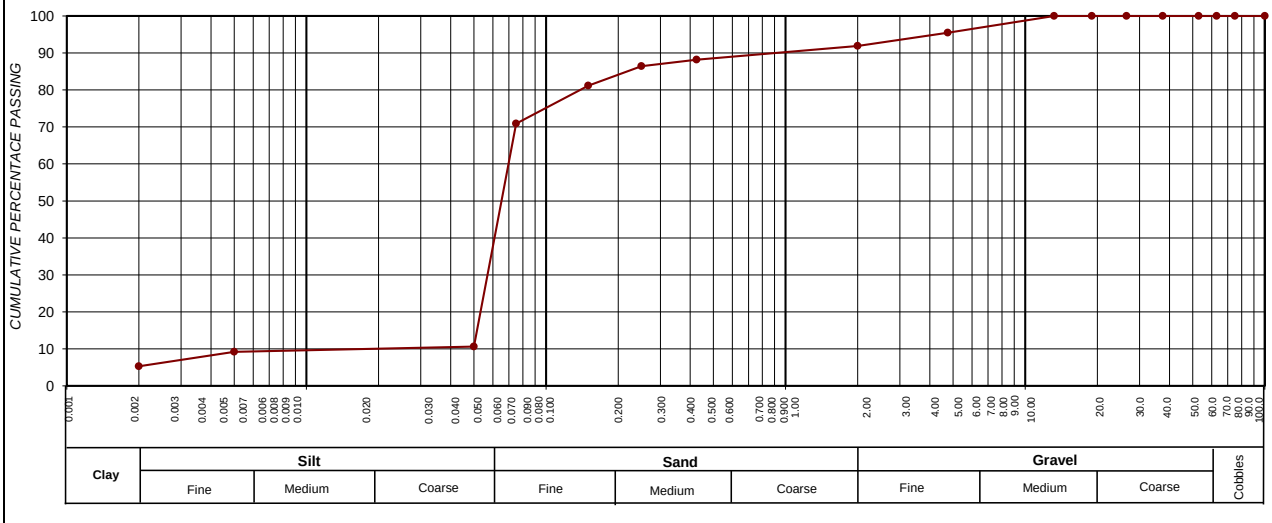


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
5,3	19,9	66,7	8,1

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 372
LAYER : 2.4-2.5
SAMPLE No. : B15860
SAMPLE DESCRIPTION : Silty Sand+Residual Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**28,3**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	98
0,425	94
0,250	92
0,150	85
0,075	73
50 µm	12
5 µm	11
2 µm	6,7

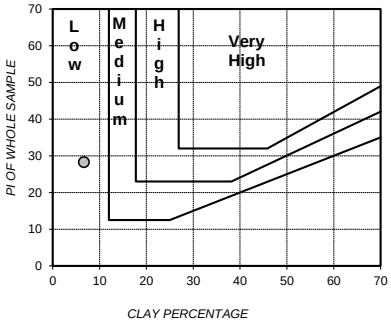
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	4
0.425 - 0.250	2
0.250 - 0.150	7
0.150 - 0.075	12
< 0.075	75

Effective size	0,004
Uniformity Coefficient	16,9
Curvature Coefficient	11,5
Oversize Index	0,0
Shrinkage Product	1367,0
Grading Coefficient	1,9
Grading modulus	0,35

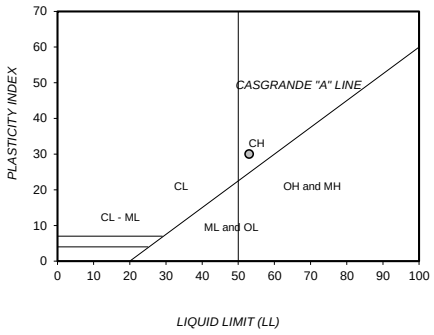
Atter-berg Limits	
Liquid Limit	53
Plasticity Index	30
Linear Shrinkage	14,5
PI < 0.075	-

Unified Soil Classification	CH
U.S. Highway Classification	A-7-6 (22)

POTENTIAL EXPANSIVENES

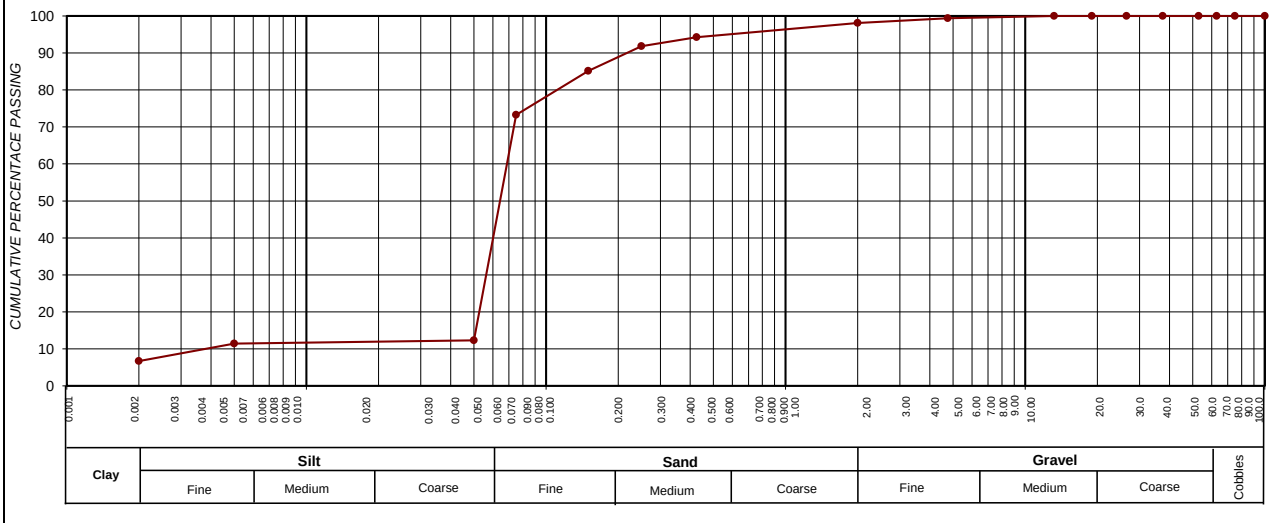


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
6,7	20,3	71,1	1,9

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CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 380
LAYER : 1.4-3.0
SAMPLE No. : B15166
SAMPLE DESCRIPTION : Dark Olive Silty Sand Colluvium

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**25,4**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	98
0,425	94
0,250	92
0,150	88
0,075	77
50 µm	12
5 µm	10
2 µm	6,0

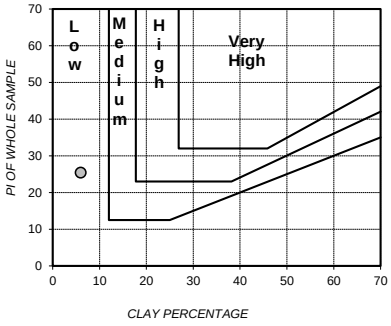
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	4
0.425 - 0.250	2
0.250 - 0.150	5
0.150 - 0.075	10
< 0.075	79

Effective size	0,010
Uniformity Coefficient	6,8
Curvature Coefficient	4,7
Oversize Index	0,0
Shrinkage Product	1315,1
Grading Coefficient	1,8
Grading modulus	0,31

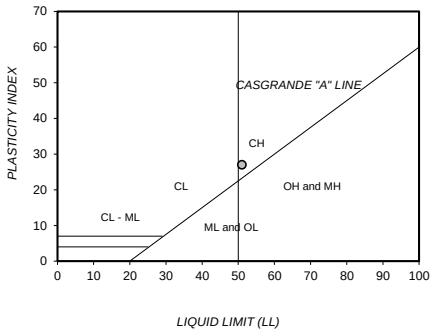
Atter-berg Limits	
Liquid Limit	51
Plasticity Index	27
Linear Shrinkage	14,0
PI < 0.075	-

Unified Soil Classification	CH
U.S. Highway Classification	A-7-6 (21)

POTENTIAL EXPANSIVENES

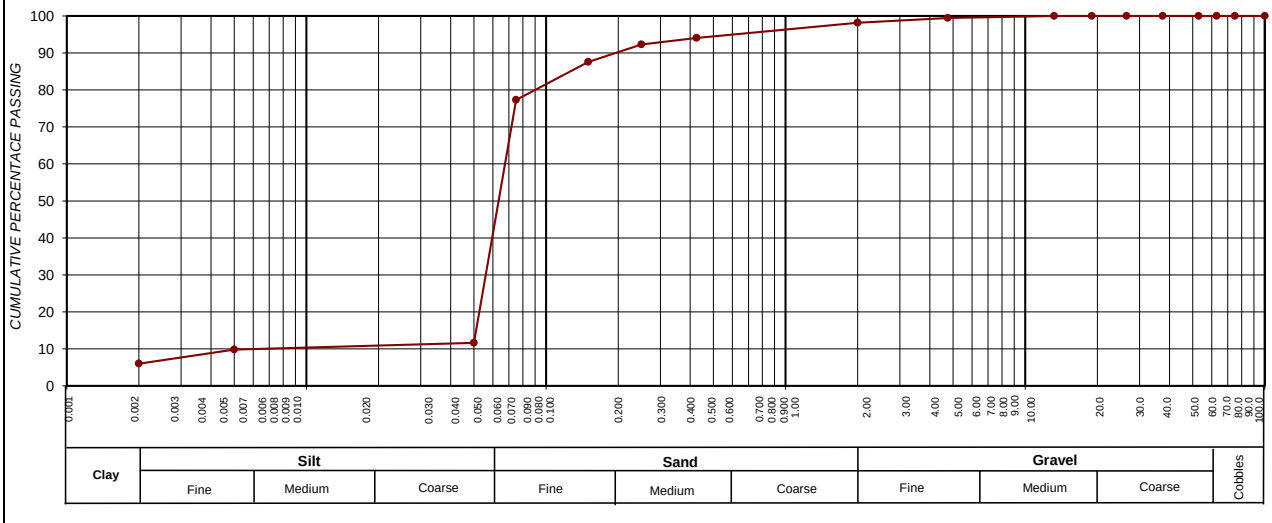


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
6,0	21,7	70,4	1,9

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CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 389
LAYER : 0.4-1.2
SAMPLE No. : B15223
SAMPLE DESCRIPTION : Gravelly Sand Colluvium

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**1,7**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	96
5,00	93
2,000	89
0,425	83
0,250	77
0,150	50
0,075	24
50 µm	2
5 µm	2
2 µm	0,9

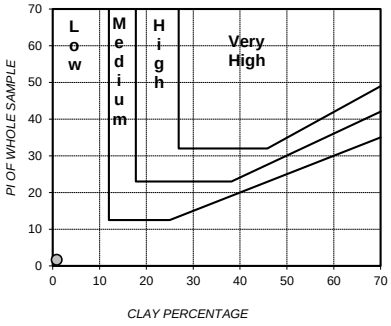
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	6
0.425 - 0.250	8
0.250 - 0.150	30
0.150 - 0.075	30
< 0.075	27

Effective size	0,059
Uniformity Coefficient	3,2
Curvature Coefficient	0,8
Oversize Index	0,0
Shrinkage Product	97,5
Grading Coefficient	10,6
Grading modulus	1,04

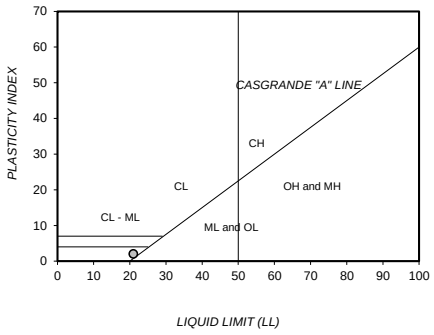
Atter-berg Limits	
Liquid Limit	21
Plasticity Index	2
Linear Shrinkage	1,2
PI < 0.075	-

Unified Soil Classification	SM
U.S. Highway Classification	A-2-4 (0)

POTENTIAL EXPANSIVENES

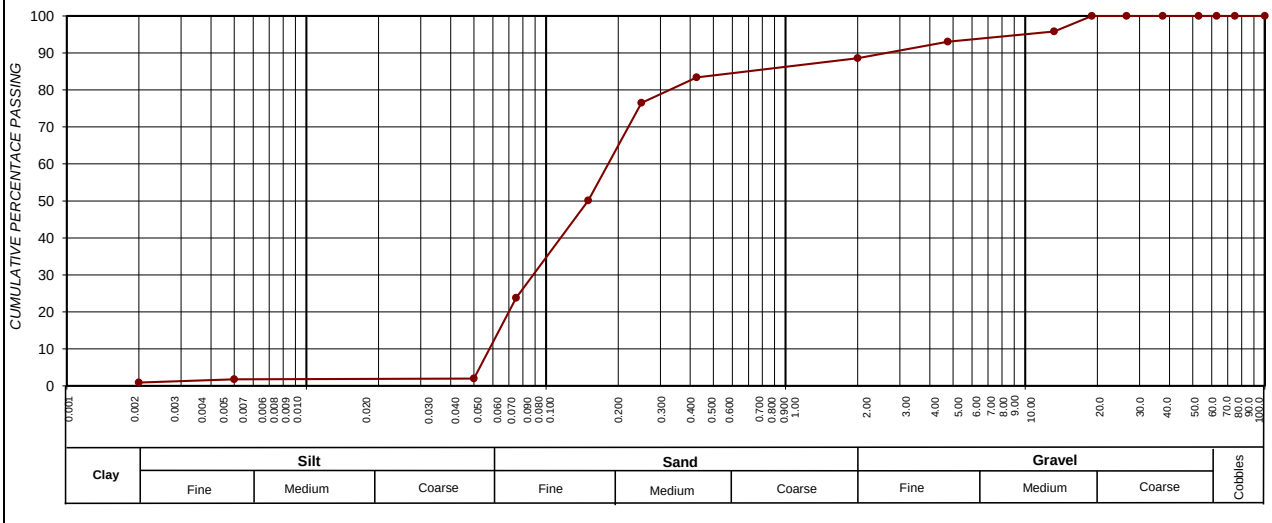


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
0,9	4,2	83,5	11,4

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 390
LAYER : 1.5m
SAMPLE No. : B15846
SAMPLE DESCRIPTION : Silty Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**21,6**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	100
2,000	99
0,425	94
0,250	92
0,150	87
0,075	77
50 µm	10
5 µm	8
2 µm	6,6

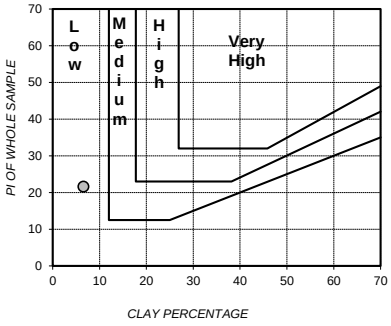
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	5
0.425 - 0.250	2
0.250 - 0.150	5
0.150 - 0.075	11
< 0.075	77

Effective size	0,050
Uniformity Coefficient	1,4
Curvature Coefficient	1,0
Oversize Index	0,0
Shrinkage Product	960,4
Grading Coefficient	1,1
Grading modulus	0,30

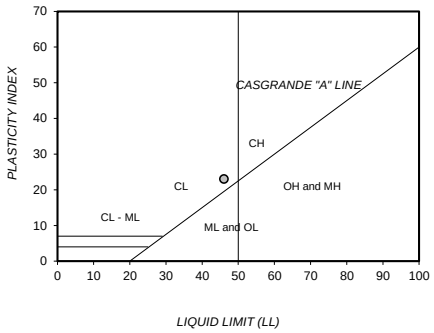
Atter-berg Limits	
Liquid Limit	46
Plasticity Index	23
Linear Shrinkage	10,2
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-7-6 (18)

POTENTIAL EXPANSIVENES

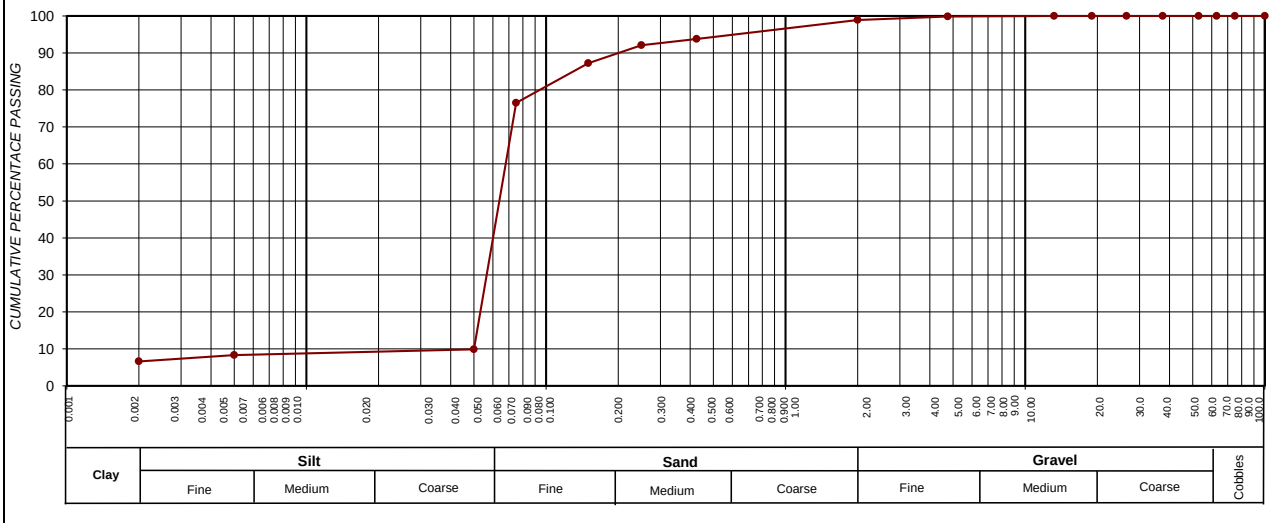


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
6,6	19,7	72,6	1,1

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 394
LAYER : 0.7-1.3
SAMPLE No. : B15167
SAMPLE DESCRIPTION : Silty Clay ,Reworked Residual Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**22,5**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	100
2,000	97
0,425	90
0,250	88
0,150	83
0,075	74
50 µm	11
5 µm	10
2 µm	5,1

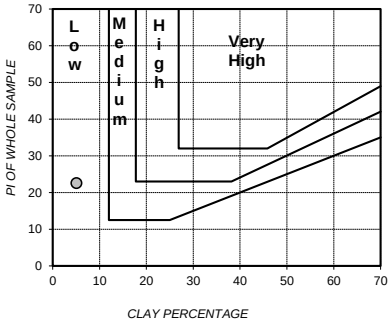
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	8
0.425 - 0.250	2
0.250 - 0.150	5
0.150 - 0.075	9
< 0.075	76

Effective size	0,008
Uniformity Coefficient	8,2
Curvature Coefficient	5,6
Oversize Index	0,0
Shrinkage Product	1117,9
Grading Coefficient	2,5
Grading modulus	0,38

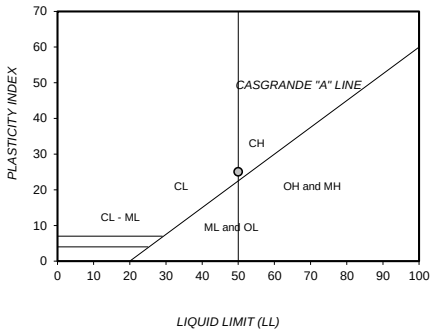
Atter-berg Limits	
Liquid Limit	50
Plasticity Index	25
Linear Shrinkage	12,4
PI < 0.075	-

Unified Soil Classification	CH
U.S. Highway Classification	A-7-6 (19)

POTENTIAL EXPANSIVENES

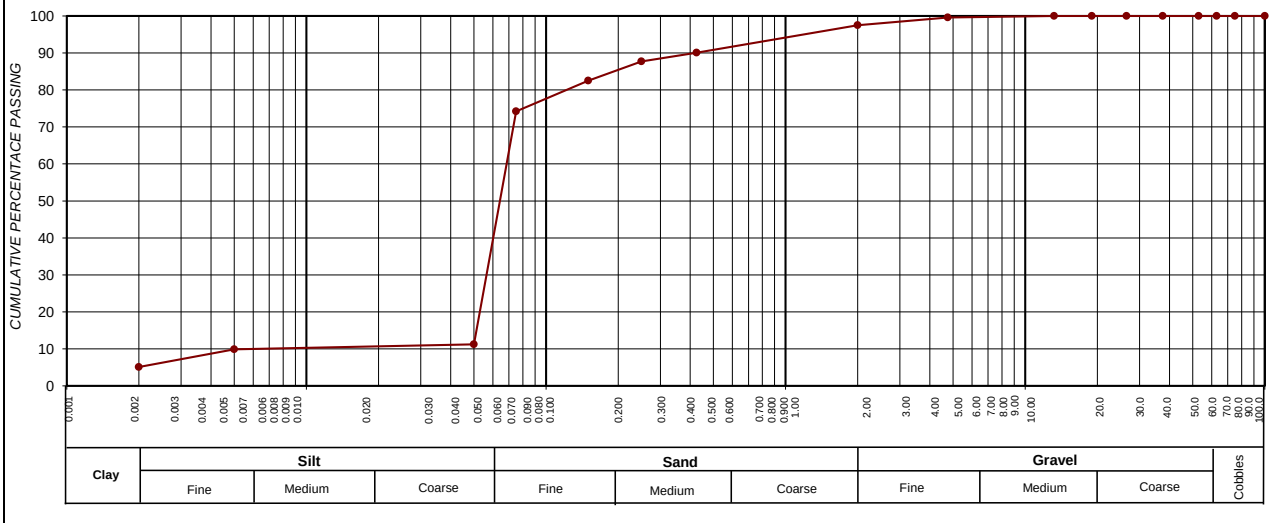


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
5,1	21,6	70,8	2,5

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

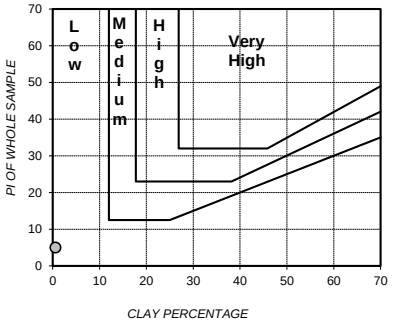
DATE RECEIVED : 11.11.2024
POSITION : TP 394
LAYER : 01-Jan-00
SAMPLE No. : B15224
SAMPLE DESCRIPTION : Gravelly Sand residual Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

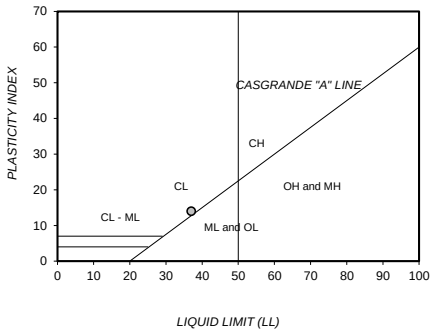
Weighted PI	**5,0**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	94
2,000	74
0,425	35
0,250	34
0,150	31
0,075	28
50 µm	3
5 µm	2
2 µm	0,6

POTENTIAL EXPANSIVENES



PLASTICITY CHART



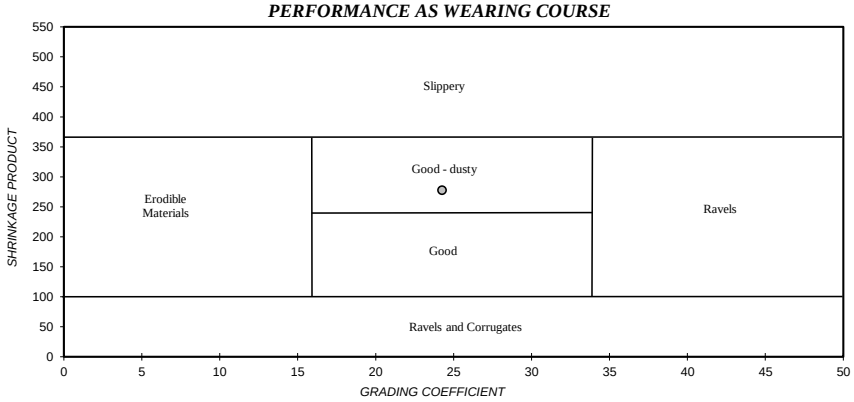
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	52
0.425 - 0.250	2
0.250 - 0.150	4
0.150 - 0.075	3
< 0.075	38

Effective size	0,057
Uniformity Coefficient	25,0
Curvature Coefficient	0,2
Oversize Index	0,0
Shrinkage Product	277,2
Grading Coefficient	24,3
Grading modulus	1,62

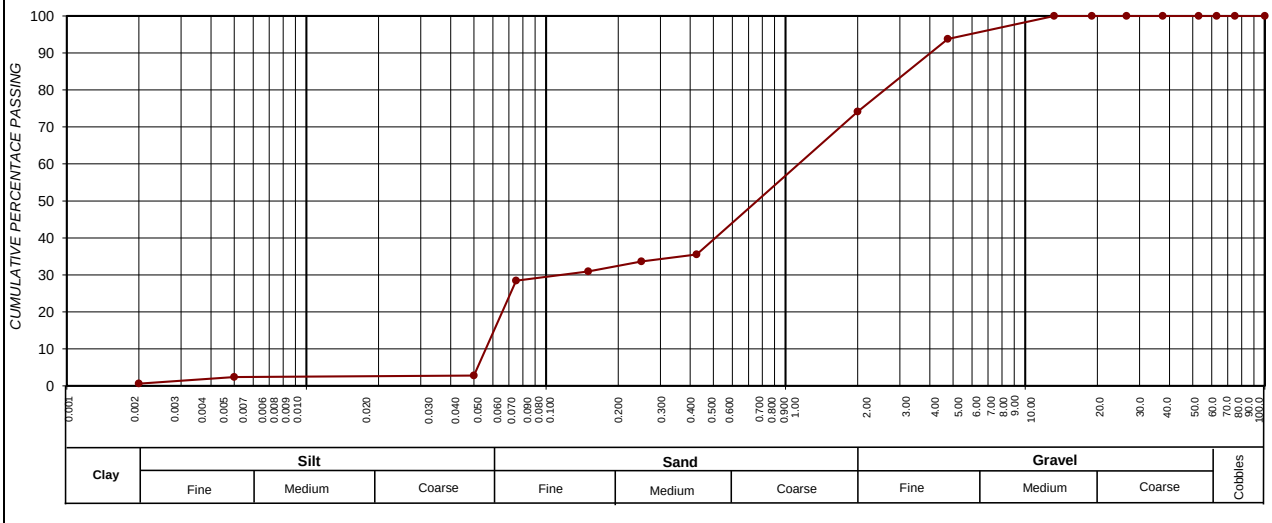
Atter-berg Limits	
Liquid Limit	37
Plasticity Index	14
Linear Shrinkage	7,8
PI < 0.075	-

Unified Soil Classification	SC
U.S. Highway Classification	A-2-6 (1)

PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
0,6	8,2	65,4	25,9

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PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 396
LAYER : 00-Jan-00
SAMPLE No. : B15225
SAMPLE DESCRIPTION : Gravelly Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**2,0**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	94
5,00	85
2,000	62
0,425	39
0,250	35
0,150	29
0,075	20
50 µm	1
5 µm	1
2 µm	0,8

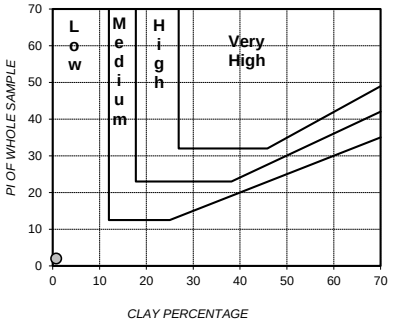
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	37
0.425 - 0.250	7
0.250 - 0.150	9
0.150 - 0.075	14
< 0.075	32

Effective size	0,062
Uniformity Coefficient	30,2
Curvature Coefficient	0,2
Oversize Index	0,0
Shrinkage Product	117,0
Grading Coefficient	32,4
Grading modulus	1,79

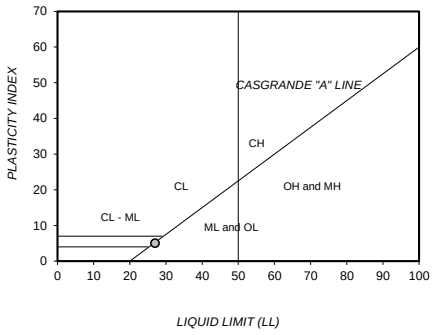
Atter-berg Limits	
Liquid Limit	27
Plasticity Index	5
Linear Shrinkage	3,0
PI < 0.075	-

Unified Soil Classification	SM
U.S. Highway Classification	A-1-b (0)

POTENTIAL EXPANSIVENES

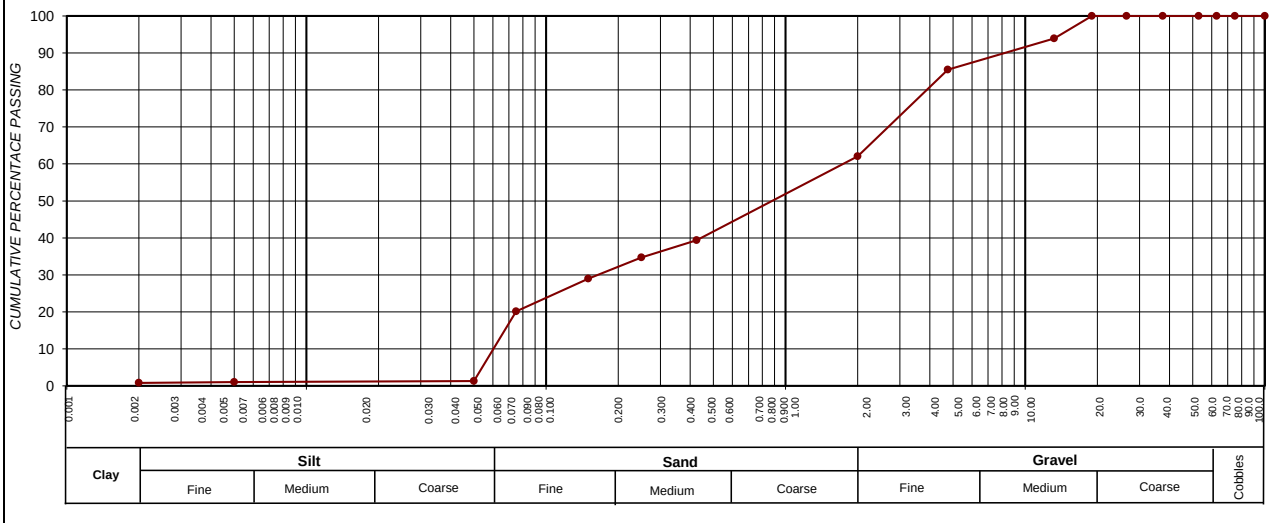


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
0,8	4,2	57,1	37,9

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

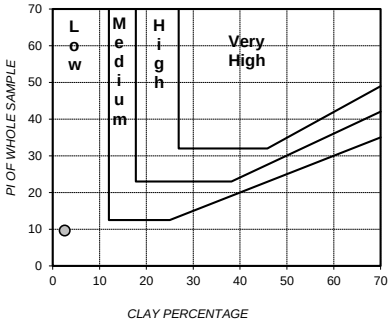
DATE RECEIVED : 11.11.2024
POSITION : TP 402
LAYER : 1.20-3.0
SAMPLE No. : B15158
SAMPLE DESCRIPTION : Silty Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

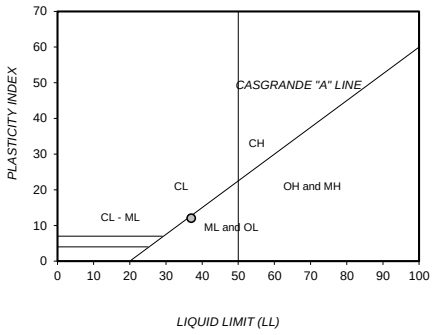
Weighted PI	**9,6**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	98
2,000	93
0,425	80
0,250	78
0,150	77
0,075	70
50 µm	5
5 µm	4
2 µm	2,6

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	14
0.425 - 0.250	2
0.250 - 0.150	2
0.150 - 0.075	7
< 0.075	75

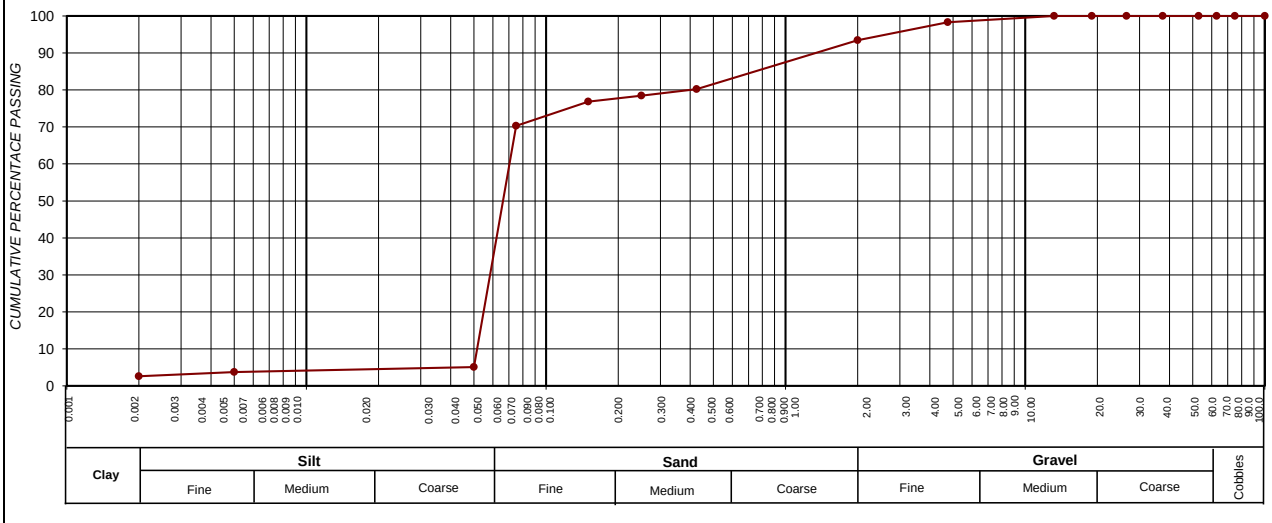
Effective size	0,052
Uniformity Coefficient	1,4
Curvature Coefficient	1,0
Oversize Index	0,0
Shrinkage Product	550,3
Grading Coefficient	6,4
Grading modulus	0,56

Atter-berg Limits	
Liquid Limit	37
Plasticity Index	12
Linear Shrinkage	6,9
PI < 0.075	-

Unified Soil Classification	ML
U.S. Highway Classification	A-6 (8)

PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
2,6	18,1	72,7	6,6

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CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 408
LAYER : 0.6-2.1
SAMPLE No. : B15159
SAMPLE DESCRIPTION : Silty Sand Clay,Reworked Residual Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	15,4	Specifc Gravity	2,35

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	97
2,000	94
0,425	86
0,250	82
0,150	72
0,075	53
50 µm	9
5 µm	8
2 µm	1,7

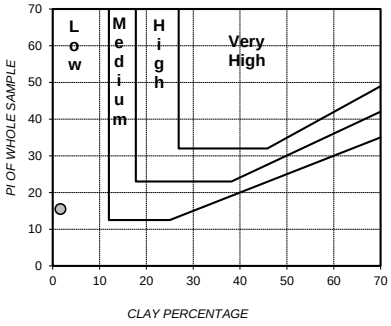
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	8
0.425 - 0.250	4
0.250 - 0.150	10
0.150 - 0.075	21
< 0.075	57

Effective size	0,051
Uniformity Coefficient	2,0
Curvature Coefficient	0,7
Oversize Index	0,0
Shrinkage Product	837,9
Grading Coefficient	6,3
Grading modulus	0,68

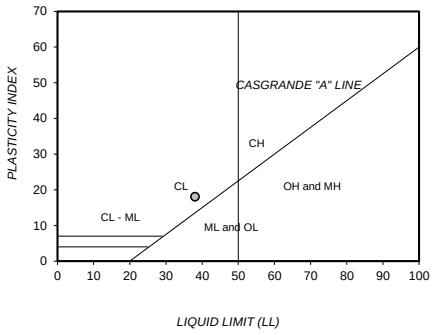
Atter-berg Limits	
Liquid Limit	38
Plasticity Index	18
Linear Shrinkage	9,8
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (6)

POTENTIAL EXPANSIVENES

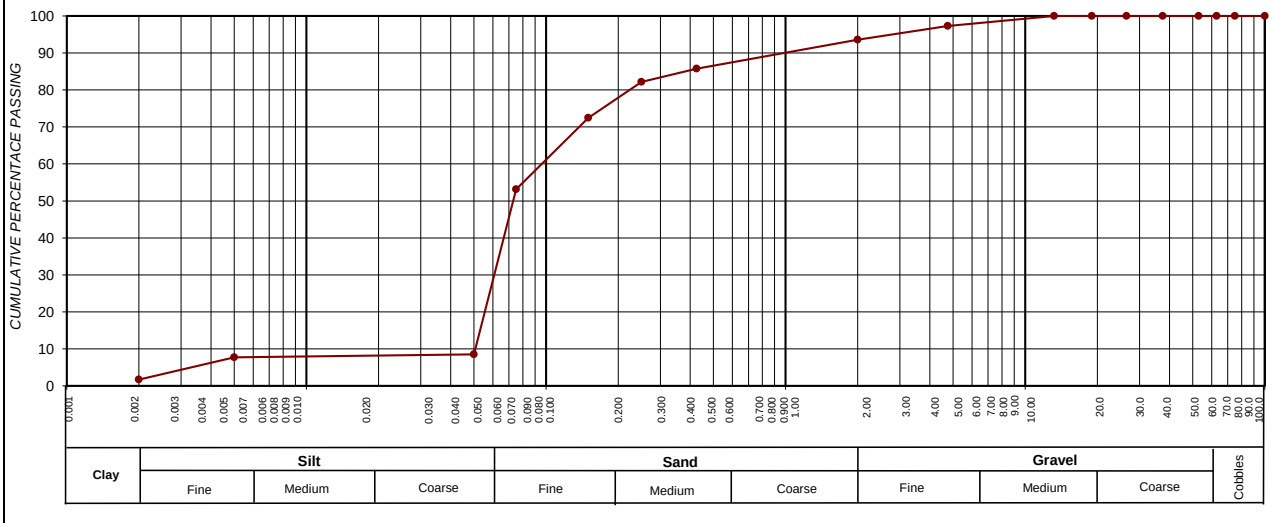


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
1,7	16,6	75,3	6,4

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 411
LAYER : 1.5-2.7
SAMPLE No. : B15160
SAMPLE DESCRIPTION : Dark Olive Silty Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**21,9**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	98
2,000	94
0,425	91
0,250	89
0,150	82
0,075	66
50 µm	11
5 µm	10
2 µm	6,4

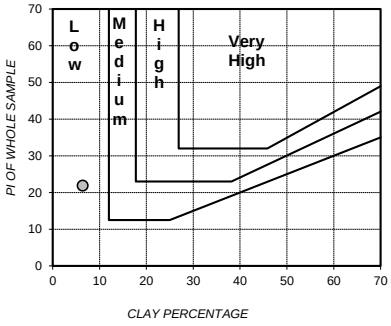
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	4
0.425 - 0.250	2
0.250 - 0.150	8
0.150 - 0.075	16
< 0.075	70

Effective size	0,018
Uniformity Coefficient	4,1
Curvature Coefficient	2,7
Oversize Index	0,0
Shrinkage Product	1045,9
Grading Coefficient	5,5
Grading modulus	0,48

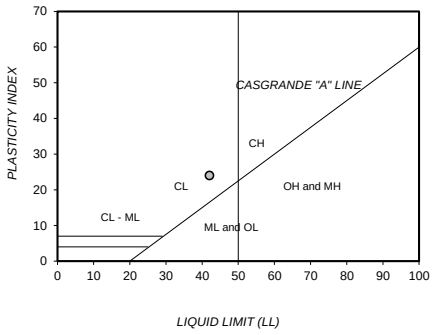
Atter-berg Limits	
Liquid Limit	42
Plasticity Index	24
Linear Shrinkage	11,5
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-7-6 (14)

POTENTIAL EXPANSIVENES

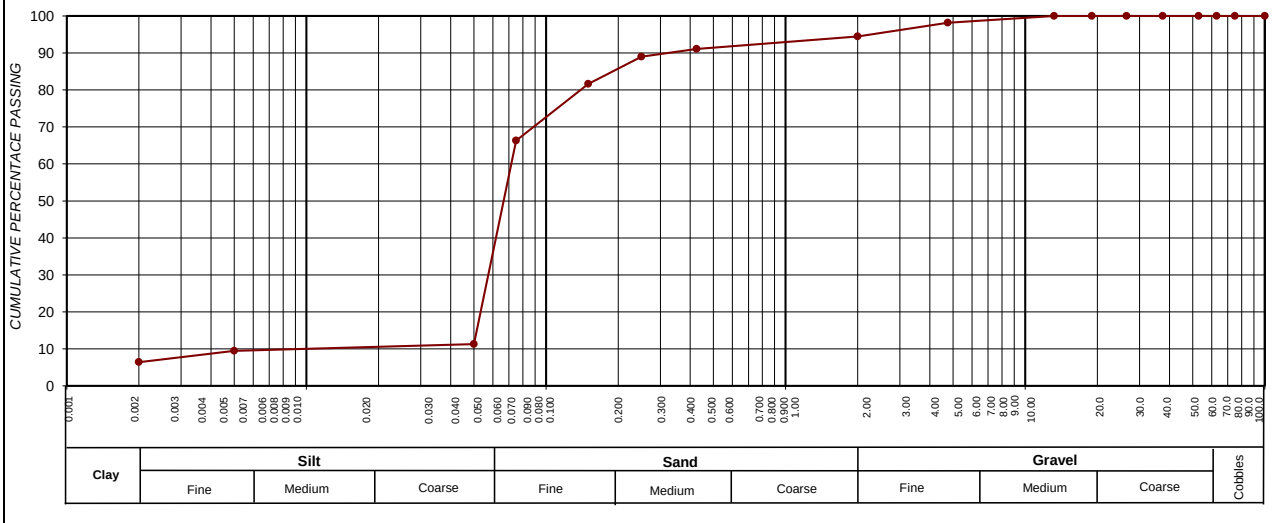


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
6,4	17,9	70,1	5,6

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 413
LAYER : 1,4
SAMPLE No. : B15214
SAMPLE DESCRIPTION : Silty Clay ,Residual Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**11,8**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)

100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	96
0,425	91
0,250	84
0,150	71
0,075	57
50 µm	7
5 µm	6
2 µm	3,5

Soil Mortar Analysis % < 2,00mm

2.000 - 0.425	6
0.425 - 0.250	7
0.250 - 0.150	13
0.150 - 0.075	15
< 0.075	59

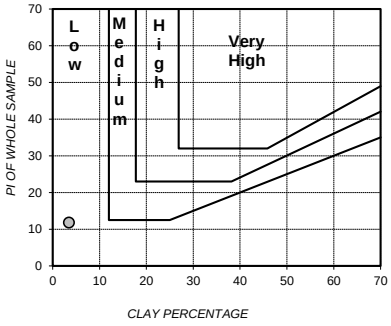
Effective size	0,052
Uniformity Coefficient	1,8
Curvature Coefficient	0,8
Oversize Index	0,0
Shrinkage Product	591,1
Grading Coefficient	3,5
Grading modulus	0,56

Atter-berg Limits

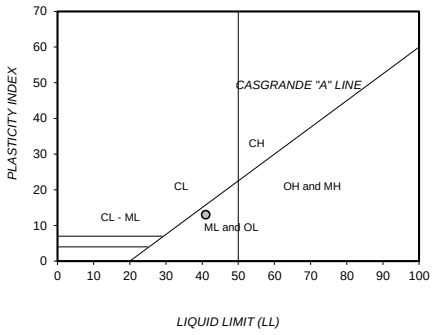
Liquid Limit	41
Plasticity Index	13
Linear Shrinkage	6,5
PI < 0.075	-

Unified Soil Classification	ML
U.S. Highway Classification	A-7-6 (6)

POTENTIAL EXPANSIVENES

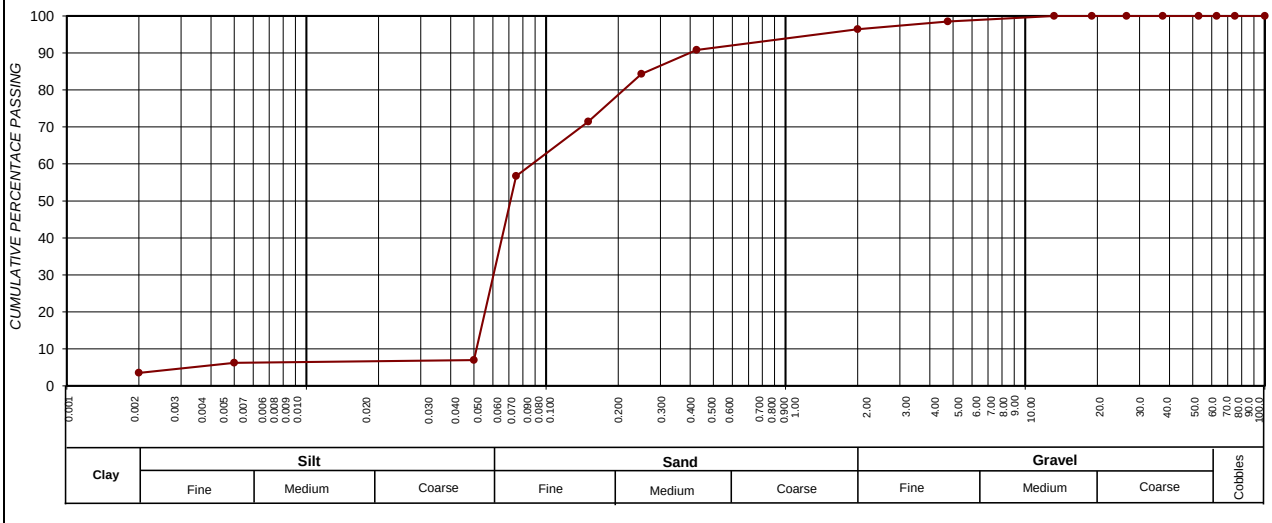


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
3,5	14,8	78,1	3,6

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PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 419
LAYER : 0.6-1.1
SAMPLE No. : B15161
SAMPLE DESCRIPTION : Dark Olive Silty Sand Colluvium

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**33,5**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	98
0,425	96
0,250	78
0,150	66
0,075	53
50 µm	12
5 µm	10
2 µm	6,7

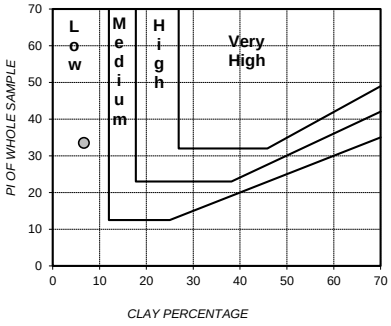
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	2
0.425 - 0.250	18
0.250 - 0.150	12
0.150 - 0.075	13
< 0.075	55

Effective size	0,016
Uniformity Coefficient	7,0
Curvature Coefficient	2,0
Oversize Index	0,0
Shrinkage Product	1645,6
Grading Coefficient	2,3
Grading modulus	0,54

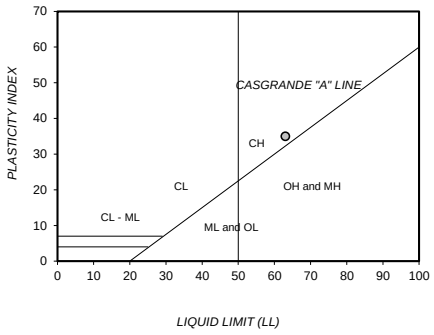
Atter-berg Limits	
Liquid Limit	63
Plasticity Index	35
Linear Shrinkage	17,2
PI < 0.075	-

Unified Soil Classification	CH
U.S. Highway Classification	A-7-6 (15)

POTENTIAL EXPANSIVENES

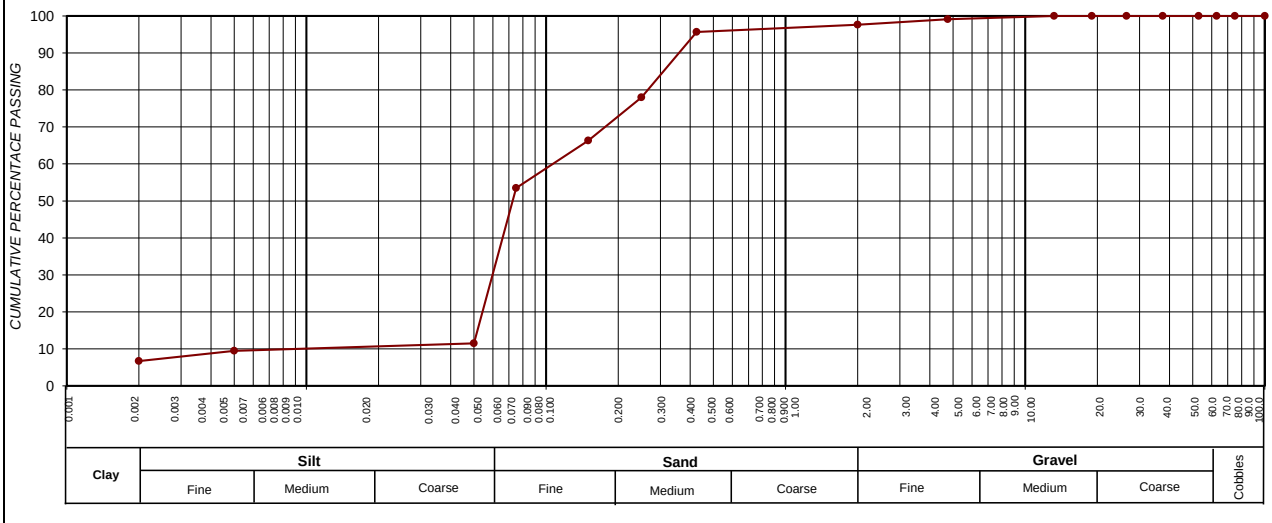


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
6,7	15,0	76,0	2,3

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

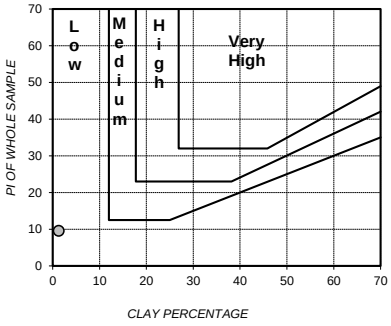
DATE RECEIVED : 11.11.2024
POSITION : TP 421
LAYER : 1.4-2.5
SAMPLE No. : B15187
SAMPLE DESCRIPTION : Calcretised Gravelly Silty Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

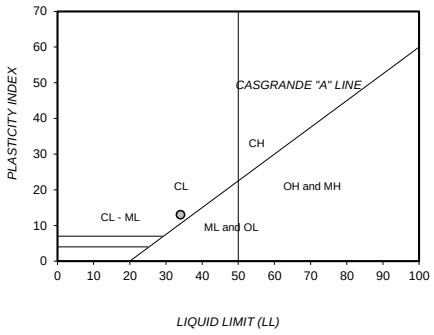
Weighted PI	**9,5**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	91
2,000	86
0,425	73
0,250	71
0,150	68
0,075	58
50 µm	5
5 µm	4
2 µm	1,3

POTENTIAL EXPANSIVENES



PLASTICITY CHART



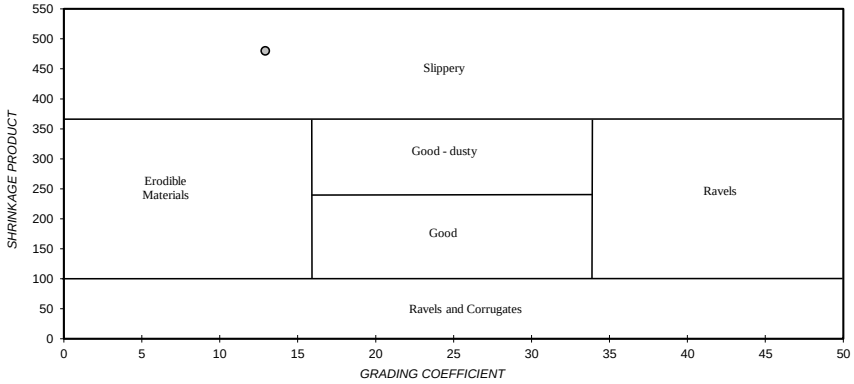
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	15
0.425 - 0.250	3
0.250 - 0.150	3
0.150 - 0.075	11
< 0.075	68

Effective size	0,052
Uniformity Coefficient	1,7
Curvature Coefficient	0,8
Oversize Index	0,0
Shrinkage Product	479,6
Grading Coefficient	12,9
Grading modulus	0,83

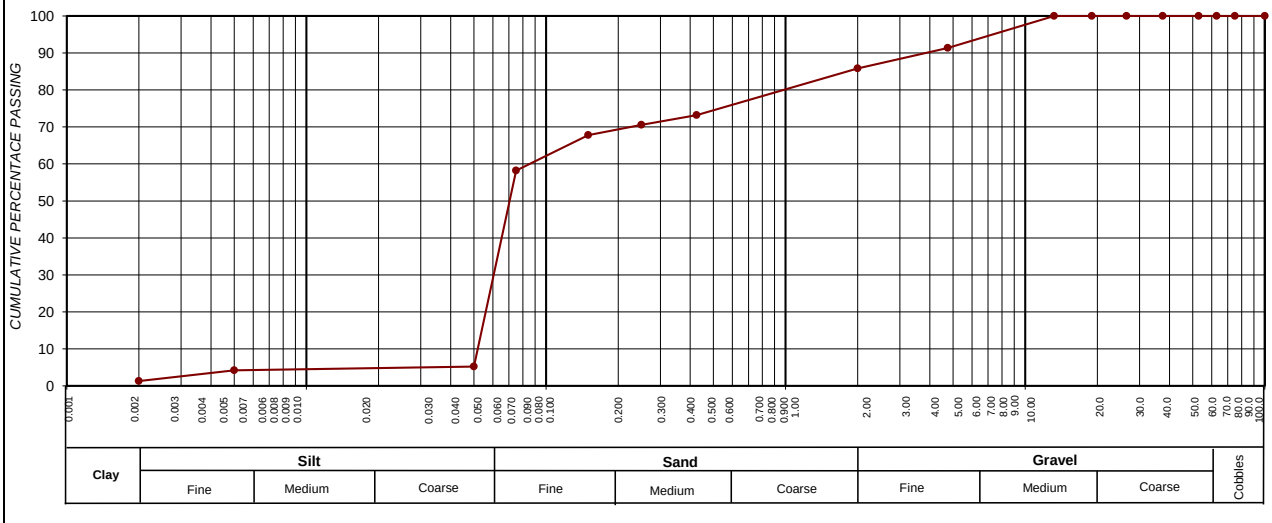
Atter-berg Limits	
Liquid Limit	34
Plasticity Index	13
Linear Shrinkage	6,6
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (5)

PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
1,3	16,3	68,3	14,2

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

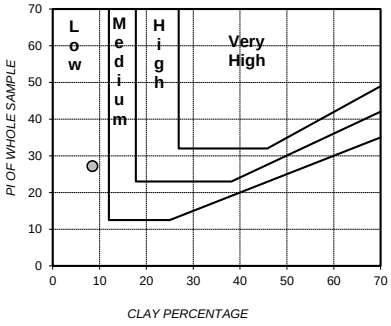
DATE RECEIVED : 11.11.2024
POSITION : TP 425
LAYER : 1.5-2.5
SAMPLE No. : B15849
SAMPLE DESCRIPTION : Interbedded Sandstone Silty Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

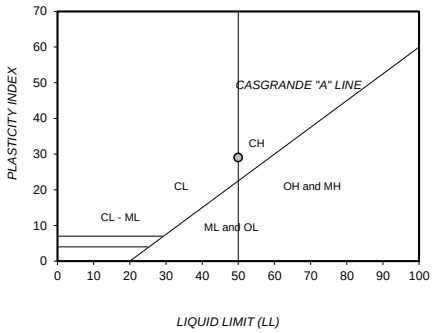
Weighted PI	**27,2**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	97
0,425	94
0,250	90
0,150	85
0,075	74
50 µm	12
5 µm	10
2 µm	8,5

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	4
0.425 - 0.250	3
0.250 - 0.150	5
0.150 - 0.075	12
< 0.075	75

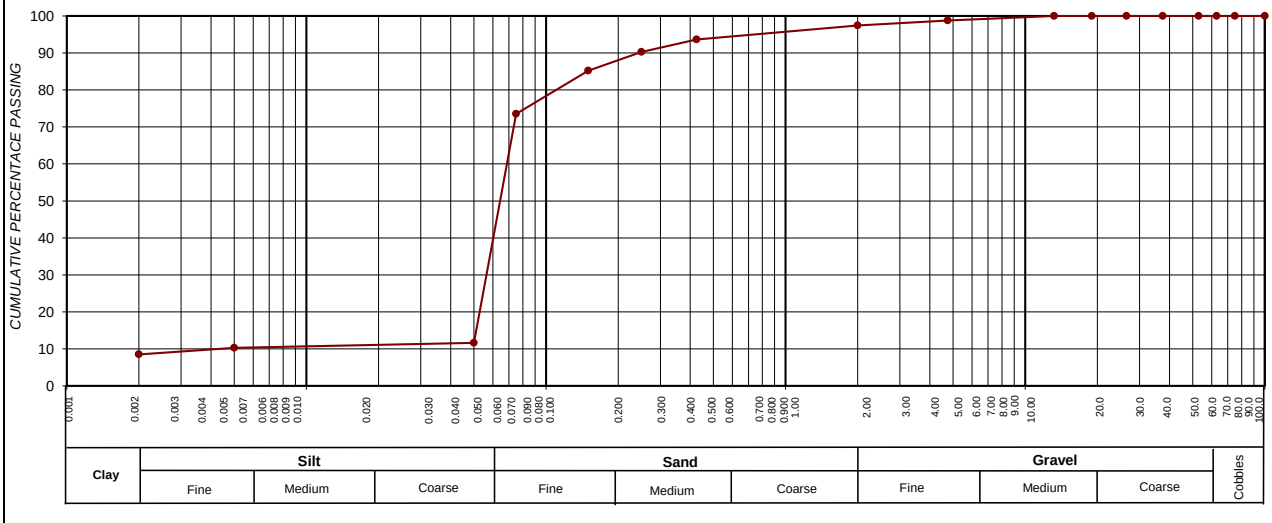
Effective size	0,005
Uniformity Coefficient	15,5
Curvature Coefficient	10,5
Oversize Index	0,0
Shrinkage Product	177,0
Grading Coefficient	2,6
Grading modulus	0,35

Atter-berg Limits	
Liquid Limit	50
Plasticity Index	29
Linear Shrinkage	1,9
PI < 0.075	-

Unified Soil Classification	CH
U.S. Highway Classification	A-7-6 (21)

PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
8,5	18,4	70,5	2,6

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 454
LAYER : 1,5
SAMPLE No. : B15362
SAMPLE DESCRIPTION : Gravelly Sand +Dolerite

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**6,3**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)

100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	93
2,000	82
0,425	58
0,250	51
0,150	42
0,075	34
50 µm	3
5 µm	2
2 µm	1,0

Soil Mortar Analysis % < 2,00mm

2.000 - 0.425	30
0.425 - 0.250	8
0.250 - 0.150	11
0.150 - 0.075	11
< 0.075	41

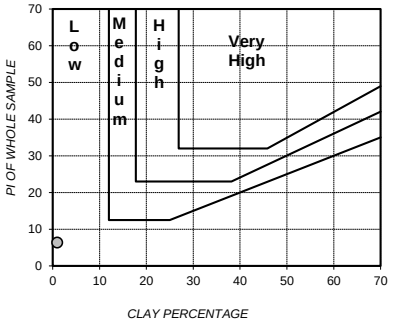
Effective size	0,056
Uniformity Coefficient	10,4
Curvature Coefficient	0,2
Oversize Index	0,0
Shrinkage Product	342,1
Grading Coefficient	16,8
Grading modulus	1,27

Atter-berg Limits

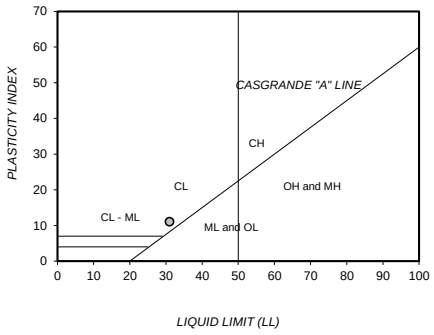
Liquid Limit	31
Plasticity Index	11
Linear Shrinkage	5,9
PI < 0.075	-

Unified Soil Classification	SC
U.S. Highway Classification	A-2-6 (0)

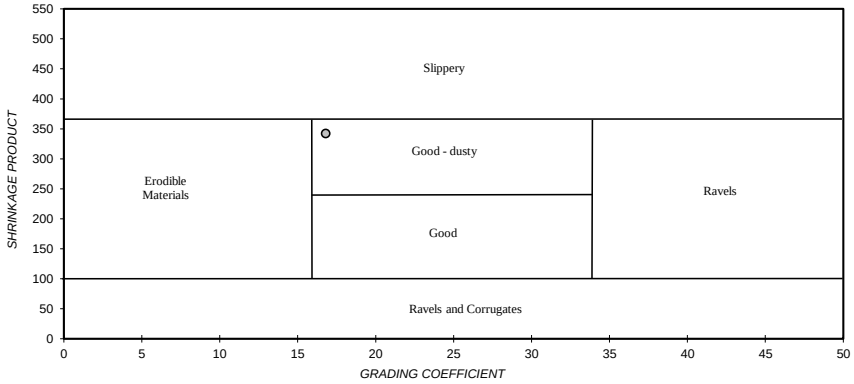
POTENTIAL EXPANSIVENES



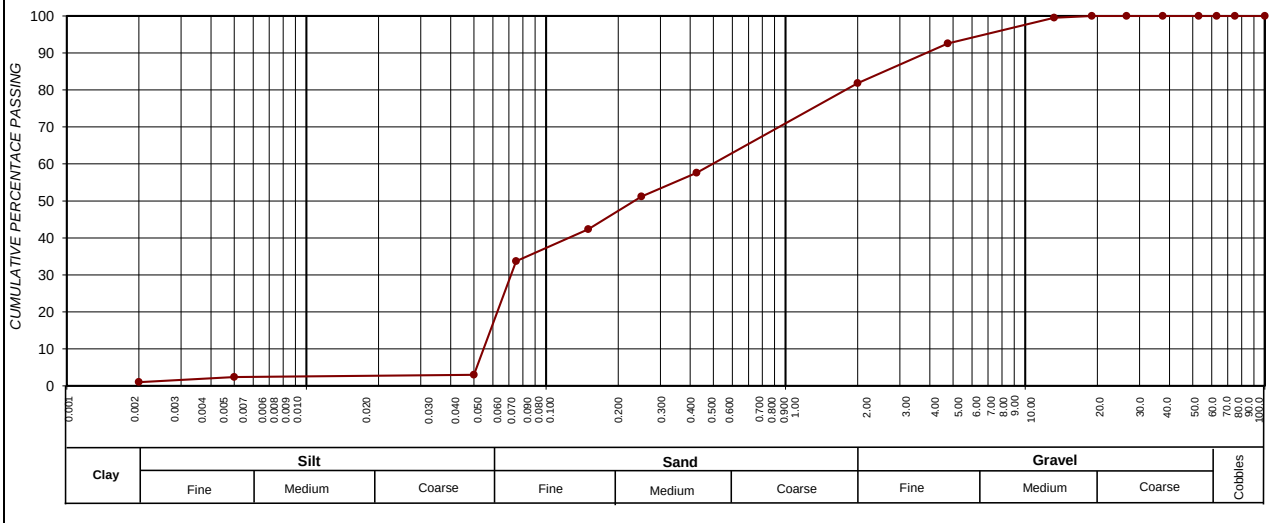
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
1,0	9,1	71,7	18,2

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

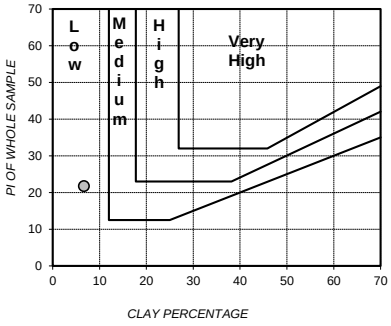
DATE RECEIVED : 11.11.2024
POSITION : TP 490
LAYER : 0.6-1.8
SAMPLE No. : B15188
SAMPLE DESCRIPTION : Silty Sand Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

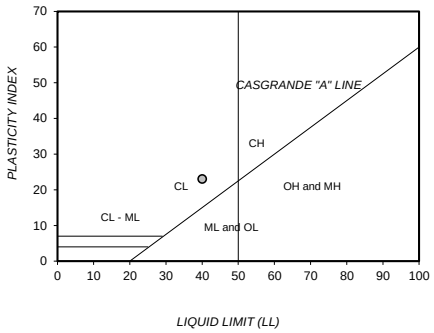
Weighted PI	**21,7**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	98
0,425	94
0,250	93
0,150	90
0,075	80
50 µm	11
5 µm	10
2 µm	6,7

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	3
0.425 - 0.250	1
0.250 - 0.150	3
0.150 - 0.075	10
< 0.075	82

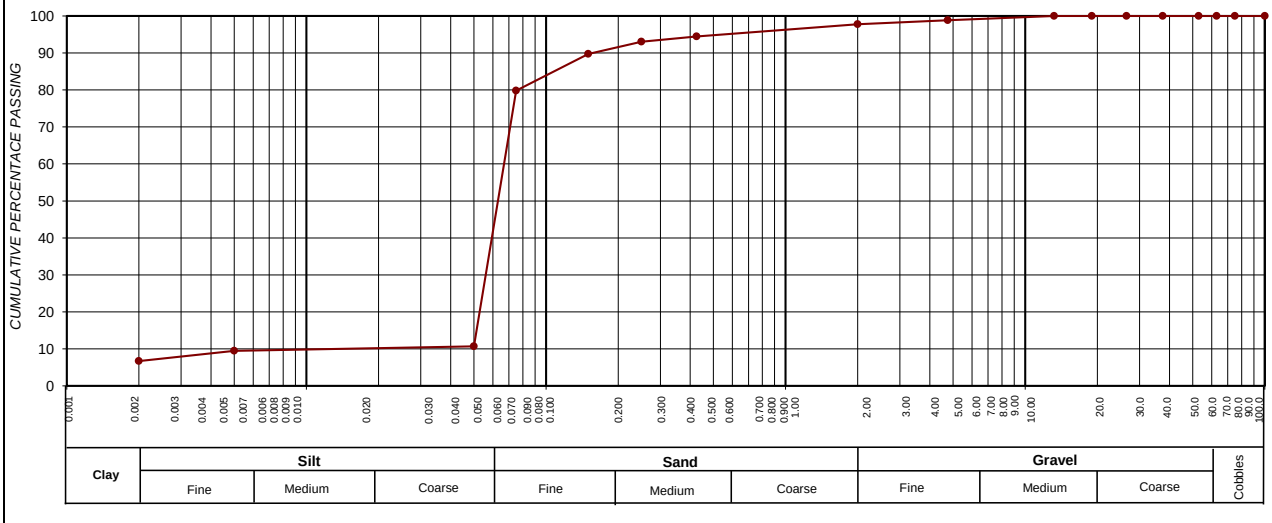
Effective size	0,024
Uniformity Coefficient	2,9
Curvature Coefficient	2,0
Oversize Index	0,0
Shrinkage Product	1006,2
Grading Coefficient	2,2
Grading modulus	0,28

Atter-berg Limits	
Liquid Limit	40
Plasticity Index	23
Linear Shrinkage	10,7
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (17)

PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
6,7	20,8	70,2	2,2

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 499
LAYER : 0.8-1.1
SAMPLE No. : B15189
SAMPLE DESCRIPTION : Silty Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**8,9**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	100
2,000	98
0,425	89
0,250	81
0,150	69
0,075	50
50 µm	5
5 µm	4
2 µm	1,5

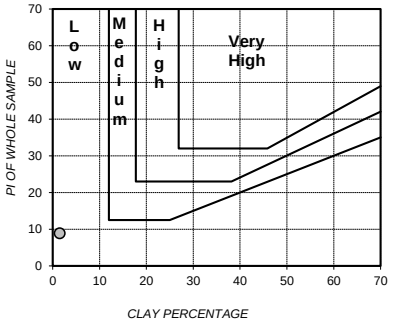
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	9
0.425 - 0.250	8
0.250 - 0.150	12
0.150 - 0.075	19
< 0.075	52

Effective size	0,053
Uniformity Coefficient	2,2
Curvature Coefficient	0,7
Oversize Index	0,0
Shrinkage Product	480,8
Grading Coefficient	2,4
Grading modulus	0,64

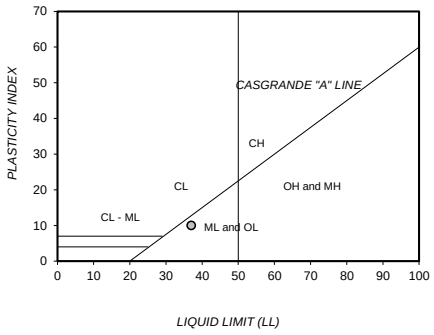
Atter-berg Limits	
Liquid Limit	37
Plasticity Index	10
Linear Shrinkage	5,4
PI < 0.075	-

Unified Soil Classification	ML
U.S. Highway Classification	A-4 (3)

POTENTIAL EXPANSIVENES

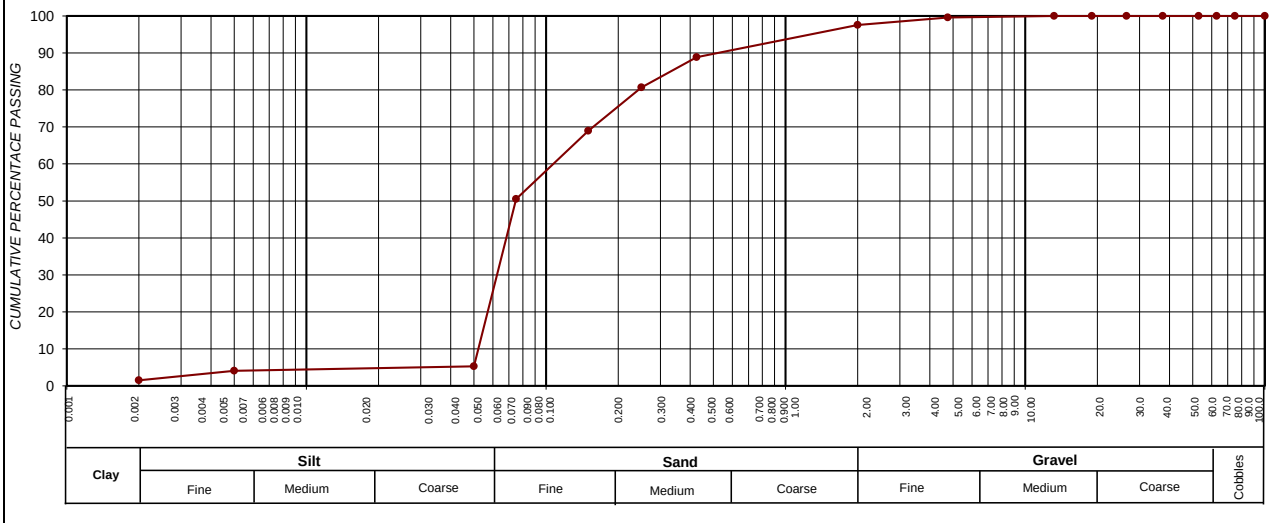


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
1,5	13,5	82,6	2,4

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

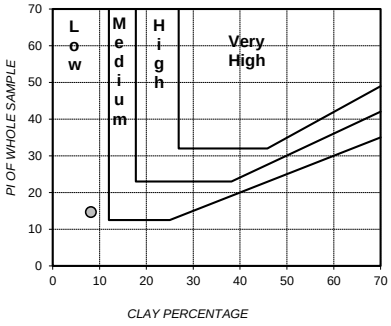
DATE RECEIVED : 11.11.2024
POSITION : TP 507
LAYER : 0,7
SAMPLE No. : B15216
SAMPLE DESCRIPTION : Silty ,Residual Shale

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

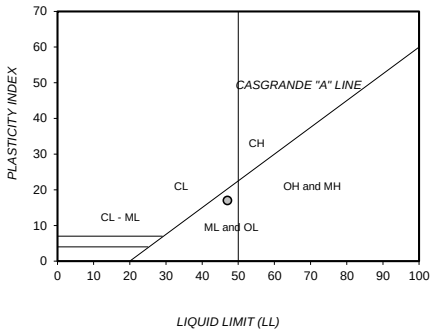
Weighted PI	**14,6**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	96
0,425	86
0,250	82
0,150	70
0,075	50
50 µm	11
5 µm	10
2 µm	8,2

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	11
0.425 - 0.250	4
0.250 - 0.150	13
0.150 - 0.075	21
< 0.075	52

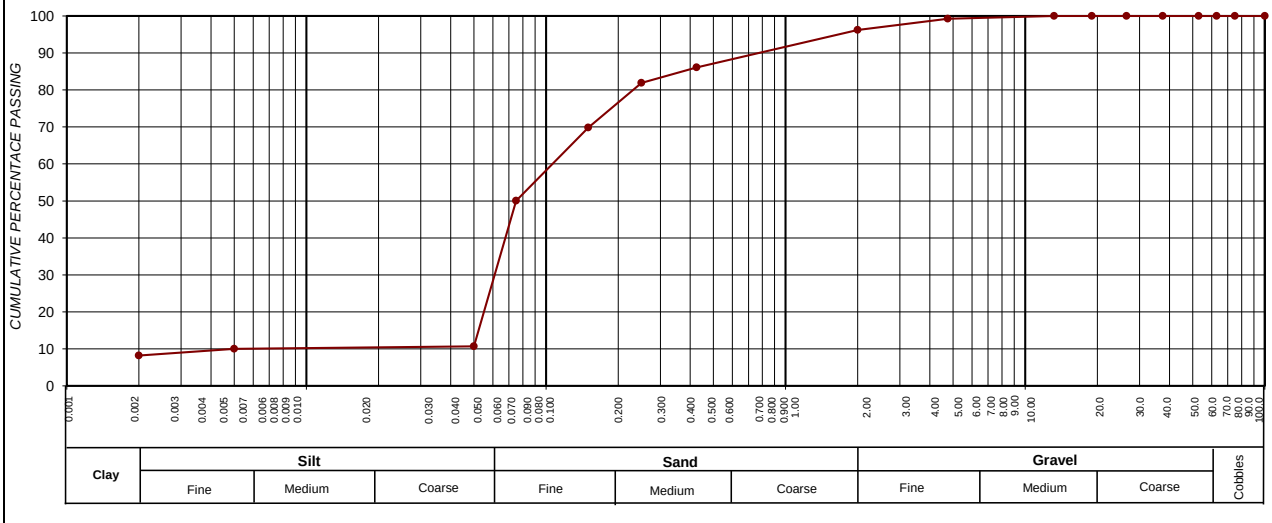
Effective size	0,005
Uniformity Coefficient	22,6
Curvature Coefficient	6,9
Oversize Index	0,0
Shrinkage Product	795,6
Grading Coefficient	3,7
Grading modulus	0,68

Atter-berg Limits	
Liquid Limit	47
Plasticity Index	17
Linear Shrinkage	9,2
PI < 0.075	-

Unified Soil Classification	ML
U.S. Highway Classification	A-7-5 (6)

PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
8,2	11,4	76,6	3,8

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 510
LAYER : 1.0-2.0
SAMPLE No. : B15363
SAMPLE DESCRIPTION : Residual SandstoneGravelly Sitly Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**17,1**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	99
5,00	91
2,000	89
0,425	86
0,250	82
0,150	71
0,075	53
50 µm	10
5 µm	9
2 µm	5,1

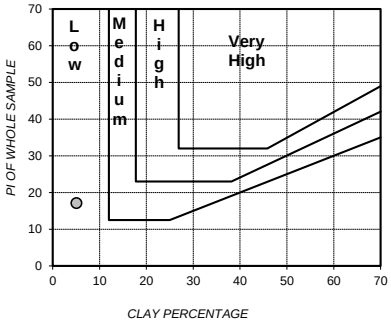
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	3
0.425 - 0.250	4
0.250 - 0.150	12
0.150 - 0.075	20
< 0.075	60

Effective size	0,050
Uniformity Coefficient	2,1
Curvature Coefficient	0,7
Oversize Index	0,0
Shrinkage Product	864,8
Grading Coefficient	10,4
Grading modulus	0,73

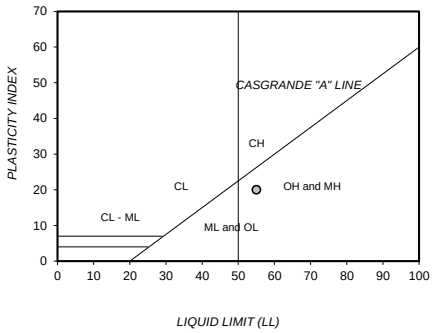
Atter-berg Limits	
Liquid Limit	55
Plasticity Index	20
Linear Shrinkage	10,1
PI < 0.075	-

Unified Soil Classification	MH
U.S. Highway Classification	A-7-5 (9)

POTENTIAL EXPANSIVENES

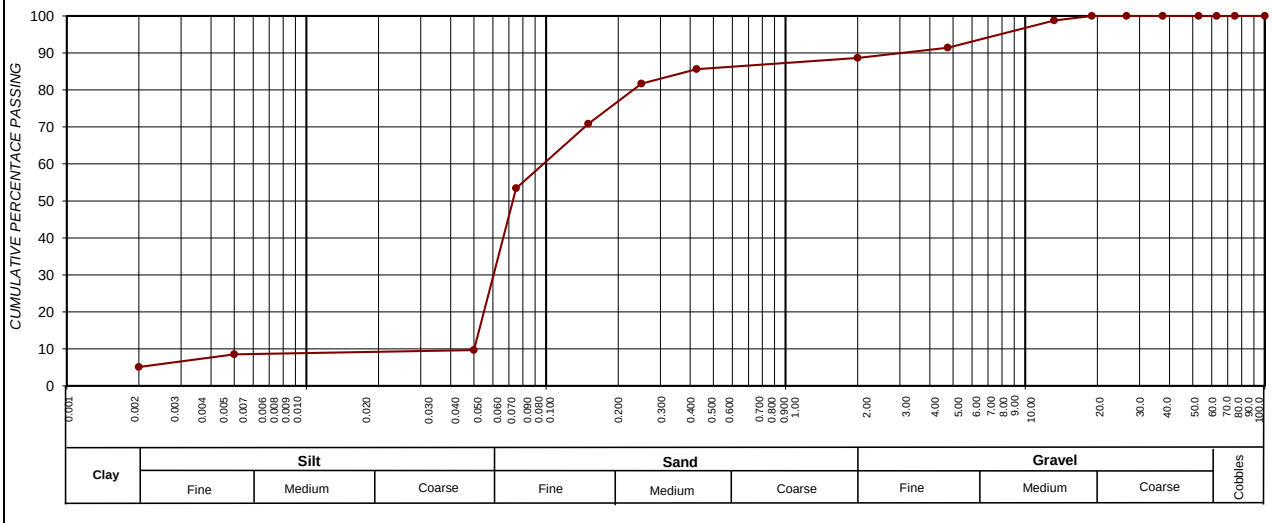


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
5,1	14,5	69,0	11,4

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

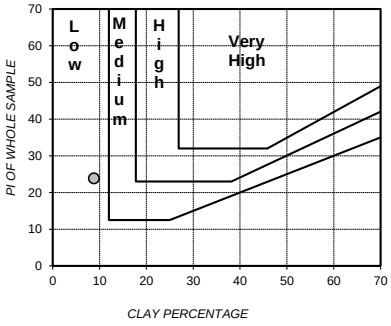
DATE RECEIVED : 11.11.2024
POSITION : TP 511
LAYER : 1.50
SAMPLE No. : B15850
SAMPLE DESCRIPTION : Silty Sand Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

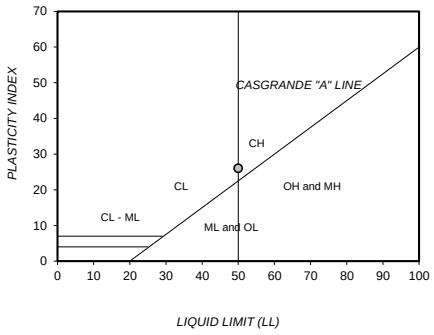
Weighted PI	**23,9**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	97
0,425	92
0,250	89
0,150	84
0,075	73
50 µm	13
5 µm	11
2 µm	8,8

POTENTIAL EXPANSIVENES



PLASTICITY CHART



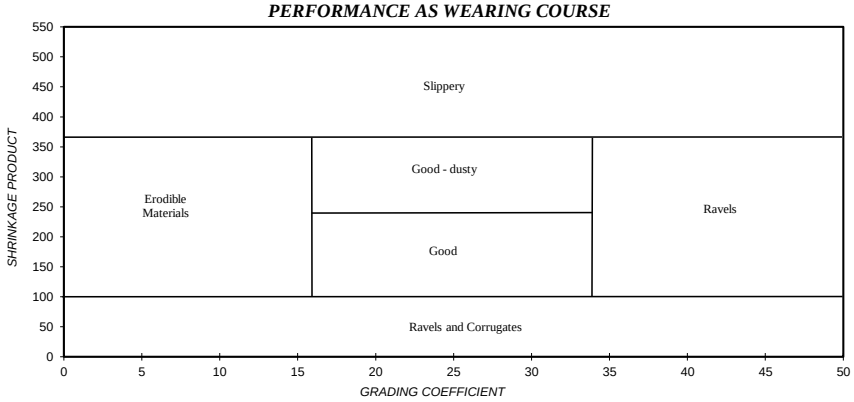
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	5
0.425 - 0.250	3
0.250 - 0.150	5
0.150 - 0.075	11
< 0.075	76

Effective size	0,004
Uniformity Coefficient	16,9
Curvature Coefficient	11,4
Oversize Index	0,0
Shrinkage Product	1072,5
Grading Coefficient	3,2
Grading modulus	0,39

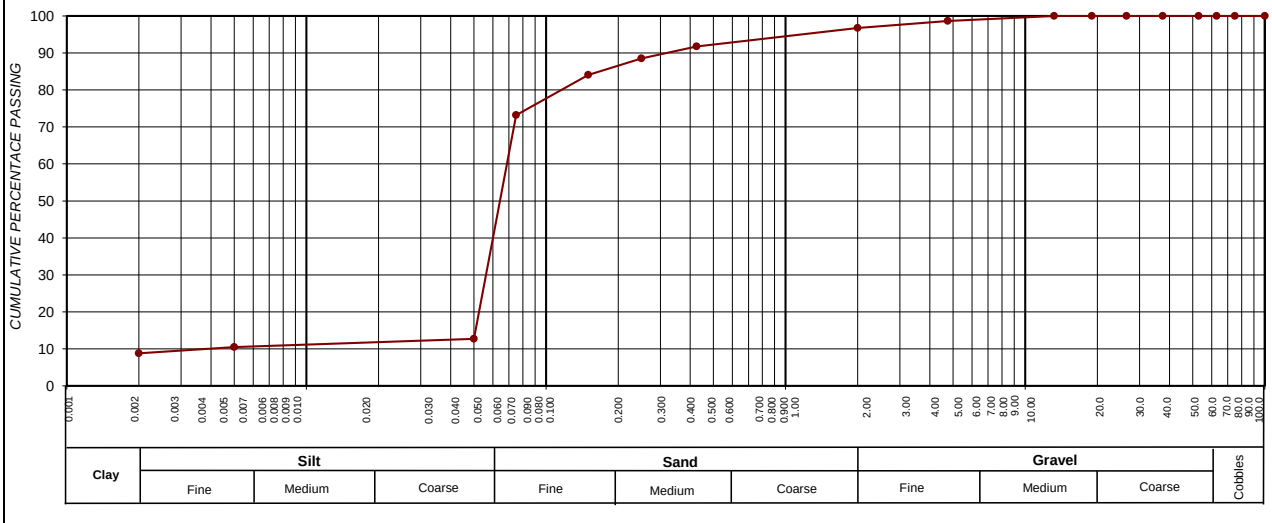
Atter-berg Limits	
Liquid Limit	50
Plasticity Index	26
Linear Shrinkage	11,7
PI < 0.075	-

Unified Soil Classification	CH
U.S. Highway Classification	A-7-6 (19)

PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
8,8	19,0	69,0	3,3

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 524
LAYER : 1.6-2.0
SAMPLE No. : B15190
SAMPLE DESCRIPTION : Weatherised Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**11,5**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	97
0,425	88
0,250	85
0,150	83
0,075	81
50 µm	6
5 µm	6
2 µm	1,5

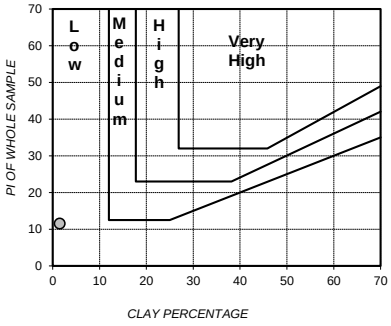
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	9
0.425 - 0.250	3
0.250 - 0.150	2
0.150 - 0.075	3
< 0.075	83

Effective size	0,051
Uniformity Coefficient	1,3
Curvature Coefficient	1,0
Oversize Index	0,0
Shrinkage Product	549,4
Grading Coefficient	2,9
Grading modulus	0,33

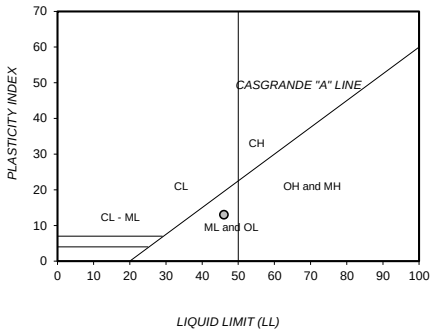
Atter-berg Limits	
Liquid Limit	46
Plasticity Index	13
Linear Shrinkage	6,2
PI < 0.075	-

Unified Soil Classification	ML
U.S. Highway Classification	A-7-5 (13)

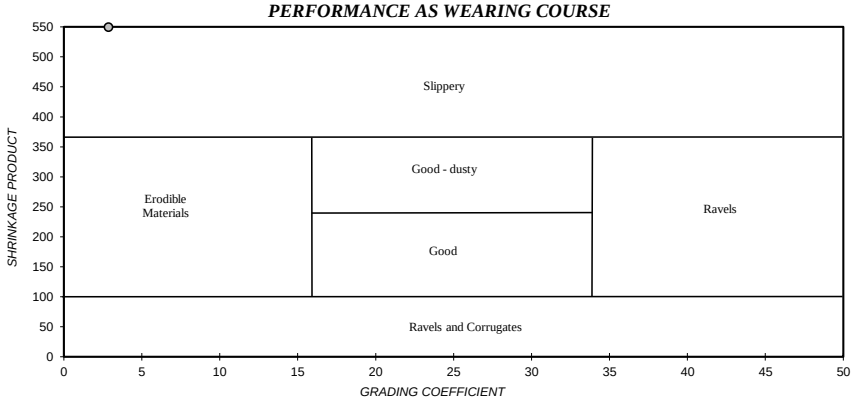
POTENTIAL EXPANSIVENES



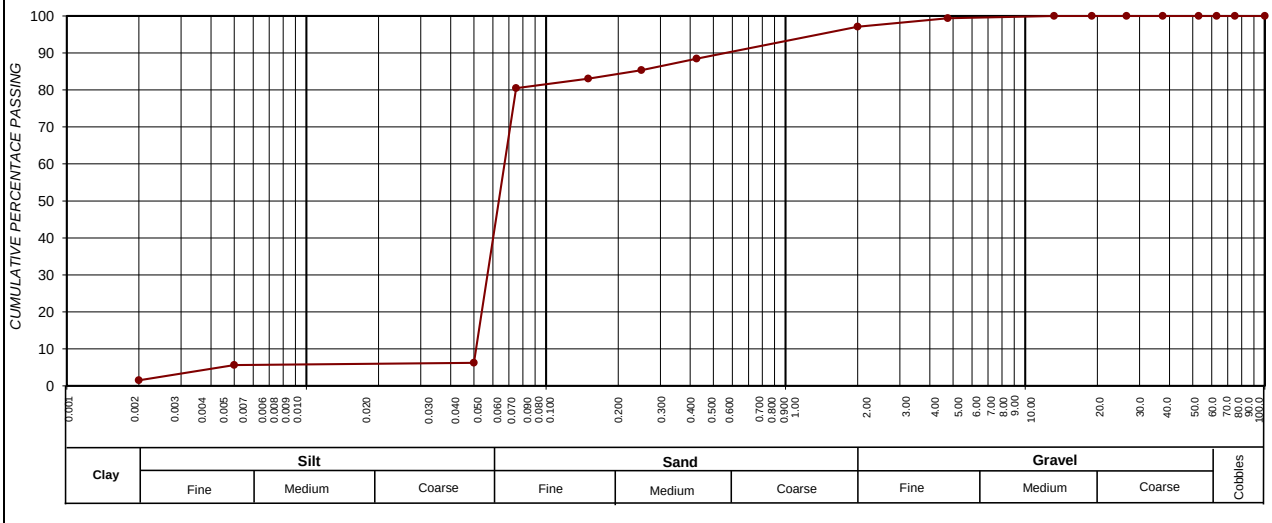
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
1,5	23,2	72,5	2,9

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 524
LAYER : 1.6-2.00
SAMPLE No. : B15434
SAMPLE DESCRIPTION : Silty Sand

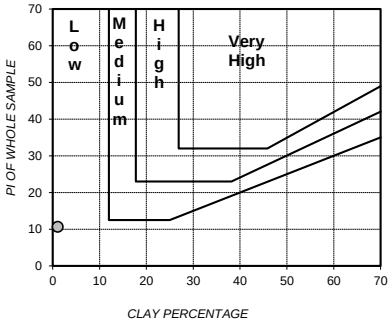
FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**10,7**	**Specifc Gravity**	**2,35**

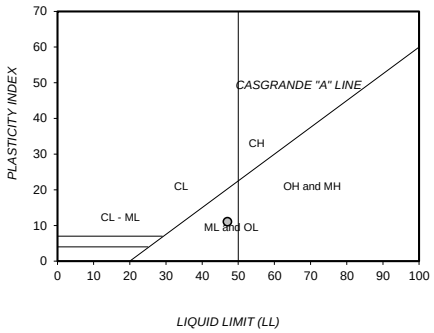
Sieve analysis Cumulative percentage passing (mm)

100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	99
0,425	97
0,250	95
0,150	91
0,075	81
50 µm	3
5 µm	2
2 µm	1,1

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2,00mm

2.000 - 0.425	2
0.425 - 0.250	2
0.250 - 0.150	4
0.150 - 0.075	10
< 0.075	82

Effective size	0,052
Uniformity Coefficient	1,3
Curvature Coefficient	1,0
Oversize Index	0,0
Shrinkage Product	587,7
Grading Coefficient	1,3
Grading modulus	0,24

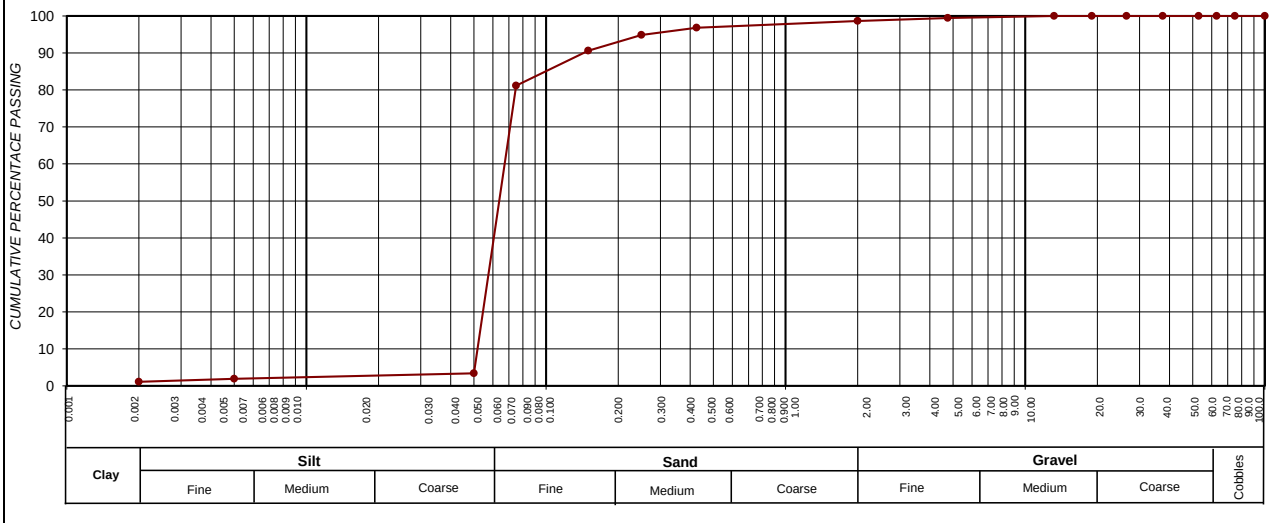
Atter-berg Limits

Liquid Limit	47
Plasticity Index	11
Linear Shrinkage	6,1
PI < 0.075	-

Unified Soil Classification	ML
U.S. Highway Classification	A-7-5 (11)

PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
1,1	20,8	76,8	1,3

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 527
LAYER : 01-Jan-00
SAMPLE No. : B15382
SAMPLE DESCRIPTION : Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**8,4**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	100
2,000	96
0,425	93
0,250	90
0,150	76
0,075	39
50 µm	5
5 µm	4
2 µm	3,0

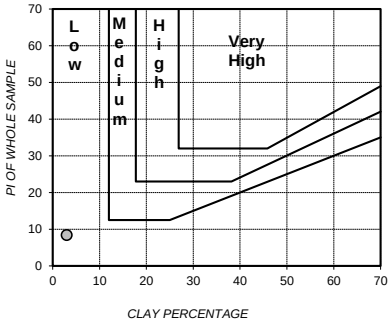
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	4
0.425 - 0.250	3
0.250 - 0.150	15
0.150 - 0.075	38
< 0.075	40

Effective size	0,054
Uniformity Coefficient	2,2
Curvature Coefficient	0,7
Oversize Index	0,0
Shrinkage Product	454,1
Grading Coefficient	3,5
Grading modulus	0,71

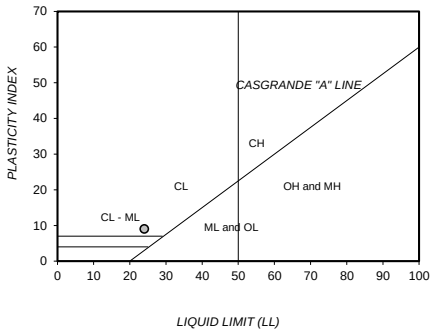
Atter-berg Limits	
Liquid Limit	24
Plasticity Index	9
Linear Shrinkage	4,9
PI < 0.075	-

Unified Soil Classification	SC
U.S. Highway Classification	A-4 (0)

POTENTIAL EXPANSIVENES

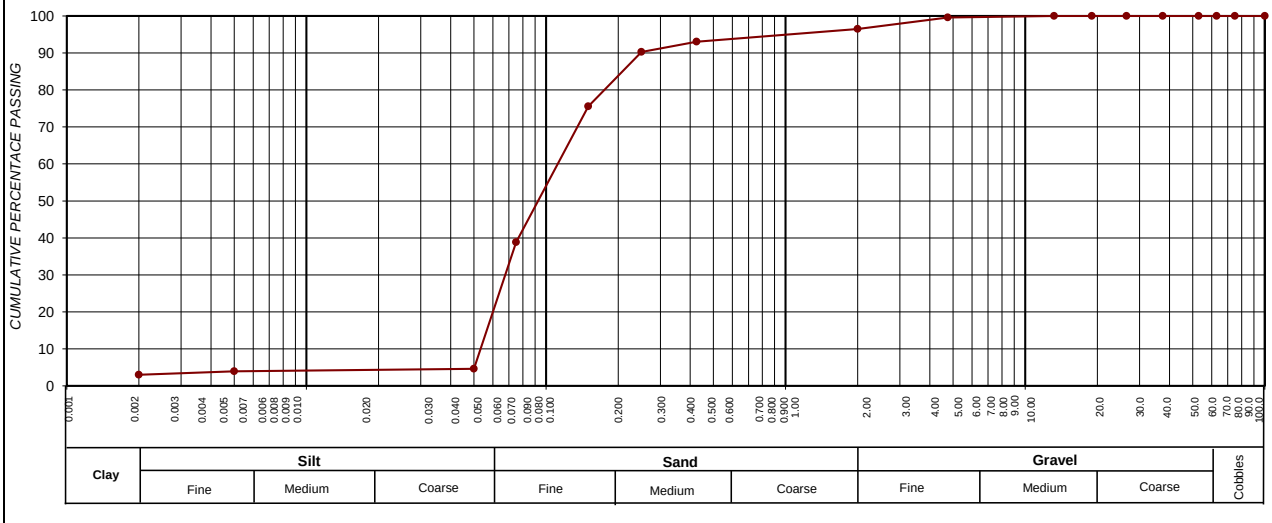


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
3,0	7,2	86,3	3,5

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 541
LAYER : 0,50
SAMPLE No. : B15217
SAMPLE DESCRIPTION : Silty Sand+ Alluvium

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**16,2**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	100
2,000	99
0,425	95
0,250	94
0,150	89
0,075	75
50 µm	9
5 µm	8
2 µm	4,7

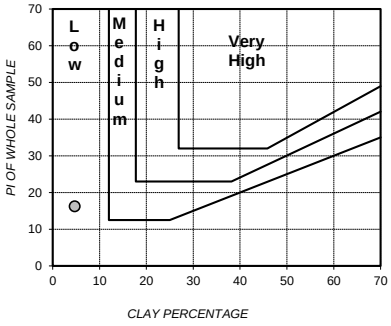
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	3
0.425 - 0.250	1
0.250 - 0.150	6
0.150 - 0.075	14
< 0.075	76

Effective size	0,050
Uniformity Coefficient	1,4
Curvature Coefficient	1,0
Oversize Index	0,0
Shrinkage Product	894,0
Grading Coefficient	1,5
Grading modulus	0,31

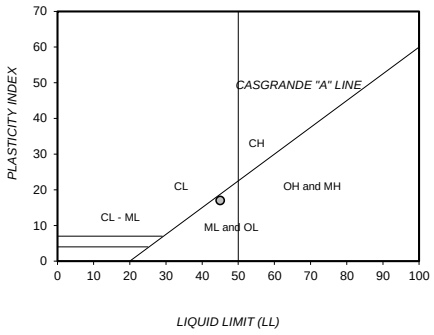
Atter-berg Limits	
Liquid Limit	45
Plasticity Index	17
Linear Shrinkage	9,4
PI < 0.075	-

Unified Soil Classification	ML
U.S. Highway Classification	A-7-6 (13)

POTENTIAL EXPANSIVENES

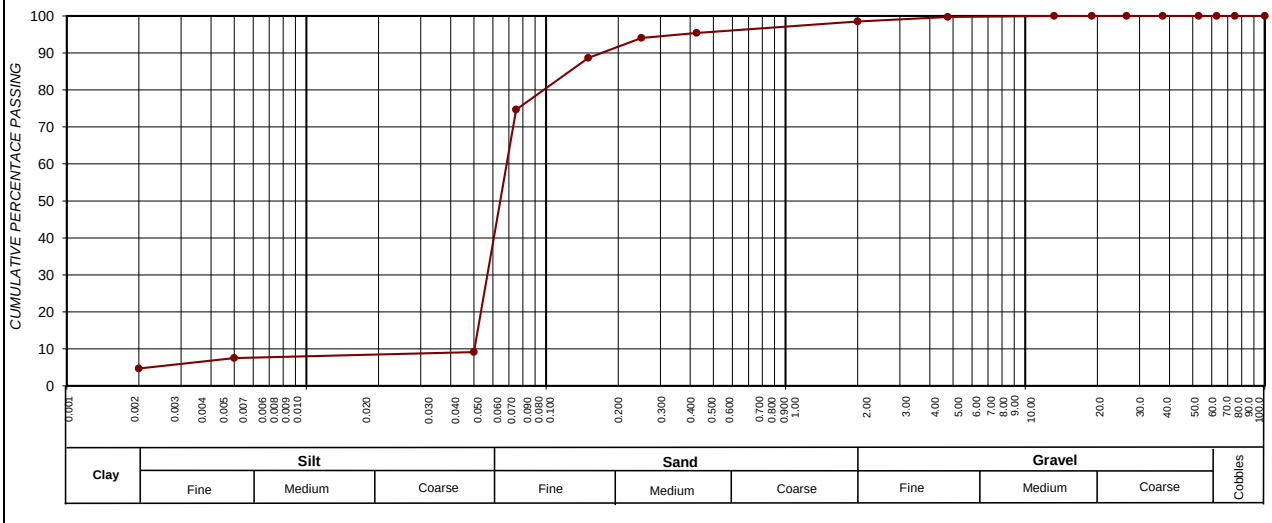


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
4,7	20,1	73,7	1,5

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

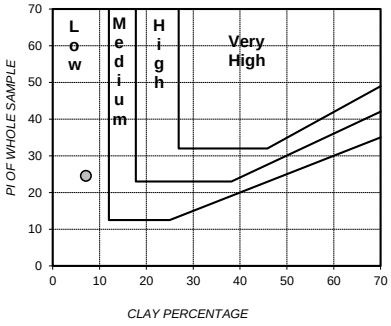
DATE RECEIVED : 11.11.2024
POSITION : TP 545
LAYER : 1.20
SAMPLE No. : B15218
SAMPLE DESCRIPTION : Silty Sand Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

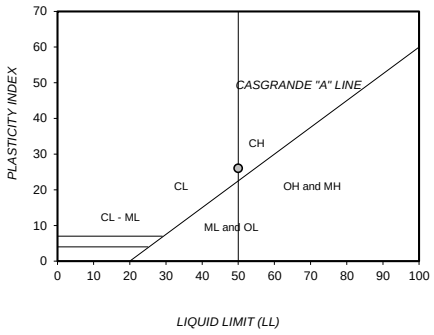
Weighted PI	**24,5**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	98
0,425	94
0,250	91
0,150	86
0,075	76
50 µm	15
5 µm	12
2 µm	7,1

POTENTIAL EXPANSIVENES



PLASTICITY CHART



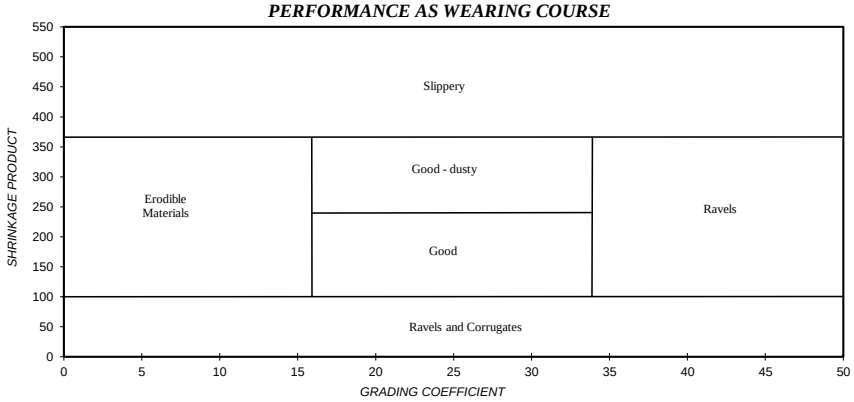
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	3
0.425 - 0.250	3
0.250 - 0.150	5
0.150 - 0.075	10
< 0.075	78

Effective size	0,004
Uniformity Coefficient	17,6
Curvature Coefficient	11,9
Oversize Index	0,0
Shrinkage Product	1004,6
Grading Coefficient	2,3
Grading modulus	0,32

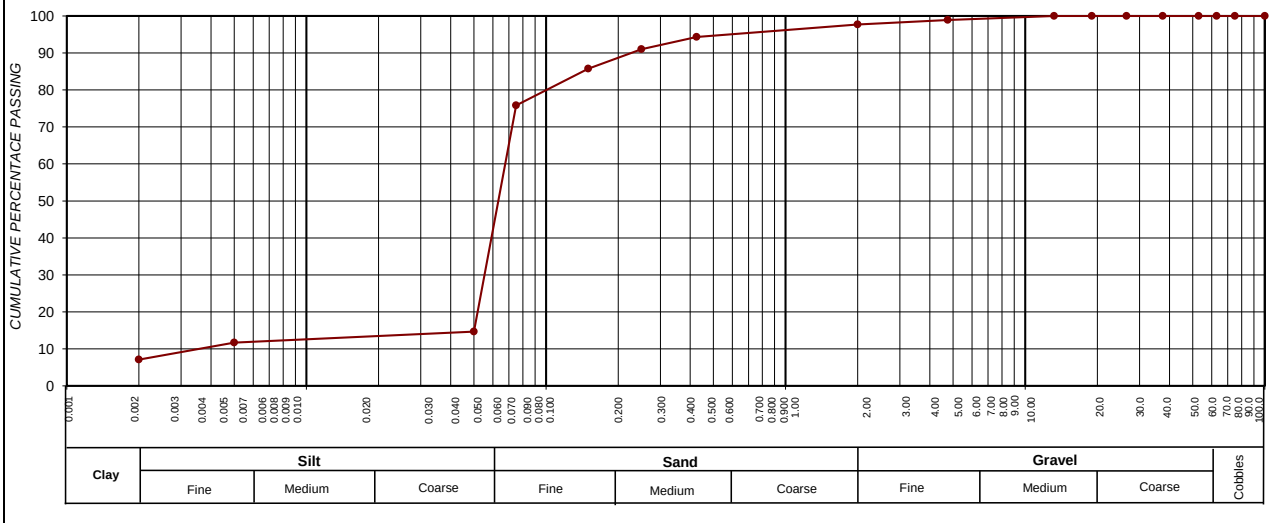
Atter-berg Limits	
Liquid Limit	50
Plasticity Index	26
Linear Shrinkage	10,7
PI < 0.075	-

Unified Soil Classification	CH
U.S. Highway Classification	A-7-6 (20)

PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
7,1	23,0	67,6	2,3

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 548
LAYER : 01-Jan-00
SAMPLE No. : B15219
SAMPLE DESCRIPTION : Silty Sand +Alluvium

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**17,2**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	100
2,000	99
0,425	96
0,250	87
0,150	71
0,075	41
50 µm	11
5 µm	10
2 µm	5,4

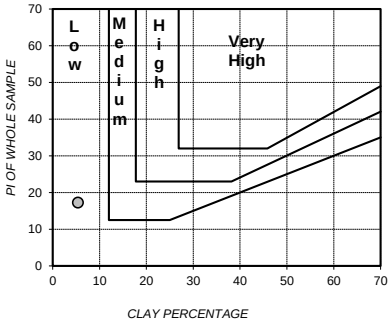
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	3
0.425 - 0.250	8
0.250 - 0.150	17
0.150 - 0.075	30
< 0.075	41

Effective size	0,022
Uniformity Coefficient	5,5
Curvature Coefficient	1,6
Oversize Index	0,0
Shrinkage Product	933,0
Grading Coefficient	1,2
Grading modulus	0,64

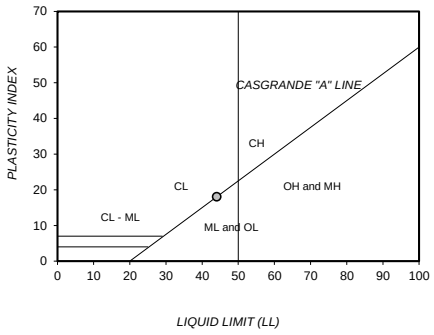
Atter-berg Limits	
Liquid Limit	44
Plasticity Index	18
Linear Shrinkage	9,8
PI < 0.075	-

Unified Soil Classification	SC
U.S. Highway Classification	A-7-6 (3)

POTENTIAL EXPANSIVENES

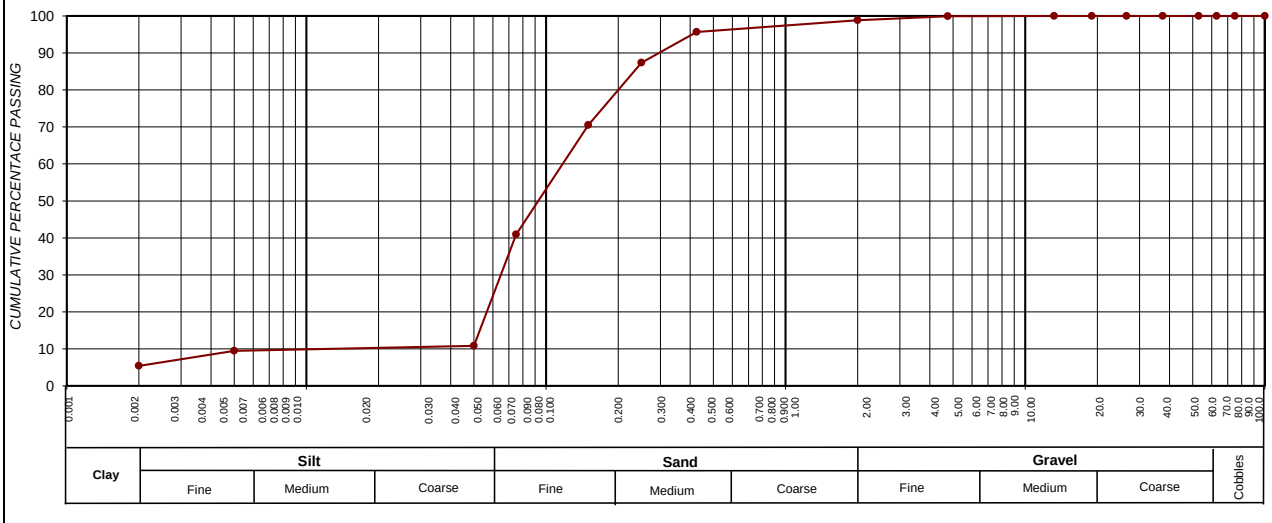


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
5,4	11,3	82,1	1,2

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 548
LAYER : 1.20
SAMPLE No. : B15220
SAMPLE DESCRIPTION : Silty Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**27,7**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	100
2,000	98
0,425	92
0,250	85
0,150	78
0,075	67
50 µm	13
5 µm	11
2 µm	6,6

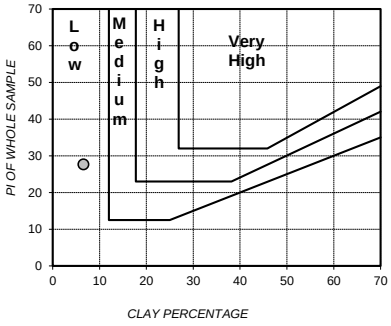
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	6
0.425 - 0.250	8
0.250 - 0.150	7
0.150 - 0.075	12
< 0.075	68

Effective size	0,004
Uniformity Coefficient	16,8
Curvature Coefficient	11,0
Oversize Index	0,0
Shrinkage Product	1447,0
Grading Coefficient	2,1
Grading modulus	0,43

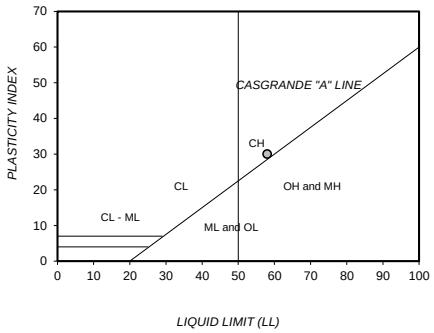
Atter-berg Limits	
Liquid Limit	58
Plasticity Index	30
Linear Shrinkage	15,7
PI < 0.075	-

Unified Soil Classification	CH
U.S. Highway Classification	A-7-6 (20)

POTENTIAL EXPANSIVENES

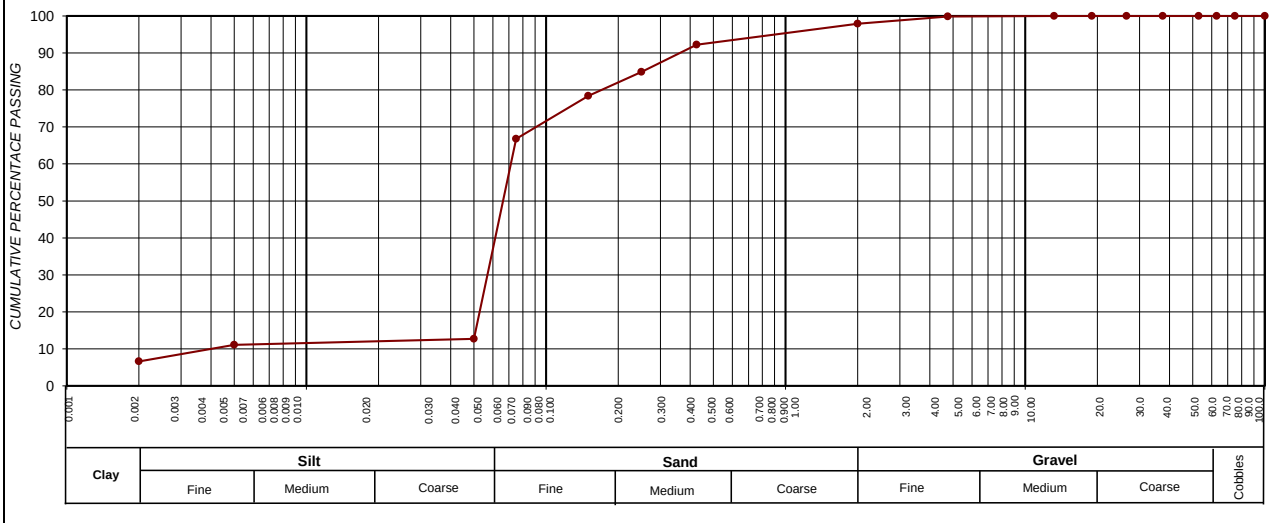


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
6,6	19,6	71,8	2,1

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207 Rietfontein Rd,
Germiston, JHB, 1400

OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 655
LAYER : 0.5-1.7
SAMPLE No. : B15228
SAMPLE DESCRIPTION : Silty Sand+ Residual Sandstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**5,3**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	97
0,425	89
0,250	85
0,150	78
0,075	58
50 µm	3
5 µm	2
2 µm	0,9

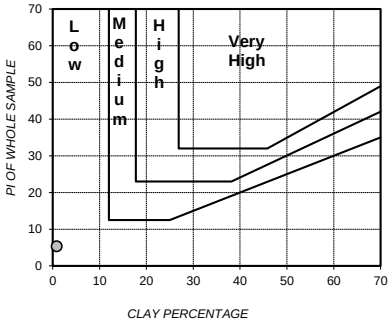
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	8
0.425 - 0.250	4
0.250 - 0.150	8
0.150 - 0.075	20
< 0.075	60

Effective size	0,053
Uniformity Coefficient	1,5
Curvature Coefficient	0,9
Oversize Index	0,0
Shrinkage Product	293,5
Grading Coefficient	3,3
Grading modulus	0,56

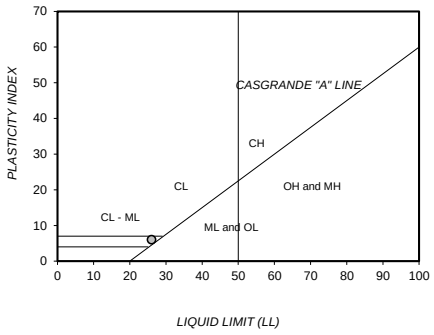
Atter-berg Limits	
Liquid Limit	26
Plasticity Index	6
Linear Shrinkage	3,3
PI < 0.075	-

Unified Soil Classification	CL & ML
U.S. Highway Classification	A-4 (1)

POTENTIAL EXPANSIVENES

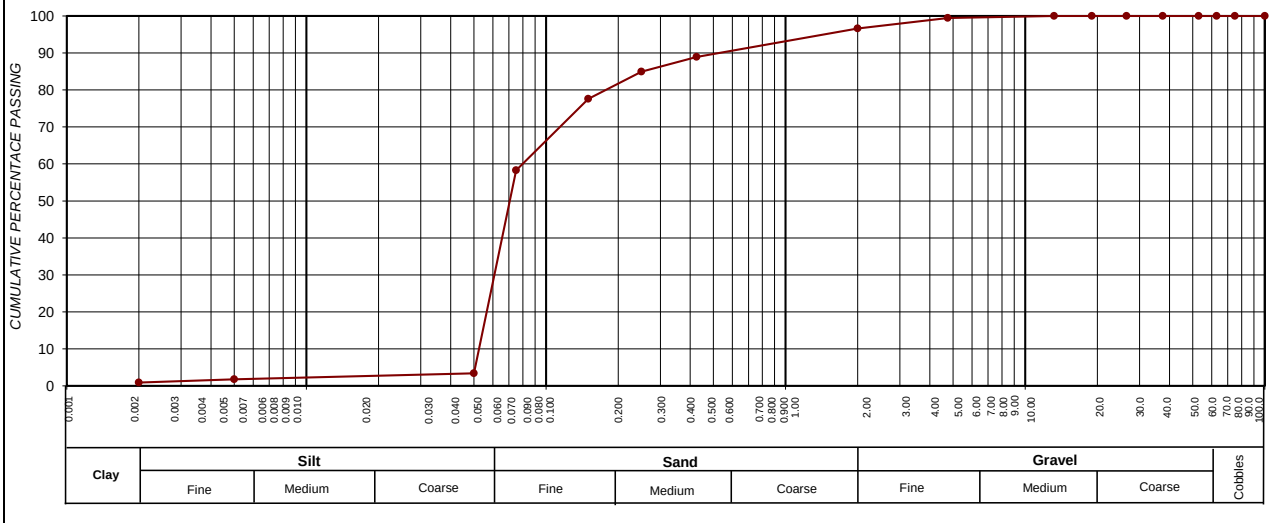


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
0,9	14,7	81,1	3,4

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 655
LAYER : 0.0-0.5
SAMPLE No. : B15364
SAMPLE DESCRIPTION : Silty Sand Residual Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**5,1**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	96
0,425	86
0,250	84
0,150	77
0,075	60
50 µm	5
5 µm	4
2 µm	1,8

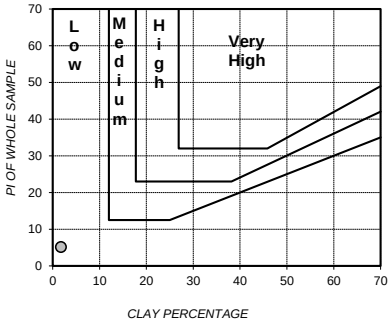
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	10
0.425 - 0.250	2
0.250 - 0.150	7
0.150 - 0.075	18
< 0.075	62

Effective size	0,052
Uniformity Coefficient	1,5
Curvature Coefficient	0,9
Oversize Index	0,0
Shrinkage Product	254,1
Grading Coefficient	4,3
Grading modulus	0,58

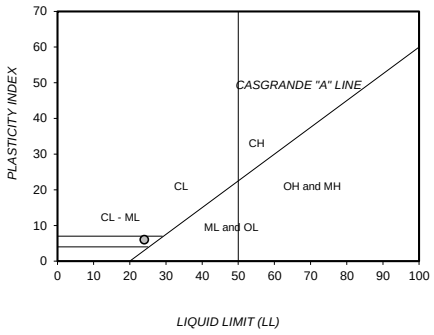
Atter-berg Limits	
Liquid Limit	24
Plasticity Index	6
Linear Shrinkage	3,0
PI < 0.075	-

Unified Soil Classification	CL & ML
U.S. Highway Classification	A-4 (1)

POTENTIAL EXPANSIVENES

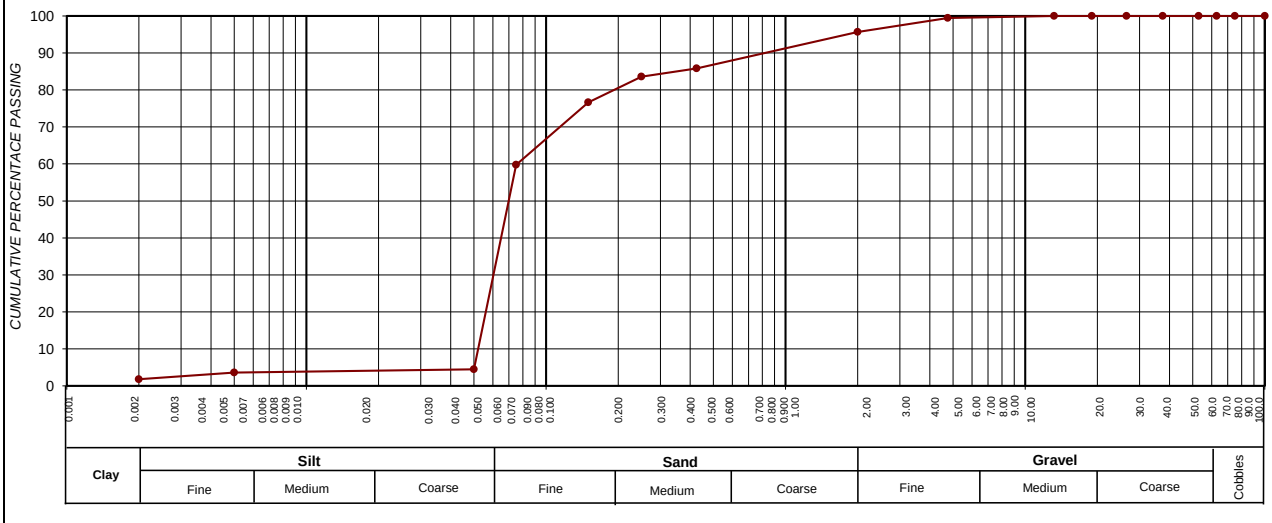


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
1,8	15,2	78,7	4,3

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 910
LAYER : 0.0-0.20
SAMPLE No. : B15429
SAMPLE DESCRIPTION : Silty Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**2,4**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	100
2,000	97
0,425	80
0,250	72
0,150	63
0,075	44
50 µm	2
5 µm	1
2 µm	-0,3

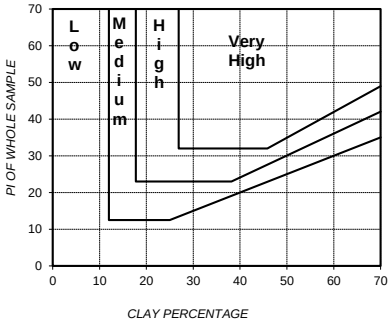
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	18
0.425 - 0.250	8
0.250 - 0.150	9
0.150 - 0.075	20
< 0.075	45

Effective size	0,055
Uniformity Coefficient	2,5
Curvature Coefficient	0,6
Oversize Index	0,0
Shrinkage Product	147,3
Grading Coefficient	2,8
Grading modulus	0,79

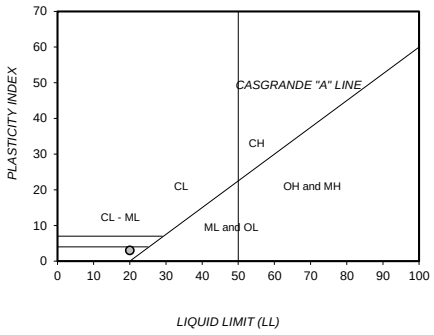
Atter-berg Limits	
Liquid Limit	20
Plasticity Index	3
Linear Shrinkage	1,9
PI < 0.075	-

Unified Soil Classification	SM
U.S. Highway Classification	A-4 (0)

POTENTIAL EXPANSIVENES

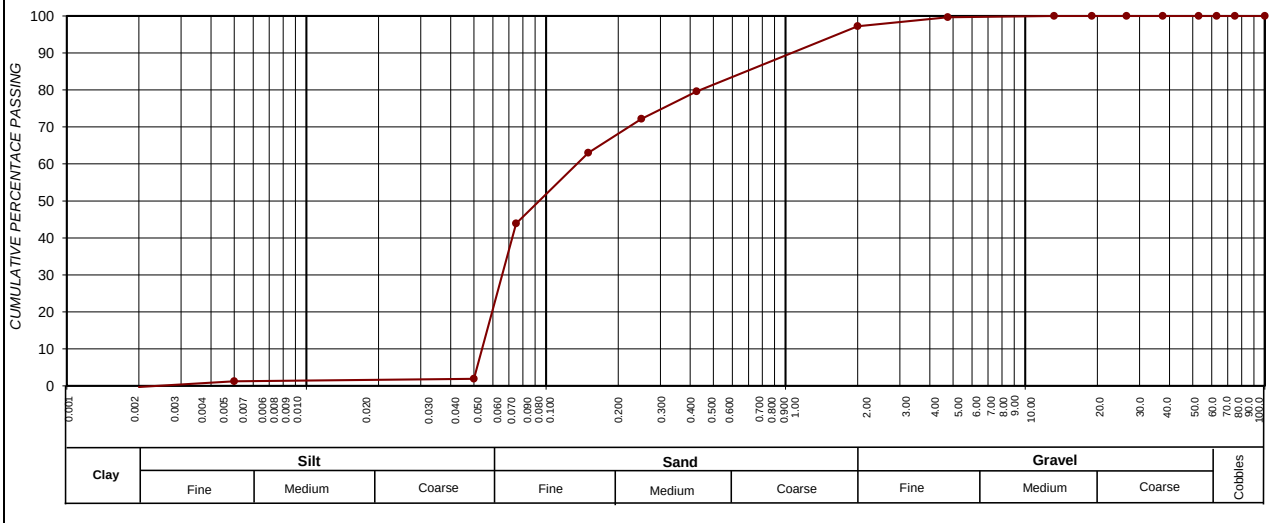


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
-0,3	10,7	86,8	2,8

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 1210
LAYER : 0.0-0.30
SAMPLE No. : B15386
SAMPLE DESCRIPTION : Silty Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**9,4**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	95
0,425	85
0,250	76
0,150	60
0,075	44
50 µm	3
5 µm	2
2 µm	0,9

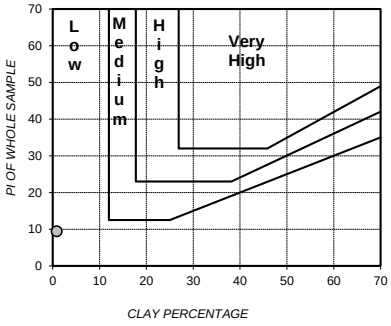
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	10
0.425 - 0.250	10
0.250 - 0.150	17
0.150 - 0.075	16
< 0.075	47

Effective size	0,054
Uniformity Coefficient	2,8
Curvature Coefficient	0,5
Oversize Index	0,0
Shrinkage Product	505,6
Grading Coefficient	4,9
Grading modulus	0,76

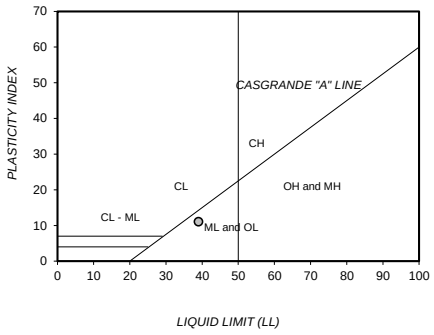
Atter-berg Limits	
Liquid Limit	39
Plasticity Index	11
Linear Shrinkage	5,9
PI < 0.075	-

Unified Soil Classification	SM
U.S. Highway Classification	A-6 (2)

POTENTIAL EXPANSIVENES

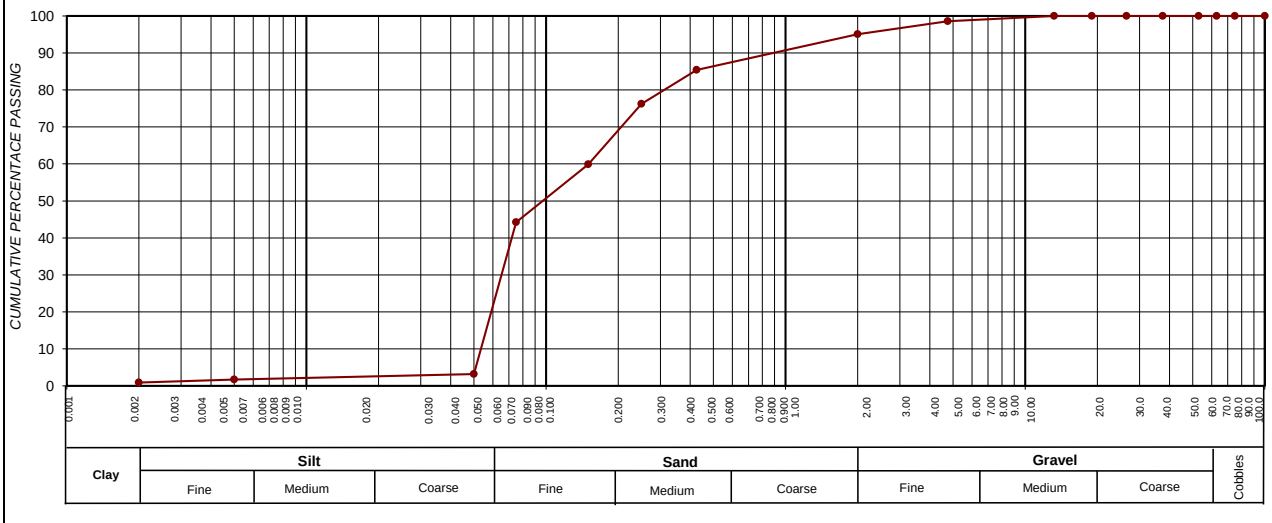


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
0,9	11,5	82,7	4,9

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Bloemfontein Branch
Rudolf Greyling St, Linquinda, Bloemfontein, Free State
bloemfontein@roadlab.co.za
060 727 8002

Roadlab Job Number RB7385

Date Reported: 02.12.2024

Mukuna Geotechnics (PTY)Ltd
International Business Gateway
Midridge Office Estate
New Road,Midrand 1685

Attention: Mr.David Msiza

Dear Sir

Test Report: **Xhariep Pipeline Feasibility Study**

Please find the attached test results for the sample/s as submitted to and tested by Roadlab (Pty)Ltd
The unambiguous description of the sample/s as received are as follows :

SAMPLE INFORMATION & PROPERTIES					
SAMPLE No.		B15859	B15249	B15248	B15165
CONTAINER USED FOR SAMPLING		Sampling Bags	Sampling Bags	Sampling Bags	Sampling Bags
SIZE / WEIGHT OF SAMPLE		-+89kg	-+110,kg	-+90,kg	+- 99,Kg
MOISTURE CONDITION OF SAMPLE ON ARRIVAL		Slightly Moist	Slightly Moist	Slightly Moist	Slightly Moist
HOLE No. / Km. / CHAINAGE		TP 35	TP 220	TP 220	TP 365
ROAD NO OR NAME		GI Xhariep Pipeline	GI Xhariep Pipeline	GI Xhariep Pipeline	GI Xhariep Pipeline
LAYER TESTED / SAMPLED FROM		0,60-1,1	0.8-1.8	1.8-2.8	1.4-3.0
DATE SAMPLED		Sampled by Client	Sampled by Client	Sampled by Client	Sampled by Client
DATE RECEIVED		11.11.2024	11.11.2024	11.11.2024	11.11.2024
CLIENTS MARKING		-	-	-	-
DESCRIPTION OF SAMPLE (COLOUR & TYPE)		Dark Brown Silty Clay Residual Sandstone	Dark Brown Silty Sand Colluvium	Dark Brown Silty Sand Colluvium	Brown Silty Clay
GRADING ANALYSIS - % PASSING SIEVES (SANS 3001-GR1:2010;SANS 3001-GR2:2010)					
SIEVE ANALYSIS **(SANS GR1:2010)**	100,0	100	100	100	100
	75,0	100	100	100	100
	63,0	100	100	100	100
	50,0	100	100	100	100
	37,5	100	100	100	100
	28,0	100	100	100	100
	20,0	100	100	100	100
	14,0	100	100	100	100
	5,0	100	97	97	99
	2,00	99	92	92	97
	0,425	94	77	77	93
	0,075	74	54	54	70
SANS 3001 - PR5					
Soil Mortar		99	92	92	97
Coarse Sand		4,9	15,6	16	4,3
Fine Sand		20	25	25	24
Coarse Fine Sand		2	3	3	2
Medium Fine Sand		5	8	8	6
Fine Fine Sand		13	15	15	16
Silt & Clay		75	60	60	72
Coarse Sand Ratio		0,05	0,16	0,16	0,04
ATTERBERG LIMITS ANALYSIS (SANS 3001-GR10:2010;SANS 3001-GR11:2010)					
ATTERBERG LIMITS **(SANSGR10;GR11)**	LL%	43	34	34	35
	P.I. (0.425mm)	18	8	8	13
	LS%	10	4	4	7
	P.I. (0.075mm)	-	-	-	-
GM		0,33	0,77	0,77	0,41
CLASSIFI - CATION	H.R.B.*	A-7-6(12)	A-4(4)	A-4(4)	A-6(8)
	COLTO*	<G9	G8	G8	<G9
	T.R.H. 14*	G10	G8	G10	G8
CALIFORNIA BEARING RATIO (SANS 3001-GR30:2010;SANS 3001-GR40:2010)					
MOD AASHTO **(SANS GR30)**	OMC%	13,4	17,6	12,5	12,6
	MDD(KG/M^3)	1658	1693	1866	1804
C.B.R.	COMP MC	13,6	17,6	12,4	12,6
	% SWELL	1,50	0,38	0,24	0,31
C.B.R. (SANS GR40)	100%	12	22	22	31
	98%	9	19	17	27
	97%	4	17	15	25
	95%	3	15	13	21
	93%	6	13	11	18
	90%	4	10	4	15
MOD ITS : DRY (kPa) (GR54)		N/S	N/S	N/S	N/S
PROCTOR ITS : DRY (kPa)		N/S	N/S	N/S	N/S
STABILISED WITH	IN LAB	N/S	N/S	N/S	N/S
	ON SITE	N/S	N/S	N/S	N/S
TEST TYPE		CBR/IND	CBR/IND	CBR/IND	CBR/IND
SAMPLED BY		Client	Client	Client	Client
DELIVERED BY		Client	Client	Client	Client
SAMPLING METHOD		**Smpled by the client**	**Sampled by the client**	**Sampled by the client**	**Sampled by the client**
ENVIRONMENTAL CONDITION WHEN SAMPLED		N/S	N/S	N/S	N/S
REMARKS & NOTES		N/S	N/S	N/S	N/S

Kind Regards

sanas
T1143

Mr. Solomon Lediga
Technical Signatory / Manager

Remarks :
*Opinions & Interpretations are not included in our schedule of Accreditation
The samples were subjected to analysis according to SANS T1143
The results reported relate only to the sample tested
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Bloemfontein Branch
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bloemfontein@roadlab.co.za
060 727 8002

Roadlab Job Number RB7385

Date Reported: 02.12.2024

Mukuna Geotechnics (PTY)Ltd
International Business Gateway
Midridge Office Estate
New Road,Midrand 1685

Attention: Mr.David Msiza

Dear Sir

Test Report: **Xhariep Pipeline Feasibility Study**

Please find the attached test results for the sample/s as submitted to and tested by Roadlab (Pty)Ltd
The unambiguous description of the sample/s as received are as follows :

SAMPLE INFORMATION & PROPERTIES					
SAMPLE No.		B15184	B15191	15147	B15182
CONTAINER USED FOR SAMPLING		Sampling Bags	Sampling Bags	Sampling Bags	Sampling Bags
SIZE / WEIGHT OF SAMPLE		-+83kg	-+73,kg	-+79,kg	+- 78,Kg
MOISTURE CONDITION OF SAMPLE ON ARRIVAL		Slightly Moist	Slightly Moist	Slightly Moist	Slightly Moist
HOLE No. / Km. / CHAINAGE		TP 27	TP 37	TP 43	TP 114
ROAD NO OR NAME		GI Xhariep Pipeline	GI Xhariep Pipeline	GI Xhariep Pipeline	GI Xhariep Pipeline
LAYER TESTED / SAMPLED FROM		0.0-0.70	0.9-1.2	0.4-1.3	0.8-1.6
DATE SAMPLED		Sampled by Client	Sampled by Client	Sampled by Client	Sampled by Client
DATE RECEIVED		11.11.2024	11.11.2024	11.11.2024	11.11.2024
CLIENTS MARKING		-	-	-	-
DESCRIPTION OF SAMPLE (COLOUR & TYPE)		Dark Brown Gravelly Sandy Clay , Residual Mudstone	Dark Brown Gravel Sandy Clay	N/S sandy Clay Mudstone	N/S Silty Sand ,Colluvium
GRADING ANALYSIS - % PASSING SIEVES (SANS 3001-GR1:2010;SANS 3001-GR2:2010)					
SIEVE ANALYSIS **(SANS GR1:2010)**	100,0	100	100	100	100
	75,0	100	100	100	100
	63,0	100	100	100	100
	50,0	100	96	100	100
	37,5	100	94	100	100
	28,0	100	92	100	100
	20,0	100	89	100	100
	14,0	91	88	100	100
	5,0	80	86	98	98
	2,00	62	83	88	94
	0,425	39	78	60	79
	0,075	26	59	30	61
SANS 3001 - PR5					
Soil Mortar		62	83	88	94
Coarse Sand		37,8	6,0	32	16,6
Fine Sand		21	23	34	18
Coarse Fine Sand		6	1	11	5
Medium Fine Sand		7	5	12	4
Fine Fine Sand		8	17	11	9
Silt & Clay		42	71	34	65
Coarse Sand Ratio		0,38	0,06	0,32	0,17
ATTERBERG LIMITS ANALYSIS (SANS 3001-GR10:2010;SANS 3001-GR11:2010)					
ATTERBERG LIMITS **(SANSGR10;GR11)**	LL%	34	39	32	32
	P.I. (0.425mm)	12	14	6	11
	LS%	6	8	3	6
	P.I. (0.075mm)	-	-	-	-
GM		1,73	0,80	1,21	0,66
CLASSIFI - CATION	H.R.B.*	A-2-6(0)	A-6(6)	A-6(6)	A-6(6)
	COLTO*	<G9	<G9	G6	<G9
	T.R.H. 14*	<G10	G8	G6	<G10
CALIFORNIA BEARING RATIO (SANS 3001-GR30:2010;SANS 3001-GR40:2010)					
MOD AASHTO **(SANS GR30)**	OMC%	14,0	10,6	9,3	14,4
	MDD(KG/M^3)	1829	1829	1957	1658
C.B.R.	COMP MC	14,0	10,6	9,3	14,4
	% SWELL	1,80	0,60	0,50	2,00
C.B.R. (SANS GR40)	100%	46	50	38	20
	98%	38	47	34	18
	97%	34	38	32	17
	95%	28	32	29	15
	93%	23	25	27	13
	90%	17	21	23	11
MOD ITS : DRY (kPa) (GR54)		N/S	N/S	N/S	N/S
PROCTOR ITS : DRY (kPa)		N/S	N/S	N/S	N/S
STABILISED WITH	IN LAB	N/S	N/S	N/S	N/S
	ON SITE	N/S	N/S	N/S	N/S
TEST TYPE		CBR/IND	CBR/IND	CBR/IND	CBR/IND
SAMPLED BY		Client	Client	Client	Client
DELIVERED BY		Client	Client	Client	Client
SAMPLING METHOD		**Smpled by the client**	**Sampled by the client**	**Sampled by the client**	**Sampled by the client**
ENVIRONMENTAL CONDITION WHEN SAMPLED		N/S	N/S	N/S	N/S
REMARKS & NOTES		N/S	N/S	N/S	N/S

Kind Regards

sanas
T1143

Mr. Solomon Lediga
Technical Signatory / Manager

Remarks :
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Roadlab Laboratories
Civil Materials Testing
BBBEE Level 1 Contributor
Trusted Experts Since 1965

Bloemfontein Branch
Rudolf Greyling St, Linquinda, Bloemfontein, Free State
bloemfontein@roadlab.co.za
060 727 8002

Roadlab Job Number RB7385

Date Reported: 02.12.2024

Mukuna Geotechnics (PTY)Ltd
International Business Gateway
Midridge Office Estate
New Road,Midrand 1685

Attention: Mr.David Msiza

Dear Sir

Test Report: **Xhariep Pipeline Feasibility Study**

Please find the attached test results for the sample/s as submitted to and tested by Roadlab (Pty)Ltd
The unambiguous description of the sample/s as received are as follows :

SAMPLE INFORMATION & PROPERTIES					
SAMPLE No.		B15162	B15164	B15167	B15160
CONTAINER USED FOR SAMPLING		Sampling Bags	Sampling Bags	Sampling Bags	Sampling Bags
SIZE / WEIGHT OF SAMPLE		-+89kg	-+98,kg	-+87,kg	+- 99,Kg
MOISTURE CONDITION OF SAMPLE ON ARRIVAL		Slightly Moist	Slightly Moist	Slightly Moist	Slightly Moist
HOLE No. / Km. / CHAINAGE		TP 343	TP 346	TP 394	TP 411
ROAD NO OR NAME		GI Xhariep Pipeline	GI Xhariep Pipeline	GI Xhariep Pipeline	GI Xhariep Pipeline
LAYER TESTED / SAMPLED FROM		0.8-1.4	0.9-1.2	0.7-1.3	1.5-2.9
DATE SAMPLED		Sampled by Client	Sampled by Client	Sampled by Client	Sampled by Client
DATE RECEIVED		11.11.2024	11.11.2024	11.11.2024	11.11.2024
CLIENTS MARKING		-	-	-	-
DESCRIPTION OF SAMPLE (COLOUR & TYPE)		Olive Silty Clayey	Dark Brown Silty Clay	Pale Olive Reworked Mudstone	Dark Brown Silty Sand ,Alluvium
GRADING ANALYSIS - % PASSING SIEVES (SANS 3001-GR1:2010;SANS 3001-GR2:2010)					
SIEVE ANALYSIS **(SANS GR1:2010)**	100,0	100	100	100	100
	75,0	100	100	100	100
	63,0	100	100	100	100
	50,0	100	100	100	100
	37,5	100	100	100	100
	28,0	100	100	100	100
	20,0	100	100	100	100
	14,0	100	100	100	100
	5,0	99	100	93	98
	2,00	95	98	58	94
	0,425	67	94	17	91
	0,075	34	74	9	66
SANS 3001 - PR5					
Soil Mortar		95	98	58	94
Coarse Sand		29,7	3,6	70	3,5
Fine Sand		34	21	14	26
Coarse Fine Sand		8	0	6	2
Medium Fine Sand		12	5	5	8
Fine Fine Sand		13	15	4	16
Silt & Clay		36	75	16	70
Coarse Sand Ratio		0,30	0,04	0,70	0,04
ATTERBERG LIMITS ANALYSIS (SANS 3001-GR10:2010;SANS 3001-GR11:2010)					
ATTERBERG LIMITS **(SANSGR10;GR11)**	LL%	28	40	37	42
	P.I. (0.425mm)	6	20	13	24
	LS%	3	10	7	11
	P.I. (0.075mm)	-	-	-	-
GM		1,04	0,34	2,16	0,48
CLASSIFI - CATION	H.R.B.*	A-2-4(0)	A-6(12)	A-6(12)	A-7-6(12)
	COLTO*	G7	<G9	<G9	<G9
	T.R.H. 14*	G7	<G10	<G10	G8
CALIFORNIA BEARING RATIO (SANS 3001-GR30:2010;SANS 3001-GR40:2010)					
MOD AASHTO **(SANS GR30)**	OMC%	10,4	14,4	7,4	11,7
	MDD(KG/M^3)	1947	1765	1882	1810
C.B.R.	COMP MC	10,4	14,4	7,4	11,7
	% SWELL	0,25	1,60	1,60	1,10
C.B.R. (SANS GR40)	100%	30	26	32	34
	98%	27	23	28	30
	97%	26	22	26	28
	95%	24	21	23	24
	93%	22	19	20	21
	90%	19	16	17	17
MOD ITS : DRY (kPa) (GR54)		N/S	N/S	N/S	N/S
PROCTOR ITS : DRY (kPa)		N/S	N/S	N/S	N/S
STABILISED WITH	IN LAB	N/S	N/S	N/S	N/S
	ON SITE	N/S	N/S	N/S	N/S
TEST TYPE		CBR/IND	CBR/IND	CBR/IND	CBR/IND
SAMPLED BY		Client	Client	Client	Client
DELIVERED BY		Client	Client	Client	Client
SAMPLING METHOD		**Smpled by the client**	**Sampled by the client**	**Sampled by the client**	**Sampled by the client**
ENVIRONMENTAL CONDITION WHEN SAMPLED		N/S	N/S	N/S	N/S
REMARKS & NOTES		N/S	N/S	N/S	N/S

Kind Regards

sanas
T1143

Mr. Solomon Lediga
Technical Signatory / Manager

Remarks :
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060 727 8002

Roadlab Job Number RB7385

Date Reported: 02.12.2024

Mukuna Geotechnics (PTY)Ltd
International Business Gateway
Midridge Office Estate
New Road,Midrand 1685

Attention: Mr.David Msiza

Dear Sir

Test Report: **Xhariep Pipeline Feasibility Study**

Please find the attached test results for the sample/s as submitted to and tested by Roadlab (Pty)Ltd
The unambiguous description of the sample/s as received are as follows :

SAMPLE INFORMATION & PROPERTIES					
SAMPLE No.		B15224	B15149	B15167	B15158
CONTAINER USED FOR SAMPLING		Sampling Bags	Sampling Bags	Sampling Bags	Sampling Bags
SIZE / WEIGHT OF SAMPLE		-+114kg	-+101,kg	-+99,kg	+- 100,Kg
MOISTURE CONDITION OF SAMPLE ON ARRIVAL		Slightly Moist	Slightly Moist	Slightly Moist	Slightly Moist
HOLE No. / Km. / CHAINAGE		TP 394	TP 210	TP 394	TP 402
ROAD NO OR NAME		GI Xhariep Pipeline	GI Xhariep Pipeline	GI Xhariep Pipeline	GI Xhariep Pipeline
LAYER TESTED / SAMPLED FROM		1,5	0.4-1.0	0.7-1.3	1.2-3.0
DATE SAMPLED		Sampled by Client	Sampled by Client	Sampled by Client	Sampled by Client
DATE RECEIVED		11.11.2024	11.11.2024	11.11.2024	11.11.2024
CLIENTS MARKING		-	-	-	-
DESCRIPTION OF SAMPLE (COLOUR & TYPE)		Dark Olive Silty Clay Residual Sandstone	Dark Olive Gravel Sand Fill	Olive Silty Mudstone	Brown Silty Sandstone
GRADING ANALYSIS - % PASSING SIEVES (SANS 3001-GR1:2010;SANS 3001-GR2:2010)					
SIEVE ANALYSIS **(SANS GR1:2010)**	100,0	100	100	100	100
	75,0	100	100	100	100
	63,0	100	100	100	100
	50,0	100	100	100	100
	37,5	100	100	100	100
	28,0	100	100	100	100
	20,0	100	100	100	100
	14,0	100	100	95	100
	5,0	100	97	94	98
	2,00	97	92	92	93
	0,425	90	77	84	80
	0,075	74	54	69	70
SANS 3001 - PR5					
Soil Mortar		97	92	92	93
Coarse Sand		7,6	15,6	8	14,2
Fine Sand		16	25	16	11
Coarse Fine Sand		2	3	2	2
Medium Fine Sand		5	8	5	2
Fine Fine Sand		9	15	8	7
Silt & Clay		76	60	76	75
Coarse Sand Ratio		0,08	0,16	0,08	0,14
ATTERBERG LIMITS ANALYSIS (SANS 3001-GR10:2010;SANS 3001-GR11:2010)					
ATTERBERG LIMITS **(SANSGR10;GR11)**	LL%	50	34	50	37
	P.I. (0.425mm)	25	8	25	12
	LS%	12	4	12	7
	P.I. (0.075mm)	-	-	-	-
GM		0,38	0,77	0,55	0,56
CLASSIFI - CATION	H.R.B.*	A-7-6(16)	A-4(4)	A-4(4)	A-6(8)
	COLTO*	<G9	G7	<G9	<G9
	T.R.H. 14*	G10	G7	G10	G10
CALIFORNIA BEARING RATIO (SANS 3001-GR30:2010;SANS 3001-GR40:2010)					
MOD AASHTO **(SANS GR30)**	OMC%	16,4	11,1	1836,0	13,6
	MDD(KG/M^3)	1705	1793	14,5	1822
C.B.R.	COMP MC	16,4	11,1	14,6	13,8
	% SWELL	1,50	0,22	1,30	1,30
C.B.R. (SANS GR40)	100%	12	29	16	13
	98%	11	26	14	11
	97%	7	24	11	9
	95%	6	22	9	7
	93%	4	20	7	5
	90%	3	17	3	3
MOD ITS : DRY (kPa) (GR54)		N/S	N/S	N/S	N/S
PROCTOR ITS : DRY (kPa)		N/S	N/S	N/S	N/S
STABILISED WITH	IN LAB	N/S	N/S	N/S	N/S
	ON SITE	N/S	N/S	N/S	N/S
TEST TYPE		CBR/IND	CBR/IND	CBR/IND	CBR/IND
SAMPLED BY		Client	Client	Client	Client
DELIVERED BY		Client	Client	Client	Client
SAMPLING METHOD		**Smpled by the client**	**Sampled by the client**	**Sampled by the client**	**Sampled by the client**
ENVIRONMENTAL CONDITION WHEN SAMPLED		N/S	N/S	N/S	N/S
REMARKS & NOTES		N/S	N/S	N/S	N/S

Kind Regards

sanas
T1143

Mr. Solomon Lediga
Technical Signatory / Manager

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bloemfontein@roadlab.co.za
060 727 8002

Roadlab Job Number RB7385

Date Reported: 02.12.2024

Mukuna Geotechnics (PTY)Ltd
International Business Gateway
Midridge Office Estate
New Road,Midrand 1685

Attention: Mr.David Msiza

Dear Sir

Test Report: **Xhariep Pipeline Feasibility Study**

Please find the attached test results for the sample/s as submitted to and tested by Roadlab (Pty)Ltd
The unambiguous description of the sample/s as received are as follows :

SAMPLE INFORMATION & PROPERTIES					
SAMPLE No.		B15363	B15150	B15191	B15155
CONTAINER USED FOR SAMPLING		Sampling Bags	Sampling Bags	Sampling Bags	Sampling Bags
SIZE / WEIGHT OF SAMPLE		-+79kg	-+108,kg	-+79,kg	+- 99,Kg
MOISTURE CONDITION OF SAMPLE ON ARRIVAL		Slightly Moist	Slightly Moist	Slightly Moist	Slightly Moist
HOLE No. / Km. / CHAINAGE		TP 510	TP 224	TP 490	TP 277
ROAD NO OR NAME		GI Xhariep Pipeline	GI Xhariep Pipeline	GI Xhariep Pipeline	GI Xhariep Pipeline
LAYER TESTED / SAMPLED FROM		1.0-2.0	1.1-1.3	0.6-1.8	1.4-3.2
DATE SAMPLED		Sampled by Client	Sampled by Client	Sampled by Client	Sampled by Client
DATE RECEIVED		11.11.2024	11.11.2024	11.11.2024	11.11.2024
CLIENTS MARKING		-	-	-	-
DESCRIPTION OF SAMPLE (COLOUR & TYPE)		Olive Silty Clay Residual Sandstone	Dark Brown Weathered Mudstone	Pale Olive Silty Sand Mudstone	Reddish Brown Clay Snad
GRADING ANALYSIS - % PASSING SIEVES (SANS 3001-GR1:2010;SANS 3001-GR2:2010)					
SIEVE ANALYSIS **(SANS GR1:2010)**	100,0	100	100	100	100
	75,0	100	100	100	100
	63,0	100	98	100	100
	50,0	100	95	100	100
	37,5	100	92	100	100
	28,0	100	90	100	100
	20,0	100	85	100	100
	14,0	99	85	100	100
	5,0	91	83	99	99
	2,00	89	81	98	97
	0,425	86	79	94	94
	0,075	53	30	80	75
SANS 3001 - PR5					
Soil Mortar		89	81	98	97
Coarse Sand		3,4	2,0	3	3,5
Fine Sand		36	61	15	19
Coarse Fine Sand		4	24	1	1
Medium Fine Sand		12	21	3	5
Fine Fine Sand		20	17	10	13
Silt & Clay		60	37	82	77
Coarse Sand Ratio		0,03	0,02	0,03	0,04
ATTERBERG LIMITS ANALYSIS (SANS 3001-GR10:2010;SANS 3001-GR11:2010)					
ATTERBERG LIMITS **(SANSGR10;GR11)**	LL%	55	24	40	63
	P.I. (0.425mm)	20	3	23	34
	LS%	10	2	11	16
	P.I. (0.075mm)	-	-	-	-
GM		0,72	1,10	0,28	0,34
CLASSIFI - CATION	H.R.B.*	A-7-5(9)	A-2-4(0)	A-2-4(0)	A-7-6(20)
	COLTO*	<G9	G7	<G9	<G9
	T.R.H. 14*	<G10	G7	G10	G9
CALIFORNIA BEARING RATIO (SANS 3001-GR30:2010;SANS 3001-GR40:2010)					
MOD AASHTO **(SANS GR30)**	OMC%	15,1	7,7	13,2	12,3
	MDD(KG/M^3)	1756	1992	1816	1681
C.B.R.	COMP MC	15,1	7,7	13,2	12,3
	% SWELL	2,20	0,60	1,20	0,45
C.B.R. (SANS GR40)	100%	36	34	16	17
	98%	30	31	13	15
	97%	28	29	11	14
	95%	23	26	7	13
	93%	19	24	5	11
	90%	15	20	3	9
MOD ITS : DRY (kPa) (GR54)		N/S	N/S	N/S	N/S
PROCTOR ITS : DRY (kPa)		N/S	N/S	N/S	N/S
STABILISED WITH	IN LAB	N/S	N/S	N/S	N/S
	ON SITE	N/S	N/S	N/S	N/S
TEST TYPE		CBR/IND	CBR/IND	CBR/IND	CBR/IND
SAMPLED BY		Client	Client	Client	Client
DELIVERED BY		Client	Client	Client	Client
SAMPLING METHOD		**Smpled by the client**	**Sampled by the client**	**Sampled by the client**	**Sampled by the client**
ENVIRONMENTAL CONDITION WHEN SAMPLED		N/S	N/S	N/S	N/S
REMARKS & NOTES		N/S	N/S	N/S	N/S

Kind Regards

T1143

Mr. Solomon Lediga
Technical Signatory / Manager

Remarks :
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bloemfontein@roadlab.co.za
060 727 8002

Roadlab Job Number: RB7385

Date of Report : 11/12.2024
Date Sampled : 11.11.2024

Mukuna Geotechnics (PTY)Ltd
28 B Hazelwood Road
Menlo Park,Pretoria
New Road,Midrand 1685

Attention:Mr.David Msiza

Dear Sir/ Madam

TEST REPORT

Project Name: **Xhariep Pipeline Feasibility Study**

Herewith the laboratory test results for above mentioned project, as per request.
As per the test report the following tests have been conducted

TEST METHODS

1.) Wet preparation and particle size analysis	**SANS 3001: GR1**
2.) Determination of the one-point liquid limit, plastic limit, plasticity index and linear shrinkage	**SANS 3001: GR10**
3.) Determination of the liquid limit with the two-point method	**SANS 3001: GR11**
4.) Determination of the maximum dry density and optimum moisture content	**SANS 3001: GR30**
5.) Determination of the california bearing ratio	**SANS 3001: GR40**
5.) Foundation Indicator	**SANS 3001: GR5**

Kind Regards

NOTE : Test marked with # is not part of Facility s accreditation scope of work

Solomon Lediga
Manager/Technical Signatory

T1143

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Date Reported: 02.12.2024

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Dear Sir

Test Report: **Xhariep Pipeline Feasibility Study**

Please find the attached test results for the sample/s as submitted to and tested by Roadlab (Pty)Ltd
The unambiguous description of the sample/s as received are as follows :

SAMPLE INFORMATION & PROPERTIES					
SAMPLE No.		B15152	B15156		
CONTAINER USED FOR SAMPLING		Sampling Bags	Sampling Bags		
SIZE / WEIGHT OF SAMPLE		-+108.4kg	-+89kg		
MOISTURE CONDITION OF SAMPLE ON ARRIVAL		Slightly Moist	Slightly Moist		
HOLE No. / Km. / CHAINAGE		TP 244	TP 299		
ROAD NO OR NAME		GI Xhariep Pipeline	GI Xhariep Pipeline		
LAYER TESTED / SAMPLED FROM		0.8-3.2	0.8-1.7		
DATE SAMPLED		11.11.2024	11.11.2024		
DATE RECEIVED		11.11.2024	11.11.2024		
CLIENTS MARKING		-	-		
DESCRIPTION OF SAMPLE (COLOUR & TYPE)		Pale Olive Weathered Mudstone	Dark Olive Weathered Mudstone		
GRADING ANALYSIS - % PASSING SIEVES (SANS 3001-GR1:2010;SANS 3001-GR2:2010)					
SIEVE ANALYSIS **(SANS GR1:2010)**	100,0	100	100		
	75,0	100	100		
	63,0	100	100		
	50,0	100	100		
	37,5	100	100		
	28,0	100	98		
	20,0	100	87		
	14,0	100	85		
	5,0	93	53		
	2,00	58	30		
	0,425	17	13		
	0,075	9	7		
SANS 3001 - PR5					
Soil Mortar		58	30		
Coarse Sand		70,2	56,8		
Fine Sand		14	21		
Coarse Fine Sand		6	9		
Medium Fine Sand		5	6		
Fine Fine Sand		4	6		
Silt & Clay		16	23		
Coarse Sand Ratio		0,70	0,57		
ATTERBERG LIMITS ANALYSIS (SANS 3001-GR10:2010;SANS 3001-GR11:2010)					
ATTERBERG LIMITS **(SANSGR10;GR11)**	LL%	37	34		
	P.I. (0.425mm)	13	9		
	LS%	7	5		
	P.I. (0.075mm)	16	12		-
GM		2,16	2,50		
CLASSIFI - CATION	H.R.B.*	A-2-6(0)	A-2-4(0)		
	COLTO*	G7	G6		
	T.R.H. 14*	G7	G7		
CALIFORNIA BEARING RATIO (SANS 3001-GR30:2010;SANS 3001-GR40:2010)					
MOD AASHTO **(SANS GR30)**	OMC%	7,4	9,7		
	MDD(KG/M^3)	1882	1942		
C.B.R.	COMP MC	7,4	9,6		
	% SWELL	0,24	0,20		
C.B.R. (SANS GR40)	100%	32	37		
	98%	28	33		
	97%	26	31		
	95%	23	28		
	93%	20	24		
	90%	17	20		
MOD ITS : DRY (kPa) (GR54)		N/S	N/S		
PROCTOR ITS : DRY (kPa)		N/S	N/S		
STABILISED WITH	IN LAB	N/S	N/S		
	ON SITE	N/S	N/S		
TEST TYPE		CBR/IND	CBR/IND		
SAMPLED BY		Client	Client		
DELIVERED BY		Client	Client		
SAMPLING METHOD		**Smpled by the client**	**Sampled by the client**		
ENVIRONMENTAL CONDITION WHEN SAMPLED		N/S	N/S		
REMARKS & NOTES		N/S	N/S		

Kind Regards

Mr. Solomon Lediga
Technical Signatory / Manager

sanas
T1143

Remarks :
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Roadlab Laboratories Pty Ltd
› Materials Testing
› Geotechnical & Road Investigations
› Mobile Lab Services
› Specialised Concrete & Forensic Investigations
+27 11 828 0279
info@roadlab.co.za
www.roadlab.co.za
207 Rietfontein Rd,
Germiston, JHB, 1400

OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 180
LAYER : 0.7-1.5
SAMPLE No. : B15183
SAMPLE DESCRIPTION : Silty Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**13.3**	**Specifc Gravity**	**2.35**

Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	100
5.00	99
2.000	98
0.425	95
0.250	93
0.150	88
0.075	75
50 µm	7
5 µm	7
2 µm	3.1

Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	3
0.425 - 0.250	1
0.250 - 0.150	6
0.150 - 0.075	13
< 0.075	76

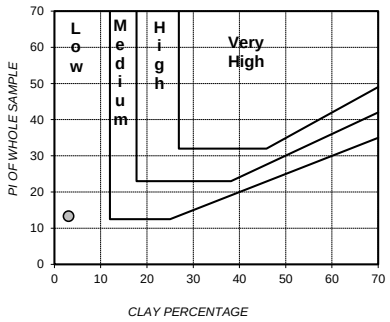
Effective size	0.051
Uniformity Coefficient	1.4
Curvature Coefficient	1.0
Oversize Index	0.0
Shrinkage Product	688.0
Grading Coefficient	2.1
Grading modulus	0.32

Atter-berg Limits

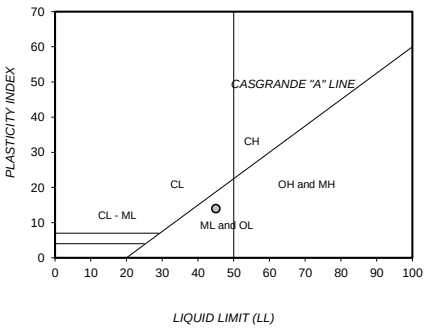
Liquid Limit	45
Plasticity Index	14
Linear Shrinkage	7.3
PI < 0.075	-

Unified Soil Classification	ML
U.S. Highway Classification	A-7-5 (11)

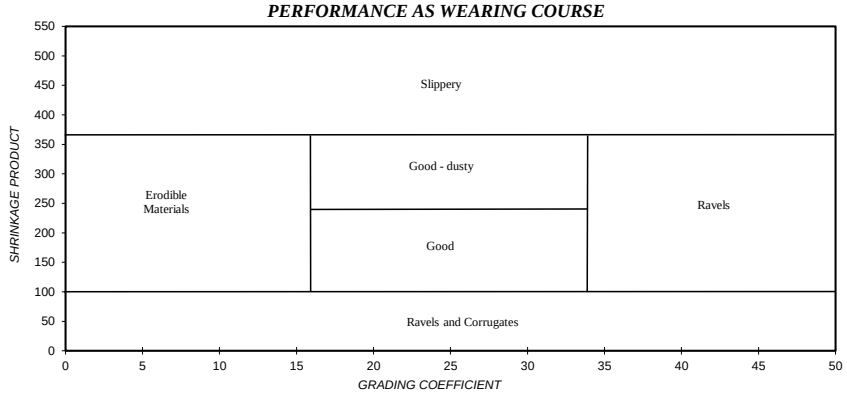
POTENTIAL EXPANSIVENES



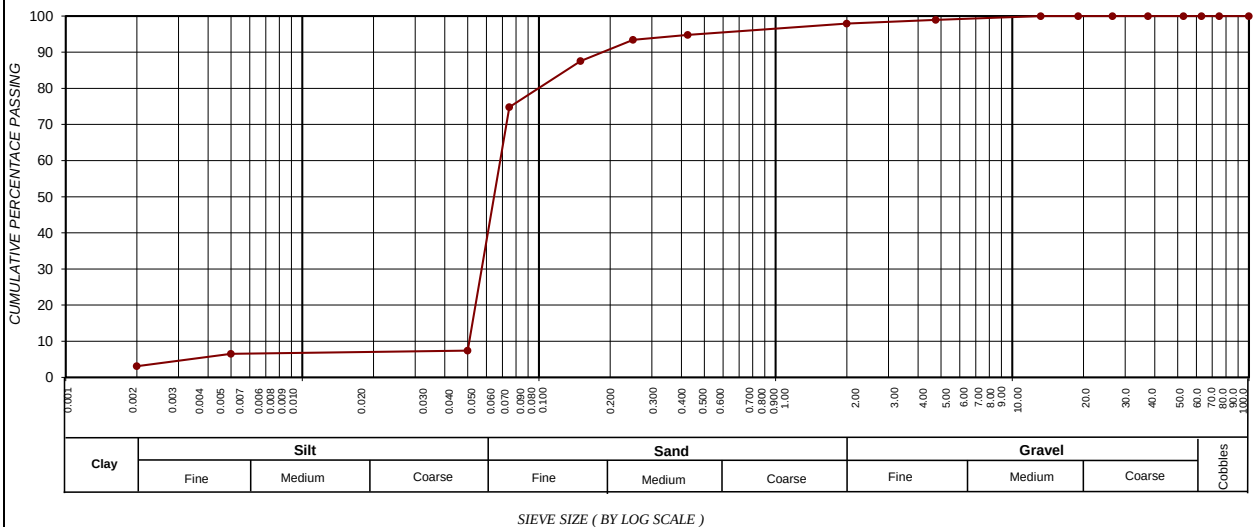
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
3.1	20.0	74.8	2.1

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 421
LAYER : 1.4-2.5
SAMPLE No. : B15187
SAMPLE DESCRIPTION : Calcretised Gravelly Silty Sand

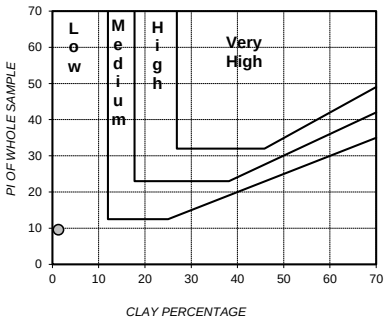
FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	9.5	Specifc Gravity	2.35

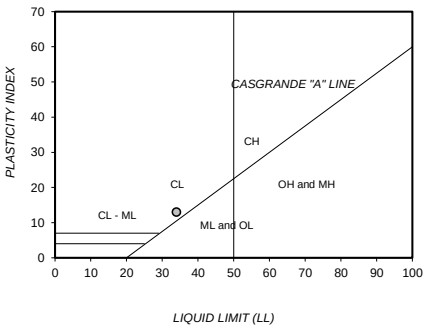
Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	100
5.00	91
2.000	86
0.425	73
0.250	71
0.150	68
0.075	66
50 µm	5
5 µm	4
2 µm	1.3

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	15
0.425 - 0.250	3
0.250 - 0.150	3
0.150 - 0.075	3
< 0.075	76

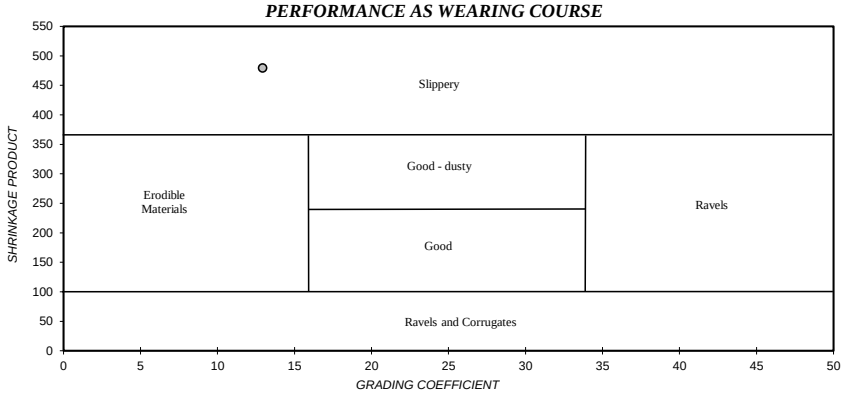
Effective size	0.052
Uniformity Coefficient	1.4
Curvature Coefficient	1.0
Oversize Index	0.0
Shrinkage Product	479.6
Grading Coefficient	12.9
Grading modulus	0.75

Atter-berg Limits

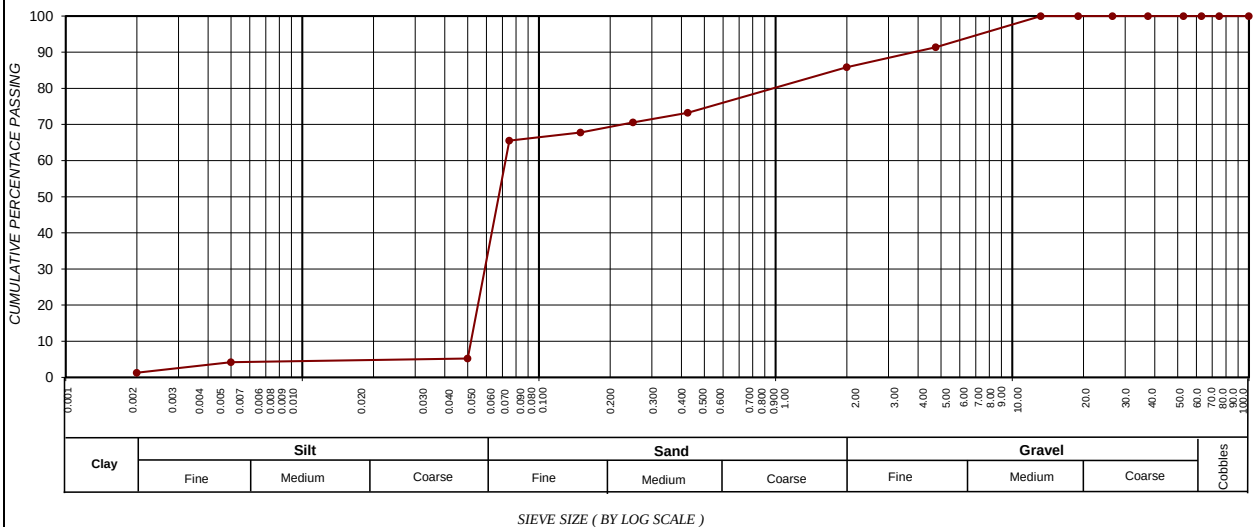
Liquid Limit	34
Plasticity Index	13
Linear Shrinkage	6.6
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (7)

PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
1.3	18.8	65.7	14.2

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 524
LAYER : 1.6-2.0
SAMPLE No. : B15190
SAMPLE DESCRIPTION : Weatherised Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**11.5**	**Specifc Gravity**	**2.35**

Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	100
5.00	99
2.000	97
0.425	88
0.250	85
0.150	83
0.075	81
50 µm	6
5 µm	6
2 µm	1.5

Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	9
0.425 - 0.250	3
0.250 - 0.150	2
0.150 - 0.075	3
< 0.075	83

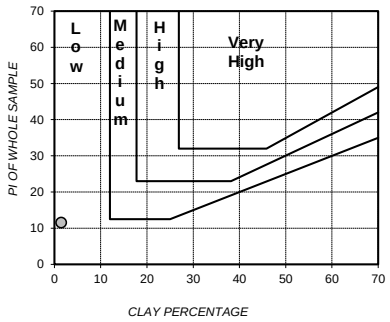
Effective size	0.051
Uniformity Coefficient	1.3
Curvature Coefficient	1.0
Oversize Index	0.0
Shrinkage Product	549.4
Grading Coefficient	2.9
Grading modulus	0.33

Atter-berg Limits

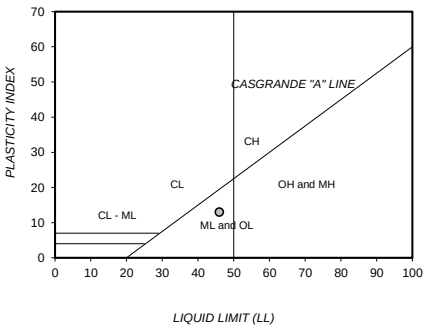
Liquid Limit	46
Plasticity Index	13
Linear Shrinkage	6.2
PI < 0.075	-

Unified Soil Classification	ML
U.S. Highway Classification	A-7-5 (13)

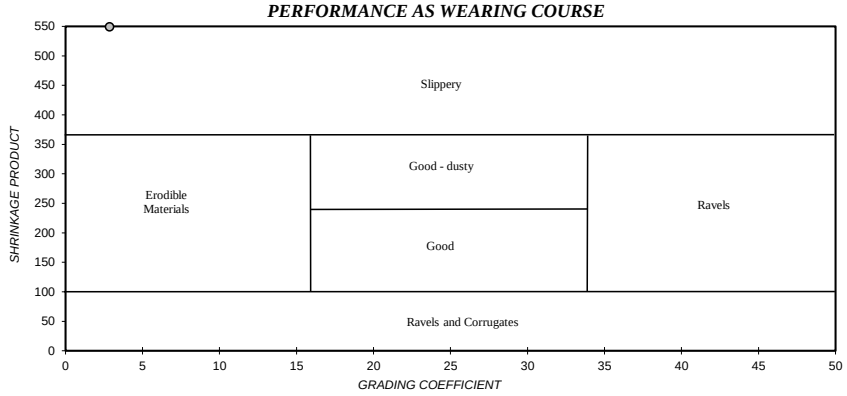
POTENTIAL EXPANSIVENES



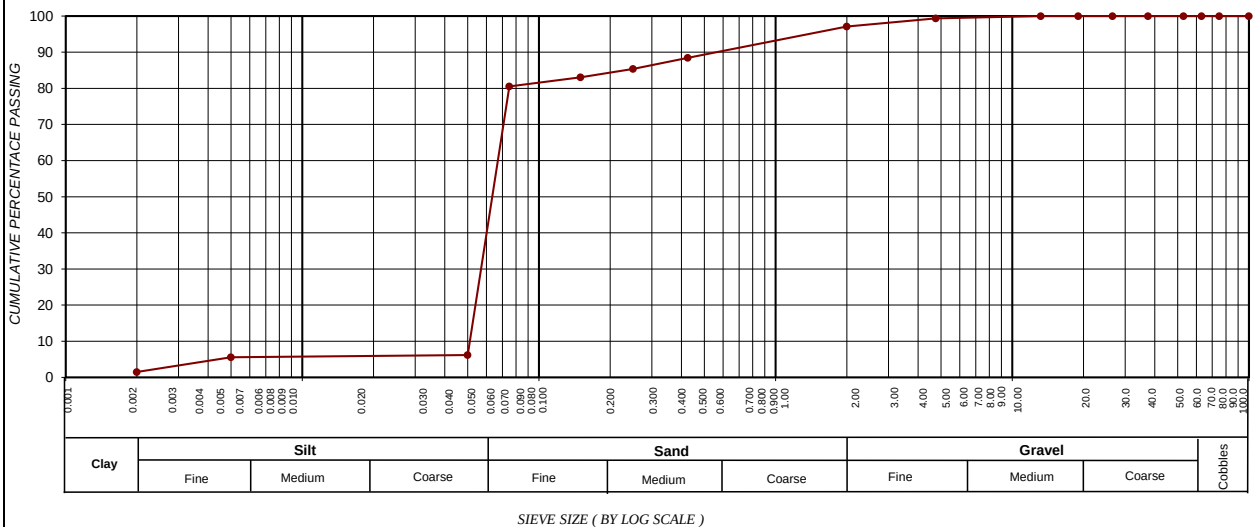
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
1.5	23.2	72.5	2.9

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 118
LAYER : 2.6-3.2
SAMPLE No. : B15194
SAMPLE DESCRIPTION : Silty Sand Restored Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**16.7**	**Specifc Gravity**	**2.35**

Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	98
5.00	97
2.000	94
0.425	88
0.250	85
0.150	75
0.075	59
50 µm	9
5 µm	8
2 µm	5.6

Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	7
0.425 - 0.250	3
0.250 - 0.150	10
0.150 - 0.075	17
< 0.075	62

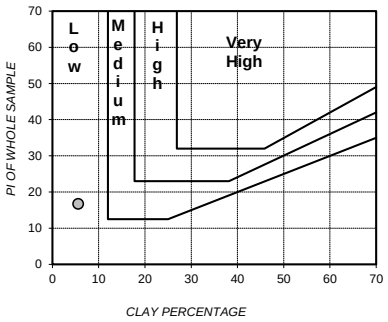
Effective size	0.050
Uniformity Coefficient	1.6
Curvature Coefficient	0.9
Oversize Index	0.0
Shrinkage Product	888.5
Grading Coefficient	5.4
Grading modulus	0.59

Atter-berg Limits

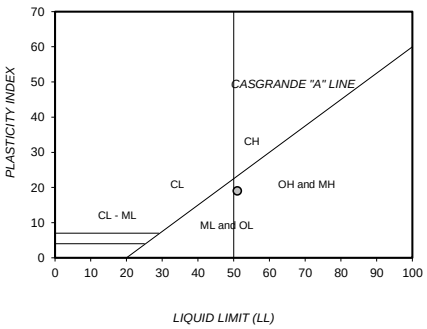
Liquid Limit	51
Plasticity Index	19
Linear Shrinkage	10.1
PI < 0.075	-

Unified Soil Classification	MH
U.S. Highway Classification	A-7-5 (10)

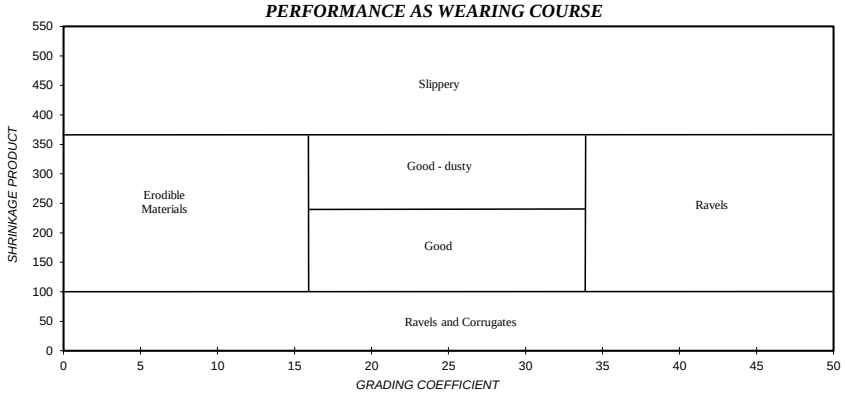
POTENTIAL EXPANSIVENES



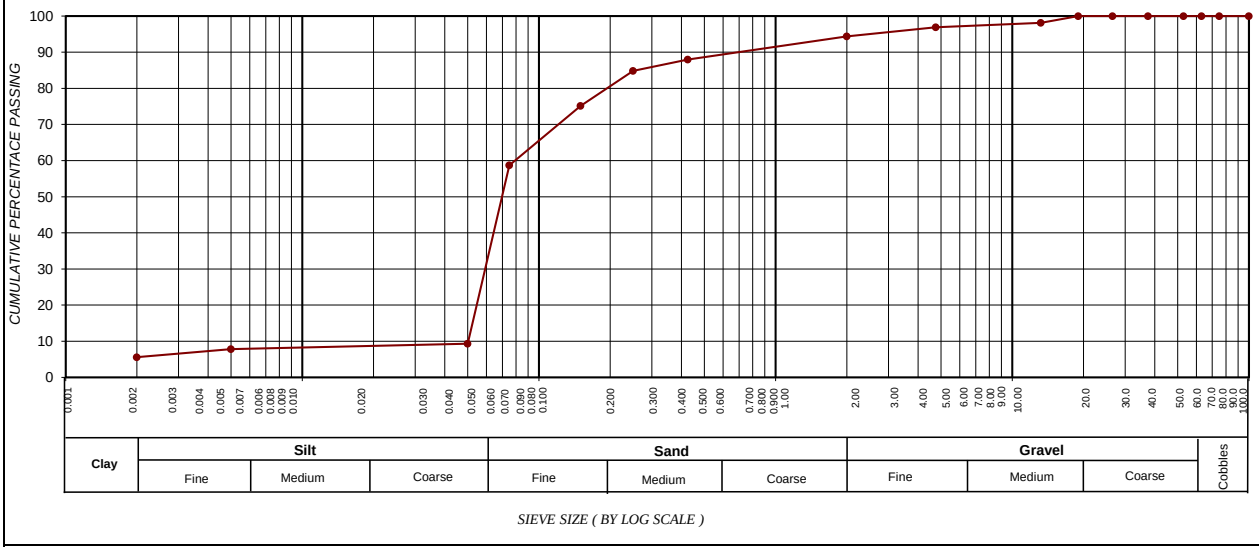
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
5.6	15.4	73.4	5.6

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 128
LAYER : 0.3-0.6
SAMPLE No. : B15196
SAMPLE DESCRIPTION : Silty Sand Colluvium

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**15.1**	**Specifc Gravity**	**2.35**

Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	100
5.00	100
2.000	99
0.425	94
0.250	91
0.150	86
0.075	75
50 µm	7
5 µm	6
2 µm	3.6

Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	5
0.425 - 0.250	3
0.250 - 0.150	5
0.150 - 0.075	11
< 0.075	76

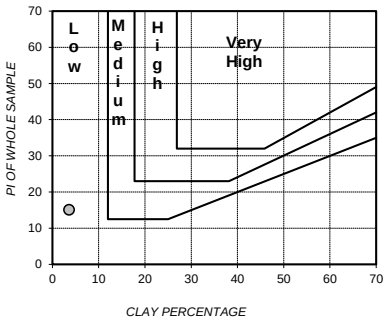
Effective size	0.051
Uniformity Coefficient	1.4
Curvature Coefficient	1.0
Oversize Index	0.0
Shrinkage Product	752.4
Grading Coefficient	1.3
Grading modulus	0.32

Atter-berg Limits

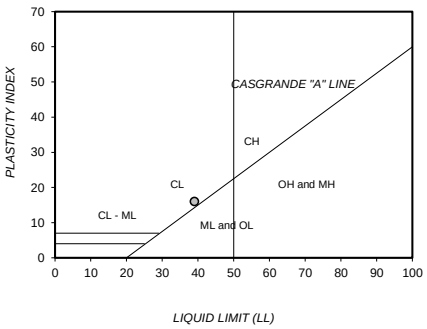
Liquid Limit	39
Plasticity Index	16
Linear Shrinkage	8.0
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (11)

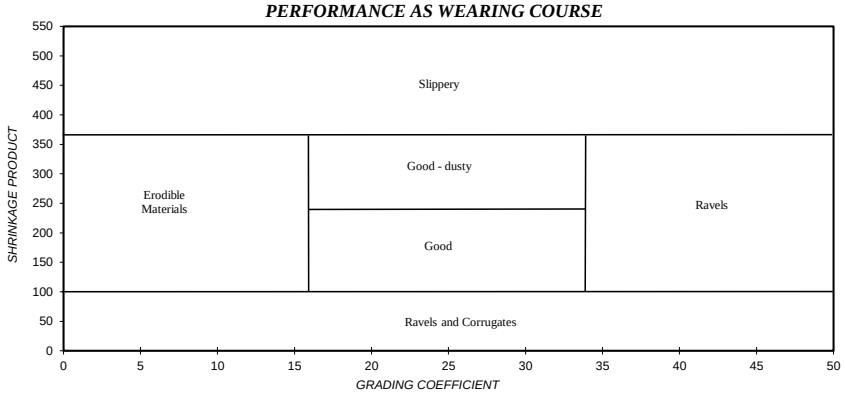
POTENTIAL EXPANSIVENES



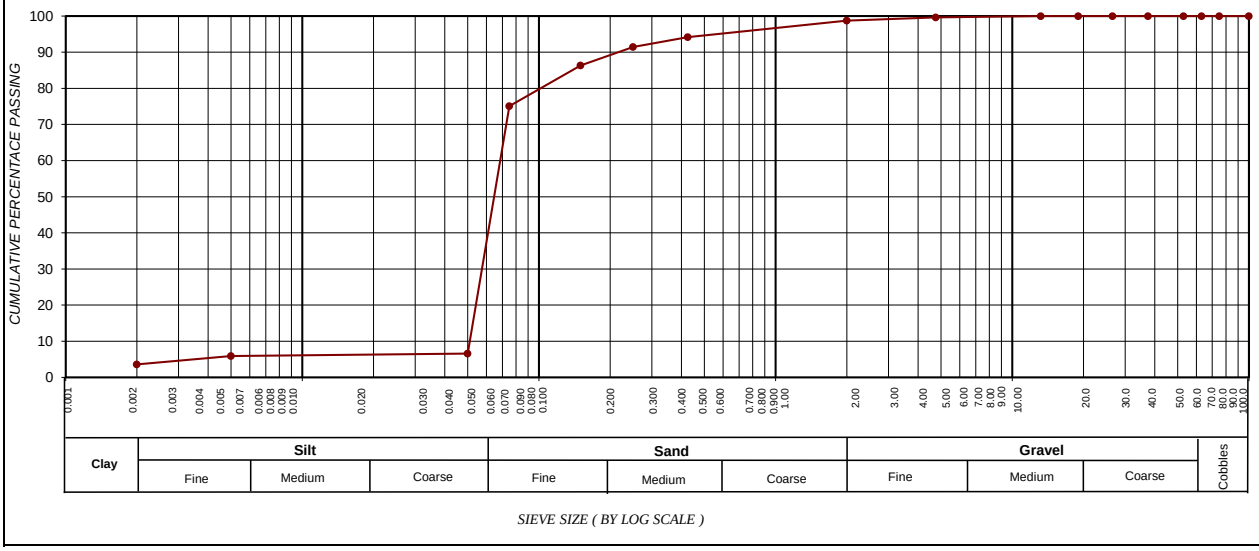
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
3.6	19.2	75.9	1.3

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 138
LAYER : 1.6-3.0
SAMPLE No. : B15197
SAMPLE DESCRIPTION : Gravelly Silty Sand

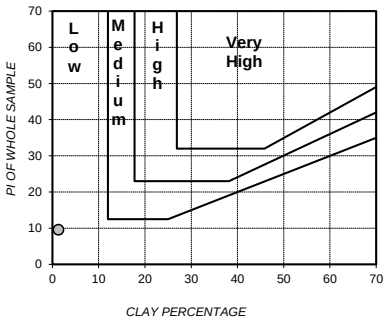
FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	9.6	Specifc Gravity	2.35

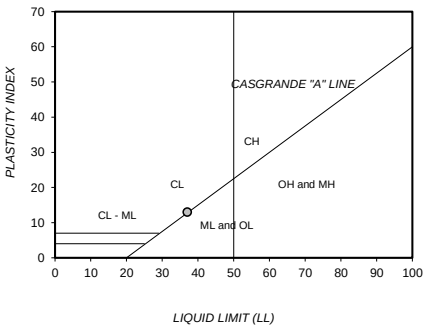
Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	100
5.00	96
2.000	90
0.425	74
0.250	72
0.150	67
0.075	58
50 µm	4
5 µm	3
2 µm	1.3

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	18
0.425 - 0.250	2
0.250 - 0.150	5
0.150 - 0.075	10
< 0.075	64

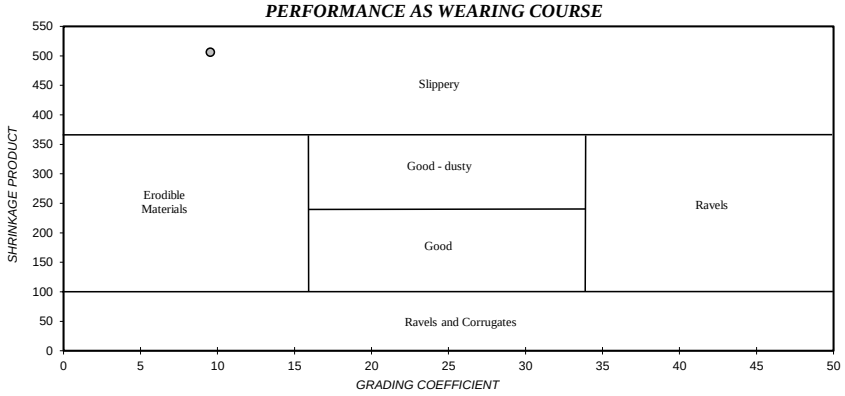
Effective size	0.053
Uniformity Coefficient	1.7
Curvature Coefficient	0.8
Oversize Index	0.0
Shrinkage Product	506.1
Grading Coefficient	9.5
Grading modulus	0.78

Atter-berg Limits

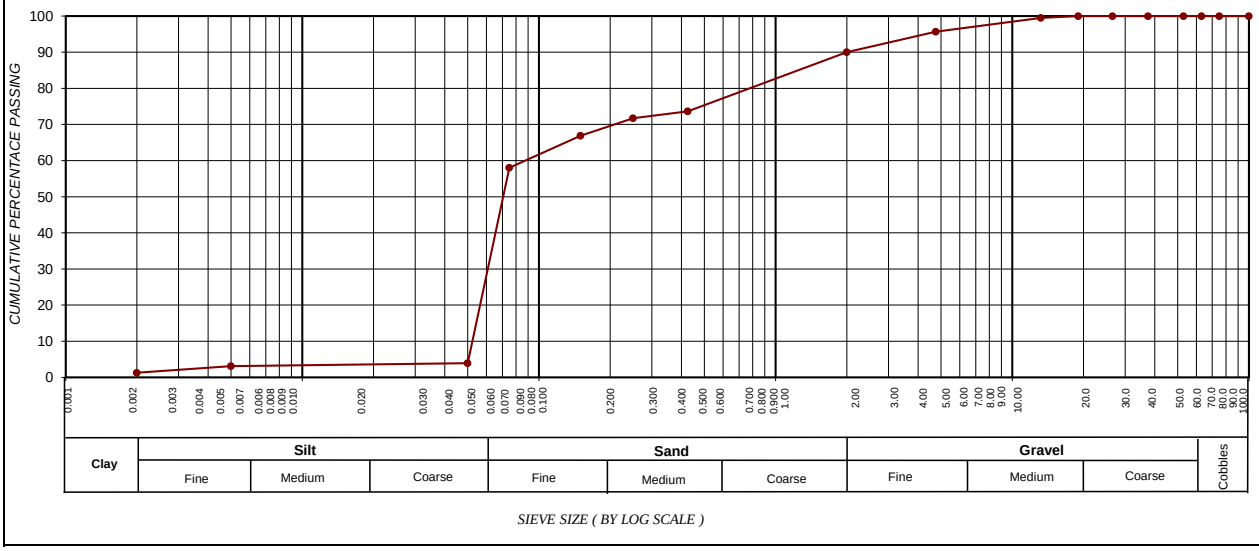
Liquid Limit	37
Plasticity Index	13
Linear Shrinkage	6.9
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (6)

PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
1.3	15.3	73.4	10.0

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 14
LAYER : 0.6-3.0
SAMPLE No. : B15198
SAMPLE DESCRIPTION : Silty Sand

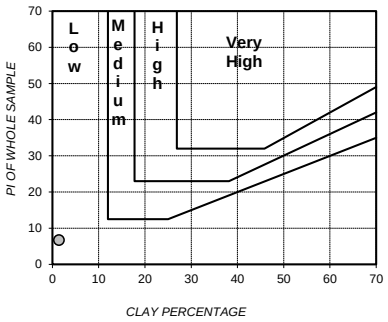
FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**6.7**	**Specifc Gravity**	**2.35**

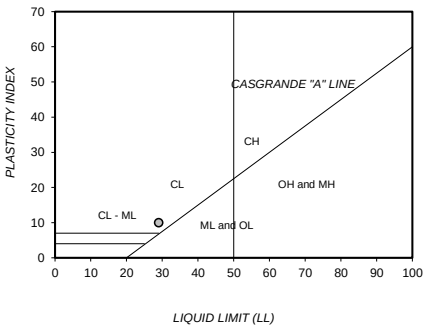
Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	100
5.00	98
2.000	92
0.425	67
0.250	63
0.150	59
0.075	51
50 µm	3
5 µm	2
2 µm	1.4

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	28
0.425 - 0.250	4
0.250 - 0.150	5
0.150 - 0.075	9
< 0.075	55

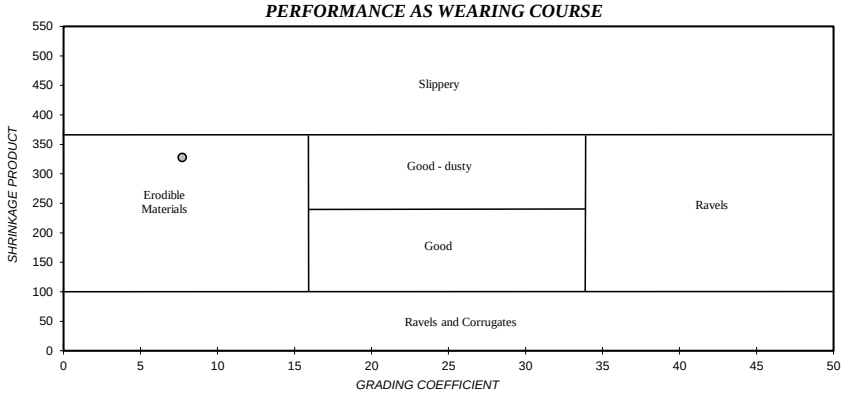
Effective size	0.054
Uniformity Coefficient	3.2
Curvature Coefficient	0.4
Oversize Index	0.0
Shrinkage Product	327.8
Grading Coefficient	7.7
Grading modulus	0.90

Atter-berg Limits

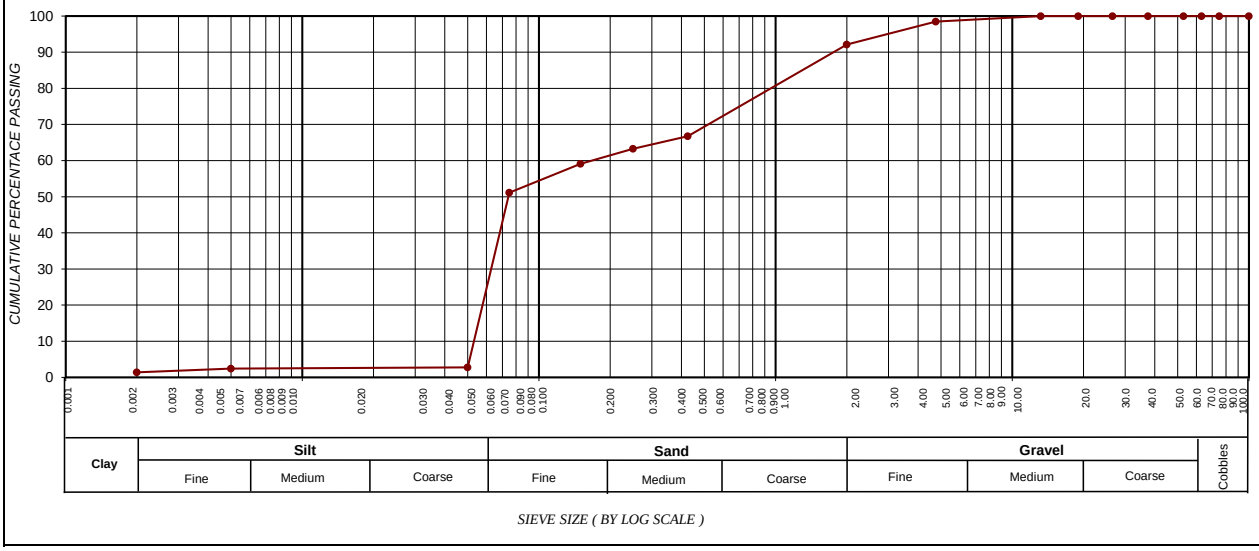
Liquid Limit	29
Plasticity Index	10
Linear Shrinkage	4.9
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-4 (2)

PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
1.4	12.4	78.3	7.8

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 172
LAYER : 0-Jan-00
SAMPLE No. : B15201
SAMPLE DESCRIPTION : Silty Sand Colluvium

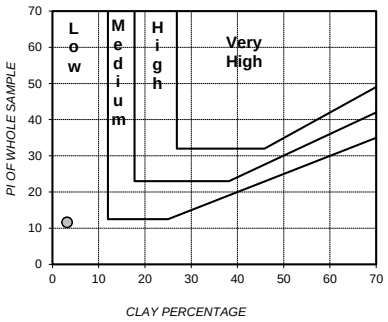
FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**11.6**	**Specifc Gravity**	**2.35**

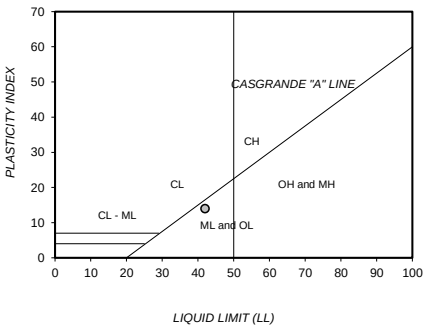
Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	100
5.00	100
2.000	98
0.425	83
0.250	81
0.150	75
0.075	65
50 µm	6
5 µm	6
2 µm	3.2

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	16
0.425 - 0.250	2
0.250 - 0.150	6
0.150 - 0.075	11
< 0.075	66

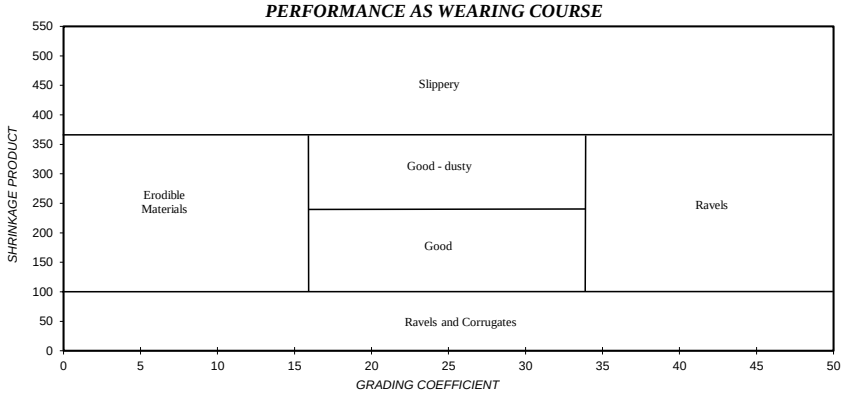
Effective size	0.052
Uniformity Coefficient	1.4
Curvature Coefficient	1.0
Oversize Index	0.0
Shrinkage Product	590.3
Grading Coefficient	2.0
Grading modulus	0.54

Atter-berg Limits

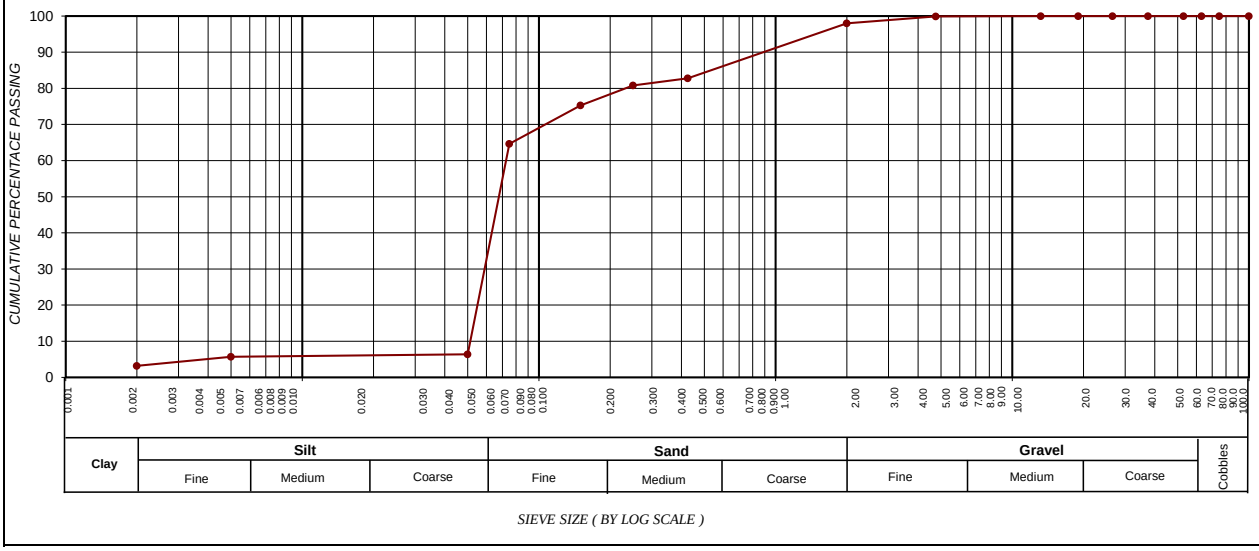
Liquid Limit	42
Plasticity Index	14
Linear Shrinkage	7.1
PI < 0.075	-

Unified Soil Classification	ML
U.S. Highway Classification	A-7-6 (8)

PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
3.2	16.9	77.9	2.0

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 214
LAYER : 0.5-2.7
SAMPLE No. : B15204
SAMPLE DESCRIPTION : Silty Sand Colluvium

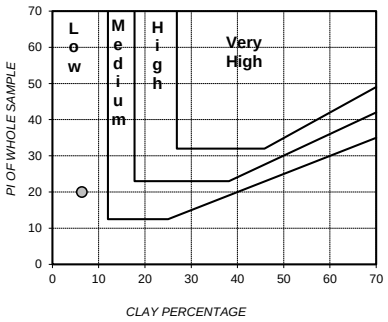
FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	20.0	Specifc Gravity	2.35

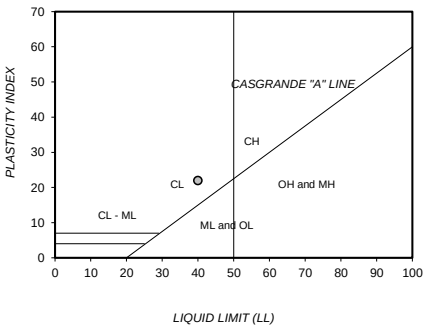
Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	100
5.00	98
2.000	96
0.425	91
0.250	87
0.150	82
0.075	70
50 µm	10
5 µm	9
2 µm	6.4

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	5
0.425 - 0.250	3
0.250 - 0.150	6
0.150 - 0.075	12
< 0.075	73

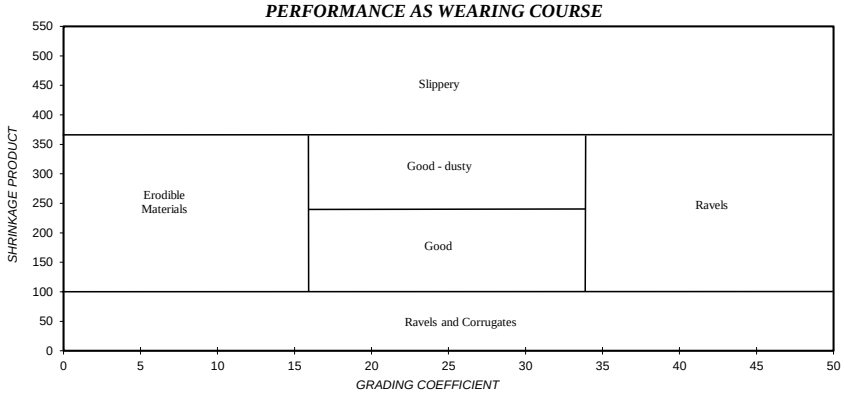
Effective size	0.042
Uniformity Coefficient	1.7
Curvature Coefficient	1.1
Oversize Index	0.0
Shrinkage Product	916.7
Grading Coefficient	4.2
Grading modulus	0.43

Atter-berg Limits

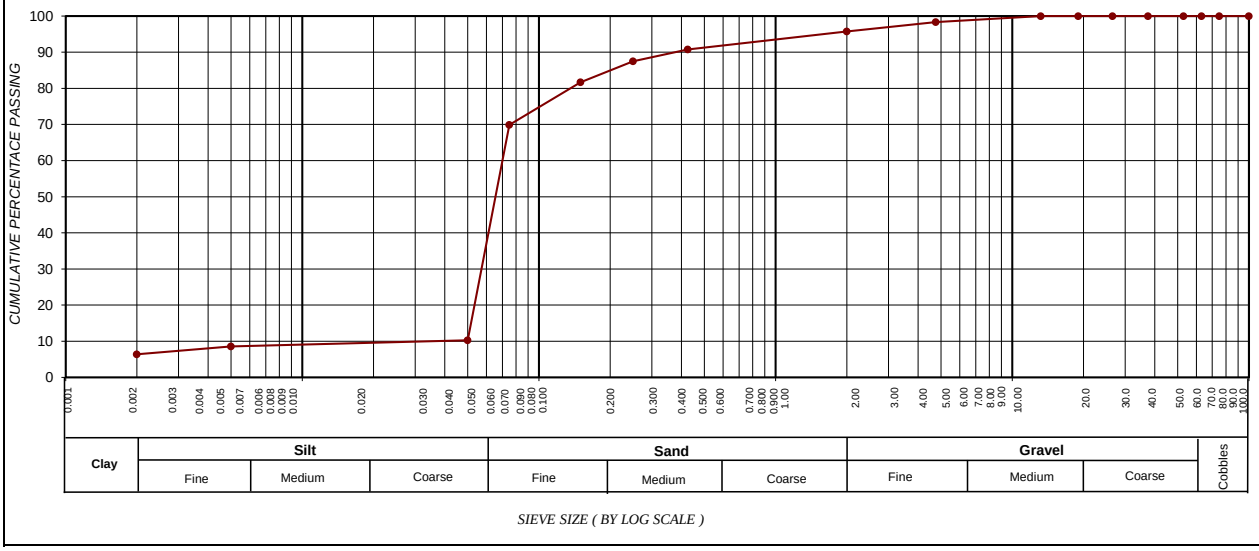
Liquid Limit	40
Plasticity Index	22
Linear Shrinkage	10.1
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (14)

PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
6.4	18.7	70.7	4.3

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 214
LAYER : 2.7-3.5
SAMPLE No. : B15205
SAMPLE DESCRIPTION : Sandy Silty Colluvium

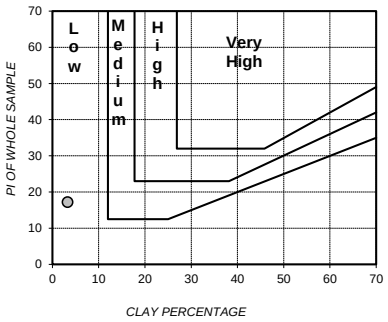
FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**17.1**	**Specifc Gravity**	**2.35**

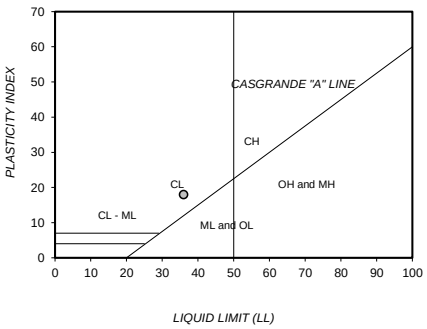
Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	100
5.00	100
2.000	99
0.425	95
0.250	91
0.150	81
0.075	65
50 µm	9
5 µm	8
2 µm	3.3

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	3
0.425 - 0.250	4
0.250 - 0.150	10
0.150 - 0.075	16
< 0.075	66

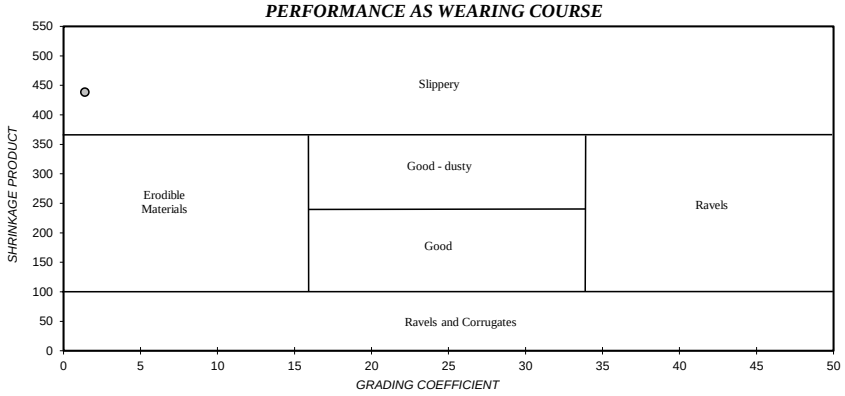
Effective size	0.050
Uniformity Coefficient	1.4
Curvature Coefficient	1.0
Oversize Index	0.0
Shrinkage Product	438.3
Grading Coefficient	1.4
Grading modulus	0.41

Atter-berg Limits

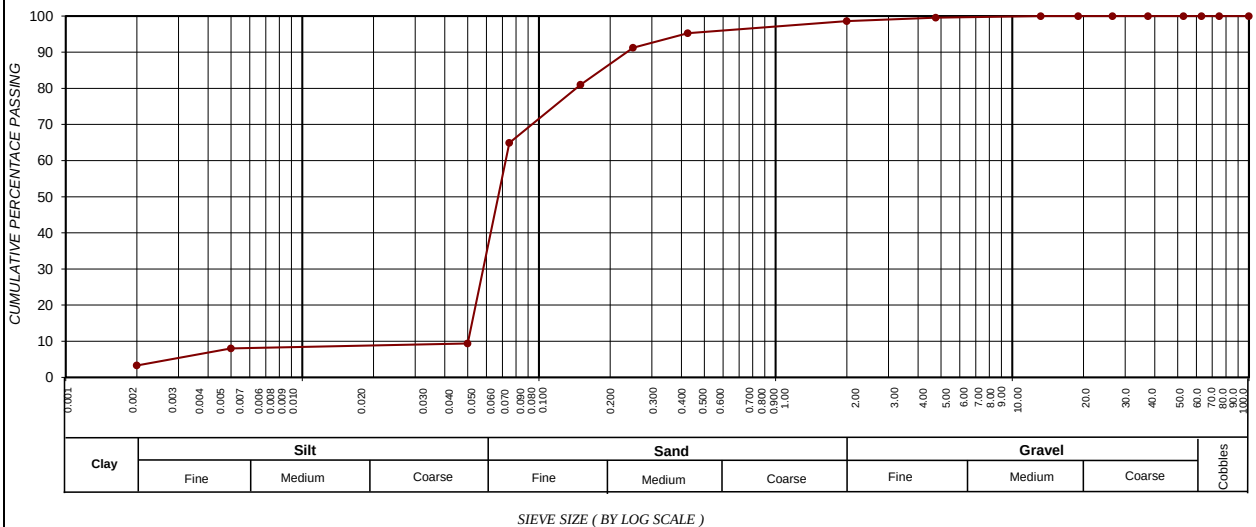
Liquid Limit	36
Plasticity Index	18
Linear Shrinkage	4.6
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (9)

PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
3.3	18.9	76.4	1.4

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 233
LAYER : 0.4-0.8
SAMPLE No. : B15206
SAMPLE DESCRIPTION : Silty Sand Colluvium

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	22.1	Specifc Gravity	2.35

Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	100
5.00	99
2.000	96
0.425	92
0.250	81
0.150	59
0.075	41
50 µm	11
5 µm	10
2 µm	7.9

Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	4
0.425 - 0.250	12
0.250 - 0.150	22
0.150 - 0.075	19
< 0.075	43

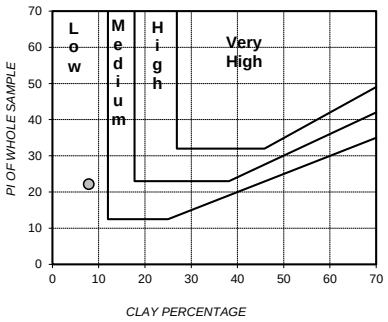
Effective size	0.005
Uniformity Coefficient	32.2
Curvature Coefficient	6.0
Oversize Index	0.0
Shrinkage Product	1186.9
Grading Coefficient	3.9
Grading modulus	0.71

Atter-berg Limits

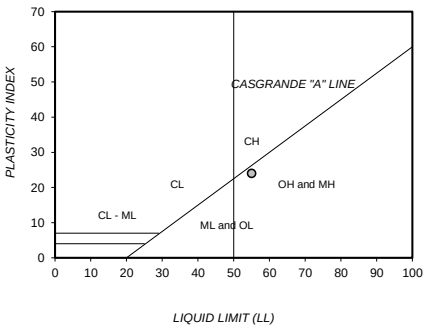
Liquid Limit	55
Plasticity Index	24
Linear Shrinkage	12.9
PI < 0.075	-

Unified Soil Classification	SM
U.S. Highway Classification	A-7-5 (5)

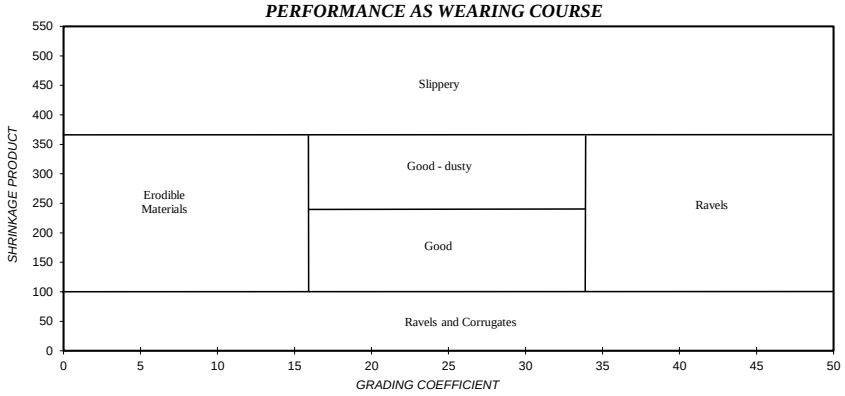
POTENTIAL EXPANSIVENES



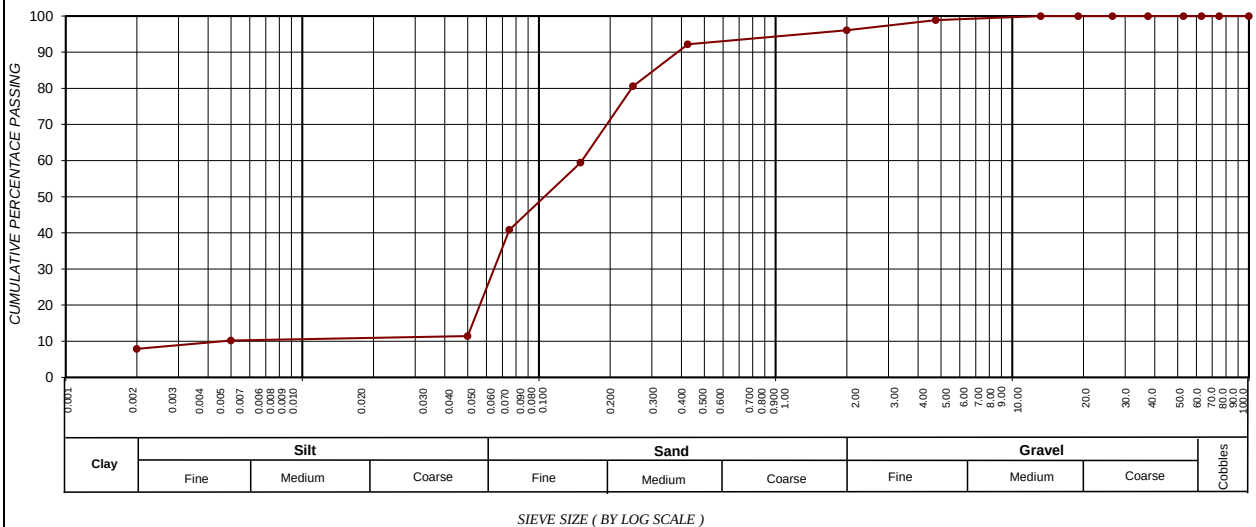
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
7.9	10.1	78.1	3.9

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 367
LAYER : 1-Jan-00
SAMPLE No. : B15222
SAMPLE DESCRIPTION : Silty Clay ,Residual Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**7.6**	**Specifc Gravity**	**2.35**

Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	100
5.00	99
2.000	95
0.425	85
0.250	76
0.150	68
0.075	54
50 µm	5
5 µm	5
2 µm	3.6

Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	11
0.425 - 0.250	9
0.250 - 0.150	9
0.150 - 0.075	14
< 0.075	57

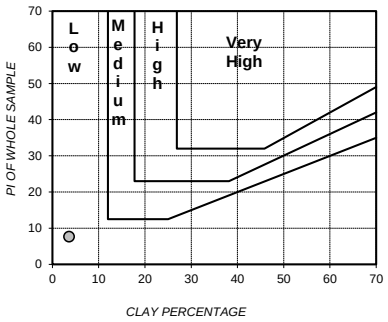
Effective size	0.052
Uniformity Coefficient	2.0
Curvature Coefficient	0.7
Oversize Index	0.0
Shrinkage Product	419.1
Grading Coefficient	4.6
Grading modulus	0.66

Atter-berg Limits

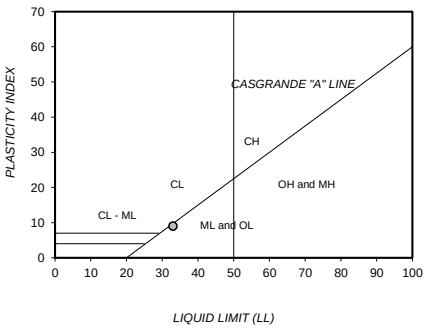
Liquid Limit	33
Plasticity Index	9
Linear Shrinkage	5.0
PI < 0.075	-

Unified Soil Classification	ML
U.S. Highway Classification	A-4 (3)

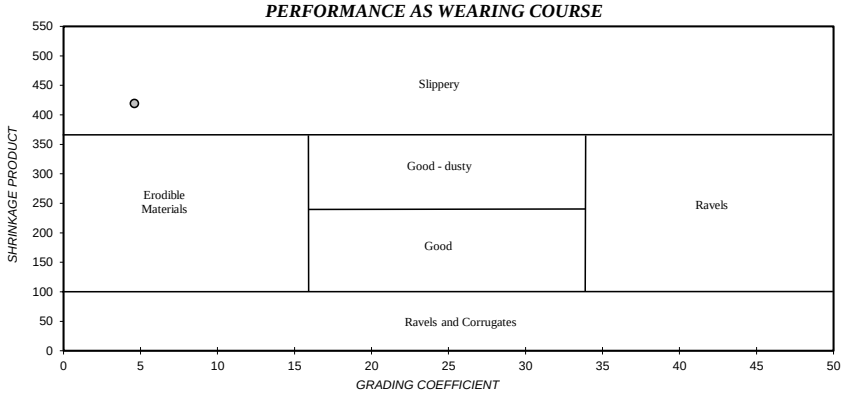
POTENTIAL EXPANSIVENES



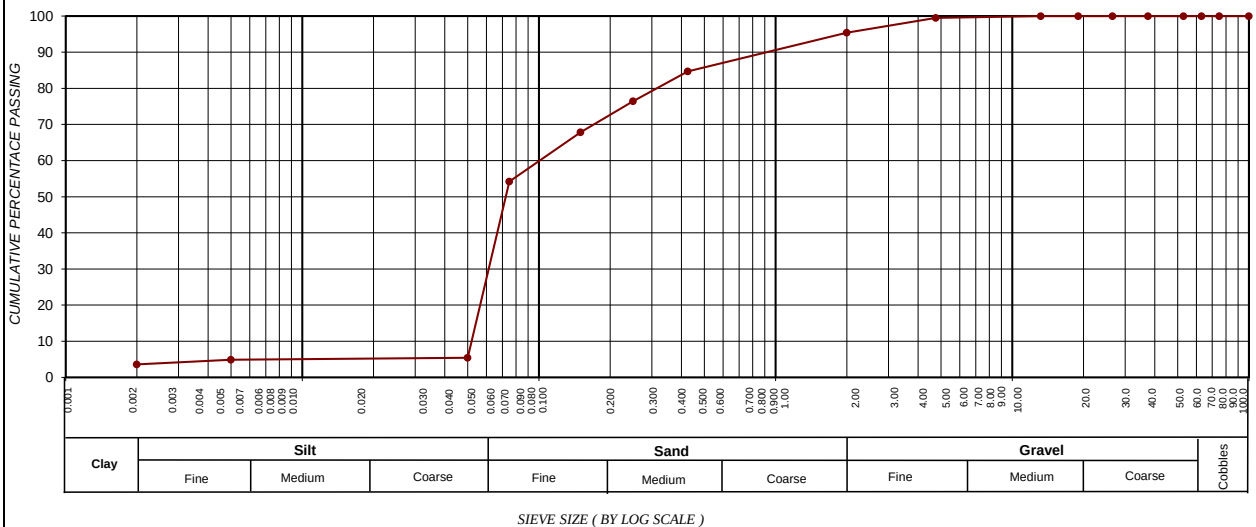
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
3.6	12.6	79.2	4.6

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 389
LAYER : 0.4-1.2
SAMPLE No. : B15223
SAMPLE DESCRIPTION : Gravelly Sand Colluvium

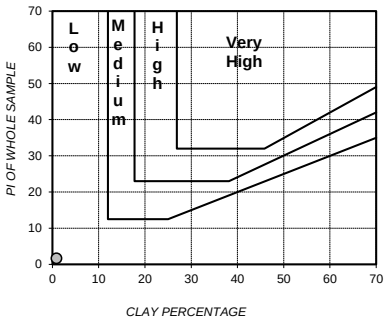
FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	1.7	Specifc Gravity	2.35

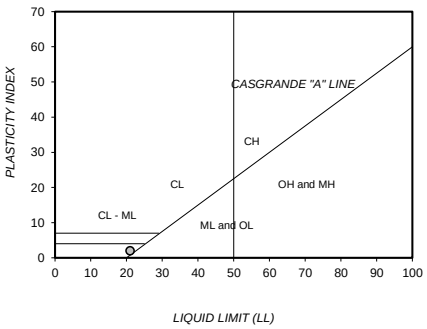
Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	96
5.00	93
2.000	89
0.425	83
0.250	77
0.150	50
0.075	24
50 µm	2
5 µm	2
2 µm	0.9

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	6
0.425 - 0.250	8
0.250 - 0.150	30
0.150 - 0.075	30
< 0.075	27

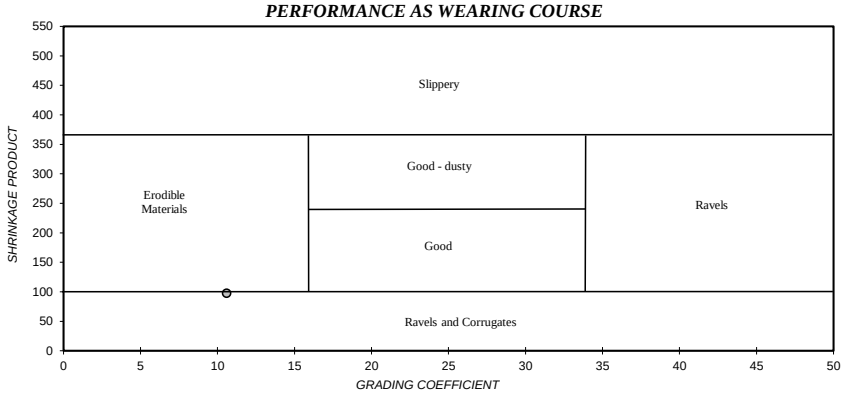
Effective size	0.059
Uniformity Coefficient	3.2
Curvature Coefficient	0.8
Oversize Index	0.0
Shrinkage Product	97.5
Grading Coefficient	10.6
Grading modulus	1.04

Atter-berg Limits

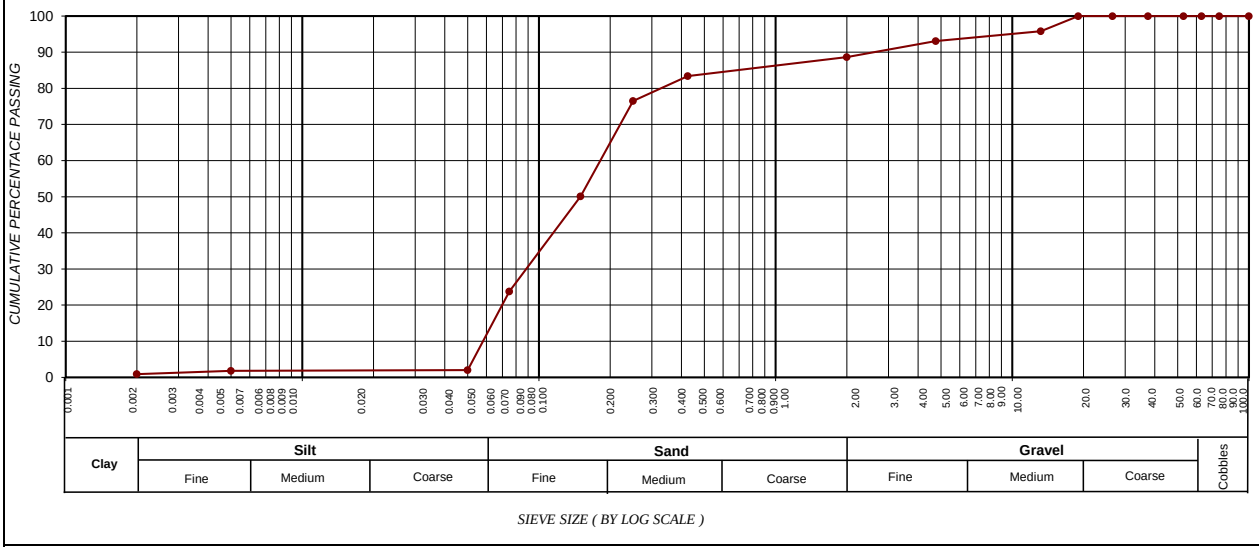
Liquid Limit	21
Plasticity Index	2
Linear Shrinkage	1.2
PI < 0.075	-

Unified Soil Classification	SM
U.S. Highway Classification	A-2-4 (0)

PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
0.9	4.2	83.5	11.4

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info@roadlab.co.za
www.roadlab.co.za
207 Rietfontein Rd,
Germiston, JHB, 1400

OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 71
LAYER : 0.3-1.0
SAMPLE No. : B15229
SAMPLE DESCRIPTION : Gravelly Sand Residual Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	7.6	Specifc Gravity	2.35

Sieve analysis Cumulative percentage passing (mm)	
100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	100
5.00	98
2.000	89
0.425	64
0.250	57
0.150	47
0.075	35
50 µm	4
5 µm	2
2 µm	1.3

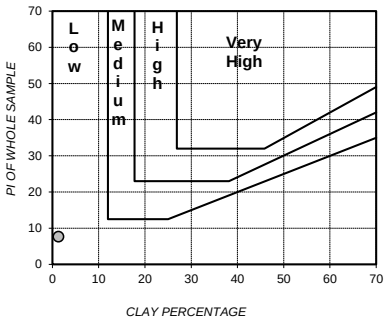
Soil Mortar Analysis % < 2.00mm	
2.000 - 0.425	29
0.425 - 0.250	8
0.250 - 0.150	10
0.150 - 0.075	14
< 0.075	39

Effective size	0.055
Uniformity Coefficient	6.1
Curvature Coefficient	0.3
Oversize Index	0.0
Shrinkage Product	404.1
Grading Coefficient	10.8
Grading modulus	1.12

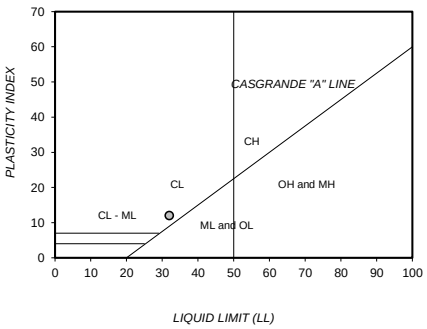
Atter-berg Limits	
Liquid Limit	32
Plasticity Index	12
Linear Shrinkage	6.4
PI < 0.075	-

Unified Soil Classification	SC
U.S. Highway Classification	A-2-6 (0)

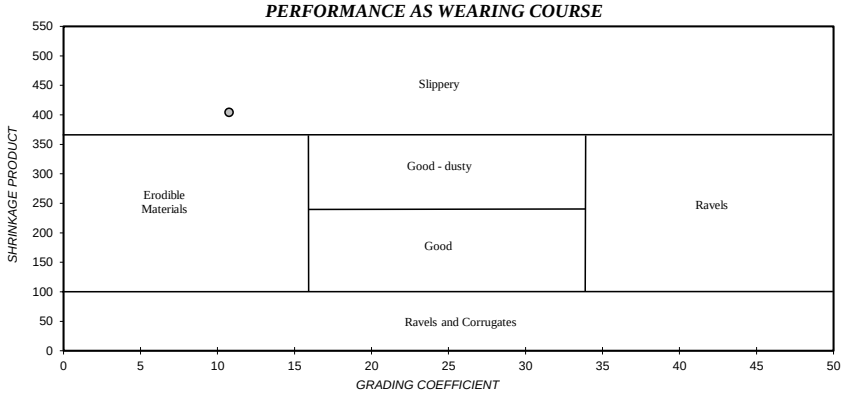
POTENTIAL EXPANSIVENES



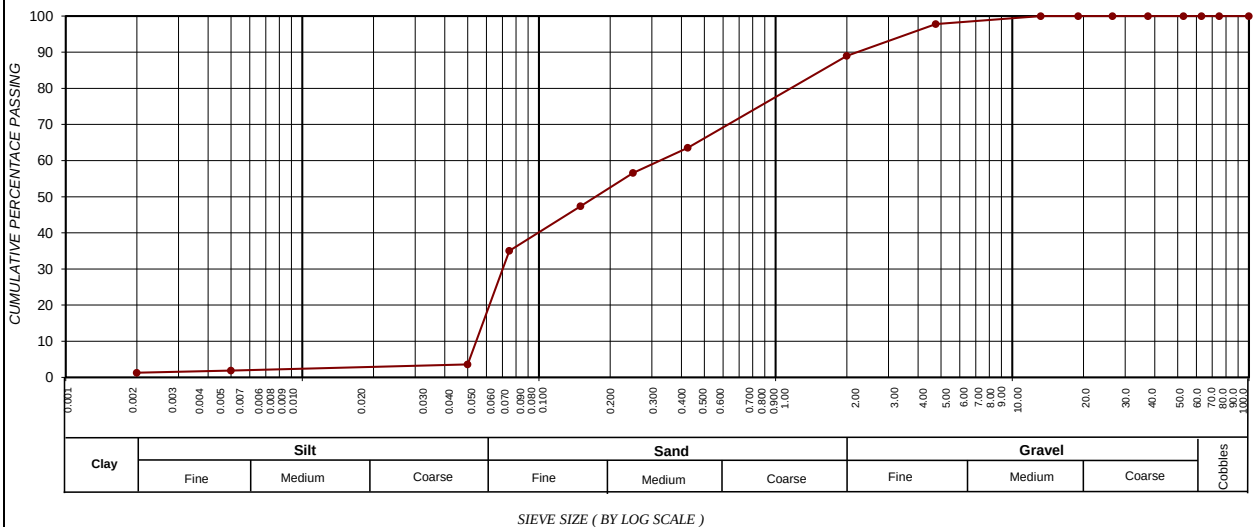
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
1.3	9.4	78.3	11.0

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 98
LAYER : 0.2-0.5
SAMPLE No. : B15231
SAMPLE DESCRIPTION : Silty Sand Colluvium

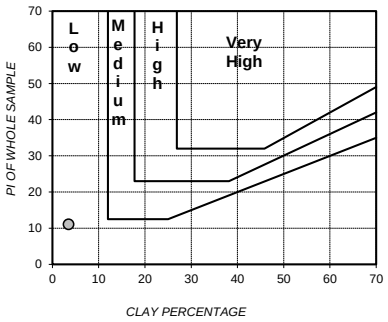
FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	11.0	Specifc Gravity	2.35

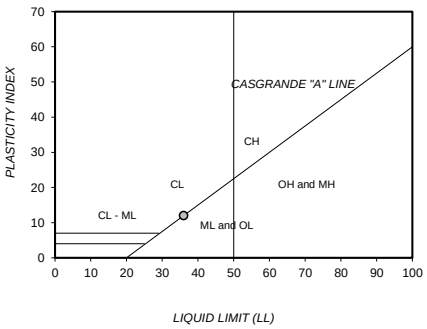
Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	100
5.00	99
2.000	97
0.425	92
0.250	90
0.150	86
0.075	75
50 µm	6
5 µm	6
2 µm	3.5

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	5
0.425 - 0.250	2
0.250 - 0.150	5
0.150 - 0.075	11
< 0.075	77

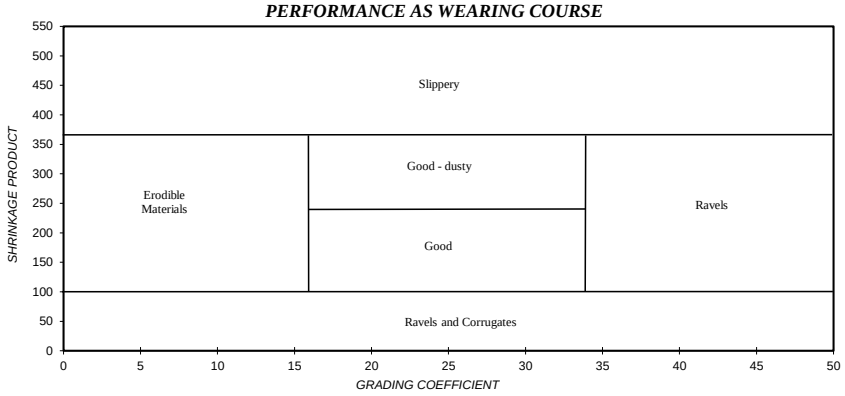
Effective size	0.051
Uniformity Coefficient	1.4
Curvature Coefficient	1.0
Oversize Index	0.0
Shrinkage Product	614.3
Grading Coefficient	2.8
Grading modulus	0.36

Atter-berg Limits

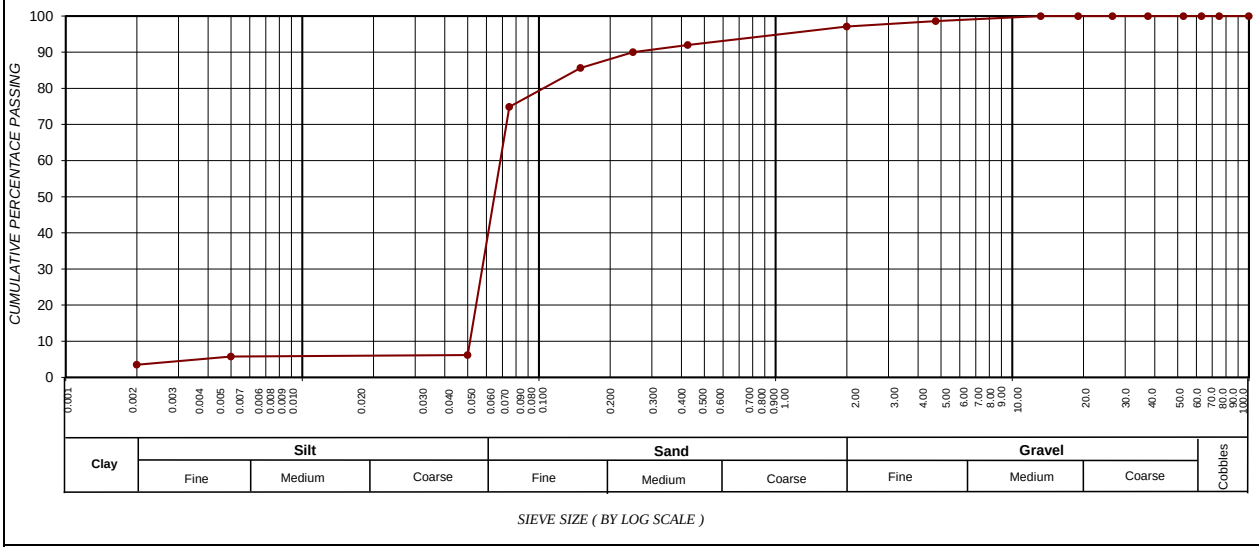
Liquid Limit	36
Plasticity Index	12
Linear Shrinkage	6.7
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (8)

PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
3.5	18.7	74.9	2.9

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Bloemfontein Branch
Rudolf Greyling St, Linquinda, Bloemfontein, Free State
bloemfontein@roadlab.co.za
060 727 8002

Roadlab Job Number: RB7385

Date of Report : 11/12.2024
Date Sampled : 11.11.2024

Mukuna Geotechnics (PTY)Ltd
28 B Hazelwood Road
Menlo Park,Pretoria
New Road,Midrand 1685

Attention:Mr.David Msiza

Dear Sir/ Madam

TEST REPORT

Project Name: **Xhariep Pipeline Feasibility Study**

Herewith the laboratory test results for above mentioned project, as per request.
As per the test report the following tests have been conducted

TEST METHODS

1.) Wet preparation and particle size analysis	**SANS 3001: GR1**
2.) Determination of the one-point liquid limit, plastic limit, plasticity index and linear shrinkage	**SANS 3001: GR10**
3.) Determination of the liquid limit with the two-point method	**SANS 3001: GR11**
4.) Determination of the maximum dry density and optimum moisture content	**SANS 3001: GR30**
5.) Determination of the california bearing ratio	**SANS 3001: GR40**
5.) Foundation Indicator	**SANS 3001: GR5**

Kind Regards

NOTE : Test marked with # is not part of Facility s accreditation scope of work

Solomon Lediga
Manager/Technical Signatory

T1143

Remarks :
*Opinions & Interpretations are not included in our schedule of Accreditation
SANAS Accredited Laboratory No. T1143
The samples were subjected to analysis according to SANS 3001
The results reported relate only to the sample tested
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Test results may only be reproduced or published in their full context with prior approval from the Technical Manager of Roadlab.
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Bloemfontein Branch
Rudolf Greyling St, Linquinda, Bloemfontein, Free State
bloemfontein@roadlab.co.za
060 727 8002

Roadlab Job Number RB7385

Date Reported: 11.12.2024

Mukuna Geotechnics (PTY)Ltd
International Business Gateway
Midridge Office Estate
New Road,Midrand 1685

Attention: Mr David Msiza

Dear Sir

Test Report: **Xhariep Pipeline Feasibility Study**

Please find the attached test results for the sample/s as submitted to and tested by Roadlab (Pty)Ltd
The unambiguous description of the sample/s as received are as follows :

SAMPLE INFORMATION & PROPERTIES					
SAMPLE No.		B15143	B15144	B15146	
CONTAINER USED FOR SAMPLING		Sampling Bags	Sampling Bags	Sampling Bags	
SIZE / WEIGHT OF SAMPLE		-+100,8kg	-+88,kg	-+107,kg	
MOISTURE CONDITION OF SAMPLE ON ARRIVAL		Slightly Moist	Slightly Moist	Slightly Moist	
HOLE No. / Km. / CHAINAGE		TP 103	TP 105	TP 126	
ROAD NO OR NAME		GI Xhariep Pipeline	GI Xhariep Pipeline	GI Xhariep Pipeline	
LAYER TESTED / SAMPLED FROM		1.1-1.4 (m)	1.2-1.4(m)	0.20-2.5(m)	
DATE SAMPLED		30.11.2024	30.11.2024	30.11.2024	
DATE RECEIVED		30.11.2024	30.11.2024	30.11.2024	
CLIENTS MARKING		-	-	-	
DESCRIPTION OF SAMPLE (COLOUR & TYPE)		Reddish Sandy Clay +Residual Mudstone	Dark Brown Olive Sandy Clay +Residual Mudstone	Reddish Brown Silty Sand+ Colluvium	
GRADING ANALYSIS - % PASSING SIEVES (SANS 3001-GR1:2010;SANS 3001-GR2:2010)					
SIEVE ANALYSIS **(SANS GR1:2010)**	100,0	100	100	100	
	75,0	100	100	100	
	63,0	100	100	100	
	50,0	100	100	100	
	37,5	100	100	100	
	28,0	100	100	100	
	20,0	100	100	100	
	14,0	98	100	100	
	5,0	94	99	99	
	2,00	89	97	98	
	0,425	72	90	92	
	0,075	45	72	70	
SANS 3001 - PR5					
Soil Mortar		89	97	98	
Coarse Sand		19,4	7,0	6	
Fine Sand		30	18	22	
Coarse Fine Sand		6	3	3	
Medium Fine Sand		12	6	6	
Fine Fine Sand		11	9	14	
Silt & Clay		51	75	71	
Coarse Sand Ratio		0,19	0,07	0,06	
ATTERBERG LIMITS ANALYSIS (SANS 3001-GR10:2010;SANS 3001-GR11:2010)					
ATTERBERG LIMITS **(SANSGR10;GR11)**	LL%	34	45	34	
	P.I. (0.425mm)	14	21	13	
	LS%	8	11	6	
	P.I. (0.075mm)	7	6	6	-
GM		0,94	0,41	0,40	
CLASSIFI - CATION	H.R.B.*	A-6(3)	A-7-6(13)	A-7-6(13)	
	COLTO*	<G9	<G9	<G9	
	T.R.H. 14*	G9	G9	G8	
CALIFORNIA BEARING RATIO (SANS 3001-GR30:2010;SANS 3001-GR40:2010)					
MOD AASHTO **(SANS GR30)**	OMC%	12,0	12,2	14,4	
	MDD(KG/M^3)	1771	1685	1725	
C.B.R.	COMP MC	12,0	12,2	14,4	
	% SWELL	0,44	0,50	0,24	
C.B.R. (SANS GR40)	100%	16	17	38	
	98%	14	14	27	
	97%	13	13	27	
	95%	11	11	24	
	93%	9	9	21	
	90%	7	7	18	
MOD ITS : DRY (kPa) (GR54)		N/S	N/S	N/S	
PROCTOR ITS : DRY (kPa)		N/S	N/S	N/S	
STABILISED WITH	IN LAB	N/S	N/S	N/S	
	ON SITE	N/S	N/S	N/S	
TEST TYPE		CBR/IND	CBR/IND	CBR/IND	
SAMPLED BY		Client	Client	Client	
DELIVERED BY		Client	Client	Client	
SAMPLING METHOD		**Smpled by the client**	**Sampled by the client**	**Sampled by the client**	
ENVIRONMENTAL CONDITION WHEN SAMPLED		N/S	N/S	N/S	
REMARKS & NOTES		N/S	N/S	N/S	

Kind Regards

sanas
T1143

Mr. Solomon Lediga
Technical Signatory / Manager

Remarks :
*Opinions & Interpretations are not included in our schedule of Accreditation
The samples were subjected to analysis according to SANS T1143
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Bloemfontein Branch
Rudolf Greyling St, Linquinda, Bloemfontein, Free State
bloemfontein@roadlab.co.za
060 727 8002

Roadlab Job Number RB7385

Date Reported: 02.12.2024

Mukuna Geotechnics (PTY)Ltd
28 B Hazelwood Road
Menlo Park,Pretoria
New Road,Midrand 1685

Attention: Mr.David Msiza

Dear Sir

Test Report: **Xhariep Pipeline Feasibility Study**

Please find the attached test results for the sample/s as submitted to and tested by Roadlab (Pty)Ltd
The unambiguous description of the sample/s as received are as follows :

SAMPLE INFORMATION & PROPERTIES					
SAMPLE No.		B15145	B15151	B15153	
CONTAINER USED FOR SAMPLING		Sampling Bags	Sampling Bags	Sampling Bags	
SIZE / WEIGHT OF SAMPLE		-+101.2kg	-+90,kg	-+102,kg	
MOISTURE CONDITION OF SAMPLE ON ARRIVAL		Slightly Moist	Slightly Moist	Slightly Moist	
HOLE No. / Km. / CHAINAGE		TP 121	TP 234	TP 256	
ROAD NO OR NAME		GI Xhariep Pipeline	GI Xhariep Pipeline	GI Xhariep Pipeline	
LAYER TESTED / SAMPLED FROM		0.6-1.1m	0.5-1.6m	1.1-2.6m	
DATE SAMPLED		11.11.2024	11.11.2024	11.11.2024	
DATE RECEIVED		11.11.2024	11.11.2024	11.11.2024	
CLIENTS MARKING		-	-	-	
DESCRIPTION OF SAMPLE (COLOUR & TYPE)		Dark Brown Sandy Clay + Residual Mudstone	Dark Olive Weathered Mudstone	Light Grey Sandy Clay + Residual Mudstone	
GRADING ANALYSIS - % PASSING SIEVES (SANS 3001-GR1:2010;SANS 3001-GR2:2010)					
SIEVE ANALYSIS **(SANS GR1:2010)**	100,0	100	100	100	
	75,0	100	100	100	
	63,0	100	100	100	
	50,0	100	100	100	
	37,5	100	99	100	
	28,0	100	96	100	
	20,0	100	83	100	
	14,0	100	77	100	
	5,0	98	54	99	
	2,00	94	38	94	
	0,425	87	20	79	
	0,075	74	9	68	
SANS 3001 - PR5					
Soil Mortar		94	38	94	
Coarse Sand		8,0	46,2	15	
Fine Sand		13	30	12	
Coarse Fine Sand		3	11	1	
Medium Fine Sand		4	11	3	
Fine Fine Sand		6	9	7	
Silt & Clay		79	23	73	
Coarse Sand Ratio		0,08	0,46	0,15	
ATTERBERG LIMITS ANALYSIS (SANS 3001-GR10:2010;SANS 3001-GR11:2010)					
ATTERBERG LIMITS **(SANSGR10;GR11)**	LL%	53	33	25	
	P.I. (0.425mm)	22	5	5	
	LS%	10	3	3	
	P.I. (0.075mm)	7	6	6	-
GM		0,45	2,33	0,59	
CLASSIFI - CATION	H.R.B.*	A-7-5(15)	A-1-a(0)	A-1-a(0)	
	COLTO*	<G9	G6	<G9	
	T.R.H. 14*	G8	G7	G7	
CALIFORNIA BEARING RATIO (SANS 3001-GR30:2010;SANS 3001-GR40:2010)					
MOD AASHTO **(SANS GR30)**	OMC%	13,8	9,7	9,1	
	MDD(KG/M^3)	1624	1924	2035	
C.B.R.	COMP MC	13,8	9,7	9,1	
	% SWELL	0,35	0,24	0,40	
C.B.R. (SANS GR40)	100%	20	36	48	
	98%	18	32	41	
	97%	17	30	36	
	95%	15	27	28	
	93%	14	24	21	
	90%	12	20	17	
MOD ITS : DRY (kPa) (GR54)		N/S	N/S	N/S	
PROCTOR ITS : DRY (kPa)		N/S	N/S	N/S	
STABILISED WITH	IN LAB	N/S	N/S	N/S	
	ON SITE	N/S	N/S	N/S	
TEST TYPE		CBR/IND	CBR/IND	CBR/IND	
SAMPLED BY		Client	Client	Client	
DELIVERED BY		Client	Client	Client	
SAMPLING METHOD		**Smpled by the client**	**Sampled by the client**	**Sampled by the client**	
ENVIRONMENTAL CONDITION WHEN SAMPLED		N/S	N/S	N/S	
REMARKS & NOTES		N/S	N/S	N/S	

Kind Regards

T1143

Mr. Solomon Lediga
Technical Signatory / Manager

Remarks :
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060 727 8002

Roadlab Job Number RB7385

Date Reported: 02.12.2024

Mukuna Geotechnics (PTY)Ltd
International Business Gateway
Midridge Office Estate
New Road,Midrand 1685

Attention: Mr.David Msiza

Dear Sir

Test Report: **Xhariep Pipeline Feasibility Study**

Please find the attached test results for the sample/s as submitted to and tested by Roadlab (Pty)Ltd
The unambiguous description of the sample/s as received are as follows :

SAMPLE INFORMATION & PROPERTIES					
SAMPLE No.		B15150	B15148	B15154	
CONTAINER USED FOR SAMPLING		Sampling Bags	Sampling Bags	Sampling Bags	
SIZE / WEIGHT OF SAMPLE		-+102,8kg	-+98,kg	+-97kg	
MOISTURE CONDITION OF SAMPLE ON ARRIVAL		Slightly Moist	Slightly Moist	Slightly Moist	
HOLE No. / Km. / CHAINAGE		TP 224	TP 52	TP 272	
ROAD NO OR NAME		GI Xhariep Pipeline	GI Xhariep Pipeline	GI Xhariep Pipeline	
LAYER TESTED / SAMPLED FROM		1.1-1.3m	0.6-0.8m	2.5-3.1m	
DATE SAMPLED		11.11.2024	11.11.2024	11.11.2024	
DATE RECEIVED		11.11.2024	11.11.2024	11.11.2024	
CLIENTS MARKING		-	-	-	
DESCRIPTION OF SAMPLE (COLOUR & TYPE)		Light Brown Weathered Mudstone	Dark Brown Silty Sand ,Colluvium	Light Brown dy Clay +Residual Mudstone/Sandst	
GRADING ANALYSIS - % PASSING SIEVES (SANS 3001-GR1:2010;SANS 3001-GR2:2010)					
SIEVE ANALYSIS **(SANS GR1:2010)**	100,0	100	100	100	
	75,0	100	100	100	
	63,0	100	100	100	
	50,0	100	98	100	
	37,5	100	98	100	
	28,0	100	95	100	
	20,0	100	88	100	
	14,0	100	88	100	
	5,0	100	57	100	
	2,00	100	40	99	
	0,425	96	26	97	
	0,075	55	19	58	
SANS 3001 - PR5					
Soil Mortar		100	40	99	
Coarse Sand		3,4	33,2	2	
Fine Sand		41	20	39	
Coarse Fine Sand		1	7	8	
Medium Fine Sand		13	6	10	
Fine Fine Sand		26	7	21	
Silt & Clay		55	47	59	
Coarse Sand Ratio		0,03	0,33	0,02	
ATTERBERG LIMITS ANALYSIS (SANS 3001-GR10:2010;SANS 3001-GR11:2010)					
ATTERBERG LIMITS **(SANSGR10;GR11)**	LL%	36	50	54	
	P.I. (0.425mm)	12	20	26	
	LS%	7	9.69	13	
	P.I. (0.075mm)	-	-	-	-
GM		0,49	2,16	0,46	
CLASSIFI - CATION	H.R.B.*	A-6(5)	A-2-7(0)	A-2-7(0)	
	COLTO*	<G9	<G9	<G9	
	T.R.H. 14*	G7	#VALUE!	G8	
CALIFORNIA BEARING RATIO (SANS 3001-GR30:2010;SANS 3001-GR40:2010)					
MOD AASHTO **(SANS GR30)**	OMC%	7,7	7,1	10,2	
	MDD(KG/M^3)	1992	1919	1724	
C.B.R.	COMP MC	7,7	7,1	10,2	
	% SWELL	0,20	0,30	0,24	
C.B.R. (SANS GR40)	100%	34	33	23	
	98%	31	29	20	
	97%	29	27	19	
	95%	26	24	16	
	93%	24	22	14	
	90%	20	18	12	
MOD ITS : DRY (kPa) (GR54)		N/S	N/S	N/S	
PROCTOR ITS : DRY (kPa)		N/S	N/S	N/S	
STABILISED WITH	IN LAB	N/S	N/S	N/S	
	ON SITE	N/S	N/S	N/S	
TEST TYPE		CBR/IND	CBR/IND	CBR/IND	
SAMPLED BY		Client	Client	Client	
DELIVERED BY		Client	Client	Client	
SAMPLING METHOD		**Smpled by the client**	**Sampled by the client**	**Sampled by the client**	
ENVIRONMENTAL CONDITION WHEN SAMPLED		N/S	N/S	N/S	
REMARKS & NOTES		N/S	N/S	N/S	

Kind Regards

sanas
T1143

Mr. Solomon Lediga
Technical Signatory / Manager

Remarks :
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Bloemfontein Branch
Rudolf Greyling St, Linquinda, Bloemfontein, Free State
bloemfontein@roadlab.co.za
060 727 8002

Roadlab Job Number RB7385

Date Reported: 02.12.2024

Mukuna Geotechnics (PTY)Ltd
International Business Gateway
Midridge Office Estate
New Road,Midrand 1685

Attention: Mr.David Msiza

Dear Sir

Test Report: **Xhariep Pipeline Feasibility Study**

Please find the attached test results for the sample/s as submitted to and tested by Roadlab (Pty)Ltd
The unambiguous description of the sample/s as received are as follows :

SAMPLE INFORMATION & PROPERTIES					
SAMPLE No.		B15157	B15159	B15160	
CONTAINER USED FOR SAMPLING		Sampling Bags	Sampling Bags	Sampling Bags	
SIZE / WEIGHT OF SAMPLE		-+101kg	-+104kg	+-97kg	
MOISTURE CONDITION OF SAMPLE ON ARRIVAL		Slightly Moist	Slightly Moist	Slightly Moist	
HOLE No. / Km. / CHAINAGE		TP 311	TP 408	TP 411	
ROAD NO OR NAME		GI Xhariep Pipeline	GI Xhariep Pipeline	GI Xhariep Pipeline	
LAYER TESTED / SAMPLED FROM		1.0-2.5m	0.6-2.1m	1.5-2.9m	
DATE SAMPLED		11.11.2024	11.11.2024	11.11.2024	
DATE RECEIVED		11.11.2024	11.11.2024	11.11.2024	
CLIENTS MARKING		-	-	-	
DESCRIPTION OF SAMPLE (COLOUR & TYPE)		Dark Olive Weathered Mudstone	Light Brown Sandy Silty Clay Reworked Residual Mudstone	Dark Olive Silty Clay+ Alluvium Residual Mudstone	
GRADING ANALYSIS - % PASSING SIEVES (SANS 3001-GR1:2010;SANS 3001-GR2:2010)					
SIEVE ANALYSIS **(SANS GR1:2010)**	100,0	100	100	100	
	75,0	100	100	100	
	63,0	100	100	100	
	50,0	100	100	100	
	37,5	99	100	100	
	28,0	95	100	100	
	20,0	77	100	100	
	14,0	77	100	100	
	5,0	72	97	98	
	2,00	71	94	94	
	0,425	70	86	90	
	0,075	35	53	65	
SANS 3001 - PR5					
Soil Mortar		71	94	94	
Coarse Sand		0,9	8,3	5	
Fine Sand		50	35	26	
Coarse Fine Sand		13	4	2	
Medium Fine Sand		15	10	8	
Fine Fine Sand		22	21	16	
Silt & Clay		49	57	69	
Coarse Sand Ratio		0,01	0,08	0,05	
ATTERBERG LIMITS ANALYSIS (SANS 3001-GR10:2010;SANS 3001-GR11:2010)					
ATTERBERG LIMITS **(SANSGR10;GR11)**	LL%	35	38	42	
	P.I. (0.425mm)	12	18	24	
	LS%	6	10	11	
	P.I. (0.075mm)	-	-	-	-
GM		1,24	0,67	0,51	
CLASSIFI - CATION	H.R.B.*	A-2-6(0)	A-6(7)	A-6(7)	
	COLTO*	G7	<G9	<G9	
	T.R.H. 14*	G7	G8	G8	
CALIFORNIA BEARING RATIO (SANS 3001-GR30:2010;SANS 3001-GR40:2010)					
MOD AASHTO **(SANS GR30)**	OMC%	16,3	14,6	11,7	
	MDD(KG/M^3)	1913	1762	1810	
C.B.R.	COMP MC	16,3	14,6	11,7	
	% SWELL	0,20	0,24	0,20	
C.B.R. (SANS GR40)	100%	30	25	34	
	98%	27	22	30	
	97%	25	20	28	
	95%	23	18	24	
	93%	21	15	21	
	90%	18	13	17	
MOD ITS : DRY (kPa) (GR54)		N/S	N/S	N/S	
PROCTOR ITS : DRY (kPa)		N/S	N/S	N/S	
STABILISED WITH	IN LAB	N/S	N/S	N/S	
	ON SITE	N/S	N/S	N/S	
TEST TYPE		CBR/IND	CBR/IND	CBR/IND	
SAMPLED BY		Client	Client	Client	
DELIVERED BY		Client	Client	Client	
SAMPLING METHOD		**Smpled by the client**	**Sampled by the client**	**Sampled by the client**	
ENVIRONMENTAL CONDITION WHEN SAMPLED		N/S	N/S	N/S	
REMARKS & NOTES		N/S	N/S	N/S	

Kind Regards

sanas
T1143

Mr. Solomon Lediga
Technical Signatory / Manager

Remarks :
*Opinions & Interpretations are not included in our schedule of Accreditation
The samples were subjected to analysis according to SANS T1143
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Test Report: **Xhariep Pipeline Feasibility Study**

Please find the attached test results for the sample/s as submitted to and tested by Roadlab (Pty)Ltd
The unambiguous description of the sample/s as received are as follows :

SAMPLE INFORMATION & PROPERTIES					
SAMPLE No.		B15161	B15163	B15166	
CONTAINER USED FOR SAMPLING		Sampling Bags	Sampling Bags	Sampling Bags	
SIZE / WEIGHT OF SAMPLE		-+87kg	-+93kg	-+100kg	
MOISTURE CONDITION OF SAMPLE ON ARRIVAL		Slightly Moist	Slightly Moist	Slightly Moist	
HOLE No. / Km. / CHAINAGE		TP 419	TP 344	TP 380	
ROAD NO OR NAME		GI Xhariep Pipeline	GI Xhariep Pipeline	GI Xhariep Pipeline	
LAYER TESTED / SAMPLED FROM		0.6-1.1m	1.4-2.2m	1.4-3.0m	
DATE SAMPLED		11.11.2024	11.11.2024	11.11.2024	
DATE RECEIVED		11.11.2024	11.11.2024	11.11.2024	
CLIENTS MARKING		-	-	-	
DESCRIPTION OF SAMPLE (COLOUR & TYPE)		Dark Olive Silty Clay,Colluvium	Light Brown Silty Clayey Sand+Residual Dolerite	Dark Brown y Silty Clay ,Reworks Residual Muds	
GRADING ANALYSIS - % PASSING SIEVES (SANS 3001-GR1:2010;SANS 3001-GR2:2010)					
SIEVE ANALYSIS **(SANS GR1:2010)**	100,0	100	100	100	
	75,0	100	100	100	
	63,0	100	100	100	
	50,0	100	100	100	
	37,5	100	100	100	
	28,0	100	100	100	
	20,0	100	100	100	
	14,0	100	100	100	
	5,0	99	96	99	
	2,00	98	91	98	
	0,425	96	79	94	
	0,075	53	57	77	
SANS 3001 - PR5					
Soil Mortar		98	91	98	
Coarse Sand		2,0	12,9	4	
Fine Sand		43	25	17	
Coarse Fine Sand		18	3	2	
Medium Fine Sand		12	9	5	
Fine Fine Sand		13	12	10	
Silt & Clay		55	63	79	
Coarse Sand Ratio		0,02	0,13	0,04	
ATTERBERG LIMITS ANALYSIS (SANS 3001-GR10:2010;SANS 3001-GR11:2010)					
ATTERBERG LIMITS **(SANSGR10;GR11)**	LL%	63	33	51	
	P.I. (0.425mm)	35	14	27	
	LS%	17	7	14	
	P.I. (0.075mm)	7	6	6	-
GM		0,53	0,73	0,30	
CLASSIFI - CATION	H.R.B.*	A-7-6(13)	A-6(6)	A-6(6)	
	COLTO*	<G9	<G9	<G9	
	T.R.H. 14*	G8	G8	G10	
CALIFORNIA BEARING RATIO (SANS 3001-GR30:2010;SANS 3001-GR40:2010)					
MOD AASHTO **(SANS GR30)**	OMC%	14,9	13,7	12,7	
	MDD(KG/M^3)	1644	1888	1593	
C.B.R.	COMP MC	14,9	13,7	12,7	
	% SWELL	0,39	0,20	0,57	
C.B.R. (SANS GR40)	100%	26	26	12	
	98%	22	24	10	
	97%	20	23	9	
	95%	17	21	7	
	93%	14	19	6	
	90%	10	17	4	
MOD ITS : DRY (kPa) (GR54)		N/S	N/S	N/S	
PROCTOR ITS : DRY (kPa)		N/S	N/S	N/S	
STABILISED WITH	IN LAB	N/S	N/S	N/S	
	ON SITE	N/S	N/S	N/S	
TEST TYPE		CBR/IND	CBR/IND	CBR/IND	
SAMPLED BY		Client	Client	Client	
DELIVERED BY		Client	Client	Client	
SAMPLING METHOD		**Smpled by the client**	**Sampled by the client**	**Sampled by the client**	
ENVIRONMENTAL CONDITION WHEN SAMPLED		N/S	N/S	N/S	
REMARKS & NOTES		N/S	N/S	N/S	

Kind Regards

sanas
T1143

Mr. Solomon Lediga
Technical Signatory / Manager

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Please find the attached test results for the sample/s as submitted to and tested by Roadlab (Pty)Ltd
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SAMPLE INFORMATION & PROPERTIES					
SAMPLE No.		B15183	B15187	B15190	
CONTAINER USED FOR SAMPLING		Sampling Bags	Sampling Bags	Sampling Bags	
SIZE / WEIGHT OF SAMPLE		+-110kg	-+98,kg	-+95kg	
MOISTURE CONDITION OF SAMPLE ON ARRIVAL		Slightly Moist	Slightly Moist	Slightly Moist	
HOLE No. / Km. / CHAINAGE		TP 180	TP 421	TP 524	
ROAD NO OR NAME		GI Xhariep Pipeline	GI Xhariep Pipeline	GI Xhariep Pipeline	
LAYER TESTED / SAMPLED FROM		0.7-1.5m	1.4-2.5m	1.6-2.0m	
DATE SAMPLED		11.11.2024	11.11.2024	11.11.2024	
DATE RECEIVED		11.11.2024	11.11.2024	11.11.2024	
CLIENTS MARKING		-	-	-	
DESCRIPTION OF SAMPLE (COLOUR & TYPE)		Dark Brown Silty Sand Residual Sandstone	Light Brown Calcreted Silt	Dark Brown Weathered Rock ,Mudstone with Pockets of Sandstone	
GRADING ANALYSIS - % PASSING SIEVES (SANS 3001-GR1:2010;SANS 3001-GR2:2010)					
SIEVE ANALYSIS **(SANS GR1:2010)**	100,0	100	100	100	
	75,0	100	100	100	
	63,0	100	100	100	
	50,0	100	100	100	
	37,5	100	100	100	
	28,0	100	100	100	
	20,0	100	100	100	
	14,0	100	100	100	
	5,0	99	91	99	
	2,00	98	86	97	
	0,425	95	73	88	
	0,075	75	66	80	
SANS 3001 - PR5					
Soil Mortar		98	86	97	
Coarse Sand		3,2	14,7	9	
Fine Sand		20	9	9	
Coarse Fine Sand		1	3	3	
Medium Fine Sand		6	3	3	
Fine Fine Sand		13	3	3	
Silt & Clay		76	76	82	
Coarse Sand Ratio		0,03	0,15	0,09	
ATTERBERG LIMITS ANALYSIS (SANS 3001-GR10:2010;SANS 3001-GR11:2010)					
ATTERBERG LIMITS **(SANSGR10;GR11)**	LL%	45	34	46	
	P.I. (0.425mm)	14	13	13	
	LS%	7	7	6	
	P.I. (0.075mm)	-	-	-	-
GM		0,33	0,75	0,35	
CLASSIFI - CATION	H.R.B.*	A-7-5(11)	A-6(7)	A-6(7)	
	COLTO*	<G9	<G9	<G9	
	T.R.H. 14*	G8	G8	G9	
CALIFORNIA BEARING RATIO (SANS 3001-GR30:2010;SANS 3001-GR40:2010)					
MOD AASHTO **(SANS GR30)**	OMC%	11,3	12,2	16,5	
	MDD(KG/M^3)	1897	1935	1662	
C.B.R.	COMP MC	11,3	1935,0	16,5	
	% SWELL	0,21	0,12	0,39	
C.B.R. (SANS GR40)	100%	27	37	19	
	98%	24	33	16	
	97%	23	32	15	
	95%	21	29	13	
	93%	19	26	11	
	90%	16	22	9	
MOD ITS : DRY (kPa) (GR54)		N/S	N/S	N/S	
PROCTOR ITS : DRY (kPa)		N/S	N/S	N/S	
STABILISED WITH	IN LAB	N/S	N/S	N/S	
	ON SITE	N/S	N/S	N/S	
TEST TYPE		CBR/IND	CBR/IND	CBR/IND	
SAMPLED BY		Client	Client	Client	
DELIVERED BY		Client	Client	Client	
SAMPLING METHOD		**Smpled by the client**	**Sampled by the client**	**Sampled by the client**	
ENVIRONMENTAL CONDITION WHEN SAMPLED		N/S	N/S	N/S	
REMARKS & NOTES		N/S	N/S	N/S	

Kind Regards

sanas
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Mr. Solomon Lediga
Technical Signatory / Manager

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Please find the attached test results for the sample/s as submitted to and tested by Roadlab (Pty)Ltd
The unambiguous description of the sample/s as received are as follows :

SAMPLE INFORMATION & PROPERTIES					
SAMPLE No.		B15184	B15185	B15189	
CONTAINER USED FOR SAMPLING		Sampling Bags	Sampling Bags	Sampling Bags	
SIZE / WEIGHT OF SAMPLE		-+108,8kg	-+95,kg	-+104,kg	
MOISTURE CONDITION OF SAMPLE ON ARRIVAL		Slightly Moist	Slightly Moist	Slightly Moist	
HOLE No. / Km. / CHAINAGE		TP 186	TP 184	TP 499	
ROAD NO OR NAME		GI Xhariep Pipeline	GI Xhariep Pipeline	GI Xhariep Pipeline	
LAYER TESTED / SAMPLED FROM		0.7-1.4m	1.3-1.7m	0.8-1.1m	
DATE SAMPLED		11.11.2024	11.11.2024	11.11.2024	
DATE RECEIVED		11.11.2024	11.11.2024	11.11.2024	
CLIENTS MARKING		-	-	-	
DESCRIPTION OF SAMPLE (COLOUR & TYPE)		Light Brown Silty Sand ,Residual Sandstone	Dark Brown Fine Sand Clay Residual Dolerite	Dark Brown Silty Sand Residual Dolerite	
GRADING ANALYSIS - % PASSING SIEVES (SANS 3001-GR1:2010;SANS 3001-GR2:2010)					
SIEVE ANALYSIS **(SANS GR1:2010)**	100,0	100	100	100	
	75,0	100	100	100	
	63,0	100	100	100	
	50,0	100	100	100	
	37,5	100	100	100	
	28,0	100	100	100	
	20,0	100	100	100	
	14,0	100	100	100	
	5,0	90	98	98	
	2,00	70	88	89	
	0,425	38	68	52	
	0,075	11	40	30	
SANS 3001 - PR5					
Soil Mortar		70	88	89	
Coarse Sand		45,4	23,1	42	
Fine Sand		39	32	25	
Coarse Fine Sand		12	5	5	
Medium Fine Sand		16	13	8	
Fine Fine Sand		12	14	12	
Silt & Clay		15	45	33	
Coarse Sand Ratio		0,45	0,23	0,42	
ATTERBERG LIMITS ANALYSIS (SANS 3001-GR10:2010;SANS 3001-GR11:2010)					
ATTERBERG LIMITS **(SANSGR10;GR11)**	LL%		36	37	
	P.I. (0.425mm)	NP	13	10	
	LS%		7	5	
	P.I. (0.075mm)	-	-	-	-
GM		1,80	1,05	1,30	
CLASSIFI - CATION	H.R.B.*	A-1-b(0)	A-6(2)	A-6(2)	
	COLTO*	G6	G7	G7	
	T.R.H. 14*	G7	G7	G6	
CALIFORNIA BEARING RATIO (SANS 3001-GR30:2010;SANS 3001-GR40:2010)					
MOD AASHTO **(SANS GR30)**	OMC%	11,3	12,6	11,2	
	MDD(KG/M^3)	1904	1785	1949	
C.B.R.	COMP MC	11,3	12,6	11,2	
	% SWELL	0,22	0,28	0,12	
C.B.R. (SANS GR40)	100%	46	50	38	
	98%	38	47	34	
	97%	34	38	32	
	95%	28	32	29	
	93%	23	25	27	
	90%	17	21	23	
MOD ITS : DRY (kPa) (GR54)		N/S	N/S	N/S	
PROCTOR ITS : DRY (kPa)		N/S	N/S	N/S	
STABILISED WITH	IN LAB	N/S	N/S	N/S	
	ON SITE	N/S	N/S	N/S	
TEST TYPE		CBR/IND	CBR/IND	CBR/IND	
SAMPLED BY		Client	Client	Client	
DELIVERED BY		Client	Client	Client	
SAMPLING METHOD		**Smpled by the client**	**Sampled by the client**	**Sampled by the client**	
ENVIRONMENTAL CONDITION WHEN SAMPLED		N/S	N/S	N/S	
REMARKS & NOTES		N/S	N/S	N/S	

Kind Regards

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T1143

Mr. Solomon Lediga
Technical Signatory / Manager

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› Geotechnical & Road Investigations
› Mobile Lab Services
› Specialised Concrete & Forensic Investigations
+27 11 828 0279
info@roadlab.co.za
www.roadlab.co.za
207 Rietfontein Rd,
Germiston, JHB, 1400

OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 103
LAYER : 1.1-1.4
SAMPLE No. : B15143
SAMPLE DESCRIPTION : Reddish Sand Clay Residual Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**10,1**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	98
5,00	94
2,000	89
0,425	72
0,250	66
0,150	55
0,075	45
50 µm	6
5 µm	5
2 µm	2,3

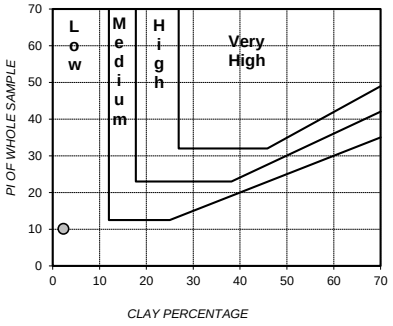
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	19
0.425 - 0.250	6
0.250 - 0.150	12
0.150 - 0.075	11
< 0.075	51

Effective size	0,053
Uniformity Coefficient	3,7
Curvature Coefficient	0,4
Oversize Index	0,0
Shrinkage Product	554,5
Grading Coefficient	10,3
Grading modulus	0,94

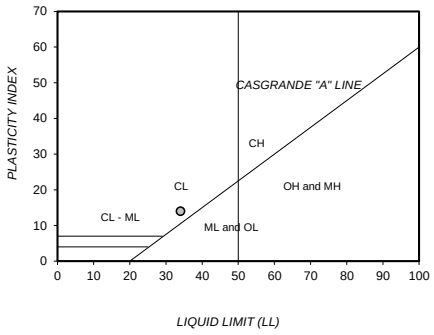
Atter-berg Limits	
Liquid Limit	34
Plasticity Index	14
Linear Shrinkage	7,7
PI < 0.075	-

Unified Soil Classification	SC
U.S. Highway Classification	A-6 (3)

POTENTIAL EXPANSIVENES

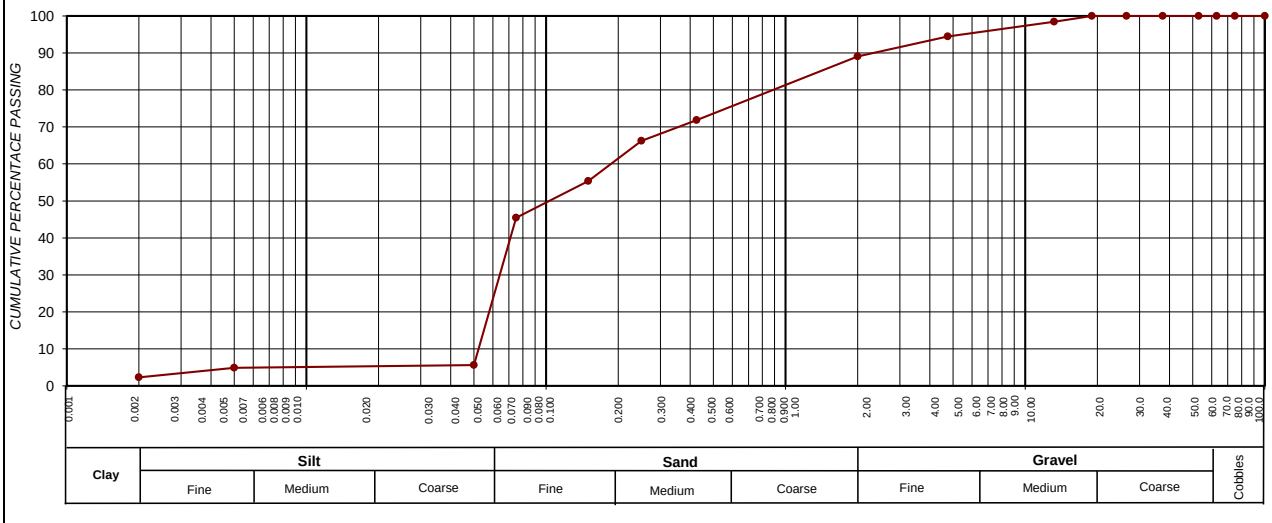


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
2,3	12,3	74,5	10,9

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 105
LAYER : 1.2-1.4
SAMPLE No. : B15144
SAMPLE DESCRIPTION : Reddish Silty Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**18,9**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	97
0,425	90
0,250	87
0,150	81
0,075	72
50 µm	11
5 µm	9
2 µm	6,7

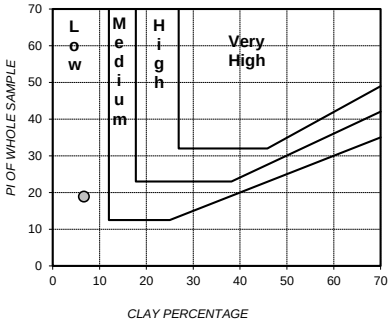
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	7
0.425 - 0.250	3
0.250 - 0.150	6
0.150 - 0.075	9
< 0.075	75

Effective size	0,031
Uniformity Coefficient	2,3
Curvature Coefficient	1,5
Oversize Index	0,0
Shrinkage Product	948,7
Grading Coefficient	3,3
Grading modulus	0,42

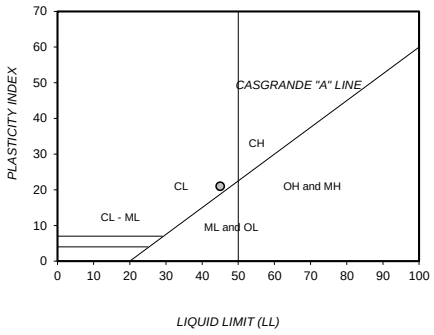
Atter-berg Limits	
Liquid Limit	45
Plasticity Index	21
Linear Shrinkage	10,6
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-7-6 (15)

POTENTIAL EXPANSIVENES

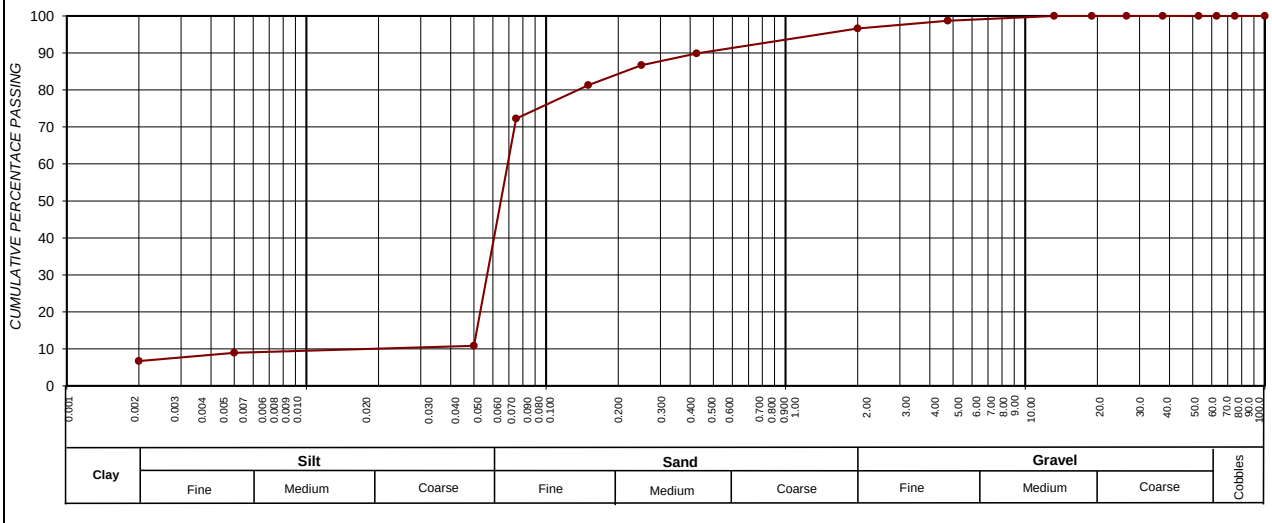


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
6,7	19,4	70,5	3,4

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

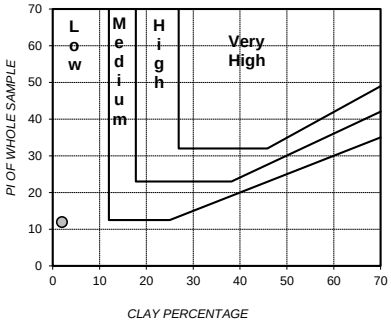
DATE RECEIVED : 11.11.2024
POSITION : TP 126
LAYER : 0.2-2.5
SAMPLE No. : B15146
SAMPLE DESCRIPTION : Silty Sand ,Colluvium

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

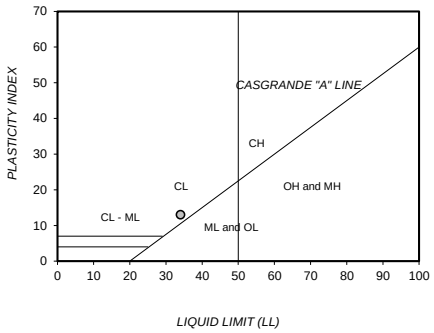
Weighted PI	**12,0**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	98
0,425	92
0,250	89
0,150	83
0,075	70
50 µm	7
5 µm	6
2 µm	2,0

POTENTIAL EXPANSIVENES



PLASTICITY CHART



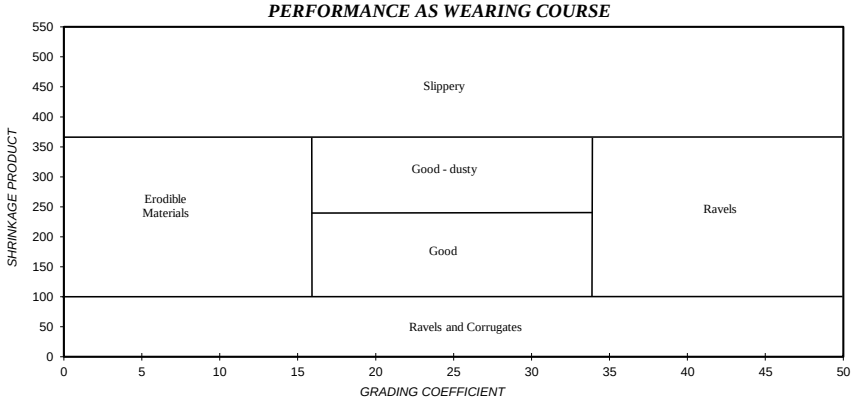
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	6
0.425 - 0.250	3
0.250 - 0.150	6
0.150 - 0.075	14
< 0.075	71

Effective size	0,051
Uniformity Coefficient	1,4
Curvature Coefficient	1,0
Oversize Index	0,0
Shrinkage Product	558,0
Grading Coefficient	1,9
Grading modulus	0,40

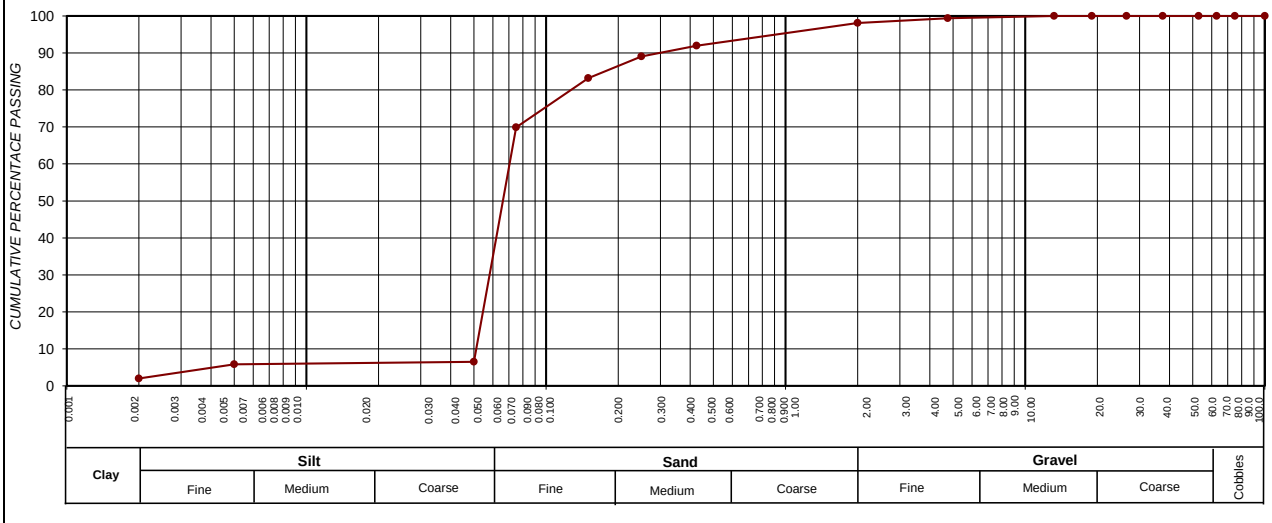
Atter-berg Limits	
Liquid Limit	34
Plasticity Index	13
Linear Shrinkage	6,1
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (8)

PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
2,0	19,3	76,8	1,9

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

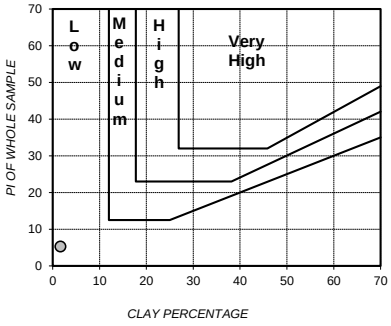
DATE RECEIVED : 11.11.2024
POSITION : TP 52
LAYER : 0.6-0.8
SAMPLE No. : B15148
SAMPLE DESCRIPTION : Dark Olive Sandy Gravel

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

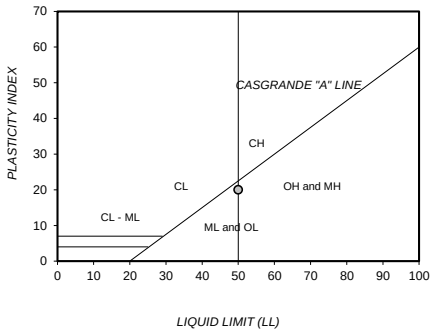
Weighted PI	**5,3**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	98
37,5	98
28,0	95
20,0	88
14,0	88
5,00	57
2,000	40
0,425	26
0,250	24
0,150	21
0,075	19
50 µm	3
5 µm	3
2 µm	1,7

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	33
0.425 - 0.250	7
0.250 - 0.150	6
0.150 - 0.075	7
< 0.075	47

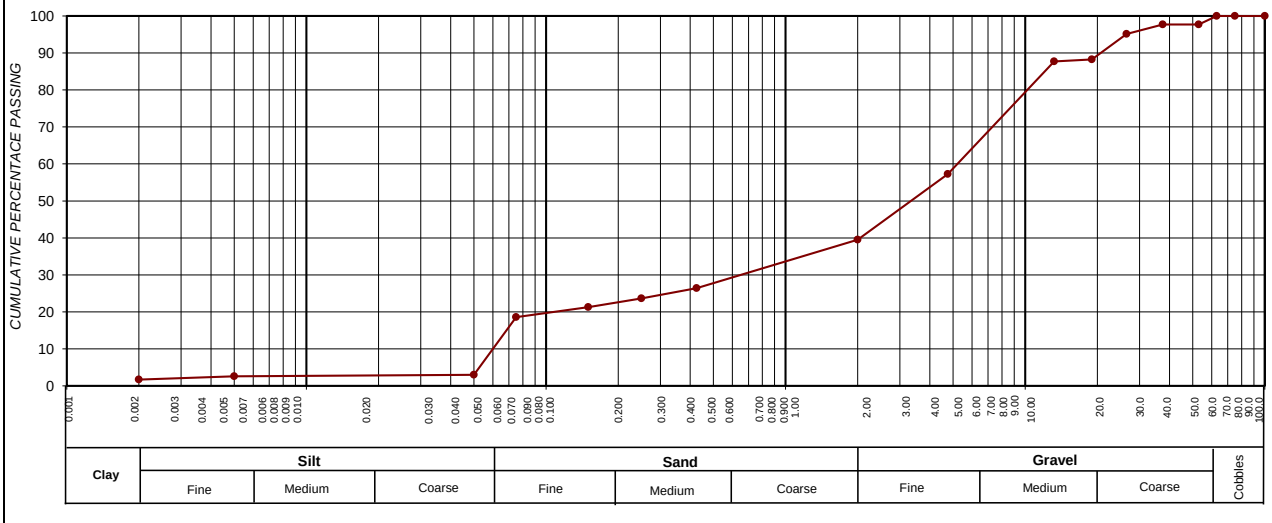
Effective size	0,061
Uniformity Coefficient	95,0
Curvature Coefficient	2,1
Oversize Index	2,3
Shrinkage Product	255,8
Grading Coefficient	31,8
Grading modulus	2,15

Atter-berg Limits	
Liquid Limit	50
Plasticity Index	20
Linear Shrinkage	9,7
PI < 0.075	-

Unified Soil Classification	SM
U.S. Highway Classification	A-2-7 (0)

PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
1,7	5,2	32,6	60,5

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CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 11
LAYER : 0.70-2.00
SAMPLE No. : B15150
SAMPLE DESCRIPTION : Dark Dark Silty Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**11,6**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	100
2,000	100
0,425	97
0,250	95
0,150	82
0,075	56
50 µm	7
5 µm	6
2 µm	1,7

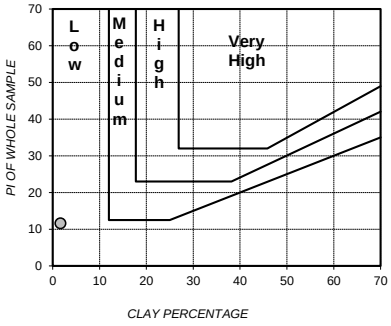
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	3
0.425 - 0.250	1
0.250 - 0.150	13
0.150 - 0.075	27
< 0.075	56

Effective size	0,052
Uniformity Coefficient	1,7
Curvature Coefficient	0,8
Oversize Index	0,0
Shrinkage Product	638,8
Grading Coefficient	0,4
Grading modulus	0,48

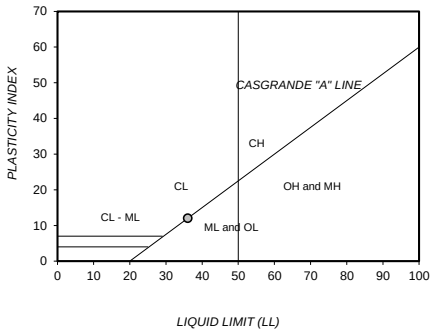
Atter-berg Limits	
Liquid Limit	36
Plasticity Index	12
Linear Shrinkage	6,6
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (5)

POTENTIAL EXPANSIVENES

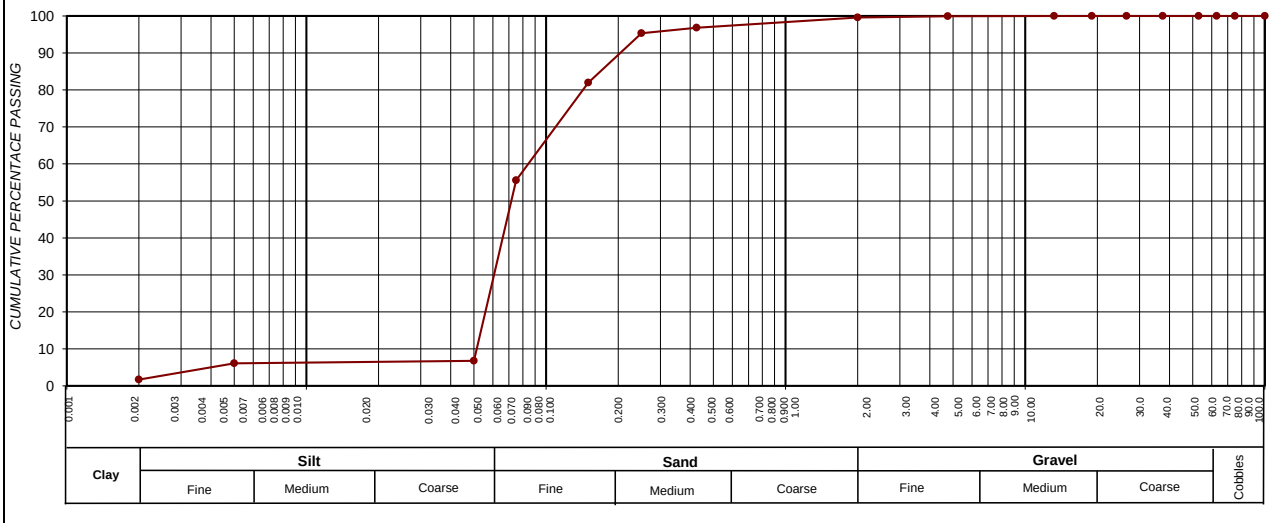


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
1,7	15,5	82,5	0,4

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CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 272
LAYER : 2.5-3.1
SAMPLE No. : B15154
SAMPLE DESCRIPTION : Clayey Sand,Residual Mudstone /Sandstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**25,2**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	100
2,000	99
0,425	97
0,250	89
0,150	78
0,075	58
50 µm	12
5 µm	10
2 µm	6,2

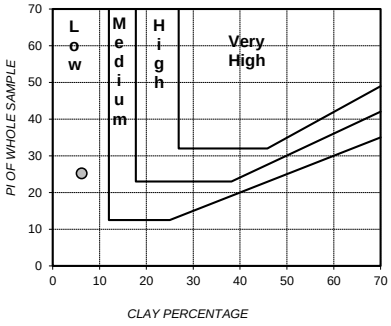
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	2
0.425 - 0.250	8
0.250 - 0.150	10
0.150 - 0.075	21
< 0.075	59

Effective size	0,005
Uniformity Coefficient	16,7
Curvature Coefficient	8,8
Oversize Index	0,0
Shrinkage Product	1245,7
Grading Coefficient	1,1
Grading modulus	0,46

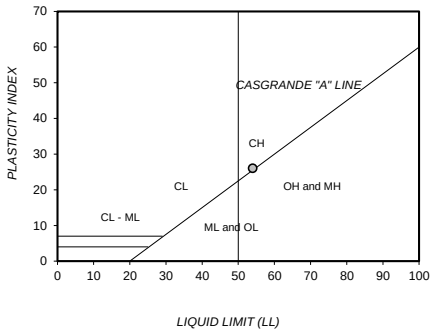
Atter-berg Limits	
Liquid Limit	54
Plasticity Index	26
Linear Shrinkage	12,9
PI < 0.075	-

Unified Soil Classification	CH
U.S. Highway Classification	A-7-6 (13)

POTENTIAL EXPANSIVENES

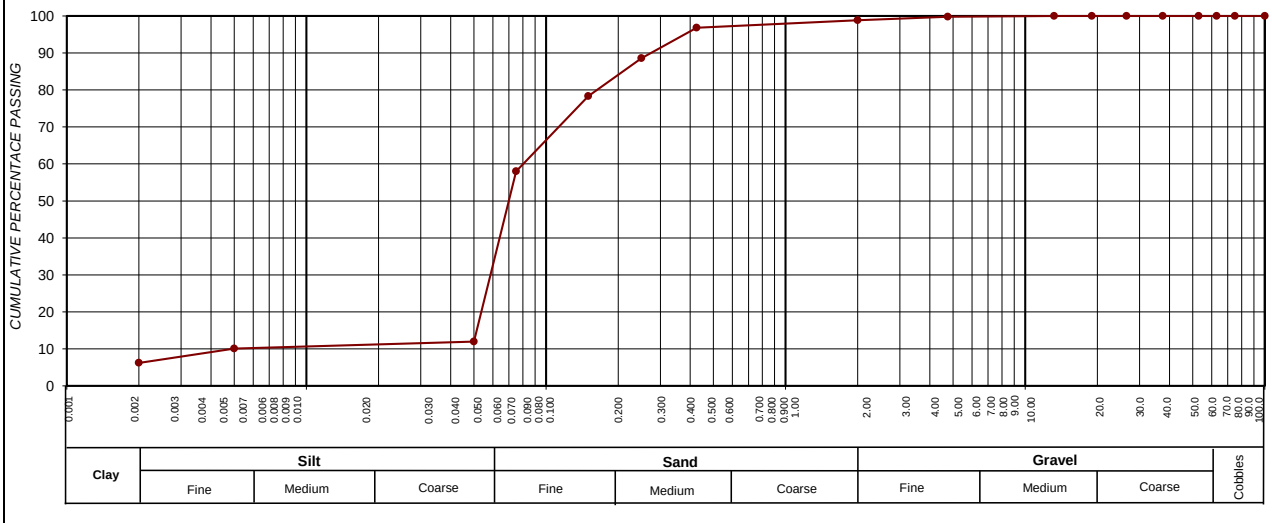


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
6,2	16,4	76,2	1,1

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 408
LAYER : 0.6-2.1
SAMPLE No. : B15159
SAMPLE DESCRIPTION : Silty Sand Clay,Reworked Residual Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	15,4	Specifc Gravity	2,35

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	97
2,000	94
0,425	86
0,250	82
0,150	72
0,075	53
50 µm	9
5 µm	8
2 µm	1,7

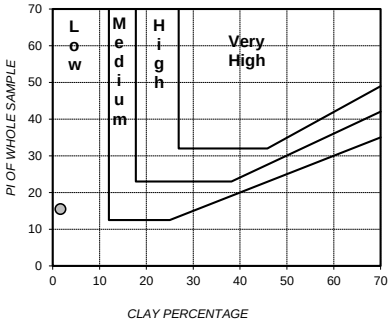
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	8
0.425 - 0.250	4
0.250 - 0.150	10
0.150 - 0.075	21
< 0.075	57

Effective size	0,051
Uniformity Coefficient	2,0
Curvature Coefficient	0,7
Oversize Index	0,0
Shrinkage Product	837,9
Grading Coefficient	6,3
Grading modulus	0,68

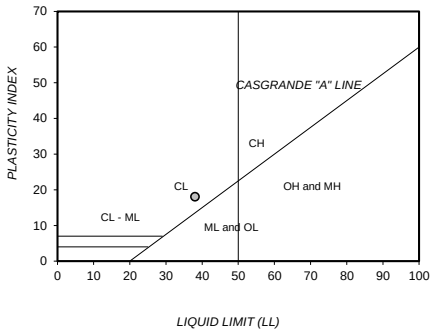
Atter-berg Limits	
Liquid Limit	38
Plasticity Index	18
Linear Shrinkage	9,8
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (6)

POTENTIAL EXPANSIVENES

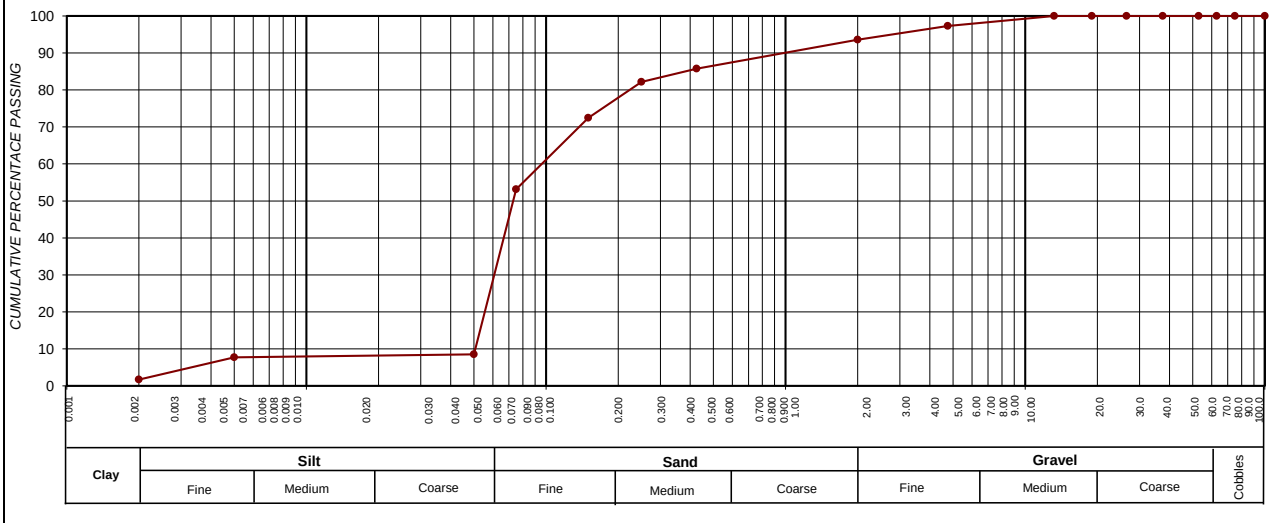


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
1,7	16,6	75,3	6,4

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : GI Xhariep Pipeline

DATE RECEIVED : 11.11.2024
POSITION : TP 343
LAYER : 0.8-1.4
SAMPLE No. : B15162
SAMPLE DESCRIPTION : Silty Clayey Sand,Residual Dolerite

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**4,0**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	95
0,425	67
0,250	59
0,150	47
0,075	34
50 µm	4
5 µm	3
2 µm	1,2

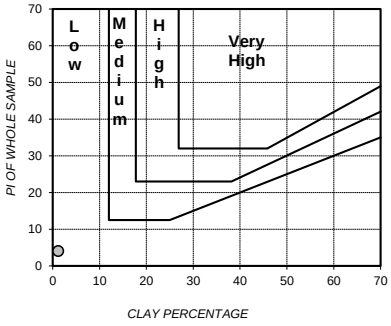
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	30
0.425 - 0.250	8
0.250 - 0.150	12
0.150 - 0.075	13
< 0.075	36

Effective size	0,055
Uniformity Coefficient	5,0
Curvature Coefficient	0,3
Oversize Index	0,0
Shrinkage Product	220,4
Grading Coefficient	4,9
Grading modulus	1,04

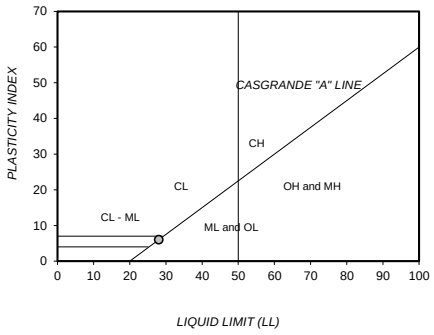
Atter-berg Limits	
Liquid Limit	28
Plasticity Index	6
Linear Shrinkage	3,3
PI < 0.075	-

Unified Soil Classification	SM & SC
U.S. Highway Classification	A-2-4 (0)

POTENTIAL EXPANSIVENES

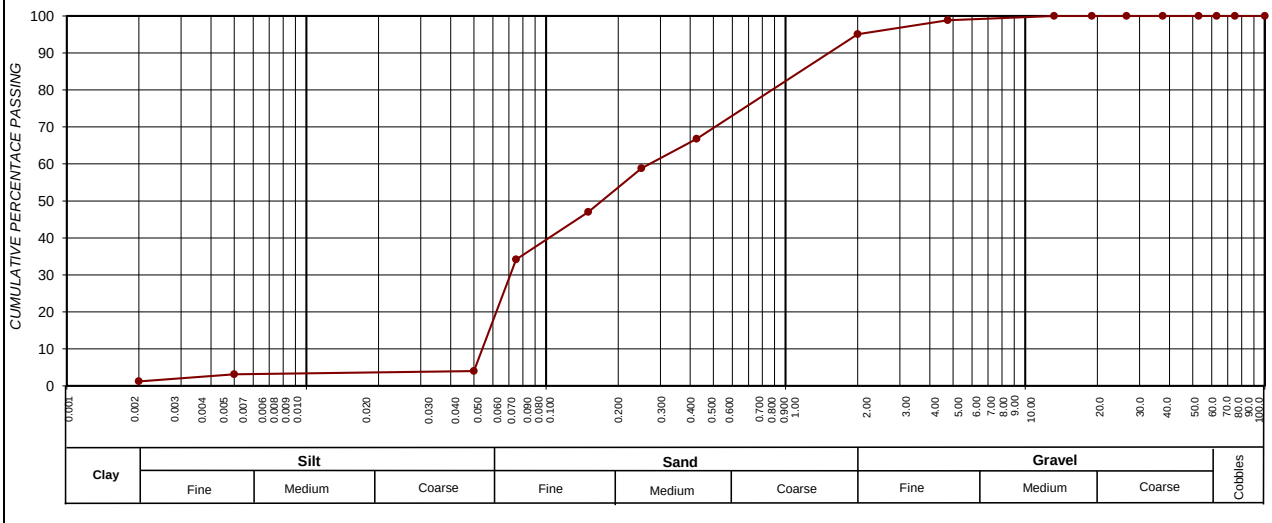


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
1,2	9,3	84,5	5,0

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 365
LAYER : 1.4-3.0
SAMPLE No. : B15165
SAMPLE DESCRIPTION : Silty Clay,Residual Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**12,1**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	97
0,425	93
0,250	91
0,150	85
0,075	70
50 µm	6
5 µm	6
2 µm	4,0

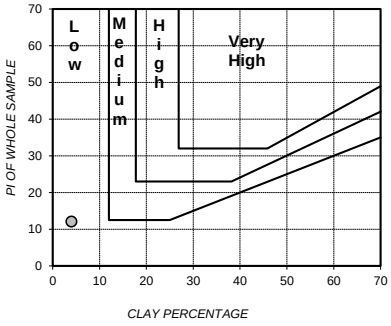
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	4
0.425 - 0.250	2
0.250 - 0.150	6
0.150 - 0.075	16
< 0.075	72

Effective size	0,051
Uniformity Coefficient	1,4
Curvature Coefficient	1,0
Oversize Index	0,0
Shrinkage Product	643,1
Grading Coefficient	3,0
Grading modulus	0,40

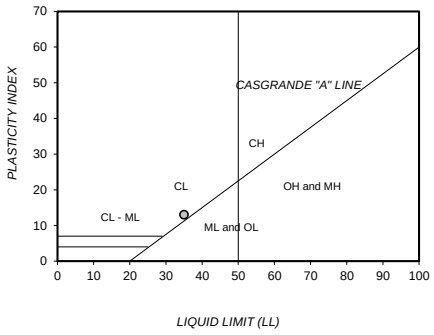
Atter-berg Limits	
Liquid Limit	35
Plasticity Index	13
Linear Shrinkage	6,9
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (8)

POTENTIAL EXPANSIVENES

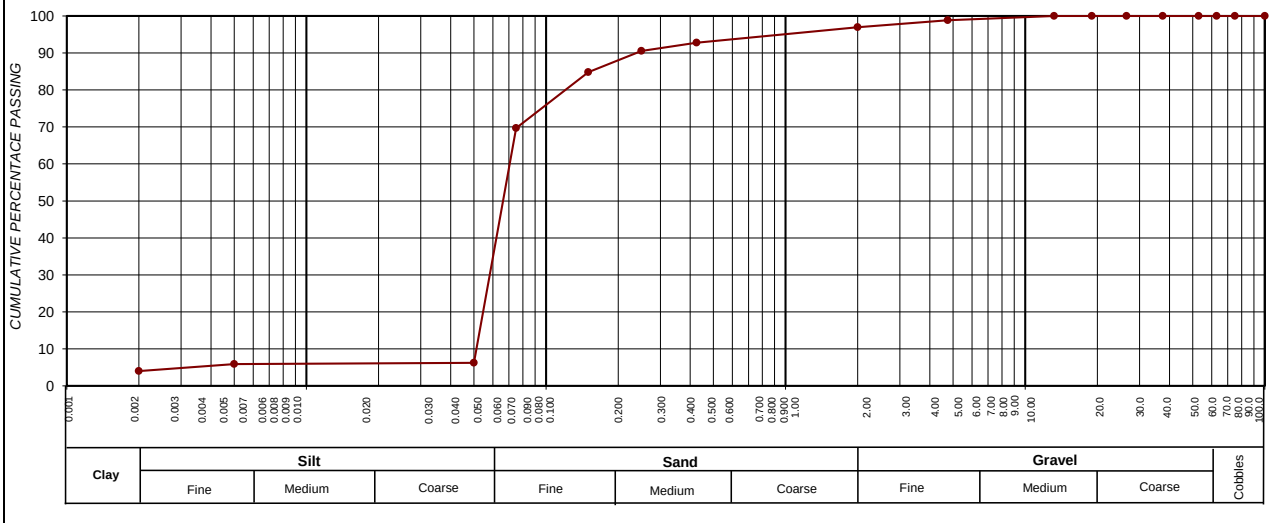


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
4,0	16,7	76,2	3,0

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 394
LAYER : 0.7-1.3
SAMPLE No. : B15167
SAMPLE DESCRIPTION : Silty Clay ,Reworked Residual Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**22,5**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	100
2,000	97
0,425	90
0,250	88
0,150	83
0,075	74
50 µm	11
5 µm	10
2 µm	5,1

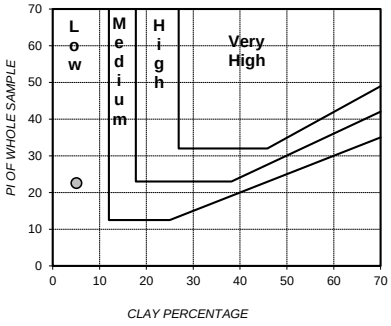
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	8
0.425 - 0.250	2
0.250 - 0.150	5
0.150 - 0.075	9
< 0.075	76

Effective size	0,008
Uniformity Coefficient	8,2
Curvature Coefficient	5,6
Oversize Index	0,0
Shrinkage Product	1117,9
Grading Coefficient	2,5
Grading modulus	0,38

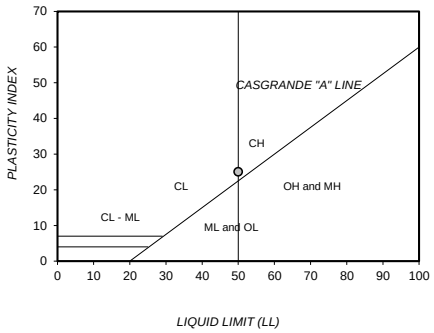
Atter-berg Limits	
Liquid Limit	50
Plasticity Index	25
Linear Shrinkage	12,4
PI < 0.075	-

Unified Soil Classification	CH
U.S. Highway Classification	A-7-6 (19)

POTENTIAL EXPANSIVENES

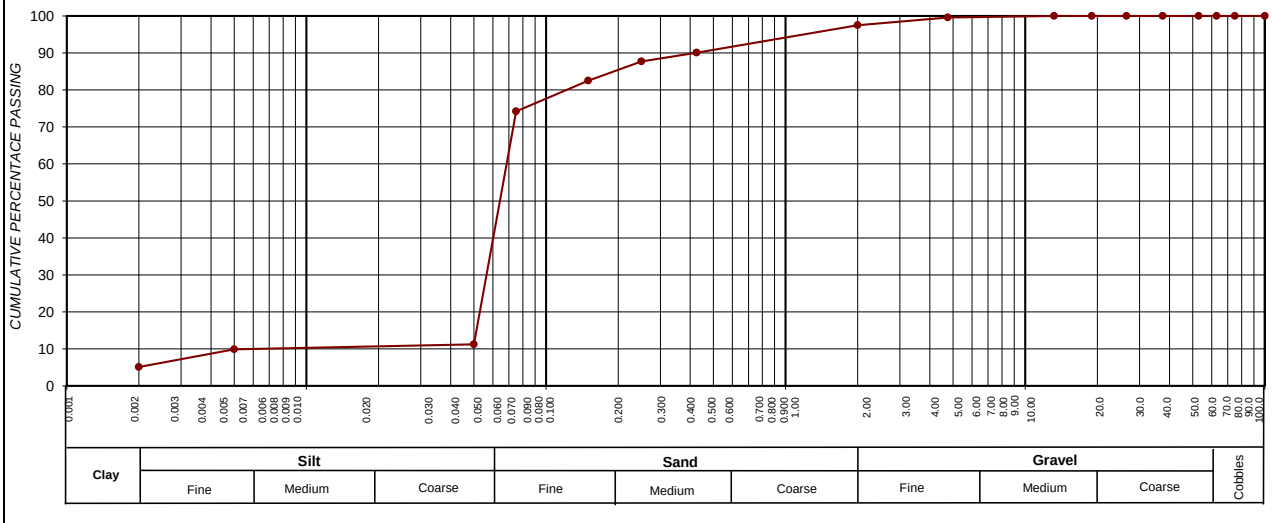


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
5,1	21,6	70,8	2,5

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

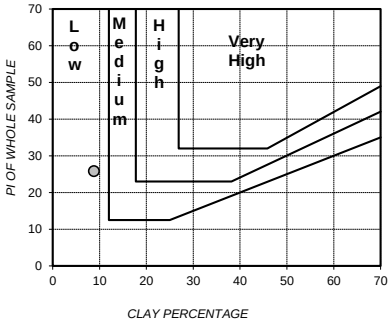
DATE RECEIVED : 11.11.2024
POSITION : TP 208
LAYER : 0.8-3.0
SAMPLE No. : B15208
SAMPLE DESCRIPTION : Silty Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

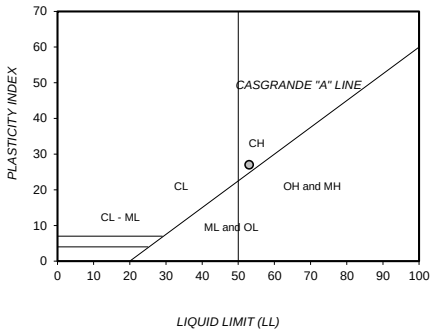
Weighted PI	**25,8**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	100
2,000	98
0,425	96
0,250	94
0,150	87
0,075	71
50 µm	13
5 µm	12
2 µm	8,8

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	3
0.425 - 0.250	2
0.250 - 0.150	7
0.150 - 0.075	17
< 0.075	72

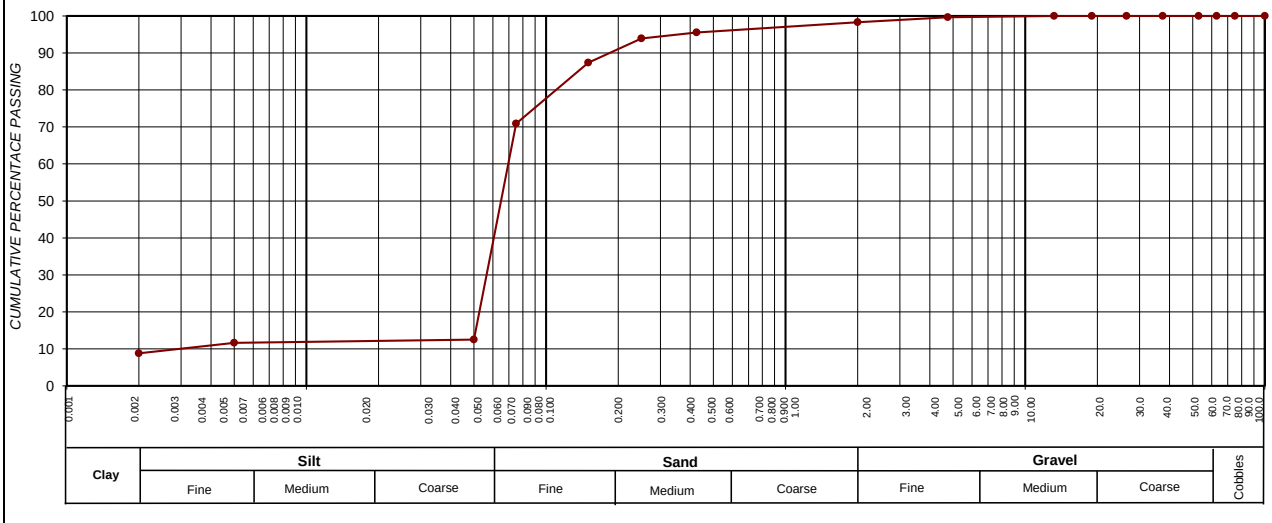
Effective size	0,003
Uniformity Coefficient	21,4
Curvature Coefficient	14,3
Oversize Index	0,0
Shrinkage Product	1299,8
Grading Coefficient	1,7
Grading modulus	0,35

Atter-berg Limits	
Liquid Limit	53
Plasticity Index	27
Linear Shrinkage	13,6
PI < 0.075	-

Unified Soil Classification	CH
U.S. Highway Classification	A-7-6 (19)

PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
8,8	17,6	71,9	1,7

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CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 337
LAYER : 01-Jan-00
SAMPLE No. : B15213
SAMPLE DESCRIPTION : Silty Clayey ,Residual Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**23,8**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	95
0,425	88
0,250	80
0,150	70
0,075	58
50 µm	11
5 µm	10
2 µm	6,2

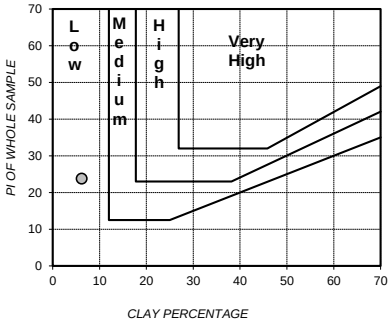
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	8
0.425 - 0.250	8
0.250 - 0.150	11
0.150 - 0.075	12
< 0.075	61

Effective size	0,016
Uniformity Coefficient	5,3
Curvature Coefficient	2,6
Oversize Index	0,0
Shrinkage Product	1156,3
Grading Coefficient	4,7
Grading modulus	0,59

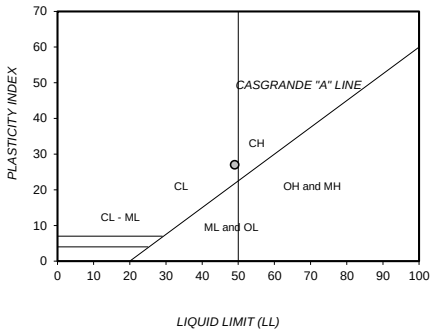
Atter-berg Limits	
Liquid Limit	49
Plasticity Index	27
Linear Shrinkage	13,1
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-7-6 (13)

POTENTIAL EXPANSIVENES

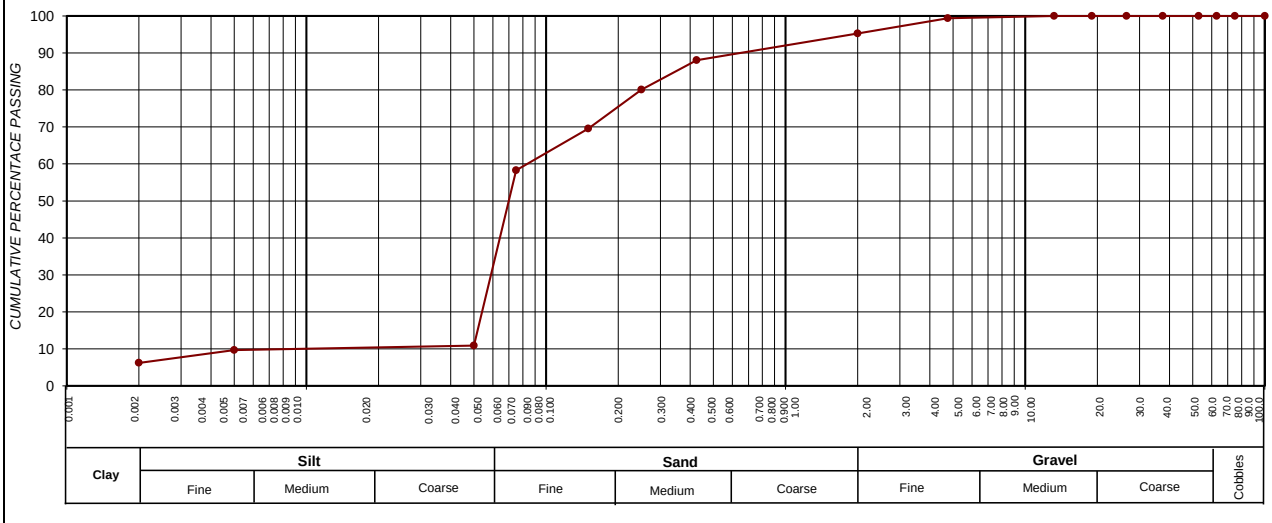


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
6,2	16,1	73,0	4,7

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 413
LAYER : 01-Jan-00
SAMPLE No. : B15214
SAMPLE DESCRIPTION : Silty Clay ,Residual Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**11,8**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	96
0,425	91
0,250	84
0,150	71
0,075	57
50 µm	7
5 µm	6
2 µm	3,5

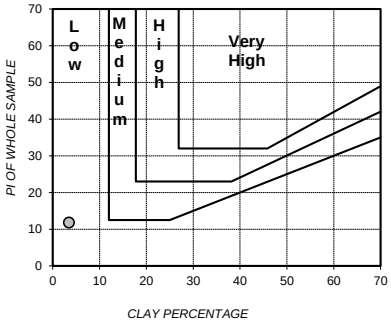
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	6
0.425 - 0.250	7
0.250 - 0.150	13
0.150 - 0.075	15
< 0.075	59

Effective size	0,052
Uniformity Coefficient	1,8
Curvature Coefficient	0,8
Oversize Index	0,0
Shrinkage Product	591,1
Grading Coefficient	3,5
Grading modulus	0,56

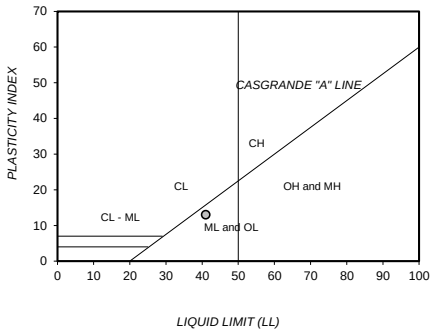
Atter-berg Limits	
Liquid Limit	41
Plasticity Index	13
Linear Shrinkage	6,5
PI < 0.075	-

Unified Soil Classification	ML
U.S. Highway Classification	A-7-6 (6)

POTENTIAL EXPANSIVENES

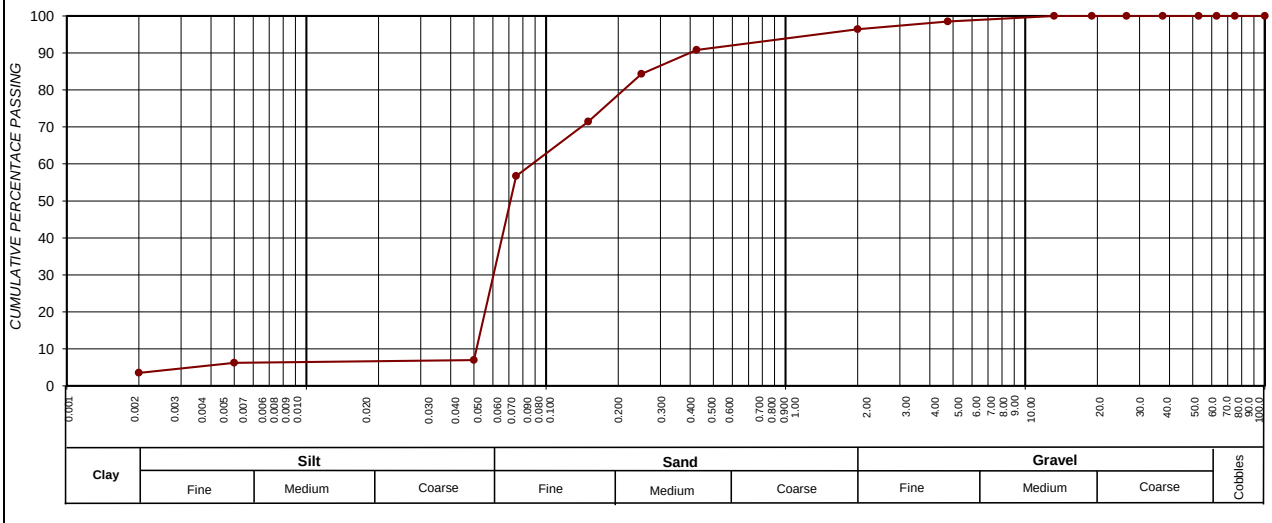


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
3,5	14,8	78,1	3,6

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CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 507
LAYER : 00-Jan-00
SAMPLE No. : B15216
SAMPLE DESCRIPTION : Silty ,Residual Shale

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**14,6**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	96
0,425	86
0,250	82
0,150	70
0,075	50
50 µm	11
5 µm	10
2 µm	8,2

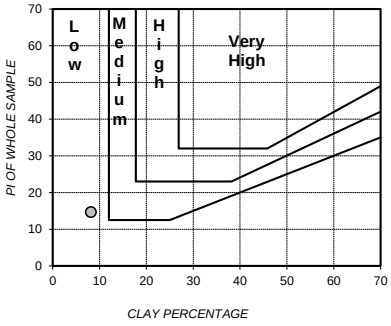
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	11
0.425 - 0.250	4
0.250 - 0.150	13
0.150 - 0.075	21
< 0.075	52

Effective size	0,005
Uniformity Coefficient	22,6
Curvature Coefficient	6,9
Oversize Index	0,0
Shrinkage Product	795,6
Grading Coefficient	3,7
Grading modulus	0,68

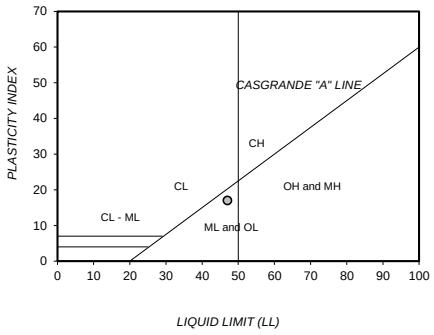
Atter-berg Limits	
Liquid Limit	47
Plasticity Index	17
Linear Shrinkage	9,2
PI < 0.075	-

Unified Soil Classification	ML
U.S. Highway Classification	A-7-5 (6)

POTENTIAL EXPANSIVENES

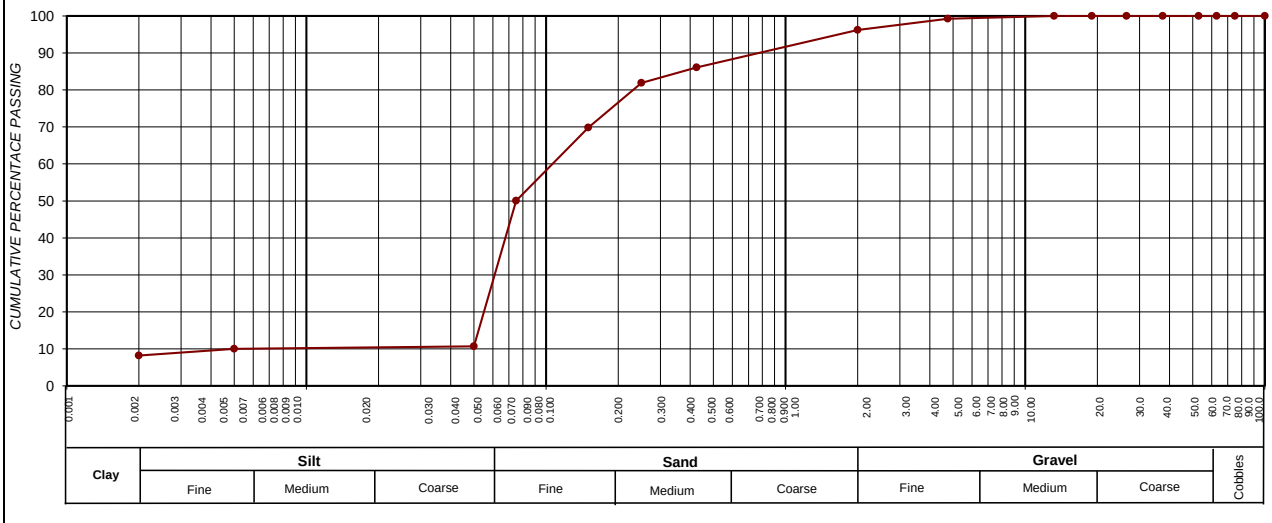


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
8,2	11,4	76,6	3,8

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OUR REF : BLO01-RBFMUK001-1-
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PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 367
LAYER : 01-Jan-00
SAMPLE No. : B15222
SAMPLE DESCRIPTION : Silty Clay ,Residual Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**7,6**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	95
0,425	85
0,250	76
0,150	68
0,075	54
50 µm	5
5 µm	5
2 µm	3,6

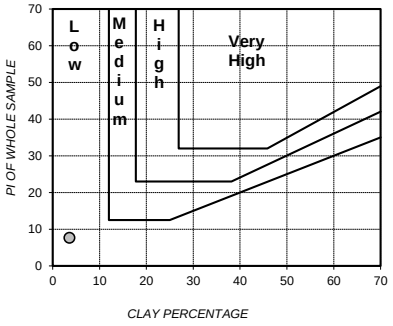
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	11
0.425 - 0.250	9
0.250 - 0.150	9
0.150 - 0.075	14
< 0.075	57

Effective size	0,052
Uniformity Coefficient	2,0
Curvature Coefficient	0,7
Oversize Index	0,0
Shrinkage Product	419,1
Grading Coefficient	4,6
Grading modulus	0,66

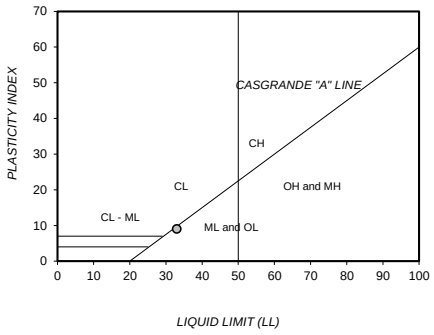
Atter-berg Limits	
Liquid Limit	33
Plasticity Index	9
Linear Shrinkage	5,0
PI < 0.075	-

Unified Soil Classification	ML
U.S. Highway Classification	A-4 (3)

POTENTIAL EXPANSIVENES

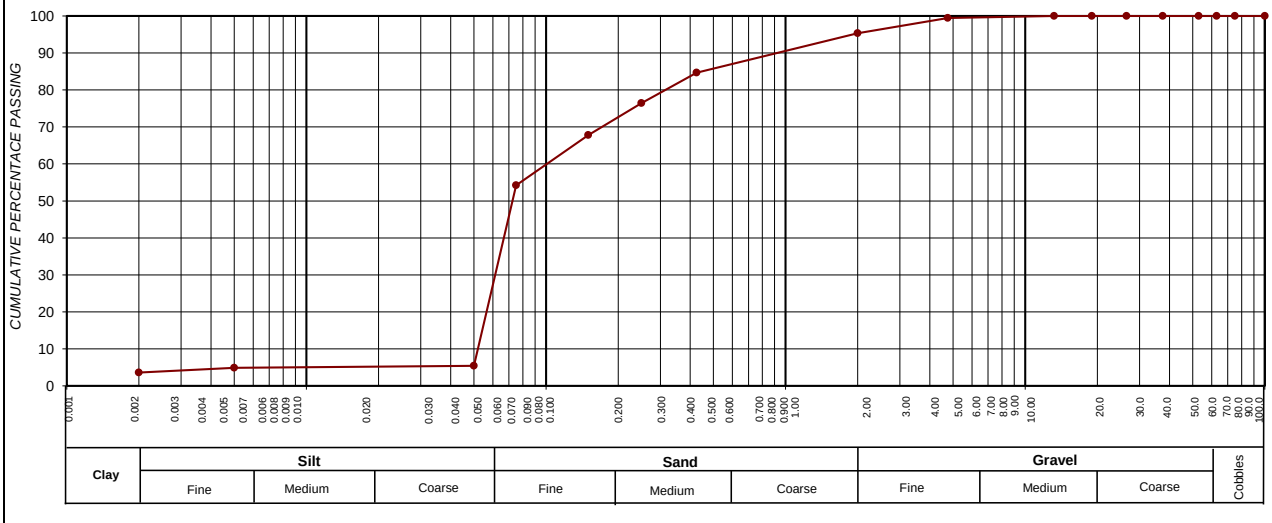


PLASTICITY CHART



PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
3,6	12,6	79,2	4,6

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PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 41
LAYER : 0.4-1.2
SAMPLE No. : B15226
SAMPLE DESCRIPTION : Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**7,4**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	100
5,00	99
2,000	95
0,425	82
0,250	72
0,150	58
0,075	42
50 µm	5
5 µm	5
2 µm	3,5

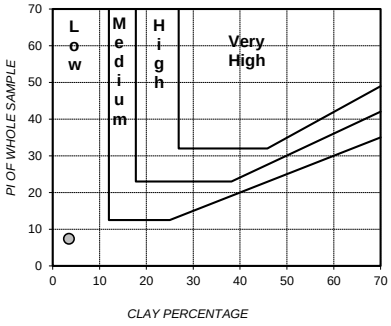
Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	14
0.425 - 0.250	10
0.250 - 0.150	15
0.150 - 0.075	17
< 0.075	44

Effective size	0,053
Uniformity Coefficient	3,1
Curvature Coefficient	0,5
Oversize Index	0,0
Shrinkage Product	405,9
Grading Coefficient	5,1
Grading modulus	0,81

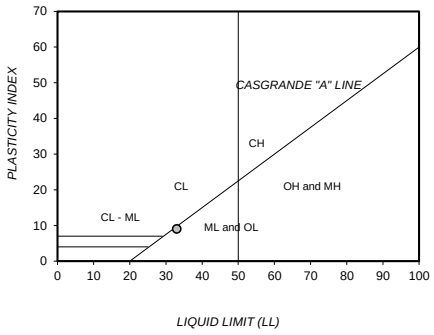
Atter-berg Limits	
Liquid Limit	33
Plasticity Index	9
Linear Shrinkage	5,0
PI < 0.075	-

Unified Soil Classification	SM
U.S. Highway Classification	A-4 (1)

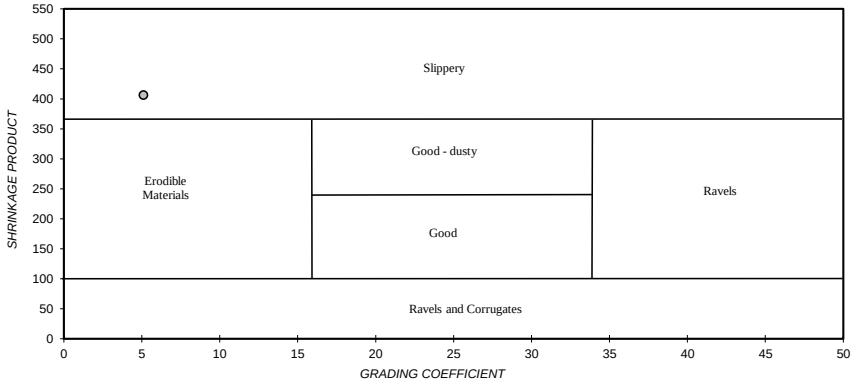
POTENTIAL EXPANSIVENES



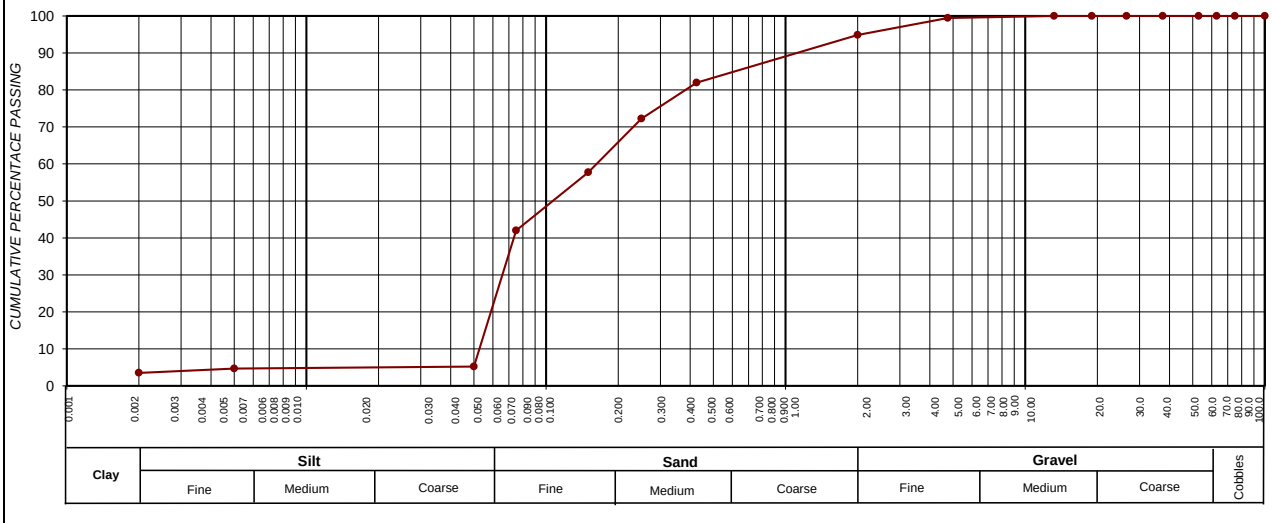
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
3,5	9,5	81,9	5,1

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

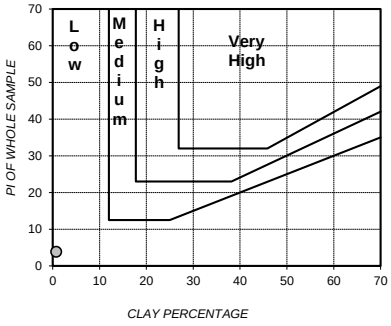
DATE RECEIVED : 11.11.2024
POSITION : TP 45
LAYER : 0.5-1.3
SAMPLE No. : B15227
SAMPLE DESCRIPTION : Sandy Clay ,Residual Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

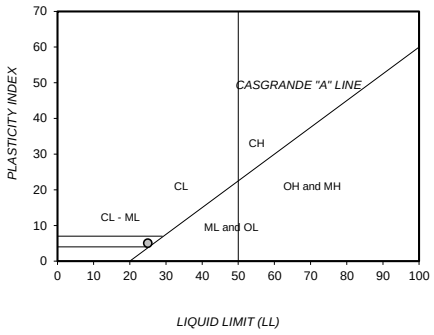
Weighted PI	**3,8**	**Specifc Gravity**	**2,35**

Sieve analysis Cumulative percentage passing (mm)	
100,0	100
75,0	100
63,0	100
50,0	100
37,5	100
28,0	100
20,0	100
14,0	99
5,00	95
2,000	90
0,425	76
0,250	68
0,150	56
0,075	30
50 µm	3
5 µm	2
2 µm	0,8

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2,00mm	
2.000 - 0.425	15
0.425 - 0.250	9
0.250 - 0.150	13
0.150 - 0.075	28
< 0.075	34

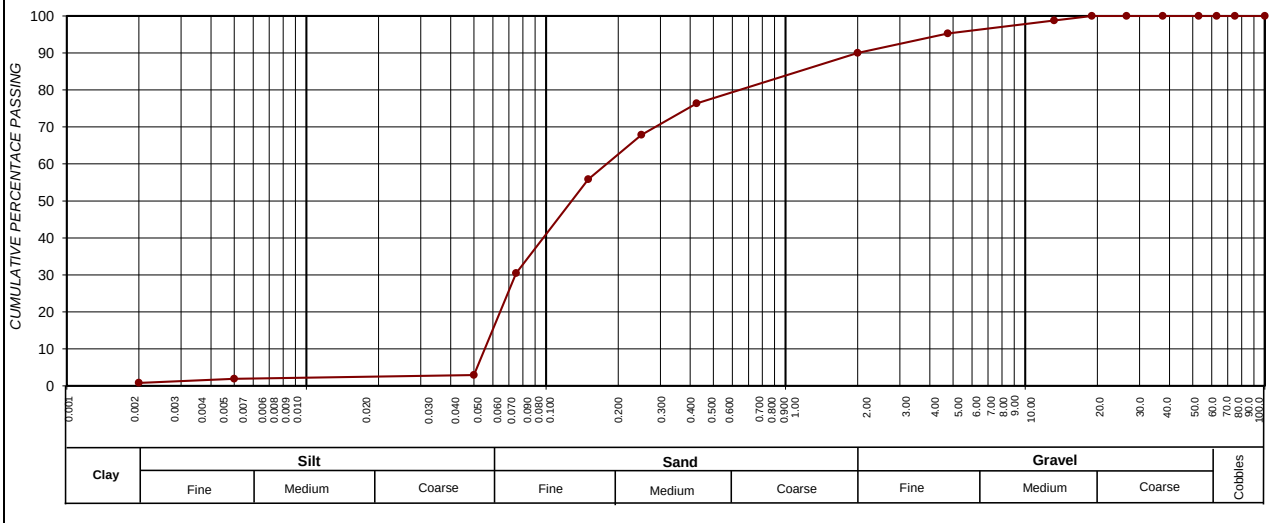
Effective size	0,056
Uniformity Coefficient	3,3
Curvature Coefficient	0,5
Oversize Index	0,0
Shrinkage Product	201,6
Grading Coefficient	9,5
Grading modulus	1,04

Atter-berg Limits	
Liquid Limit	25
Plasticity Index	5
Linear Shrinkage	2,6
PI < 0.075	-

Unified Soil Classification	SM & SC
U.S. Highway Classification	A-2-4 (0)

PERFORMANCE AS WEARING COURSE

PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
0,8	6,8	82,4	10,0

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060 727 8002

Roadlab Job Number: RB7385

Date of Report : 11/12.2024
Date Sampled : 11.11.2024

Mukuna Geotechnics (PTY)Ltd
28 B Hazelwood Road
Menlo Park,Pretoria
New Road,Midrand 1685

Attention:Mr.David Msiza

Dear Sir/ Madam

TEST REPORT

Project Name: **Xhariep Pipeline Feasibility Study**

Herewith the laboratory test results for above mentioned project, as per request.
As per the test report the following tests have been conducted

TEST METHODS

1.) Wet preparation and particle size analysis	**SANS 3001: GR1**
2.) Determination of the one-point liquid limit, plastic limit, plasticity index and linear shrinkage	**SANS 3001: GR10**
3.) Determination of the liquid limit with the two-point method	**SANS 3001: GR11**
4.) Determination of the maximum dry density and optimum moisture content	**SANS 3001: GR30**
5.) Determination of the california bearing ratio	**SANS 3001: GR40**
5.) Foundation Indicator	**SANS 3001: GR5**

Kind Regards

NOTE : Test marked with # is not part of Facility s accreditation scope of work

Solomon Lediga
Manager/Technical Signatory

T1143

Remarks :
*Opinions & Interpretations are not included in our schedule of Accreditation
SANAS Accredited Laboratory No. T1143
The samples were subjected to analysis according to SANS 3001
The results reported relate only to the sample tested
Further use of the above information is not the responsibility or liability of Roadlab
Test results may only be reproduced or published in their full context with prior approval from the Technical Manager of Roadlab.
Compiled By : MA Tau

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 43
LAYER : 0.4-1.3
SAMPLE No. : B15147
SAMPLE DESCRIPTION : Sand

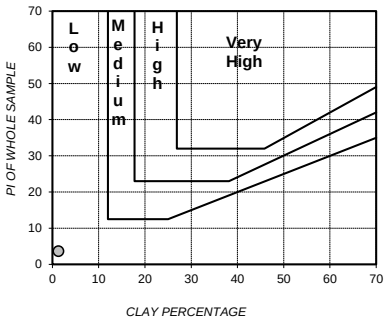
FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	3.6	Specifc Gravity	2.35

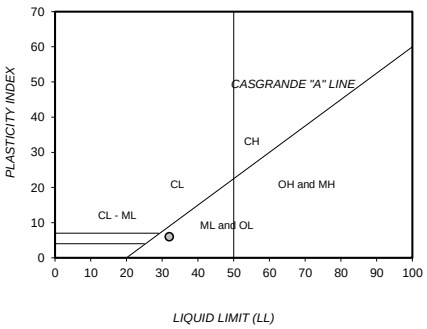
Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	100
5.00	98
2.000	88
0.425	60
0.250	51
0.150	40
0.075	30
50 µm	3
5 µm	3
2 µm	1.3

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	32
0.425 - 0.250	11
0.250 - 0.150	12
0.150 - 0.075	11
< 0.075	34

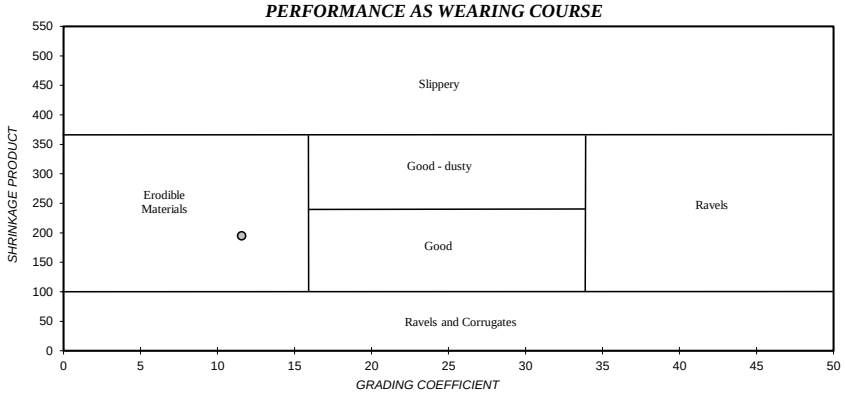
Effective size	0.056
Uniformity Coefficient	7.5
Curvature Coefficient	0.2
Oversize Index	0.0
Shrinkage Product	194.7
Grading Coefficient	11.6
Grading modulus	1.22

Atter-berg Limits

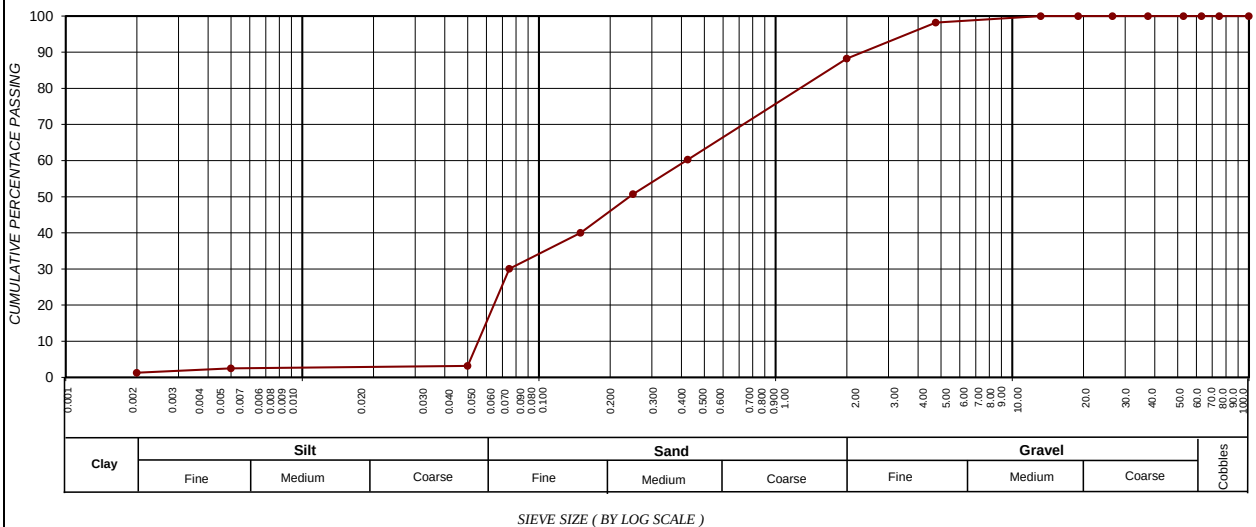
Liquid Limit	32
Plasticity Index	6
Linear Shrinkage	3.2
PI < 0.075	-

Unified Soil Classification	SM
U.S. Highway Classification	A-2-4 (0)

PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
1.3	7.8	79.1	11.8

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 299
LAYER : 0.80-1.70
SAMPLE No. : B15156
SAMPLE DESCRIPTION : Light Grey Mudstone Gravel

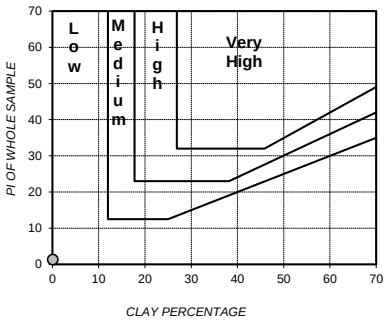
FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	1.3	Specifc Gravity	2.35

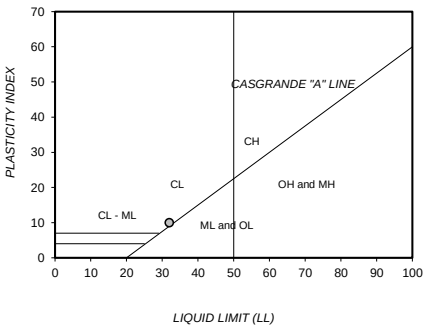
Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	99
28.0	95
20.0	77
14.0	76
5.00	56
2.000	30
0.425	13
0.250	13
0.150	12
0.075	11
50 µm	1
5 µm	1
2 µm	0.1

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	57
0.425 - 0.250	1
0.250 - 0.150	1
0.150 - 0.075	4
< 0.075	36

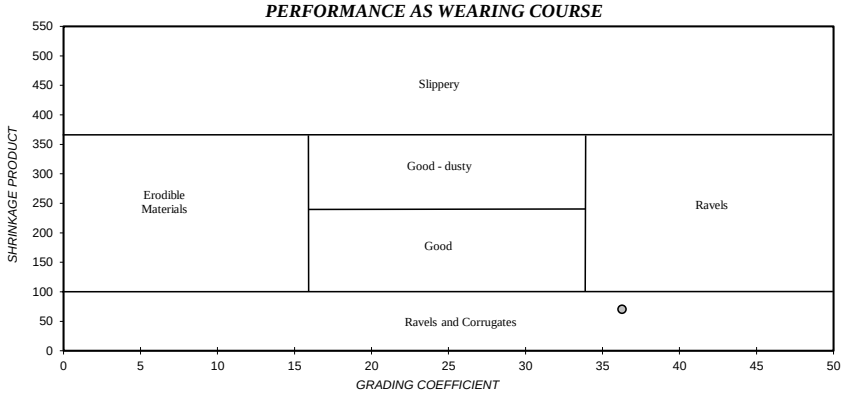
Effective size	0.072
Uniformity Coefficient	92.6
Curvature Coefficient	8.0
Oversize Index	0.6
Shrinkage Product	70.5
Grading Coefficient	36.3
Grading modulus	2.46

Atter-berg Limits

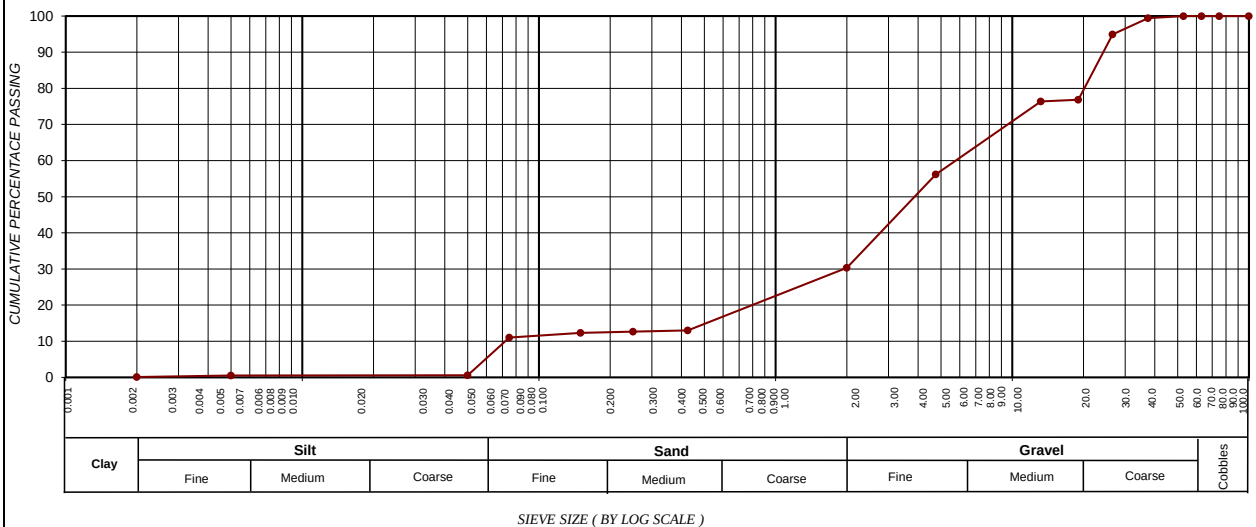
Liquid Limit	32
Plasticity Index	10
Linear Shrinkage	5.4
PI < 0.075	-

Unified Soil Classification	SC
U.S. Highway Classification	A-2-4 (0)

PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
0.1	2.9	27.3	69.7

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 402
LAYER : 1.20-3.0
SAMPLE No. : B15158
SAMPLE DESCRIPTION : Silty Sand

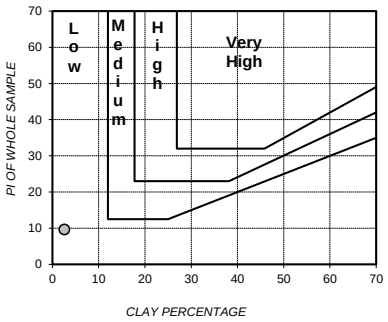
FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**9.6**	**Specifc Gravity**	**2.35**

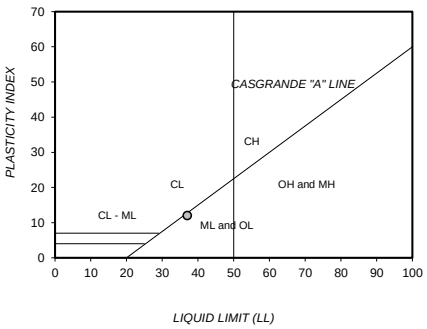
Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	100
5.00	98
2.000	93
0.425	80
0.250	78
0.150	77
0.075	70
50 µm	5
5 µm	4
2 µm	2.6

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	14
0.425 - 0.250	2
0.250 - 0.150	2
0.150 - 0.075	7
< 0.075	75

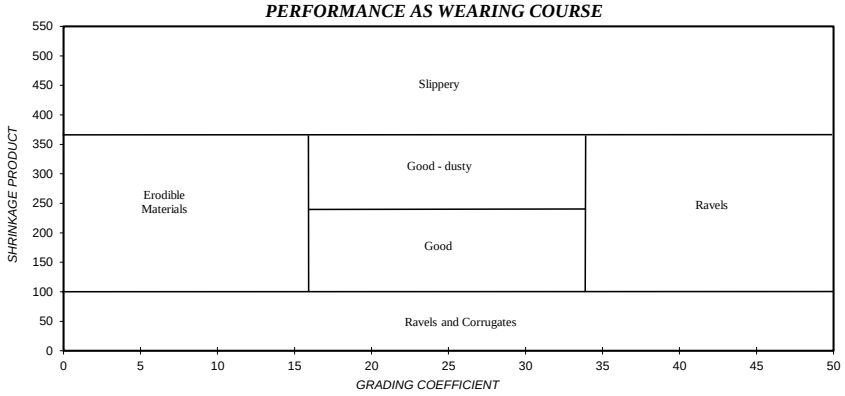
Effective size	0.052
Uniformity Coefficient	1.4
Curvature Coefficient	1.0
Oversize Index	0.0
Shrinkage Product	550.3
Grading Coefficient	6.4
Grading modulus	0.56

Atter-berg Limits

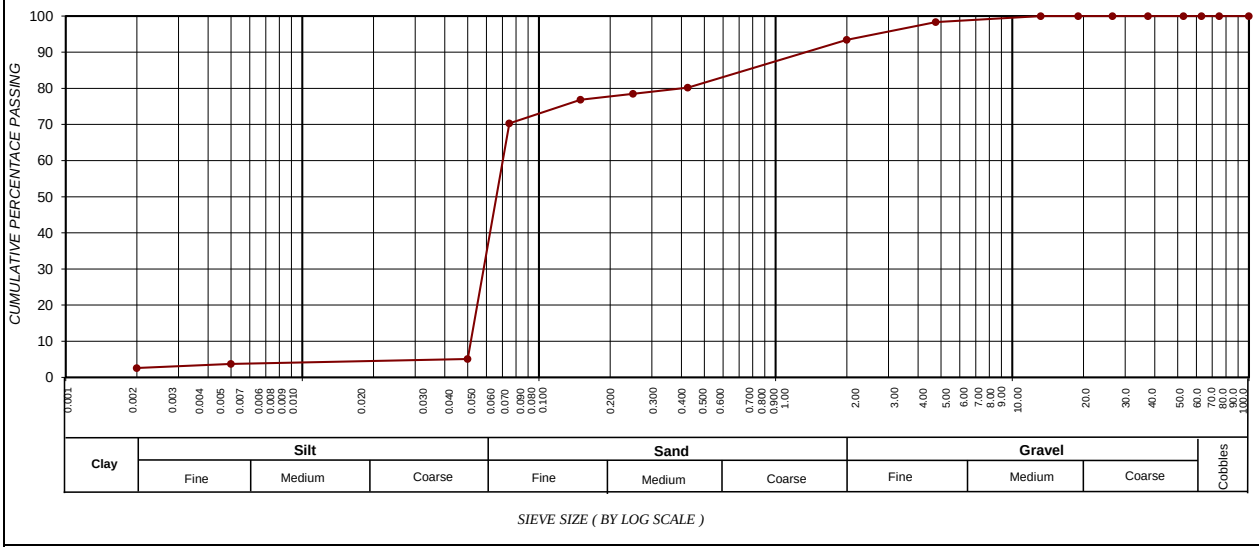
Liquid Limit	37
Plasticity Index	12
Linear Shrinkage	6.9
PI < 0.075	-

Unified Soil Classification	ML
U.S. Highway Classification	A-6 (8)

PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	**SILT (%) (0.002-0.060)**	**SAND (%) (0.060-2.00)**	**GRAVEL (%) (2.00-60.0)**
2.6	**18.1**	**72.7**	**6.6**

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 346
LAYER : 0.9-1.2
SAMPLE No. : B15164
SAMPLE DESCRIPTION : Brown Silty Sand

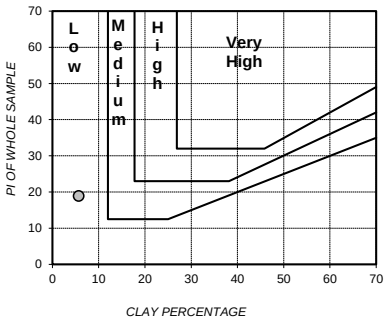
FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**18.9**	**Specifc Gravity**	**2.35**

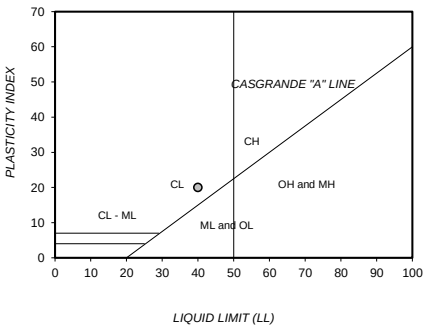
Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	100
5.00	100
2.000	98
0.425	94
0.250	93
0.150	88
0.075	73
50 µm	11
5 µm	9
2 µm	5.7

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	4
0.425 - 0.250	1
0.250 - 0.150	5
0.150 - 0.075	15
< 0.075	74

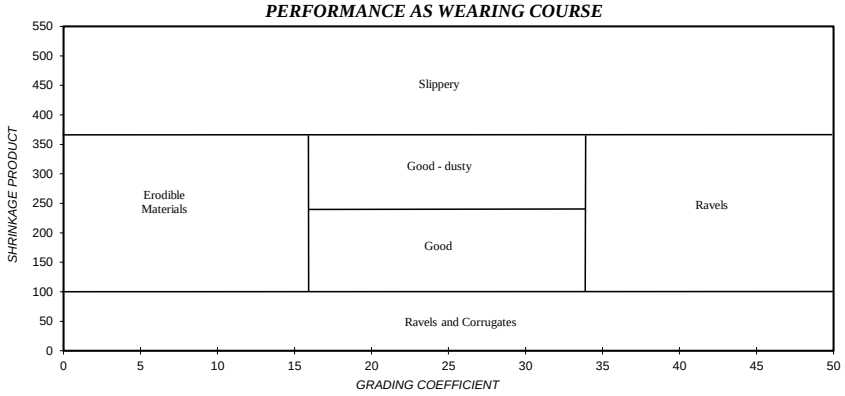
Effective size	0.026
Uniformity Coefficient	2.7
Curvature Coefficient	1.9
Oversize Index	0.0
Shrinkage Product	910.7
Grading Coefficient	2.0
Grading modulus	0.35

Atter-berg Limits

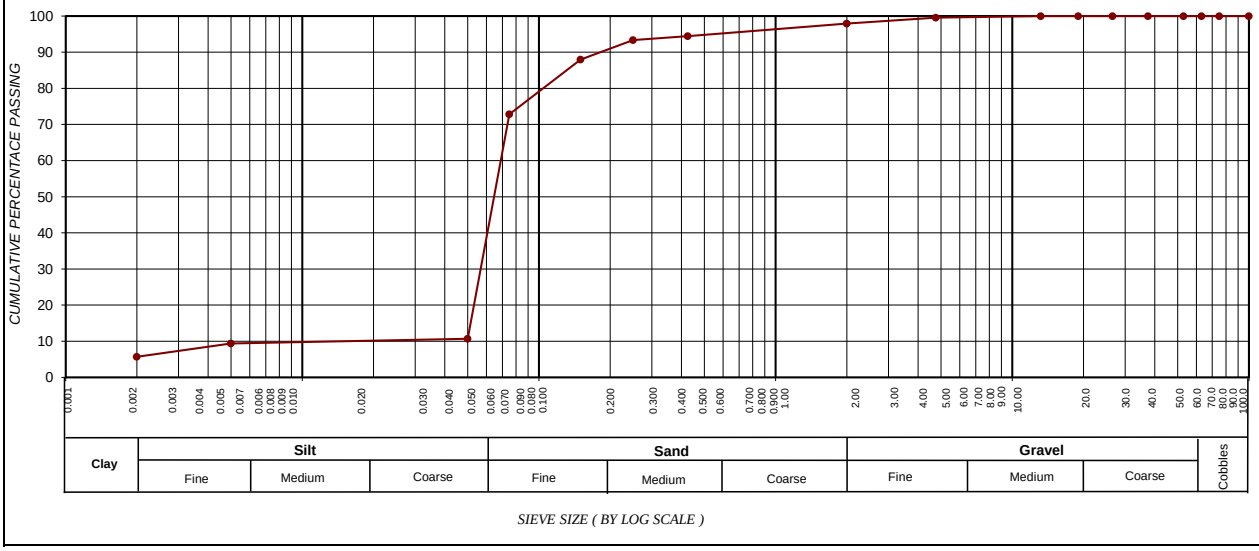
Liquid Limit	40
Plasticity Index	20
Linear Shrinkage	9.6
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (13)

PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
5.7	19.9	72.4	2.0

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : N/S
LAYER : 0.8-1.6
SAMPLE No. : B15182
SAMPLE DESCRIPTION : Silty Sand Colluvium

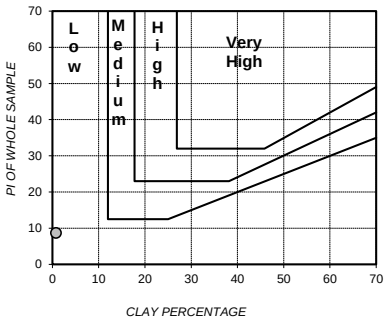
FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	8.6	Specifc Gravity	2.35

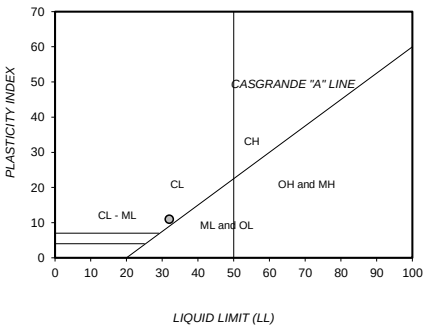
Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	100
5.00	98
2.000	94
0.425	79
0.250	73
0.150	70
0.075	61
50 µm	2
5 µm	2
2 µm	0.8

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	17
0.425 - 0.250	5
0.250 - 0.150	4
0.150 - 0.075	9
< 0.075	65

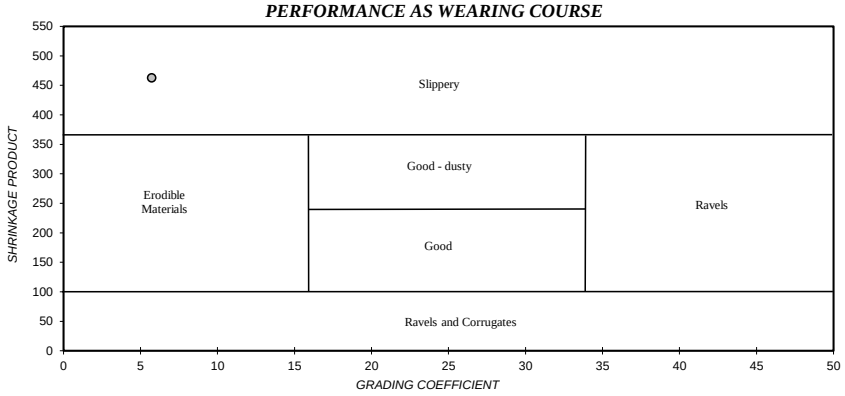
Effective size	0.053
Uniformity Coefficient	1.4
Curvature Coefficient	1.0
Oversize Index	0.0
Shrinkage Product	462.6
Grading Coefficient	5.7
Grading modulus	0.66

Atter-berg Limits

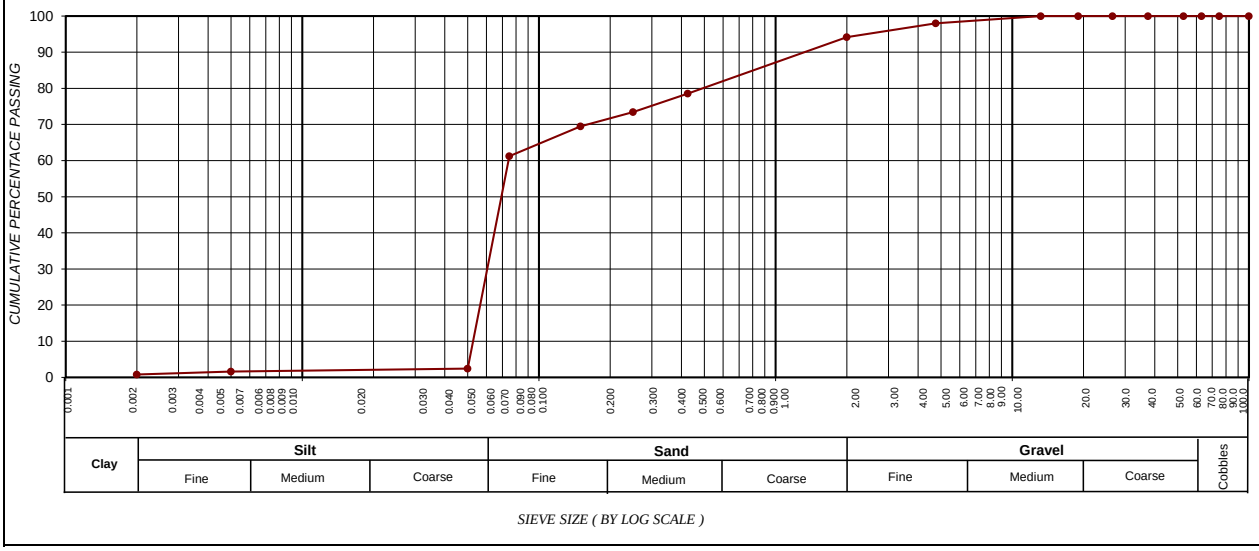
Liquid Limit	32
Plasticity Index	11
Linear Shrinkage	5.9
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (5)

PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
0.8	15.3	78.0	5.9

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 37
LAYER : 0.90-1.20
SAMPLE No. : B15191
SAMPLE DESCRIPTION : Sandy Gravel

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	7.0	Specifc Gravity	2.35

Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	96
37.5	94
28.0	92
20.0	89
14.0	88
5.00	86
2.000	55
0.425	50
0.250	49
0.150	47
0.075	38
50 µm	4
5 µm	4
2 µm	2.7

Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	9
0.425 - 0.250	1
0.250 - 0.150	5
0.150 - 0.075	16
< 0.075	69

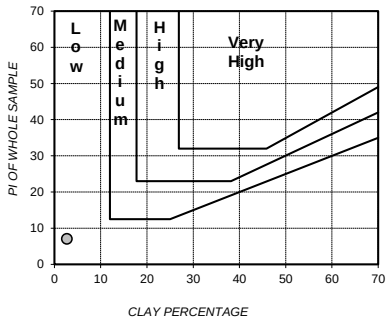
Effective size	0.054
Uniformity Coefficient	45.6
Curvature Coefficient	0.0
Oversize Index	6.4
Shrinkage Product	391.1
Grading Coefficient	31.8
Grading modulus	1.57

Atter-berg Limits

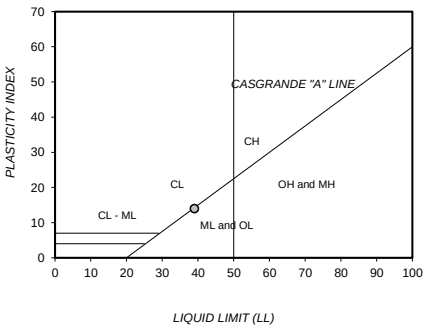
Liquid Limit	39
Plasticity Index	14
Linear Shrinkage	7.8
PI < 0.075	-

Unified Soil Classification	SC
U.S. Highway Classification	A-6 (2)

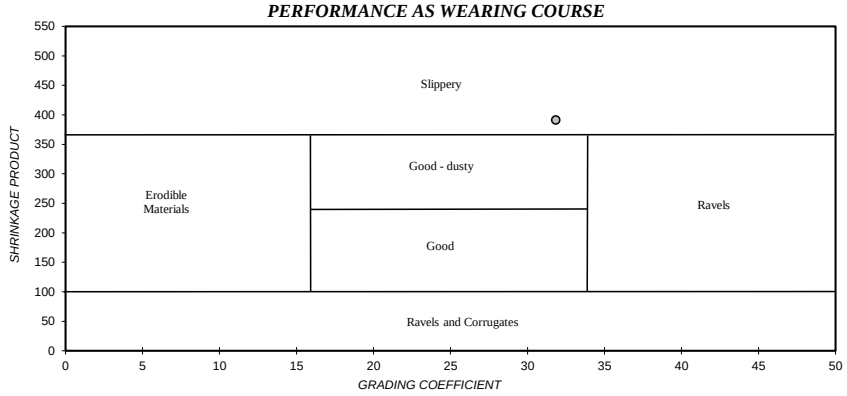
POTENTIAL EXPANSIVENES



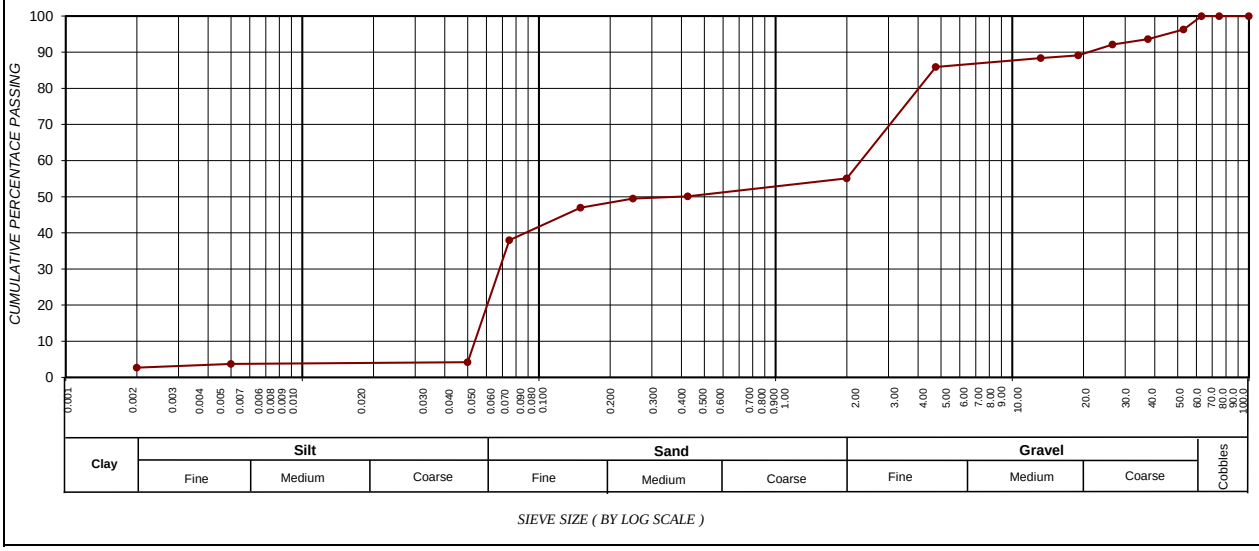
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
2.7	9.4	43.0	44.9

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 07
LAYER : 0.0-0.8
SAMPLE No. : B15192
SAMPLE DESCRIPTION : Sand Colluvium

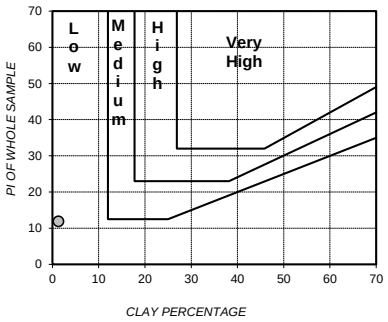
FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**11.8**	**Specifc Gravity**	**2.35**

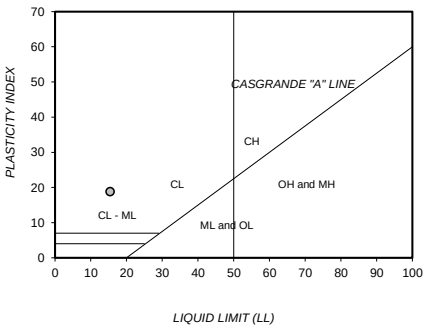
Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	96
5.00	85
2.000	77
0.425	63
0.250	53
0.150	41
0.075	28
50 µm	2
5 µm	2
2 µm	1.3

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	18
0.425 - 0.250	13
0.250 - 0.150	15
0.150 - 0.075	18
< 0.075	36

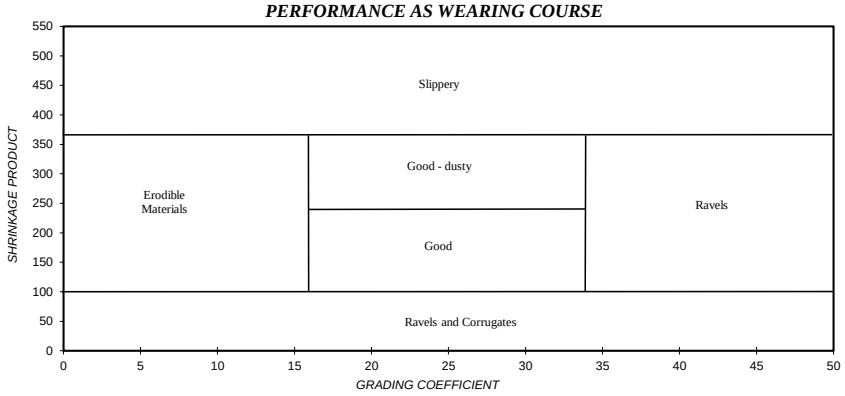
Effective size	0.057
Uniformity Coefficient	6.4
Curvature Coefficient	0.4
Oversize Index	0.0
Shrinkage Product	1361.5
Grading Coefficient	19.8
Grading modulus	1.32

Atter-berg Limits

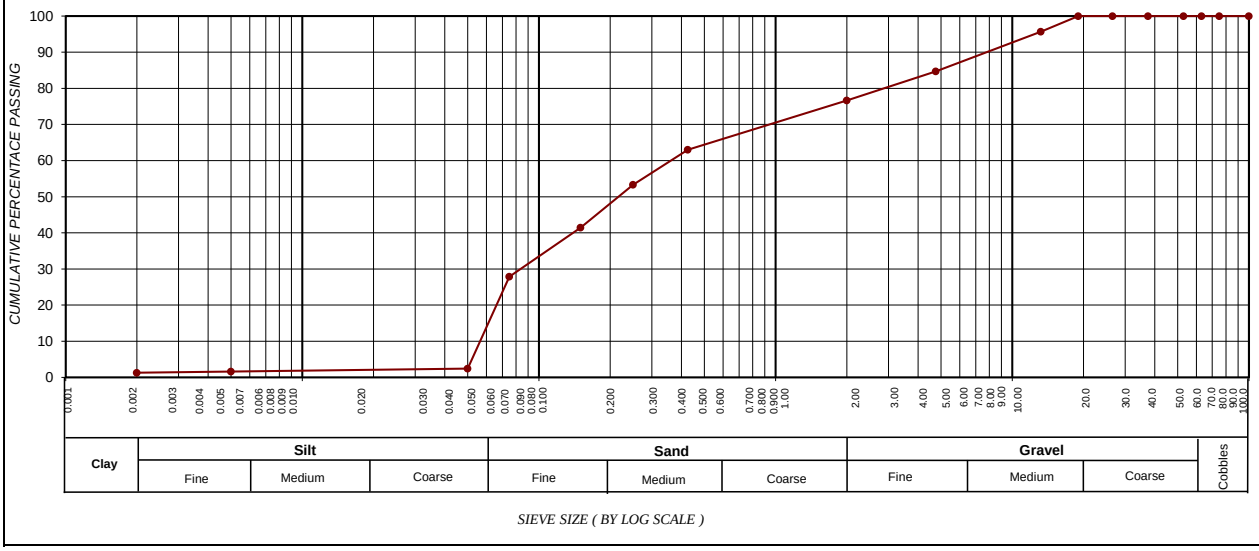
Liquid Limit	15
Plasticity Index	19
Linear Shrinkage	21.6
PI < 0.075	-

Unified Soil Classification	SC
U.S. Highway Classification	A-2-6 (1)

PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
1.3	6.4	68.9	23.3

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 180
LAYER : 2-Jan-00
SAMPLE No. : B15202
SAMPLE DESCRIPTION : Silty Sand Residual Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**13.1**	**Specifc Gravity**	**2.35**

Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	100
5.00	99
2.000	97
0.425	94
0.250	93
0.150	88
0.075	78
50 µm	7
5 µm	6
2 µm	4.0

Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	3
0.425 - 0.250	1
0.250 - 0.150	5
0.150 - 0.075	10
< 0.075	81

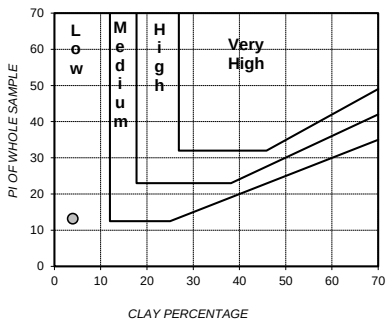
Effective size	0.051
Uniformity Coefficient	1.3
Curvature Coefficient	1.0
Oversize Index	0.0
Shrinkage Product	627.2
Grading Coefficient	2.9
Grading modulus	0.31

Atter-berg Limits

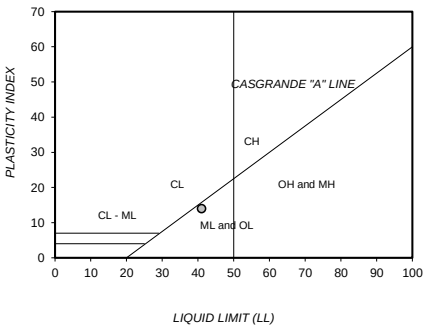
Liquid Limit	41
Plasticity Index	14
Linear Shrinkage	6.7
PI < 0.075	-

Unified Soil Classification	ML
U.S. Highway Classification	A-7-6 (11)

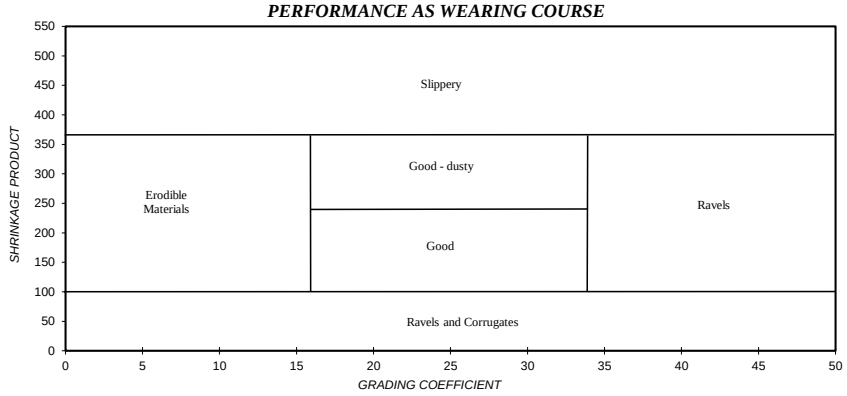
POTENTIAL EXPANSIVENES



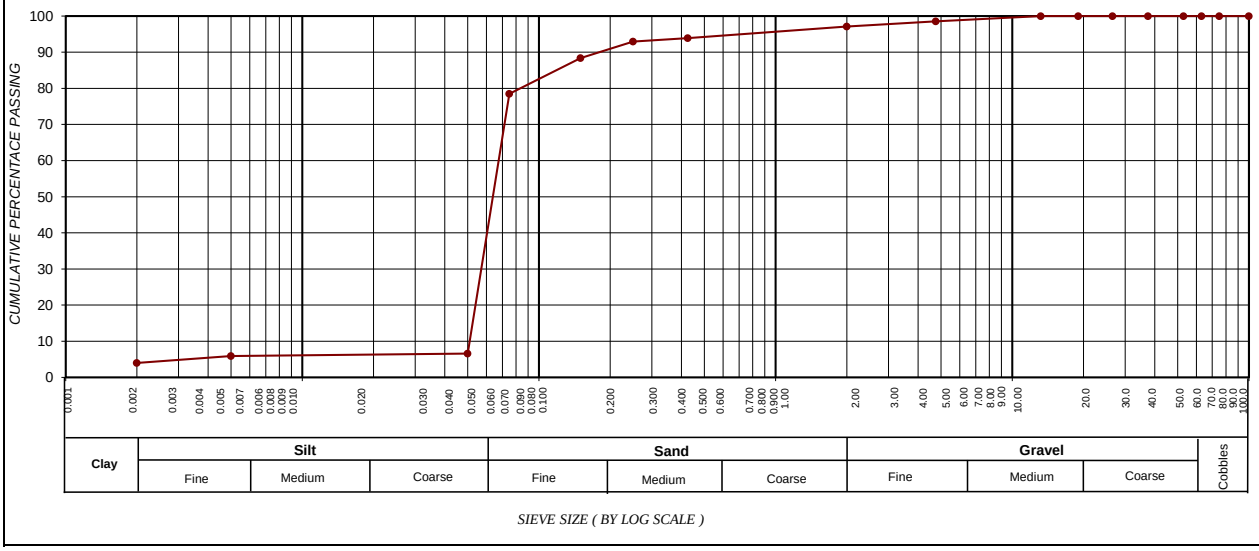
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
4.0	19.6	73.5	2.9

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 207
LAYER : 0.6-2.4
SAMPLE No. : B15207
SAMPLE DESCRIPTION : Silty Sand Colluvium

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	25.4	Specifc Gravity	2.35

Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	96
5.00	96
2.000	95
0.425	94
0.250	92
0.150	86
0.075	71
50 µm	14
5 µm	12
2 µm	9.1

Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	1
0.425 - 0.250	2
0.250 - 0.150	7
0.150 - 0.075	15
< 0.075	75

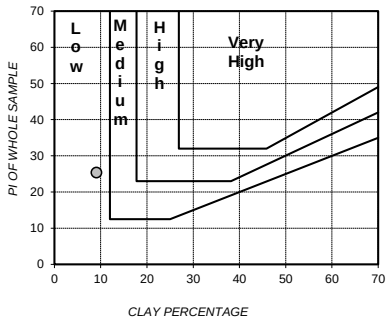
Effective size	0.003
Uniformity Coefficient	24.6
Curvature Coefficient	16.2
Oversize Index	0.0
Shrinkage Product	1294.9
Grading Coefficient	4.8
Grading modulus	0.40

Atter-berg Limits

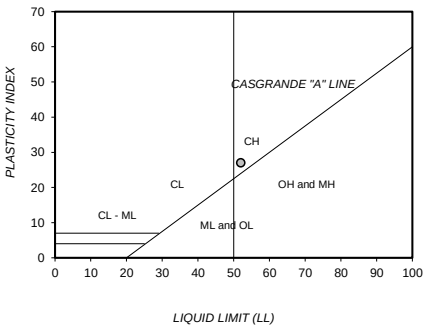
Liquid Limit	52
Plasticity Index	27
Linear Shrinkage	13.8
PI < 0.075	-

Unified Soil Classification	CH
U.S. Highway Classification	A-7-6 (19)

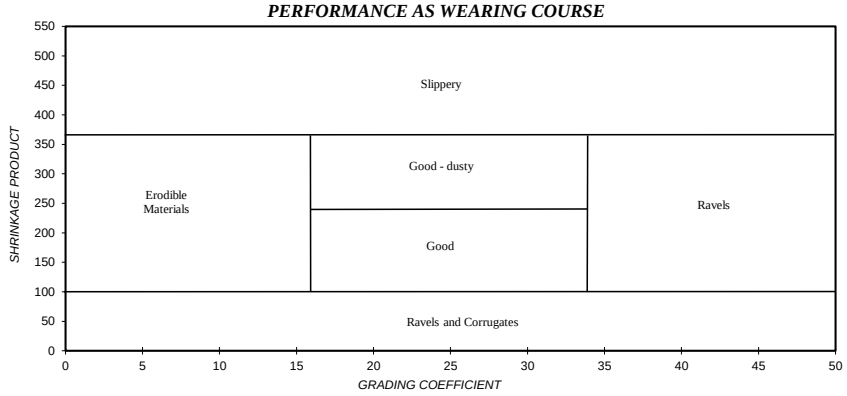
POTENTIAL EXPANSIVENES



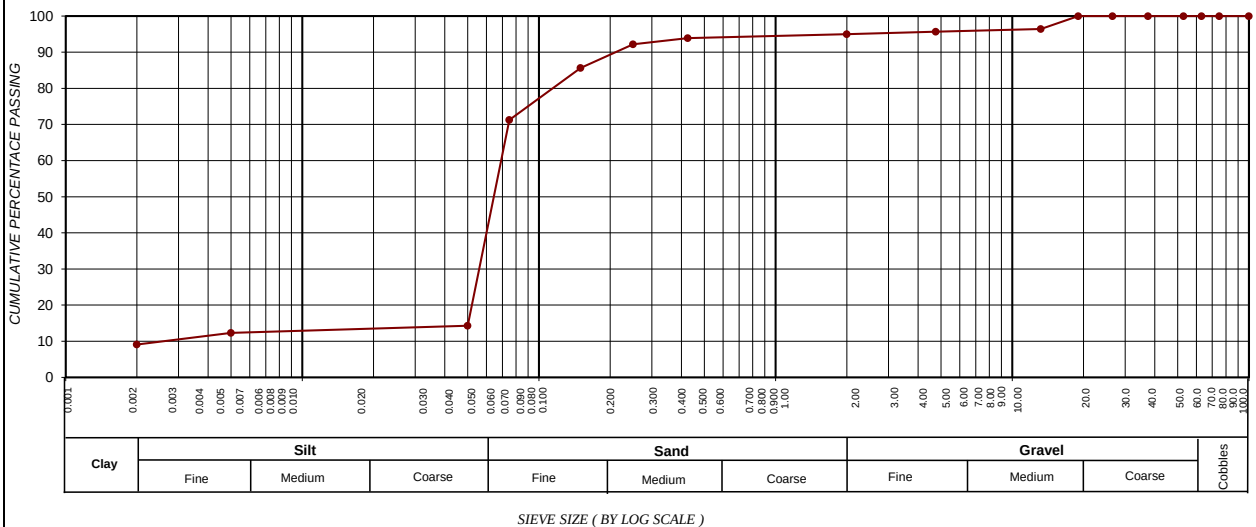
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
9.1	19.4	66.5	5.0

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 329
LAYER : 0.5-1.7
SAMPLE No. : B15212
SAMPLE DESCRIPTION : Silty Sand Weathered Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	22.9	Specifc Gravity	2.35

Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	100
5.00	100
2.000	99
0.425	95
0.250	95
0.150	92
0.075	85
50 µm	12
5 µm	9
2 µm	4.7

Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	3
0.425 - 0.250	1
0.250 - 0.150	2
0.150 - 0.075	8
< 0.075	86

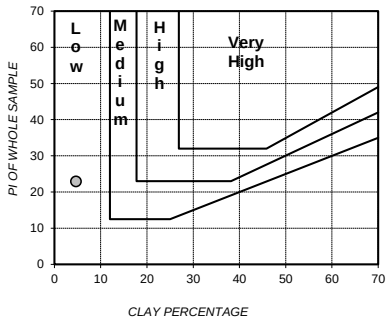
Effective size	0.022
Uniformity Coefficient	3.0
Curvature Coefficient	2.2
Oversize Index	0.0
Shrinkage Product	1235.2
Grading Coefficient	1.2
Grading modulus	0.21

Atter-berg Limits

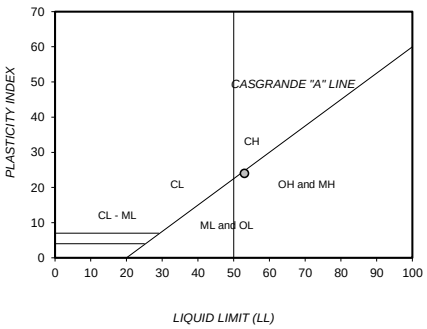
Liquid Limit	53
Plasticity Index	24
Linear Shrinkage	12.9
PI < 0.075	-

Unified Soil Classification	MH
U.S. Highway Classification	A-7-6 (23)

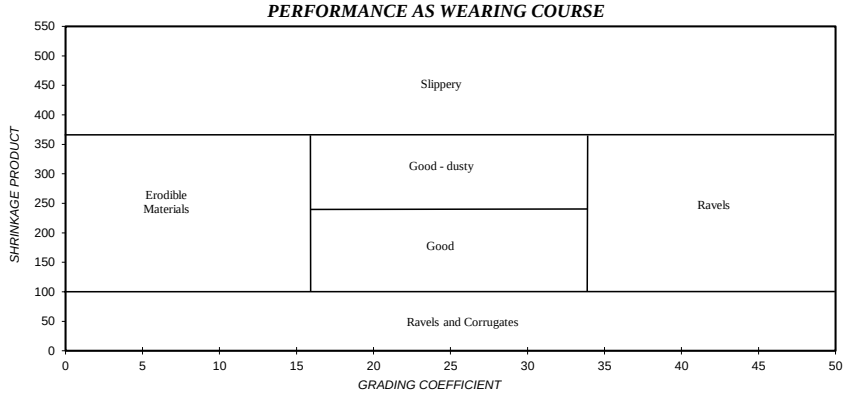
POTENTIAL EXPANSIVENES



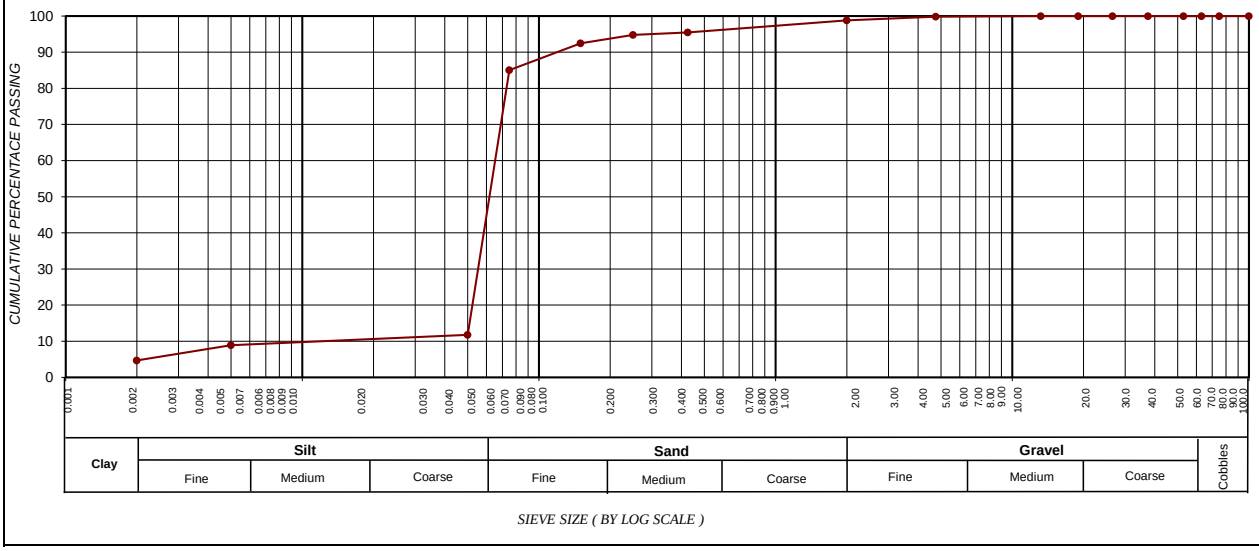
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
4.7	25.7	68.4	1.2

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 394
LAYER : 1-Jan-00
SAMPLE No. : B15224
SAMPLE DESCRIPTION : Gravelly Sand residual Mudstone

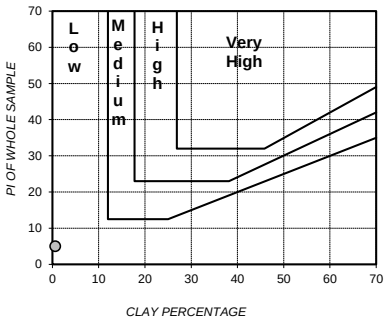
FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	5.0	Specifc Gravity	2.35

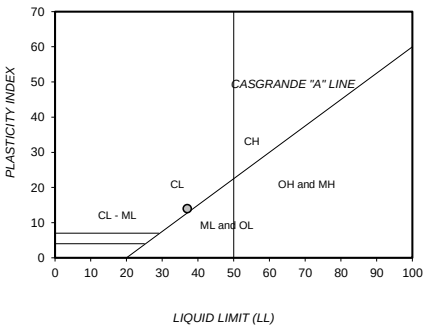
Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	100
5.00	94
2.000	74
0.425	35
0.250	34
0.150	31
0.075	28
50 µm	3
5 µm	2
2 µm	0.6

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	52
0.425 - 0.250	2
0.250 - 0.150	4
0.150 - 0.075	3
< 0.075	38

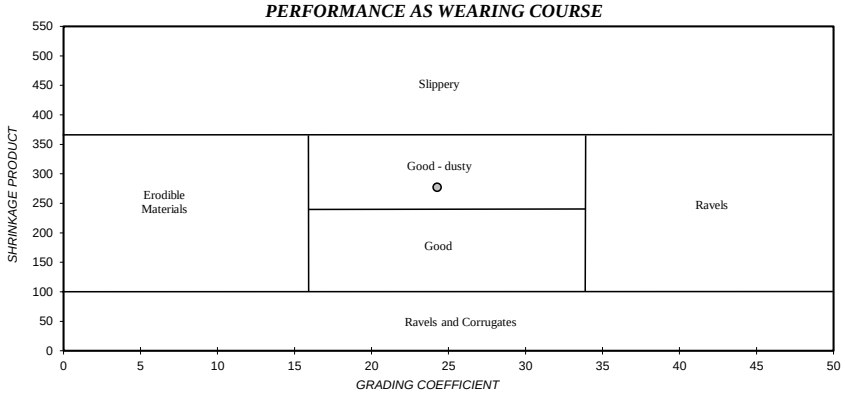
Effective size	0.057
Uniformity Coefficient	25.0
Curvature Coefficient	0.2
Oversize Index	0.0
Shrinkage Product	277.2
Grading Coefficient	24.3
Grading modulus	1.62

Atter-berg Limits

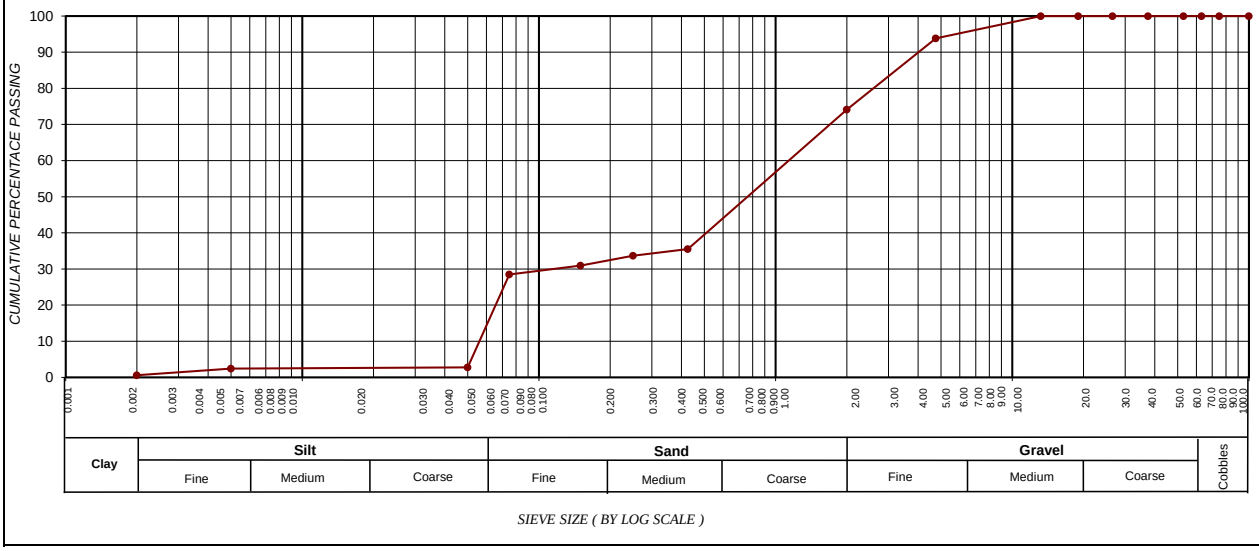
Liquid Limit	37
Plasticity Index	14
Linear Shrinkage	7.8
PI < 0.075	-

Unified Soil Classification	SC
U.S. Highway Classification	A-2-6 (1)

PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
0.6	8.2	65.4	25.9

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 81
LAYER : 0.0-0.7
SAMPLE No. : B15230
SAMPLE DESCRIPTION : Silty Sand Colluvium

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**16.4**	**Specifc Gravity**	**2.35**

Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	100
5.00	99
2.000	97
0.425	91
0.250	89
0.150	80
0.075	65
50 µm	9
5 µm	7
2 µm	3.9

Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	6
0.425 - 0.250	2
0.250 - 0.150	9
0.150 - 0.075	16
< 0.075	67

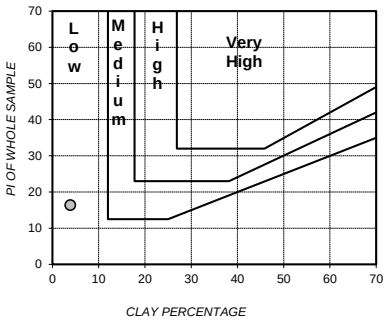
Effective size	0.051
Uniformity Coefficient	1.4
Curvature Coefficient	1.0
Oversize Index	0.0
Shrinkage Product	792.4
Grading Coefficient	3.3
Grading modulus	0.47

Atter-berg Limits

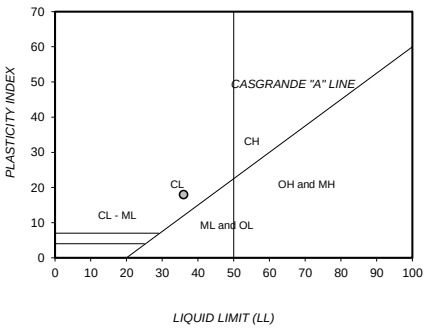
Liquid Limit	36
Plasticity Index	18
Linear Shrinkage	8.7
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (9)

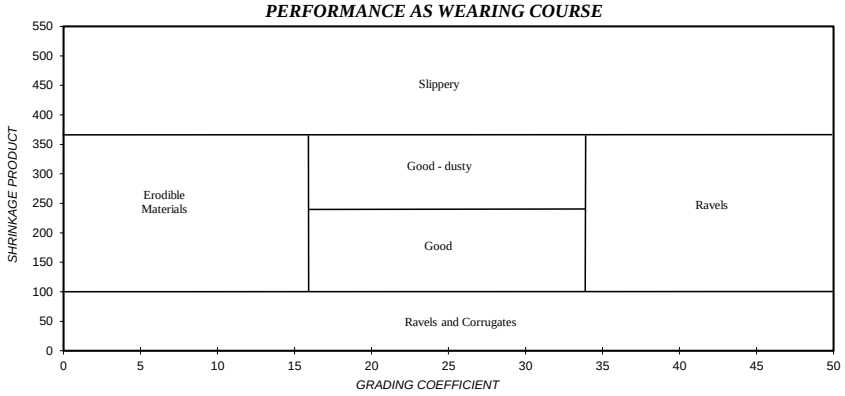
POTENTIAL EXPANSIVENES



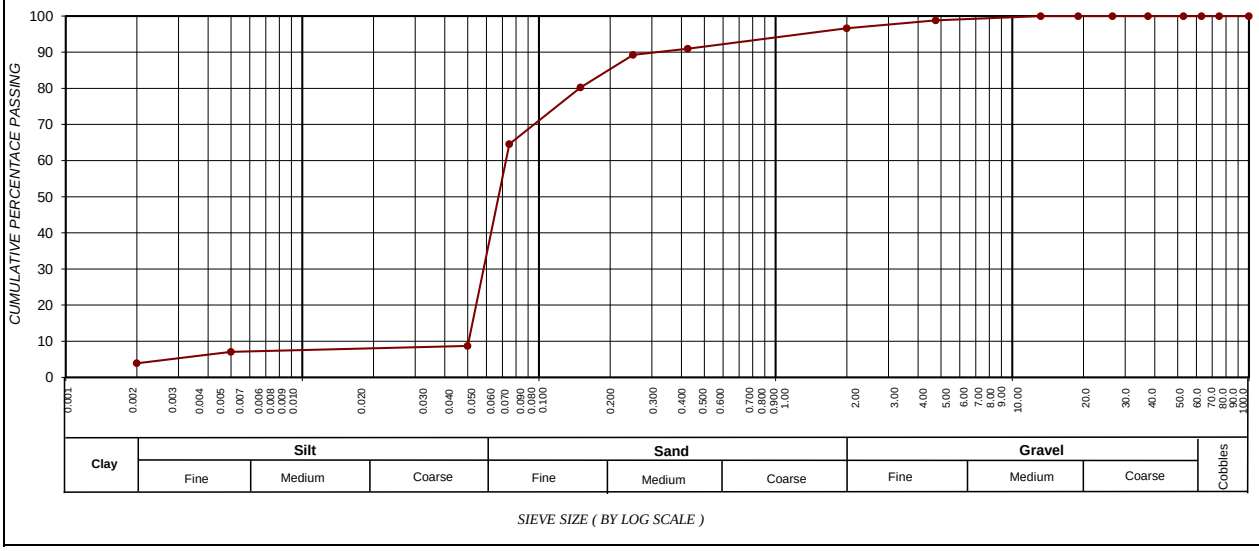
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
3.9	18.0	74.7	3.3

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 160
LAYER : 0.7-1.3
SAMPLE No. : B15250
SAMPLE DESCRIPTION : Silty Sand Residual Mudstone

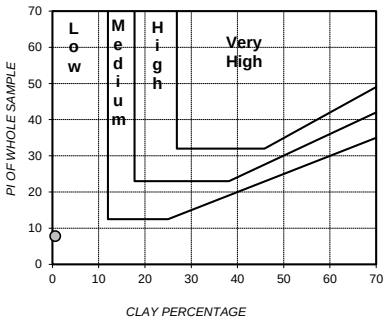
FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	7.8	Specifc Gravity	2.35

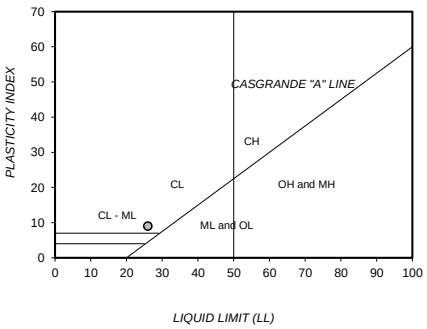
Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	100
5.00	100
2.000	97
0.425	86
0.250	84
0.150	79
0.075	67
50 µm	3
5 µm	2
2 µm	0.6

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	11
0.425 - 0.250	2
0.250 - 0.150	5
0.150 - 0.075	13
< 0.075	69

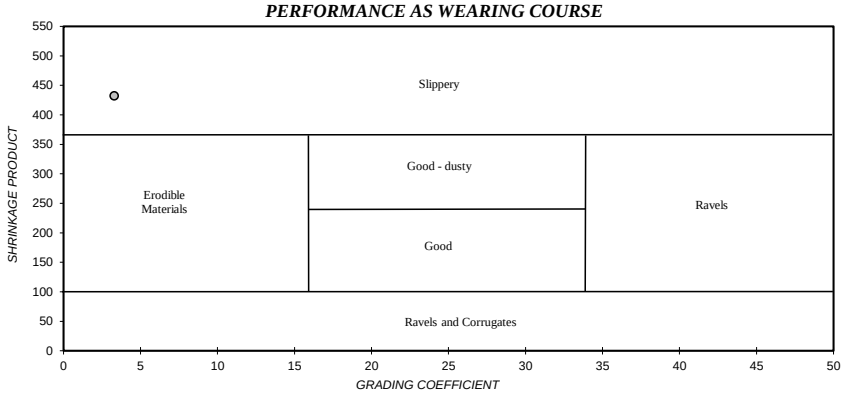
Effective size	0.053
Uniformity Coefficient	1.4
Curvature Coefficient	1.0
Oversize Index	0.0
Shrinkage Product	432.4
Grading Coefficient	3.3
Grading modulus	0.50

Atter-berg Limits

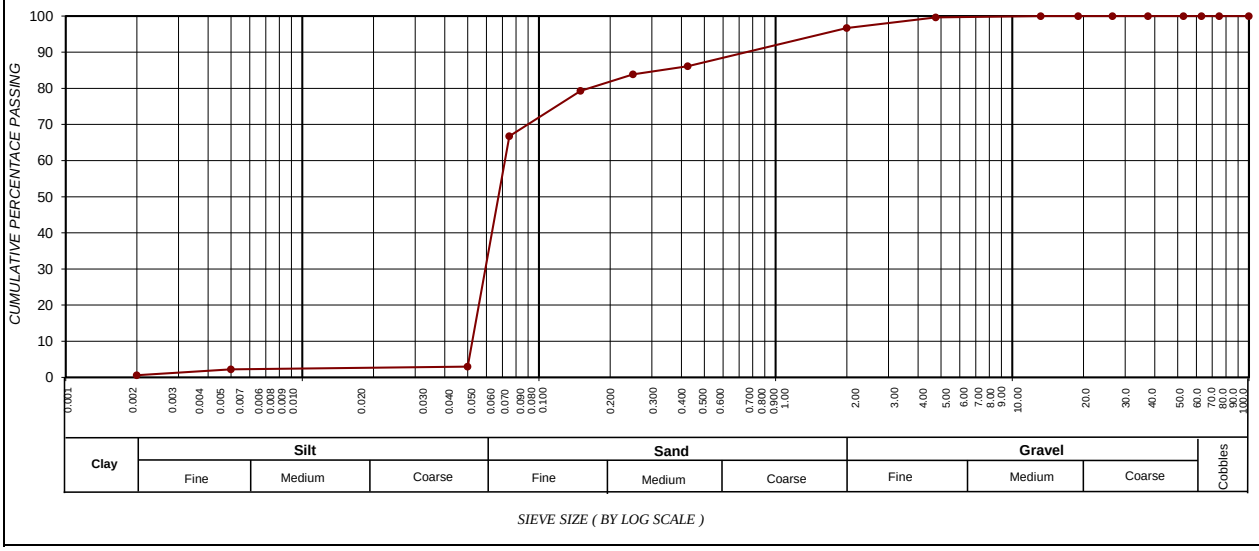
Liquid Limit	26
Plasticity Index	9
Linear Shrinkage	5.0
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-4 (4)

PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
0.6	16.9	79.2	3.3

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 27
LAYER : 0.0-0.7
SAMPLE No. : B15360
SAMPLE DESCRIPTION : Sandy Gravel + Colluvium

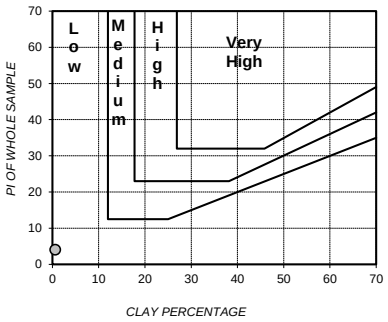
FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	4.0	Specifc Gravity	2.35

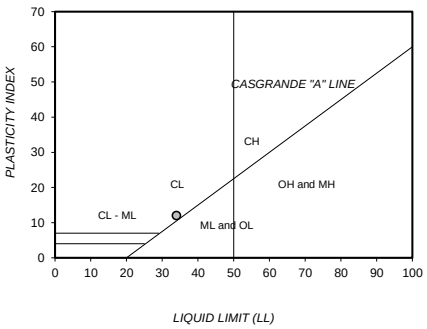
Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	91
5.00	75
2.000	57
0.425	34
0.250	31
0.150	27
0.075	22
50 µm	2
5 µm	2
2 µm	0.6

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	41
0.425 - 0.250	5
0.250 - 0.150	7
0.150 - 0.075	7
< 0.075	39

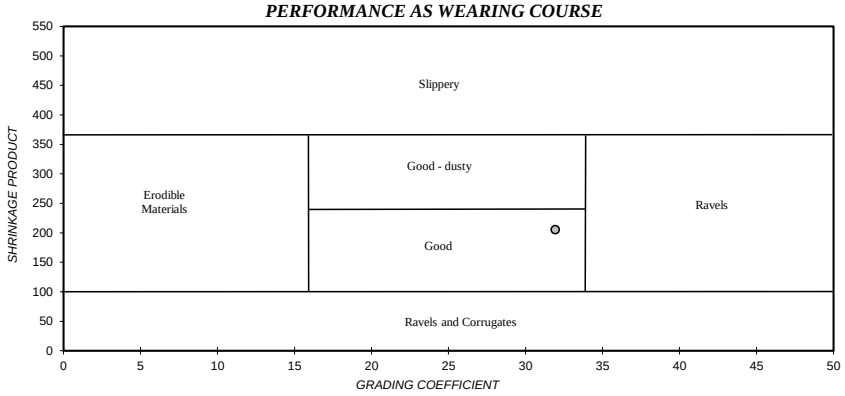
Effective size	0.059
Uniformity Coefficient	41.9
Curvature Coefficient	0.4
Oversize Index	0.0
Shrinkage Product	205.1
Grading Coefficient	31.9
Grading modulus	1.87

Atter-berg Limits

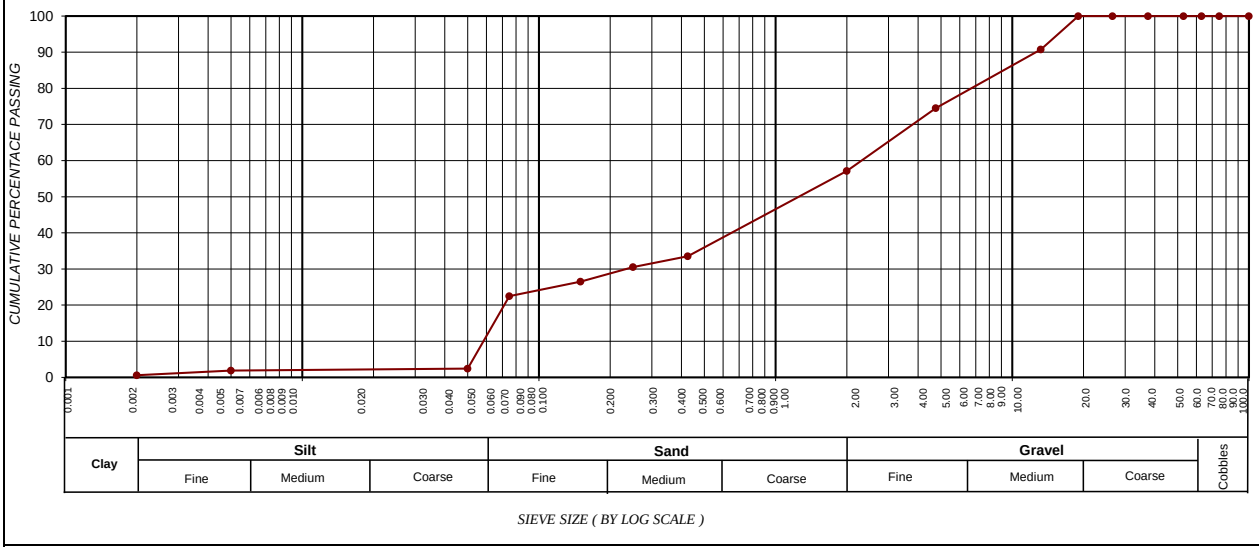
Liquid Limit	34
Plasticity Index	12
Linear Shrinkage	6.1
PI < 0.075	-

Unified Soil Classification	SC
U.S. Highway Classification	A-2-6 (0)

PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
0.6	6.3	50.3	42.9

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 27
LAYER : 0.2-1.1
SAMPLE No. : B15361
SAMPLE DESCRIPTION : Silty Sand +Weathered Dolerite

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	20.5	Specifc Gravity	2.35

Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	100
5.00	100
2.000	99
0.425	98
0.250	96
0.150	91
0.075	82
50 µm	10
5 µm	8
2 µm	4.8

Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	1
0.425 - 0.250	2
0.250 - 0.150	5
0.150 - 0.075	9
< 0.075	82

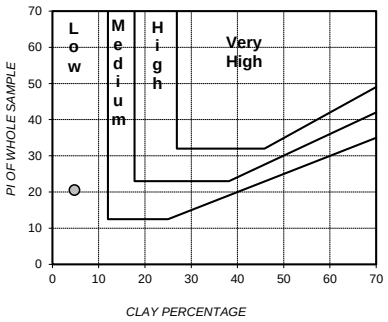
Effective size	0.050
Uniformity Coefficient	1.3
Curvature Coefficient	1.0
Oversize Index	0.0
Shrinkage Product	1063.1
Grading Coefficient	0.9
Grading modulus	0.21

Atter-berg Limits

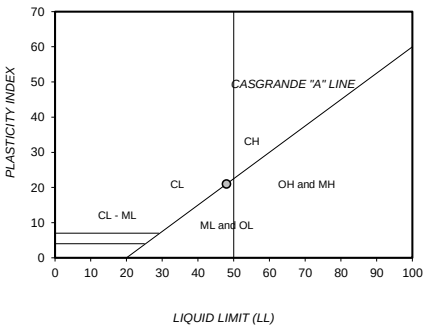
Liquid Limit	48
Plasticity Index	21
Linear Shrinkage	10.9
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-7-6 (19)

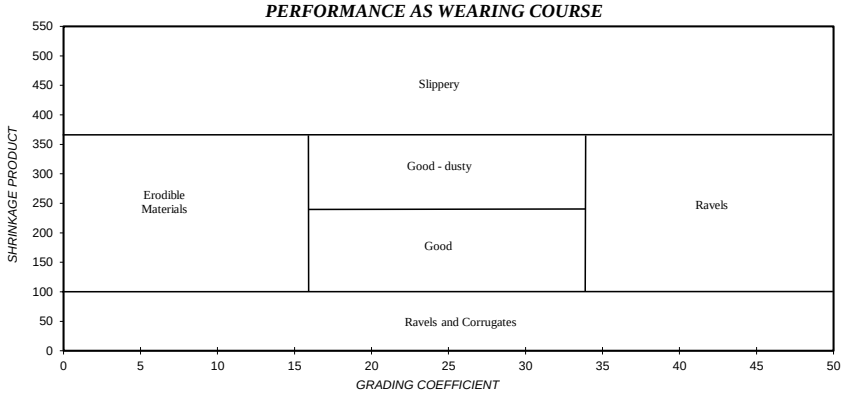
POTENTIAL EXPANSIVENES



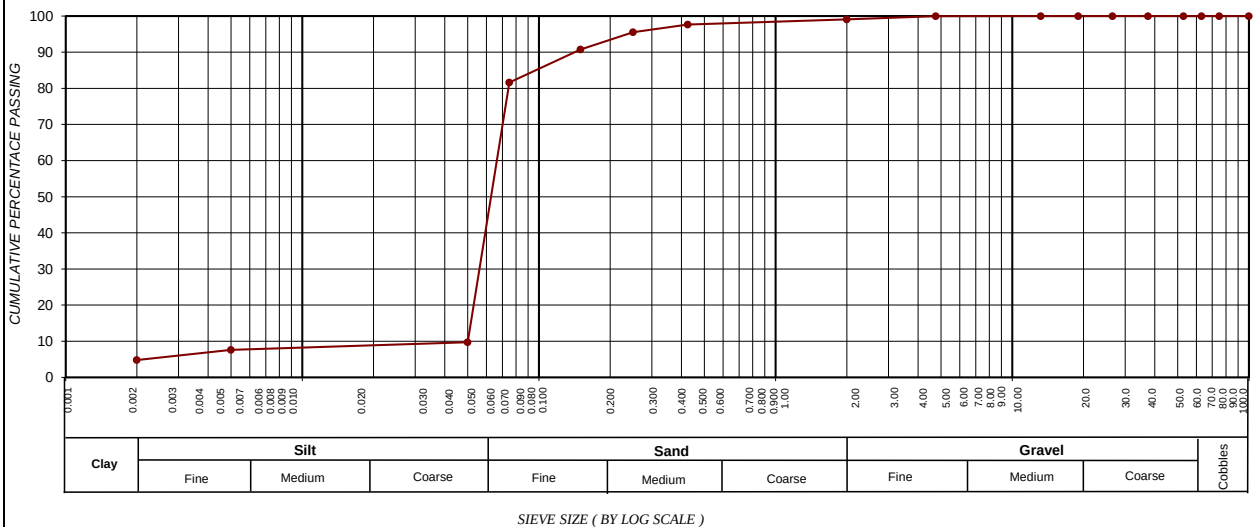
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
4.8	22.7	71.6	0.9

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 454
LAYER : 1-Jan-00
SAMPLE No. : B15362
SAMPLE DESCRIPTION : Gravelly Sand +Dolerite

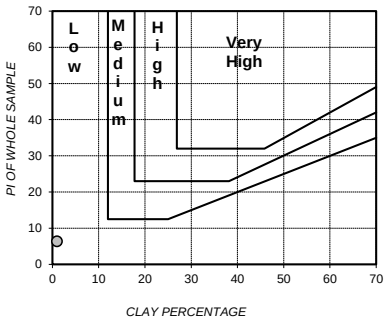
FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	6.3	Specifc Gravity	2.35

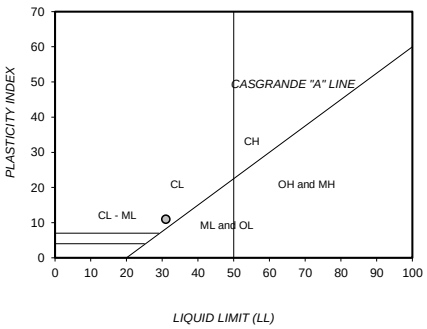
Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	100
5.00	93
2.000	82
0.425	58
0.250	51
0.150	42
0.075	34
50 µm	3
5 µm	2
2 µm	1.0

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	30
0.425 - 0.250	8
0.250 - 0.150	11
0.150 - 0.075	11
< 0.075	41

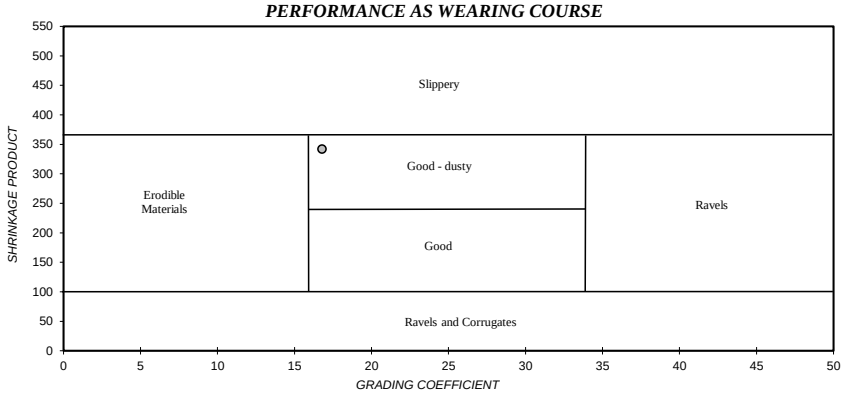
Effective size	0.056
Uniformity Coefficient	10.4
Curvature Coefficient	0.2
Oversize Index	0.0
Shrinkage Product	342.1
Grading Coefficient	16.8
Grading modulus	1.27

Atter-berg Limits

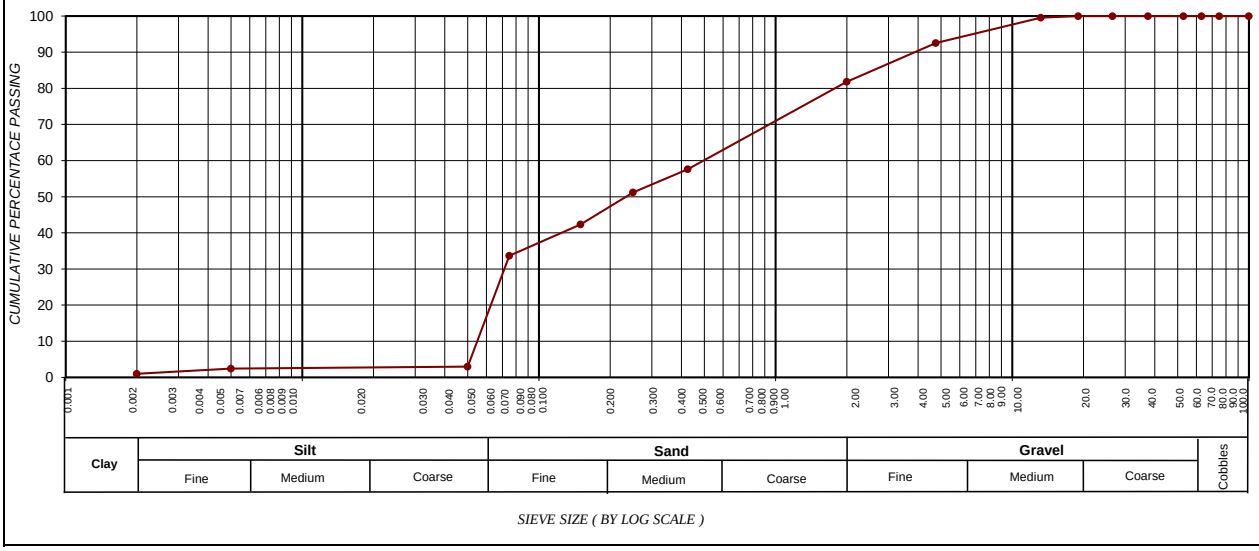
Liquid Limit	31
Plasticity Index	11
Linear Shrinkage	5.9
PI < 0.075	-

Unified Soil Classification	SC
U.S. Highway Classification	A-2-6 (0)

PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
1.0	9.1	71.7	18.2

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 510
LAYER : 1.0-2.0
SAMPLE No. : B15363
SAMPLE DESCRIPTION : Residual SandstoneGravelly Sitly Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	17.1	Specifc Gravity	2.35

Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	99
5.00	91
2.000	89
0.425	86
0.250	82
0.150	71
0.075	53
50 µm	10
5 µm	9
2 µm	5.1

Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	3
0.425 - 0.250	4
0.250 - 0.150	12
0.150 - 0.075	20
< 0.075	60

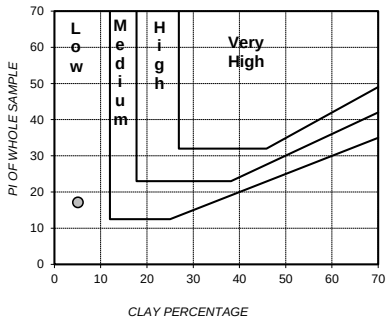
Effective size	0.050
Uniformity Coefficient	2.1
Curvature Coefficient	0.7
Oversize Index	0.0
Shrinkage Product	864.8
Grading Coefficient	10.4
Grading modulus	0.73

Atter-berg Limits

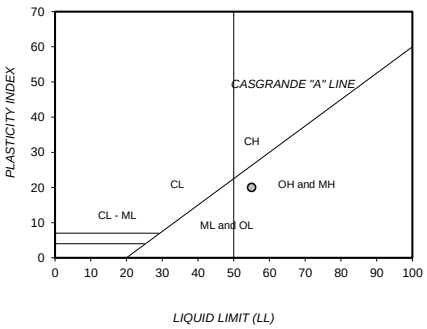
Liquid Limit	55
Plasticity Index	20
Linear Shrinkage	10.1
PI < 0.075	-

Unified Soil Classification	MH
U.S. Highway Classification	A-7-5 (9)

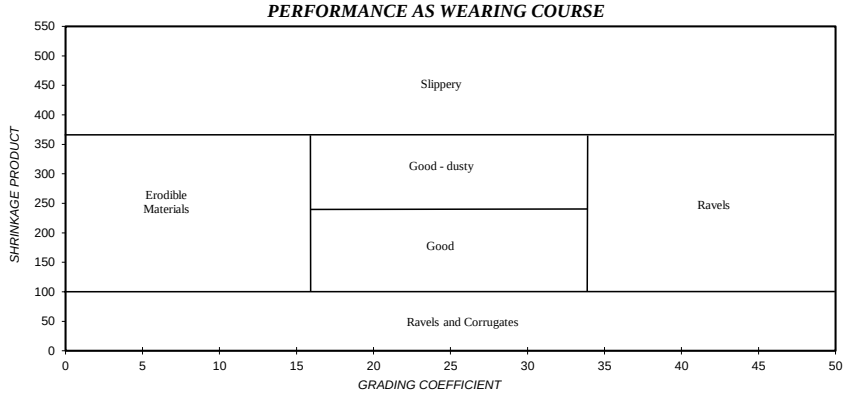
POTENTIAL EXPANSIVENES



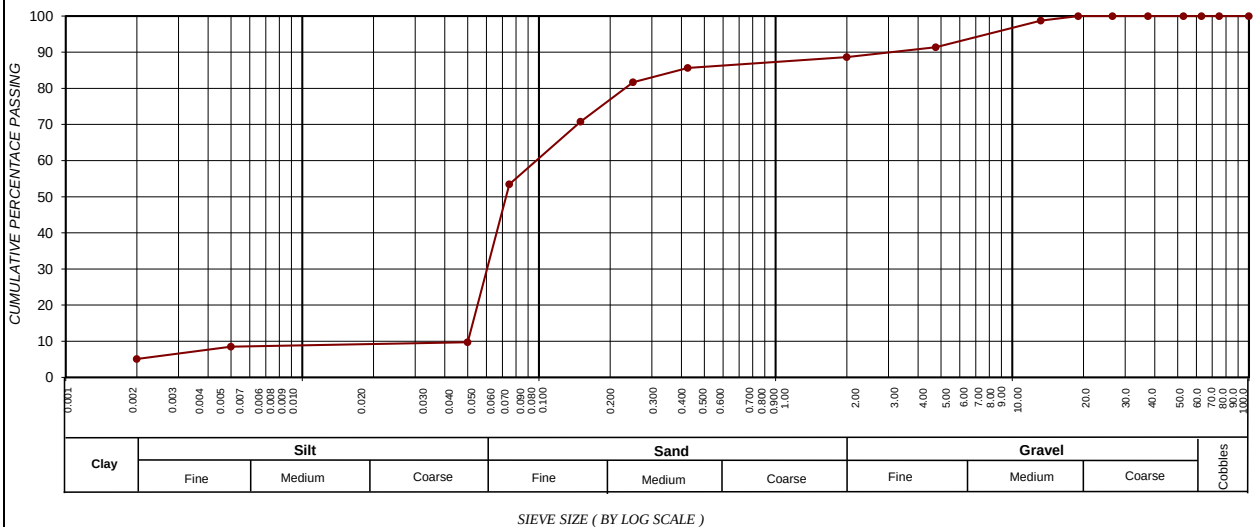
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
5.1	14.5	69.0	11.4

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 655
LAYER : 0.0-0.5
SAMPLE No. : B15364
SAMPLE DESCRIPTION : Silty Sand Residual Sand

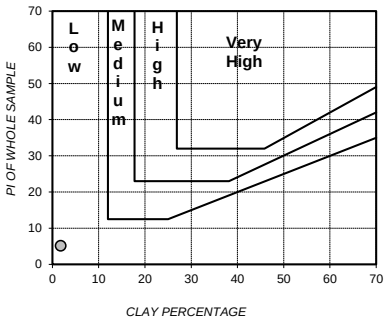
FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	5.1	Specifc Gravity	2.35

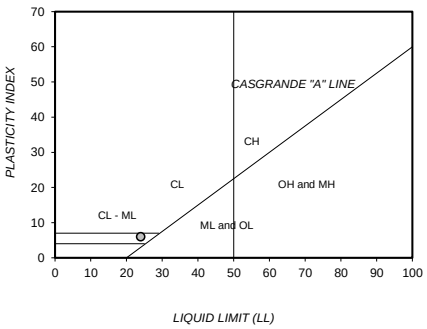
Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	100
5.00	99
2.000	96
0.425	86
0.250	84
0.150	77
0.075	60
50 µm	5
5 µm	4
2 µm	1.8

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	10
0.425 - 0.250	2
0.250 - 0.150	7
0.150 - 0.075	18
< 0.075	62

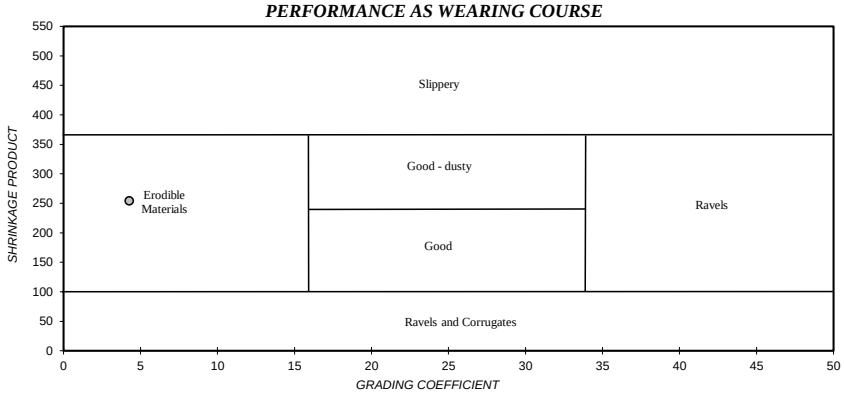
Effective size	0.052
Uniformity Coefficient	1.5
Curvature Coefficient	0.9
Oversize Index	0.0
Shrinkage Product	254.1
Grading Coefficient	4.3
Grading modulus	0.58

Atter-berg Limits

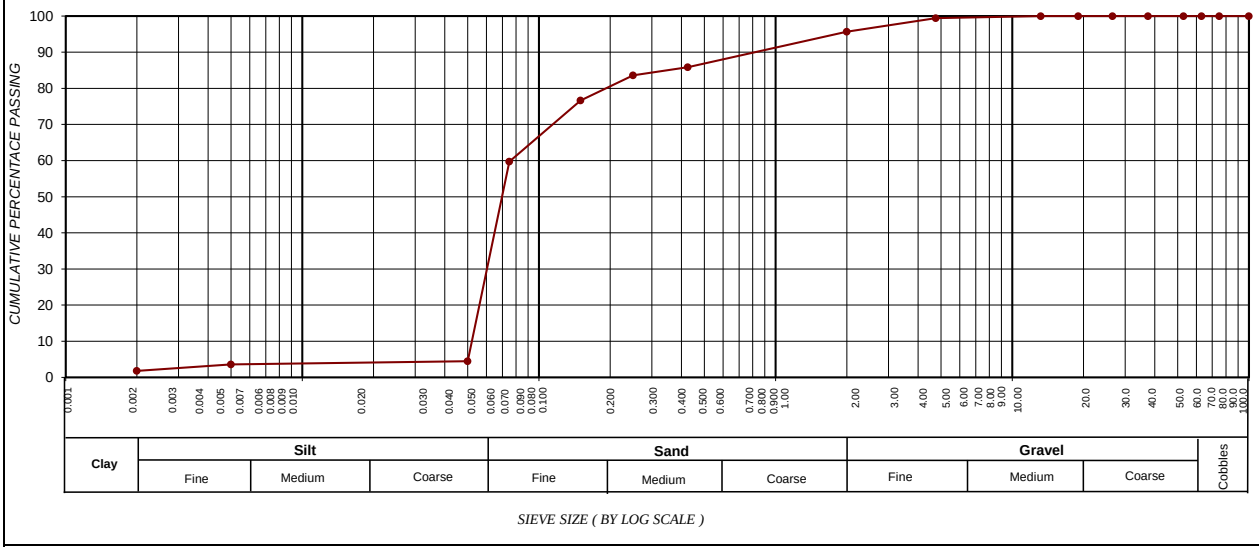
Liquid Limit	24
Plasticity Index	6
Linear Shrinkage	3.0
PI < 0.075	-

Unified Soil Classification	CL & ML
U.S. Highway Classification	A-4 (1)

PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
1.8	15.2	78.7	4.3

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 81
LAYER : 0.7-0.9
SAMPLE No. : B15365
SAMPLE DESCRIPTION : Silty Sand + Residual Mudstone

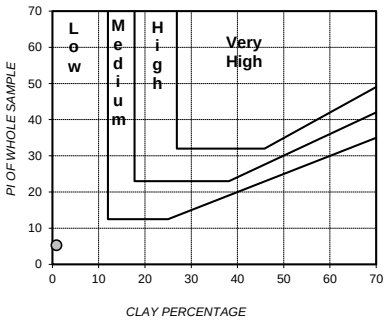
FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	5.3	Specifc Gravity	2.35

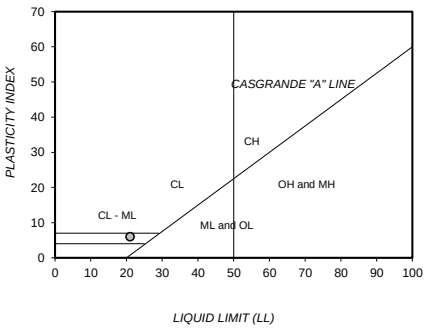
Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	99
5.00	97
2.000	94
0.425	88
0.250	85
0.150	75
0.075	49
50 µm	4
5 µm	3
2 µm	0.9

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	7
0.425 - 0.250	3
0.250 - 0.150	11
0.150 - 0.075	27
< 0.075	53

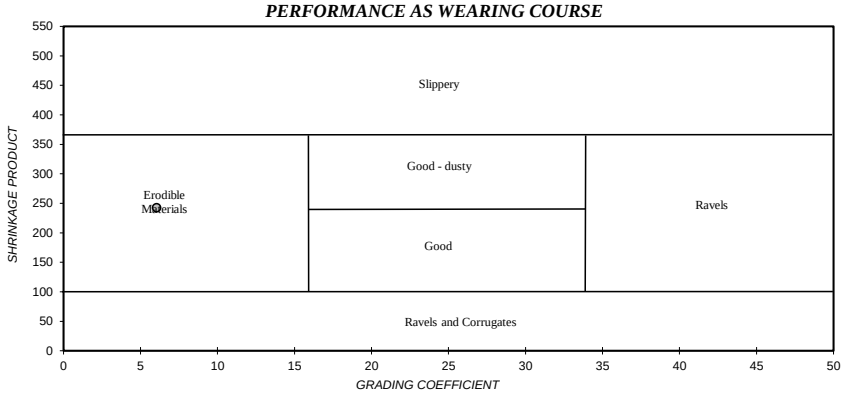
Effective size	0.053
Uniformity Coefficient	2.0
Curvature Coefficient	0.7
Oversize Index	0.0
Shrinkage Product	242.7
Grading Coefficient	6.1
Grading modulus	0.70

Atter-berg Limits

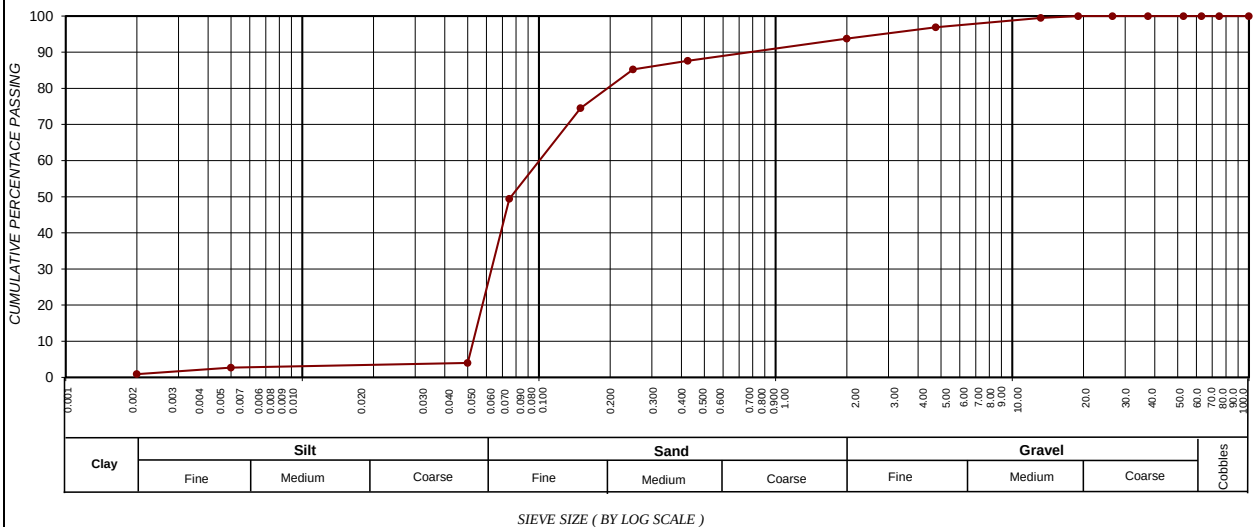
Liquid Limit	21
Plasticity Index	6
Linear Shrinkage	2.8
PI < 0.075	-

Unified Soil Classification	SM & SC
U.S. Highway Classification	A-4 (0)

PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
0.9	11.9	80.9	6.2

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CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 315
LAYER : 0.5-1.4
SAMPLE No. : B15371
SAMPLE DESCRIPTION : Silty Sand + Weathered Mudstone

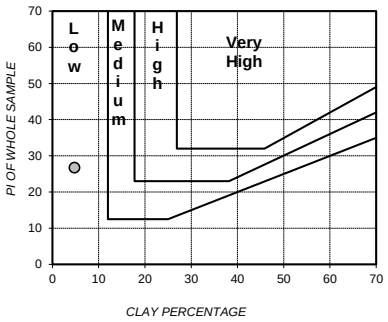
FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	26.7	Specifc Gravity	2.35

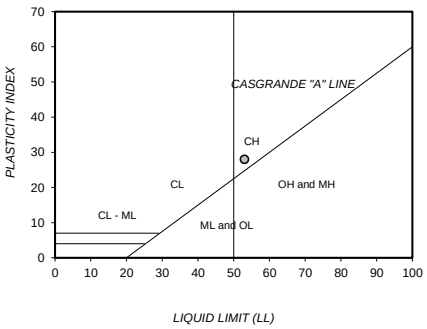
Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	100
5.00	100
2.000	100
0.425	95
0.250	94
0.150	90
0.075	82
50 µm	12
5 µm	11
2 µm	4.8

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	4
0.425 - 0.250	2
0.250 - 0.150	4
0.150 - 0.075	8
< 0.075	83

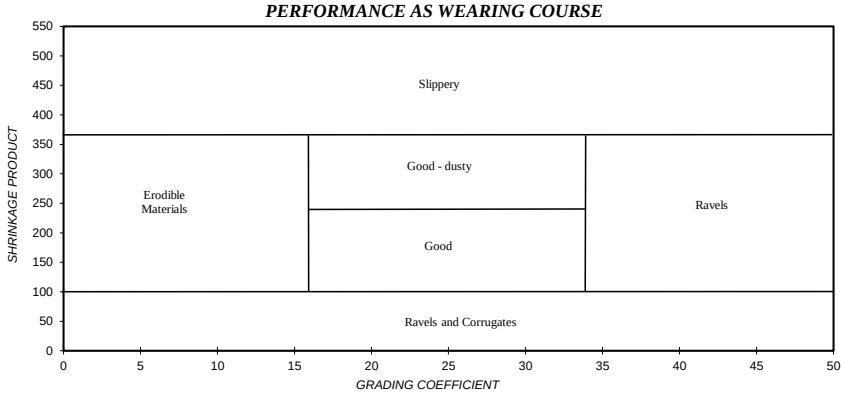
Effective size	0.005
Uniformity Coefficient	14.3
Curvature Coefficient	10.2
Oversize Index	0.0
Shrinkage Product	1264.5
Grading Coefficient	0.2
Grading modulus	0.23

Atter-berg Limits

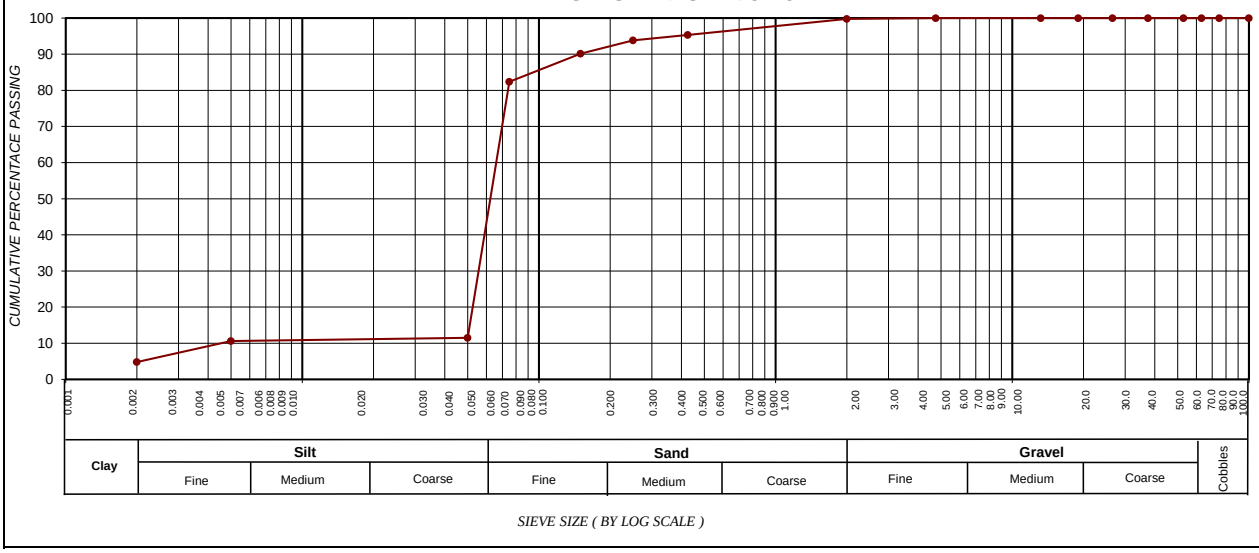
Liquid Limit	53
Plasticity Index	28
Linear Shrinkage	13.3
PI < 0.075	-

Unified Soil Classification	CH
U.S. Highway Classification	A-7-6 (25)

PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
4.8	23.9	71.0	0.2

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 527
LAYER : 1-Jan-00
SAMPLE No. : B15382
SAMPLE DESCRIPTION : Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	8.4	Specifc Gravity	2.35

Sieve analysis Cumulative percentage passing (mm)	
100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	100
5.00	100
2.000	96
0.425	93
0.250	90
0.150	76
0.075	39
50 µm	5
5 µm	4
2 µm	3.0

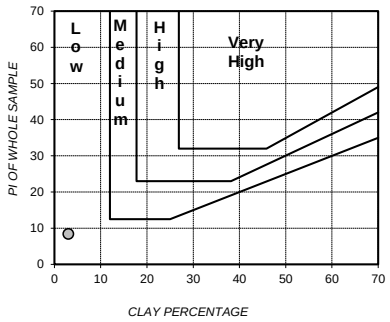
Soil Mortar Analysis % < 2.00mm	
2.000 - 0.425	4
0.425 - 0.250	3
0.250 - 0.150	15
0.150 - 0.075	38
< 0.075	40

Effective size	0.054
Uniformity Coefficient	2.2
Curvature Coefficient	0.7
Oversize Index	0.0
Shrinkage Product	454.1
Grading Coefficient	3.5
Grading modulus	0.71

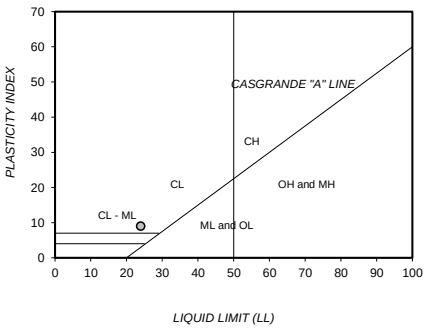
Atter-berg Limits	
Liquid Limit	24
Plasticity Index	9
Linear Shrinkage	4.9
PI < 0.075	-

Unified Soil Classification	SC
U.S. Highway Classification	A-4 (0)

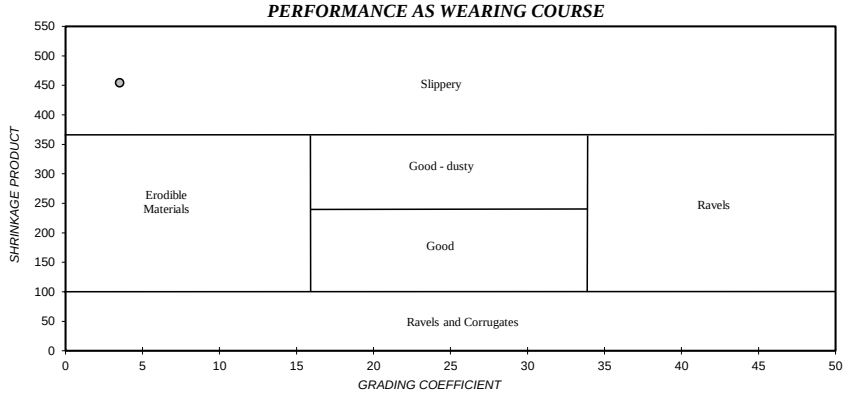
POTENTIAL EXPANSIVENES



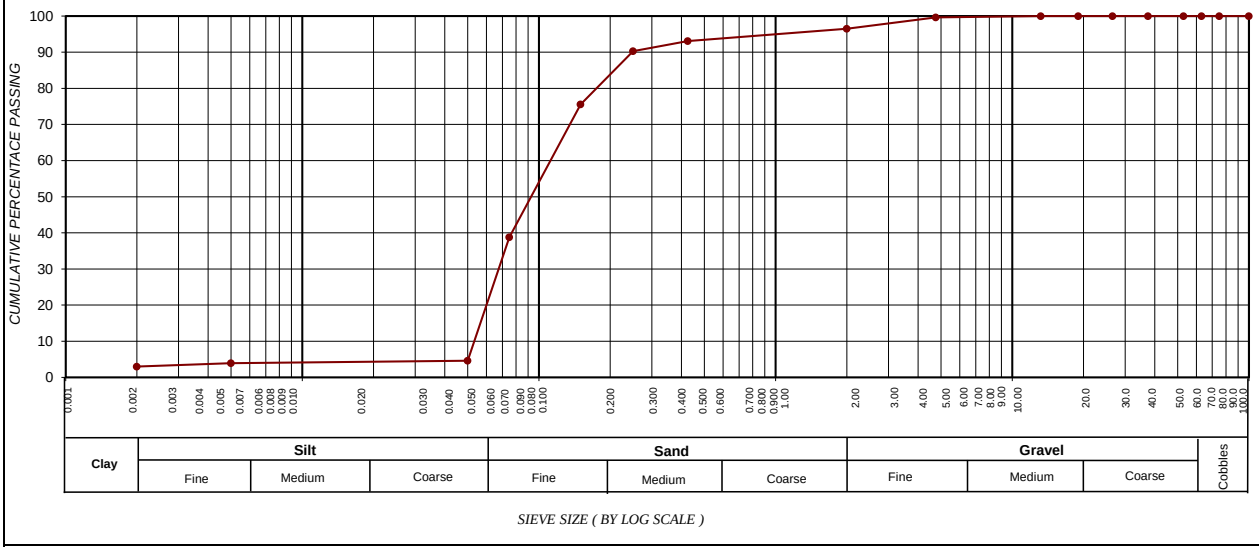
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
3.0	7.2	86.3	3.5

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP260
LAYER : 0.3-0.80
SAMPLE No. : B15383
SAMPLE DESCRIPTION : Dark Brown Clay Silty Sand

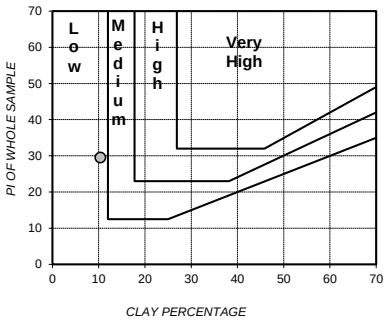
FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	29.5	Specifc Gravity	2.35

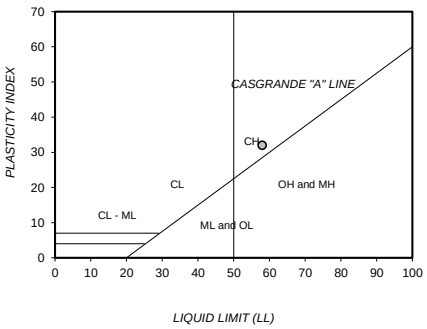
Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	100
5.00	99
2.000	96
0.425	92
0.250	90
0.150	77
0.075	70
50 µm	14
5 µm	12
2 µm	10.4

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	4
0.425 - 0.250	2
0.250 - 0.150	13
0.150 - 0.075	7
< 0.075	73

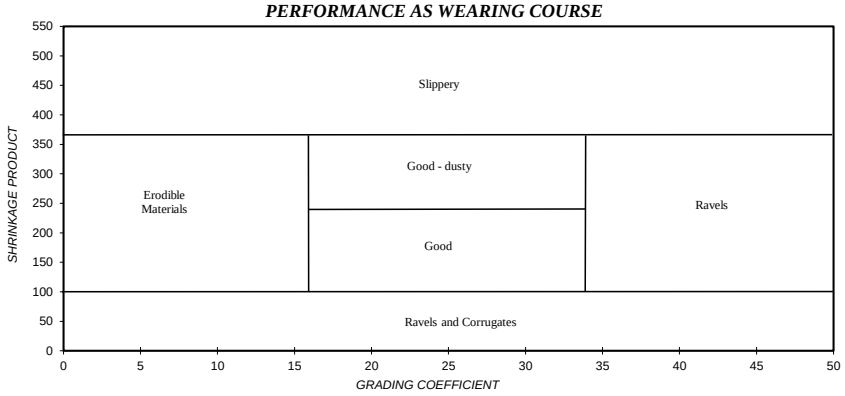
Effective size	0.002
Uniformity Coefficient	35.2
Curvature Coefficient	23.1
Oversize Index	0.0
Shrinkage Product	1540.9
Grading Coefficient	3.6
Grading modulus	0.41

Atter-berg Limits

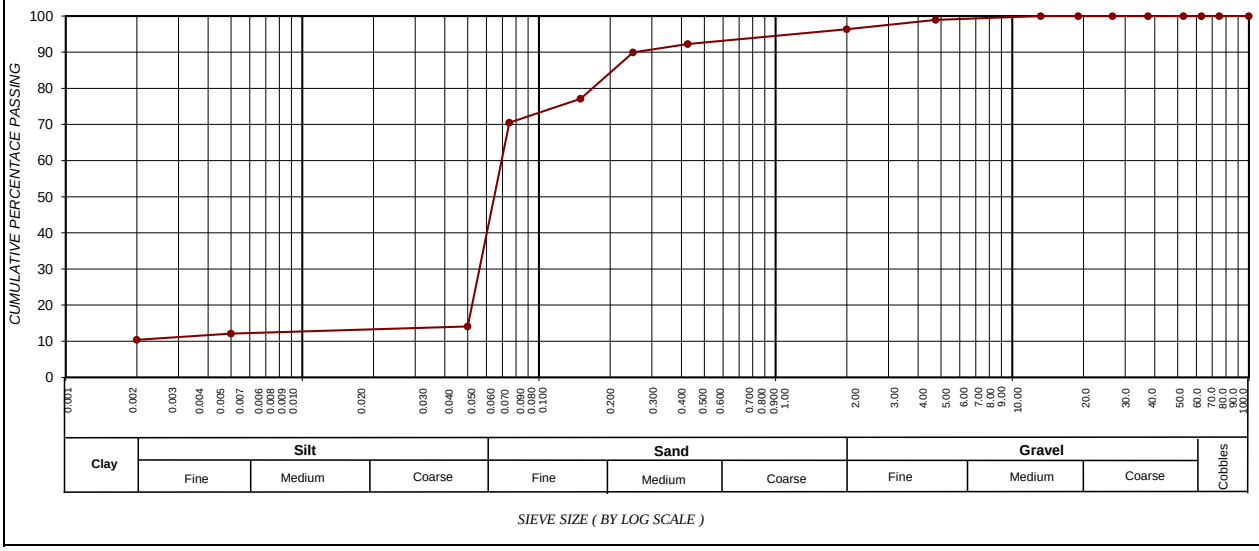
Liquid Limit	58
Plasticity Index	32
Linear Shrinkage	16.7
PI < 0.075	-

Unified Soil Classification	CH
U.S. Highway Classification	A-7-6 (22)

PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
10.4	17.9	68.0	3.6

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 216
LAYER : 0.70-3.1
SAMPLE No. : B15384
SAMPLE DESCRIPTION : Silty Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**7.4**	**Specifc Gravity**	**2.35**

Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	100
5.00	99
2.000	94
0.425	82
0.250	80
0.150	73
0.075	53
50 µm	4
5 µm	3
2 µm	0.9

Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	12
0.425 - 0.250	3
0.250 - 0.150	8
0.150 - 0.075	21
< 0.075	56

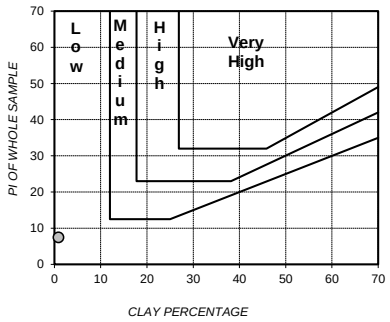
Effective size	0.053
Uniformity Coefficient	1.9
Curvature Coefficient	0.7
Oversize Index	0.0
Shrinkage Product	386.3
Grading Coefficient	5.9
Grading modulus	0.71

Atter-berg Limits

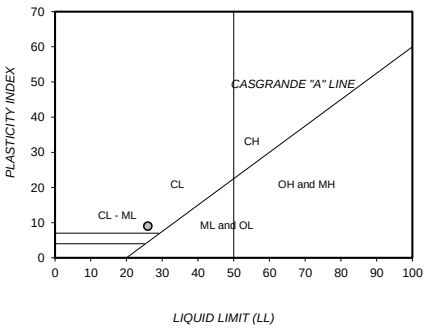
Liquid Limit	26
Plasticity Index	9
Linear Shrinkage	4.7
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-4 (2)

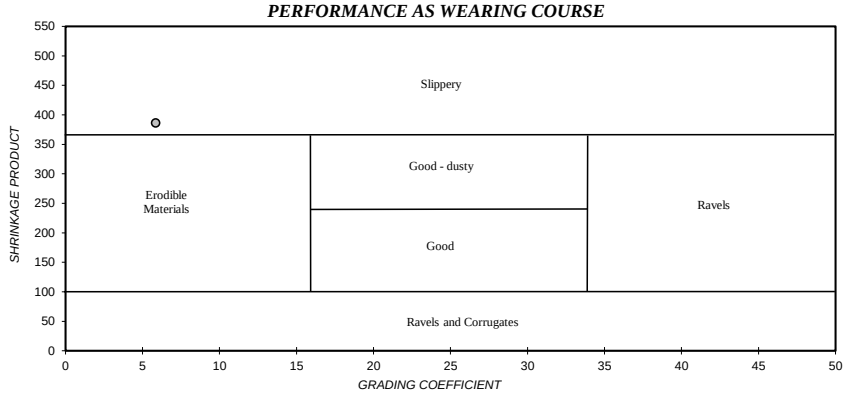
POTENTIAL EXPANSIVENES



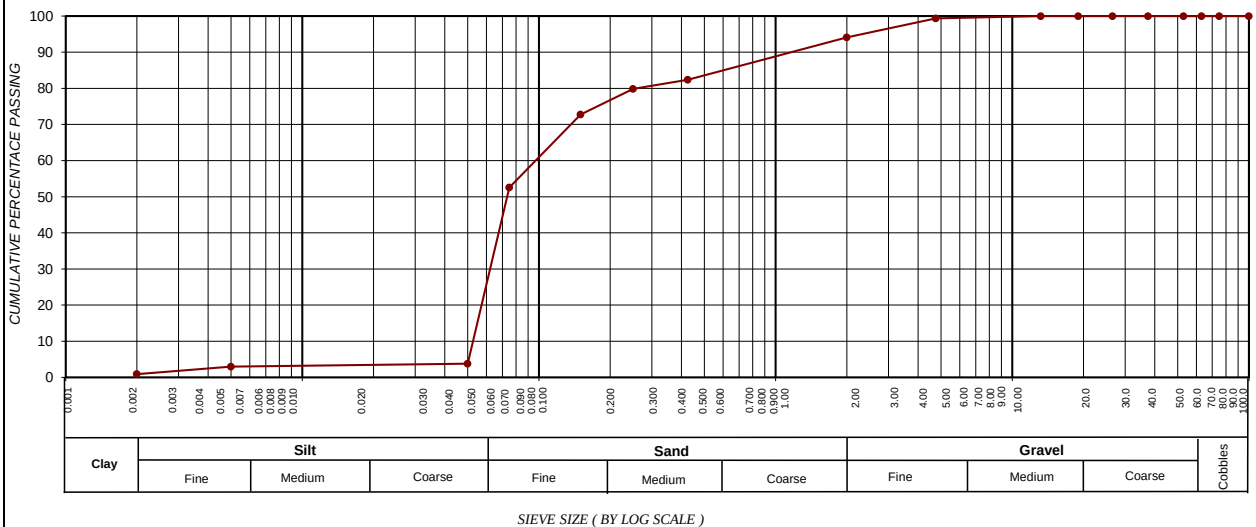
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
0.9	13.2	80.0	5.9

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 92
LAYER : 0.10-0.70
SAMPLE No. : B15385
SAMPLE DESCRIPTION : Silty Sand

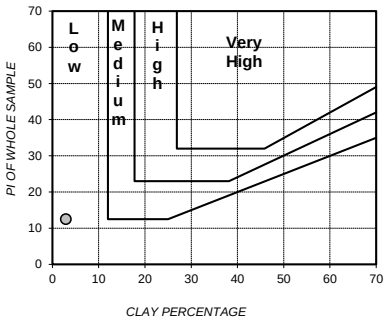
FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**12.5**	**Specifc Gravity**	**2.35**

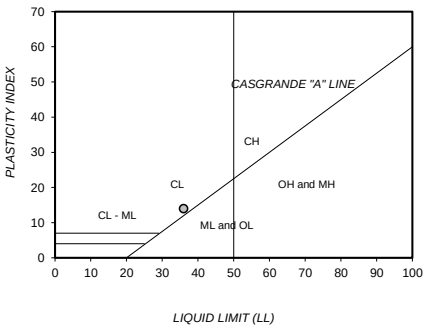
Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	100
5.00	99
2.000	97
0.425	89
0.250	86
0.150	81
0.075	71
50 µm	6
5 µm	5
2 µm	2.9

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	8
0.425 - 0.250	4
0.250 - 0.150	5
0.150 - 0.075	10
< 0.075	73

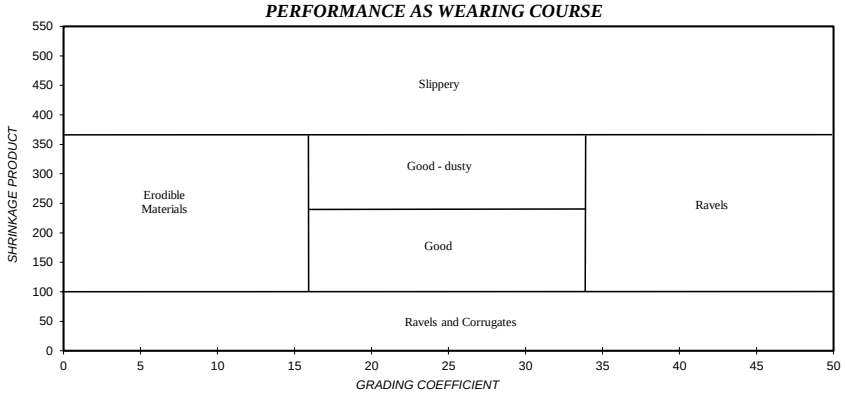
Effective size	0.052
Uniformity Coefficient	1.4
Curvature Coefficient	1.0
Oversize Index	0.0
Shrinkage Product	712.7
Grading Coefficient	3.2
Grading modulus	0.43

Atter-berg Limits

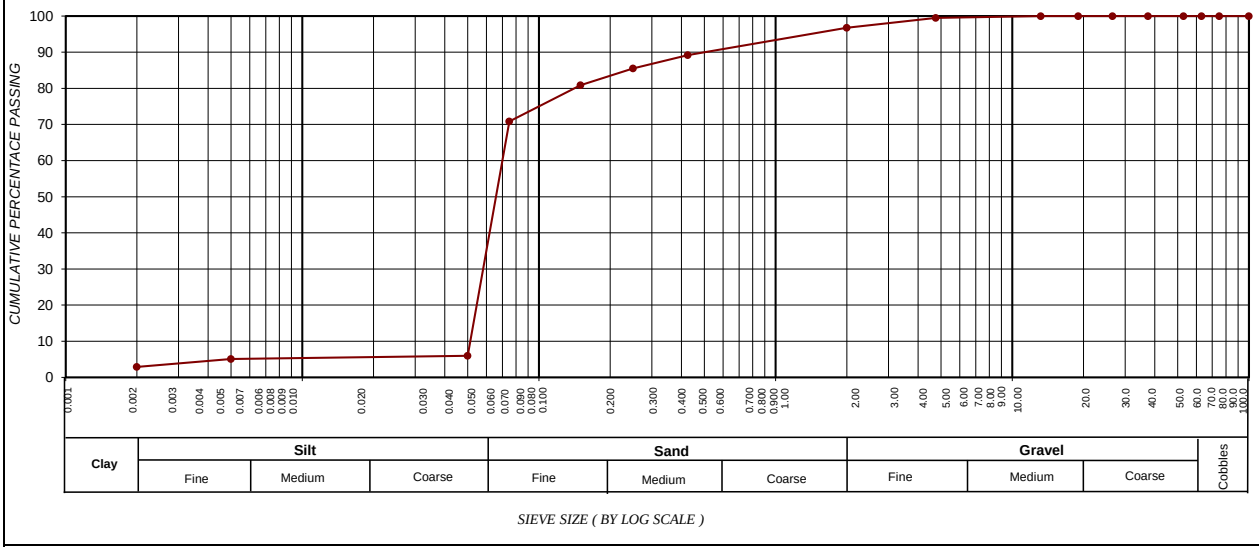
Liquid Limit	36
Plasticity Index	14
Linear Shrinkage	8.0
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (9)

PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	**SILT (%) (0.002-0.060)**	**SAND (%) (0.060-2.00)**	**GRAVEL (%) (2.00-60.0)**
2.9	**18.3**	**75.6**	**3.3**

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 1210
LAYER : 0.0-0.30
SAMPLE No. : B15386
SAMPLE DESCRIPTION : Silty Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**9.4**	**Specifc Gravity**	**2.35**

Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	100
5.00	99
2.000	95
0.425	85
0.250	76
0.150	60
0.075	44
50 µm	3
5 µm	2
2 µm	0.9

Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	10
0.425 - 0.250	10
0.250 - 0.150	17
0.150 - 0.075	16
< 0.075	47

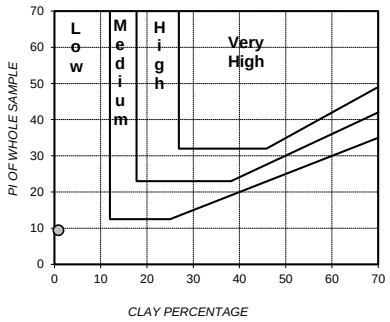
Effective size	0.054
Uniformity Coefficient	2.8
Curvature Coefficient	0.5
Oversize Index	0.0
Shrinkage Product	505.6
Grading Coefficient	4.9
Grading modulus	0.76

Atter-berg Limits

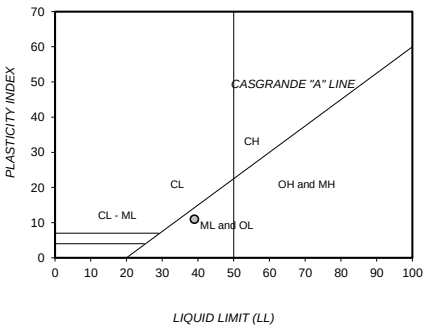
Liquid Limit	39
Plasticity Index	11
Linear Shrinkage	5.9
PI < 0.075	-

Unified Soil Classification	SM
U.S. Highway Classification	A-6 (2)

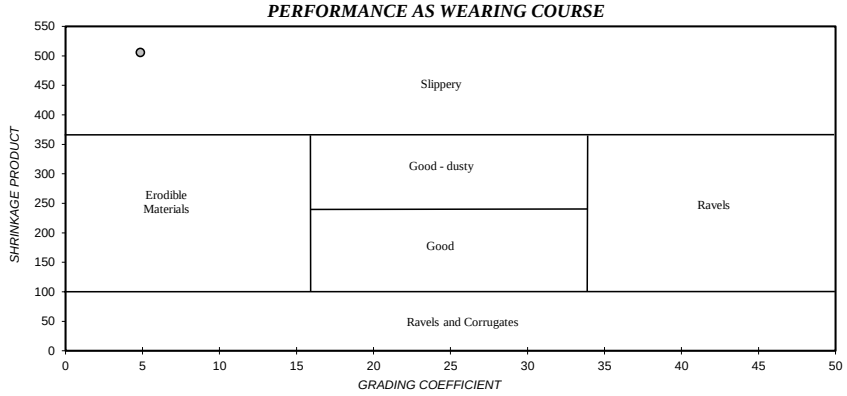
POTENTIAL EXPANSIVENES



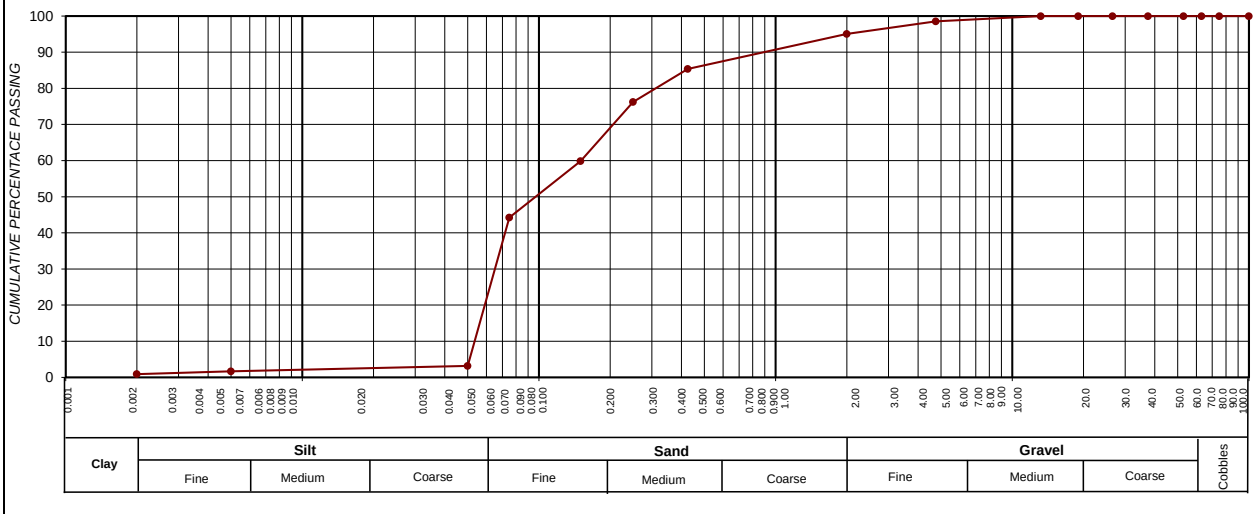
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
0.9	11.5	82.7	4.9

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 358
LAYER : 1-Jan-00
SAMPLE No. : B15387
SAMPLE DESCRIPTION : Light Brown Khaki Silty Sand

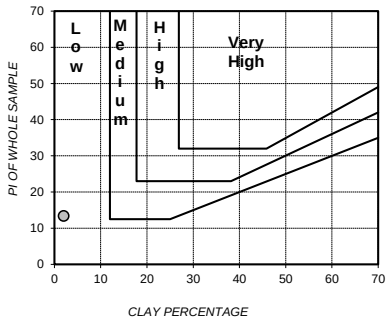
FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**13.4**	**Specifc Gravity**	**2.35**

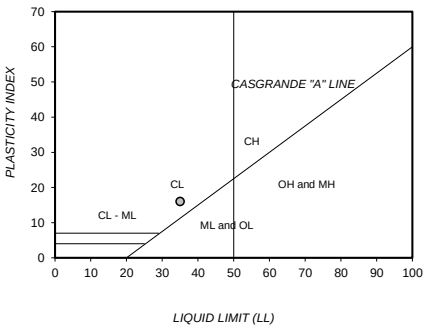
Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	100
5.00	100
2.000	93
0.425	84
0.250	79
0.150	67
0.075	51
50 µm	7
5 µm	6
2 µm	2.0

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	10
0.425 - 0.250	5
0.250 - 0.150	13
0.150 - 0.075	16
< 0.075	55

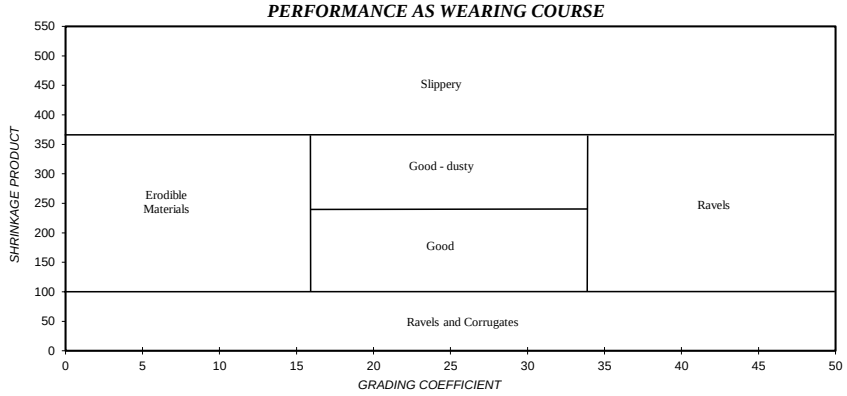
Effective size	0.052
Uniformity Coefficient	2.3
Curvature Coefficient	0.7
Oversize Index	0.0
Shrinkage Product	674.4
Grading Coefficient	6.8
Grading modulus	0.72

Atter-berg Limits

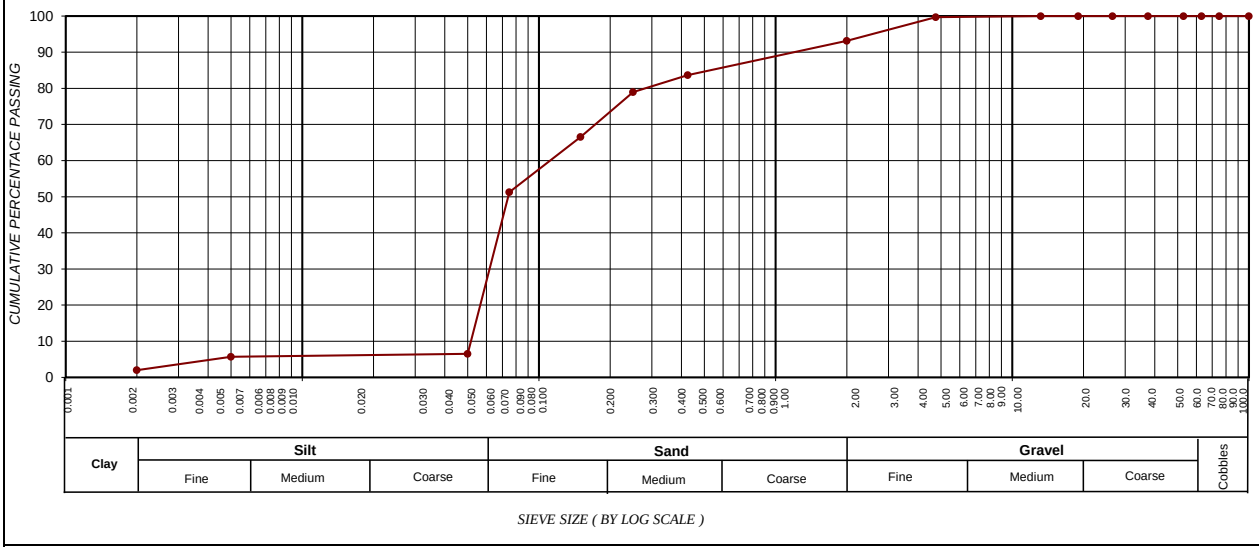
Liquid Limit	35
Plasticity Index	16
Linear Shrinkage	8.1
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (5)

PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
2.0	14.3	76.9	6.9

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 184
LAYER : 2-Jan-00
SAMPLE No. : B15388
SAMPLE DESCRIPTION : Gravelly Sand

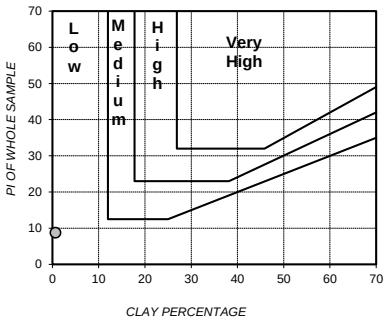
FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**8.7**	**Specifc Gravity**	**2.35**

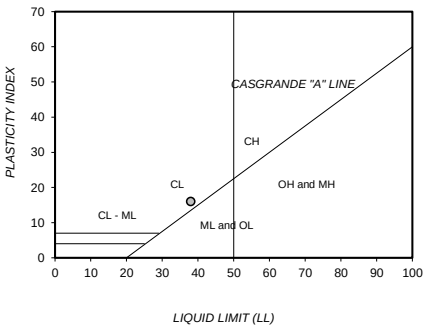
Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	100
5.00	96
2.000	83
0.425	54
0.250	51
0.150	42
0.075	32
50 µm	4
5 µm	4
2 µm	0.7

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	35
0.425 - 0.250	4
0.250 - 0.150	10
0.150 - 0.075	12
< 0.075	38

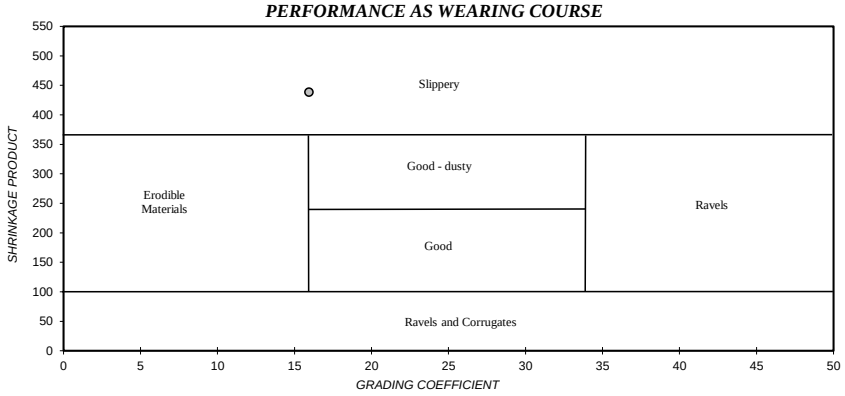
Effective size	0.055
Uniformity Coefficient	13.2
Curvature Coefficient	0.1
Oversize Index	0.0
Shrinkage Product	438.5
Grading Coefficient	15.9
Grading modulus	1.30

Atter-berg Limits

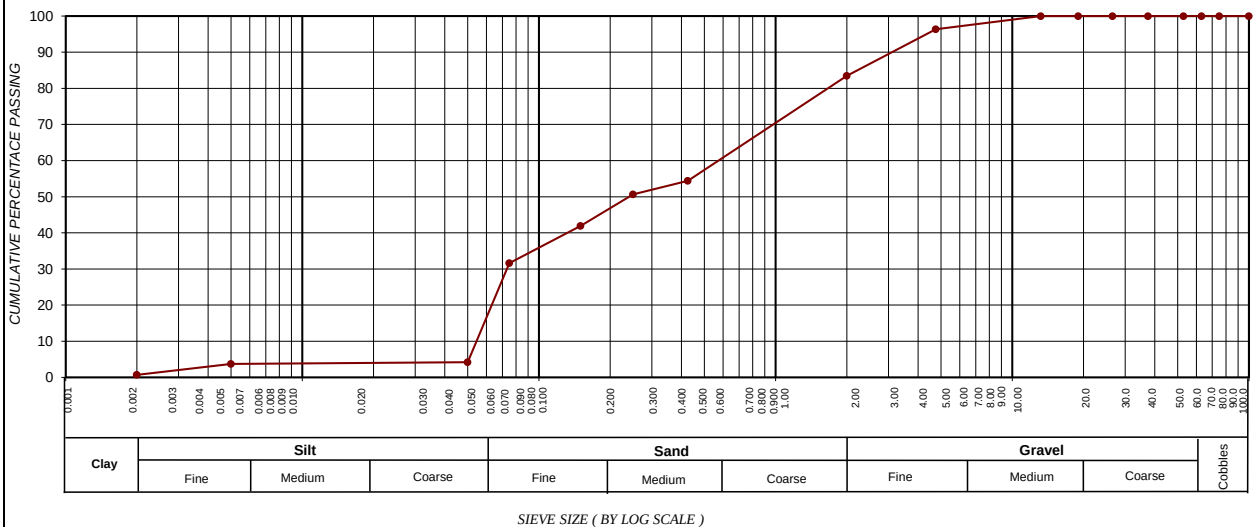
Liquid Limit	38
Plasticity Index	16
Linear Shrinkage	8.1
PI < 0.075	-

Unified Soil Classification	SC
U.S. Highway Classification	A-2-6 (1)

PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
0.7	9.6	73.1	16.6

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 318
LAYER : 1.4-2.80
SAMPLE No. : B15391
SAMPLE DESCRIPTION : Light Grey Silty Sand Mudstone

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	8.3	Specifc Gravity	2.35

Sieve analysis Cumulative percentage passing (mm)	
100.0	100
75.0	100
63.0	97
50.0	93
37.5	92
28.0	89
20.0	81
14.0	81
5.00	80
2.000	78
0.425	76
0.250	75
0.150	72
0.075	69
50 µm	4
5 µm	3
2 µm	1.3

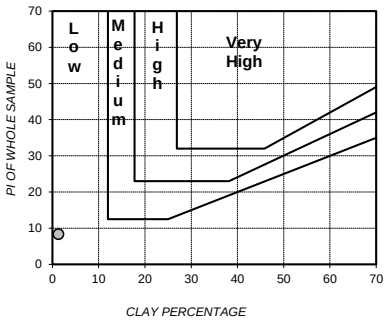
Soil Mortar Analysis % < 2.00mm	
2.000 - 0.425	3
0.425 - 0.250	1
0.250 - 0.150	3
0.150 - 0.075	4
< 0.075	89

Effective size	0.052
Uniformity Coefficient	1.4
Curvature Coefficient	1.0
Oversize Index	8.0
Shrinkage Product	393.9
Grading Coefficient	8.7
Grading modulus	0.77

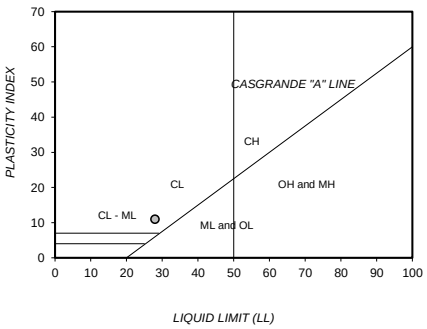
Atter-berg Limits	
Liquid Limit	28
Plasticity Index	11
Linear Shrinkage	5.2
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (5)

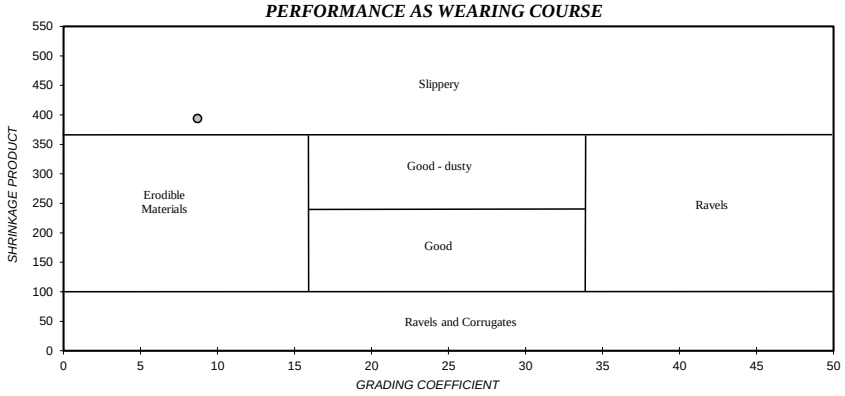
POTENTIAL EXPANSIVENES



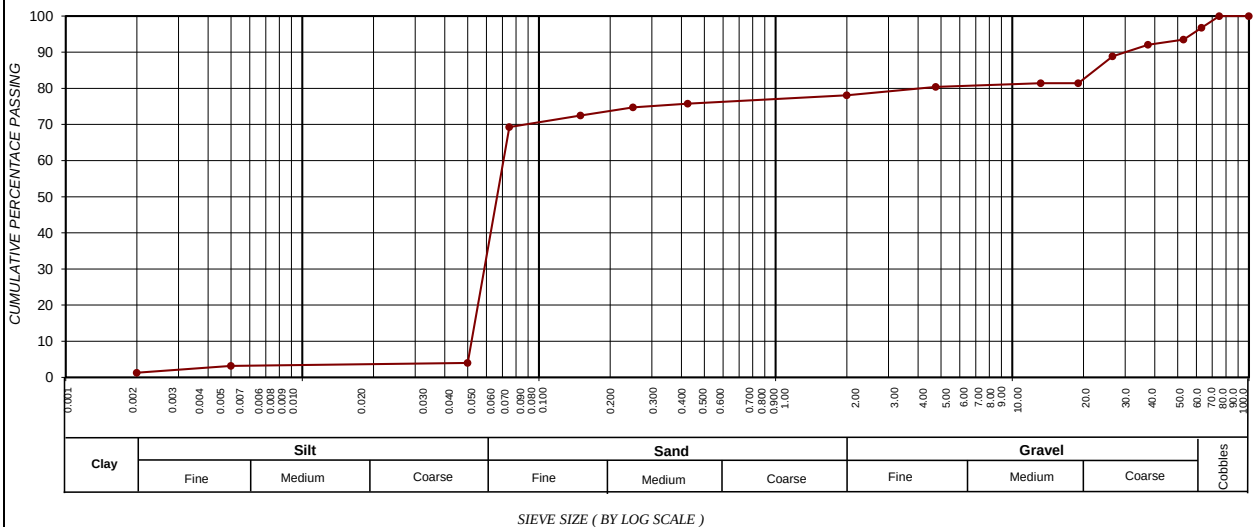
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
1.3	18.5	58.2	22.0

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 370
LAYER : 1.3-2.4
SAMPLE No. : B15392
SAMPLE DESCRIPTION : Light Olive Brown Silty Sandy Calcrete

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	18.5	Specifc Gravity	2.35

Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	100
5.00	95
2.000	92
0.425	88
0.250	86
0.150	81
0.075	71
50 µm	11
5 µm	9
2 µm	5.3

Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	4
0.425 - 0.250	2
0.250 - 0.150	6
0.150 - 0.075	11
< 0.075	77

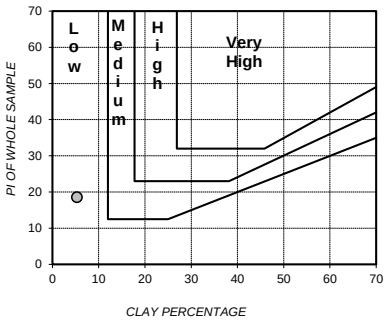
Effective size	0.031
Uniformity Coefficient	2.3
Curvature Coefficient	1.6
Oversize Index	0.0
Shrinkage Product	919.9
Grading Coefficient	7.7
Grading modulus	0.49

Atter-berg Limits

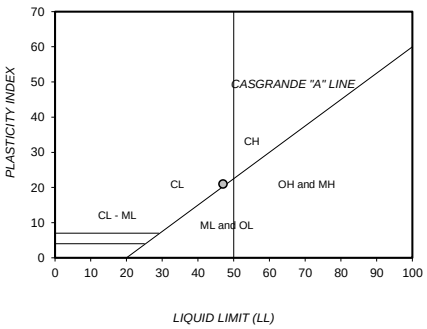
Liquid Limit	47
Plasticity Index	21
Linear Shrinkage	10.4
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-7-6 (15)

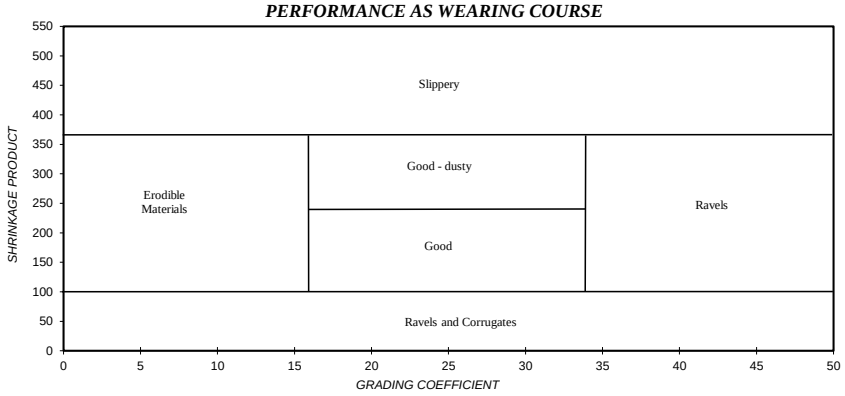
POTENTIAL EXPANSIVENES



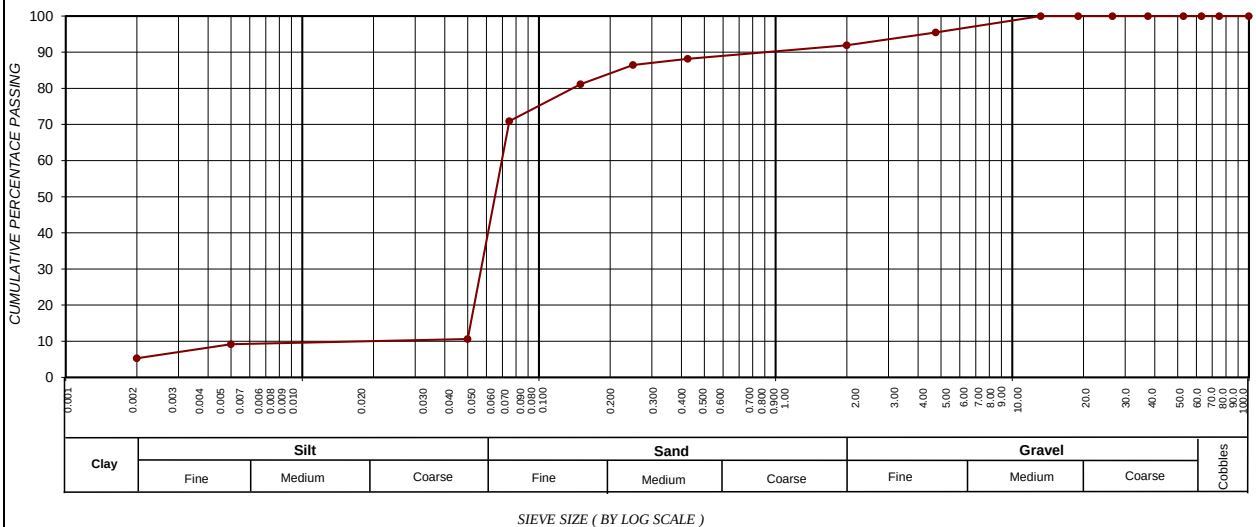
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
5.3	19.9	66.7	8.1

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OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

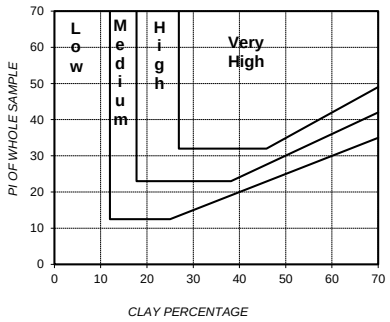
DATE RECEIVED : 11.11.2024
POSITION : TP 910
LAYER : 0.0-0.20
SAMPLE No. : B15429
SAMPLE DESCRIPTION : Silty Sand

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

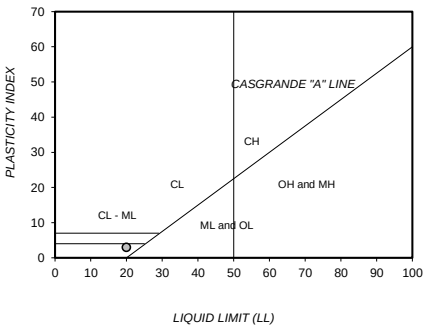
Weighted PI	**2.4**	**Specifc Gravity**	**2.35**

Sieve analysis Cumulative percentage passing (mm)	
100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	100
5.00	100
2.000	97
0.425	80
0.250	72
0.150	63
0.075	44
50 µm	2
5 µm	1
2 µm	-0.3

POTENTIAL EXPANSIVENES



PLASTICITY CHART



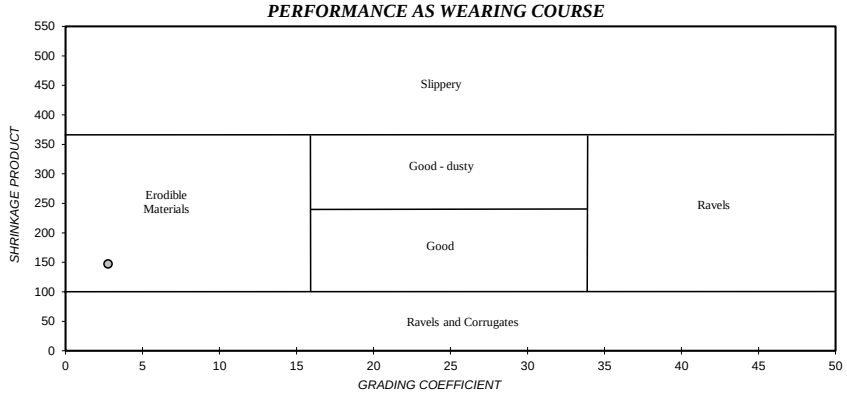
Soil Mortar Analysis % < 2.00mm	
2.000 - 0.425	18
0.425 - 0.250	8
0.250 - 0.150	9
0.150 - 0.075	20
< 0.075	45

Effective size	0.055
Uniformity Coefficient	2.5
Curvature Coefficient	0.6
Oversize Index	0.0
Shrinkage Product	147.3
Grading Coefficient	2.8
Grading modulus	0.79

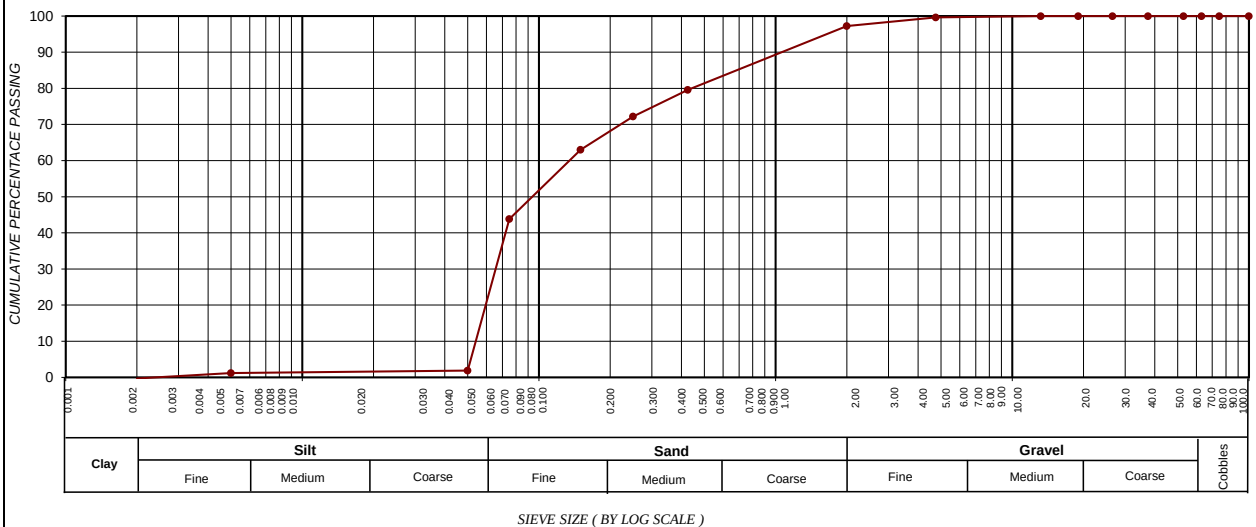
Atter-berg Limits	
Liquid Limit	20
Plasticity Index	3
Linear Shrinkage	1.9
PI < 0.075	-

Unified Soil Classification	SM
U.S. Highway Classification	A-4 (0)

PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
-0.3	10.7	86.8	2.8

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Germiston, JHB, 1400

OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 524
LAYER : 1.6-2.00
SAMPLE No. : B15434
SAMPLE DESCRIPTION : Silty Sand

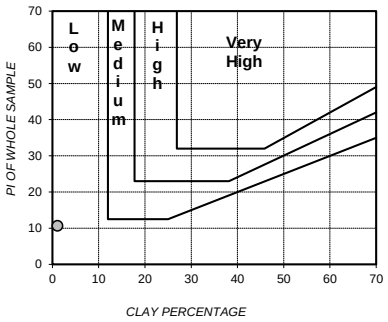
FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	10.7	Specifc Gravity	2.35

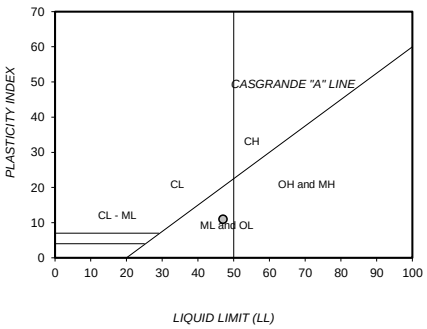
Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	100
5.00	99
2.000	99
0.425	97
0.250	95
0.150	91
0.075	81
50 µm	3
5 µm	2
2 µm	1.1

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	2
0.425 - 0.250	2
0.250 - 0.150	4
0.150 - 0.075	10
< 0.075	82

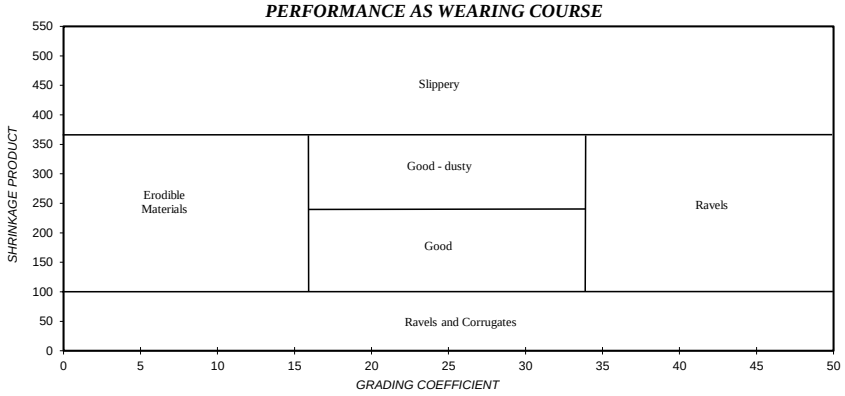
Effective size	0.052
Uniformity Coefficient	1.3
Curvature Coefficient	1.0
Oversize Index	0.0
Shrinkage Product	587.7
Grading Coefficient	1.3
Grading modulus	0.24

Atter-berg Limits

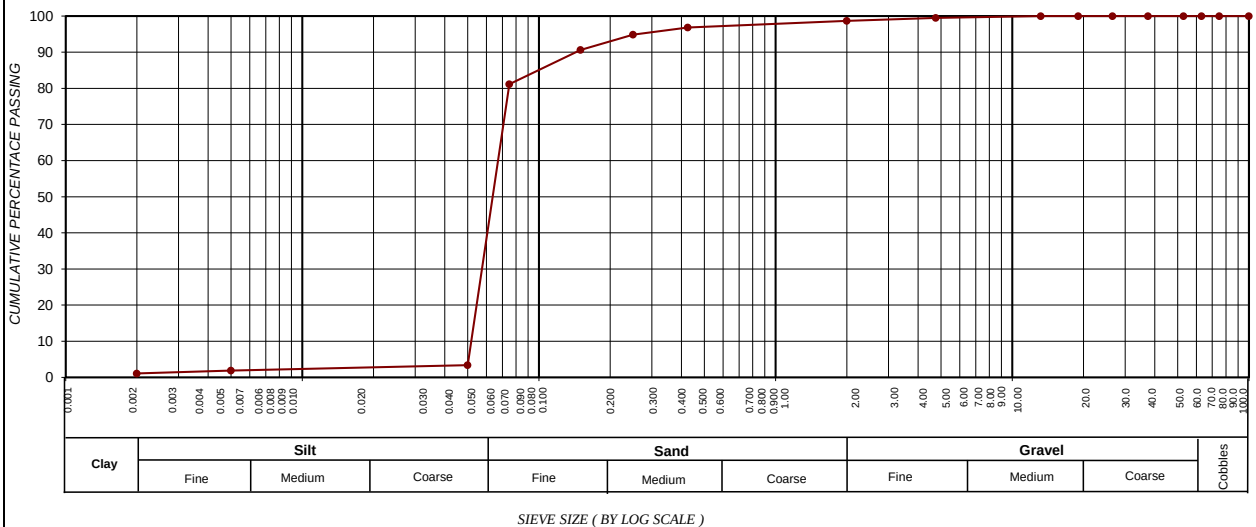
Liquid Limit	47
Plasticity Index	11
Linear Shrinkage	6.1
PI < 0.075	-

Unified Soil Classification	ML
U.S. Highway Classification	A-7-5 (11)

PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
1.1	20.8	76.8	1.3

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Germiston, JHB, 1400

OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 138
LAYER : 1.6-3.00
SAMPLE No. : B15441
SAMPLE DESCRIPTION : Silty Sand Fill

FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	**12.5**	**Specifc Gravity**	**2.35**

Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	100
5.00	99
2.000	95
0.425	89
0.250	88
0.150	80
0.075	68
50 µm	7
5 µm	6
2 µm	2.0

Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	6
0.425 - 0.250	2
0.250 - 0.150	8
0.150 - 0.075	12
< 0.075	72

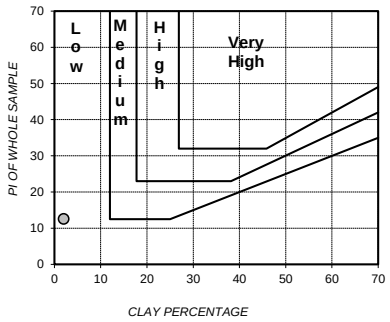
Effective size	0.051
Uniformity Coefficient	1.4
Curvature Coefficient	1.0
Oversize Index	0.0
Shrinkage Product	701.8
Grading Coefficient	4.9
Grading modulus	0.48

Atter-berg Limits

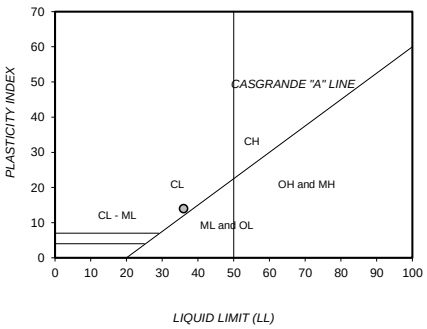
Liquid Limit	36
Plasticity Index	14
Linear Shrinkage	7.9
PI < 0.075	-

Unified Soil Classification	CL
U.S. Highway Classification	A-6 (8)

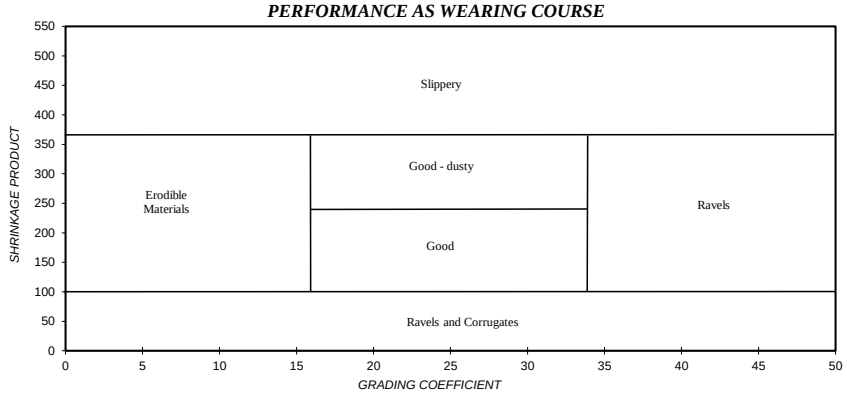
POTENTIAL EXPANSIVENES



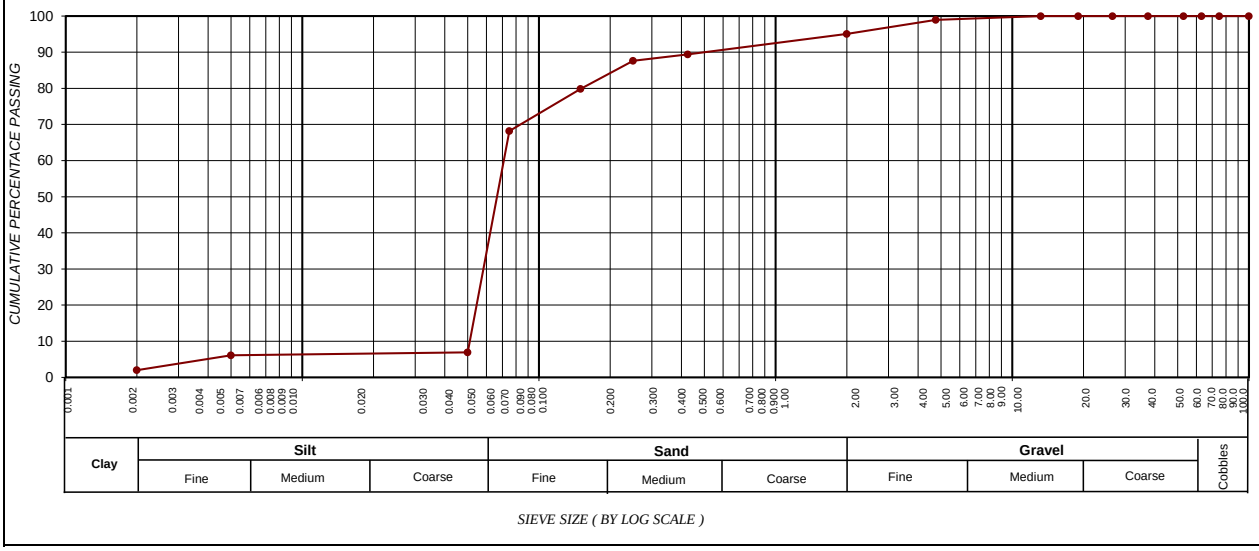
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
2.0	19.1	74.0	4.9

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Germiston, JHB, 1400

OUR REF : BLO01-RBFMUK001-1-
CLIENT : Mukona Geotechnics (Pty) Ltd
PROJECT : Xhariep Pipeline Feasibility Study

DATE RECEIVED : 11.11.2024
POSITION : TP 115
LAYER : 1.0-2.80
SAMPLE No. : B15442
SAMPLE DESCRIPTION : Gravelly Silty Sand

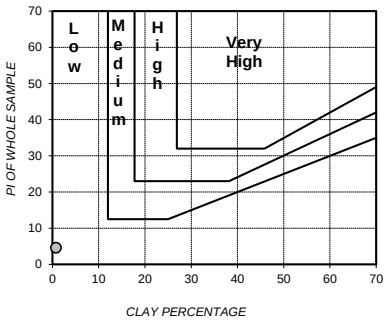
FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI	4.5	Specifc Gravity	2.35

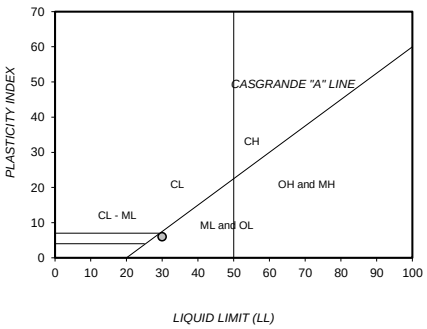
Sieve analysis Cumulative percentage passing (mm)

100.0	100
75.0	100
63.0	100
50.0	100
37.5	100
28.0	100
20.0	100
14.0	100
5.00	97
2.000	90
0.425	76
0.250	71
0.150	61
0.075	47
50 µm	2
5 µm	1
2 µm	0.8

POTENTIAL EXPANSIVENES



PLASTICITY CHART



Soil Mortar Analysis % < 2.00mm

2.000 - 0.425	15
0.425 - 0.250	6
0.250 - 0.150	11
0.150 - 0.075	15
< 0.075	52

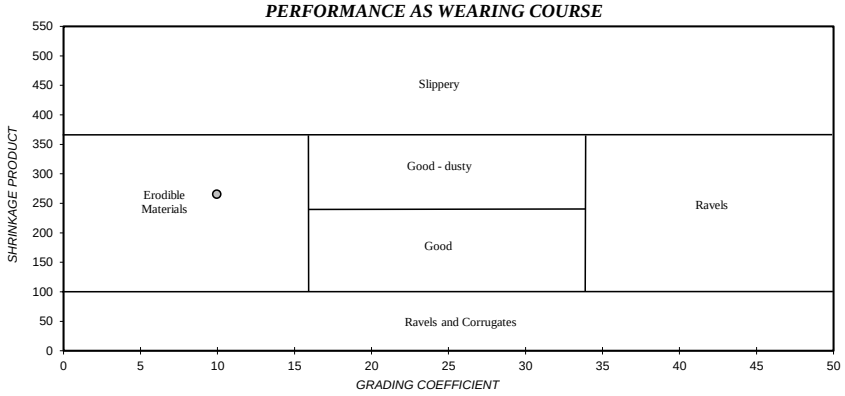
Effective size	0.055
Uniformity Coefficient	2.7
Curvature Coefficient	0.5
Oversize Index	0.0
Shrinkage Product	265.4
Grading Coefficient	10.0
Grading modulus	0.87

Atter-berg Limits

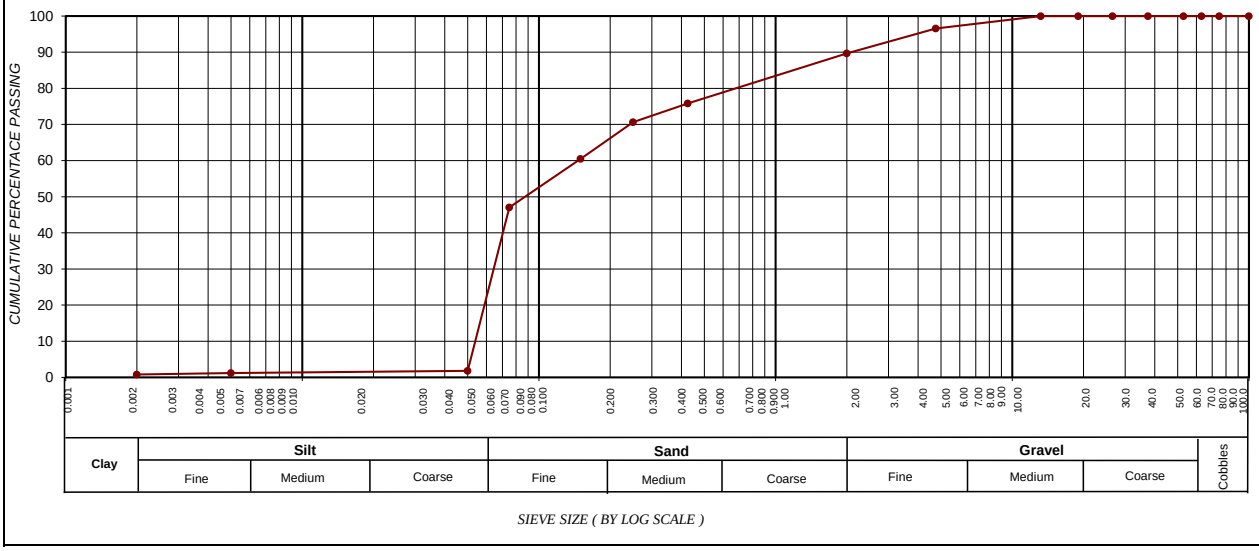
Liquid Limit	30
Plasticity Index	6
Linear Shrinkage	3.5
PI < 0.075	-

Unified Soil Classification	SM
U.S. Highway Classification	A-4 (1)

PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
0.8	10.7	78.2	10.3

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Roadlab Job RB7385
Client Mukuna Geotechnics (Pty)Ltd
Project Xhariep Pipeline Feasibility Study

ATTENTION: Mr David Msiza

Test Report : **- pH & CONDUCTIVITY TEST RESULTS**

Clients Marking: N10-9 (36,00 km -72,94km)
Sample delivered to Roadlab Bloemfontein

Date Sampled: Not advised
Date Tested : 14-29 January 2025

Sample Number	**Sample Origin**	**Test Pit Number**	**Depth mm**	**Temperature (°C) : Conductivity**	**Conductivity (ms/m)**	**Temperature (°C) :**	**pH Value**	Remarks
PH 55	Sandy GRAVEL,Fill	TP05	0.0-1.2	29,6	220	29,6	6,9	
PH 56	Sandy CLAY,Residual Mudstone	TP112	1.4-2.9	28,4	185	28,4	7,3	
PH 57	Silty SAND,Colluvium	TP114	0.8-1.6	26,4	168	26,4	7,2	
PH 58	Sandy CLAY,Residual Mudstone	TP118	1.2-2.6	31,0	148	31,0	6,8	
PH 59	Silty SAND,Residual Sandsone	TP130	0.9-1.1	27,0	168	27,0	7,6	
PH 60	Sandy CLAY,Residual Dolerite	TP14	0.6-1.3	28,4	138	28,4	6,9	
PH 61	Sandy CLAY,Residual Mudstone	TP147	1-1.4	27,8	164	27,8	7,1	
PH 62	Silty SAND,Colluvium	TP154	0.6-1.7	28,4	208	28,4	7,3	
PH 63	Clayey SILT,Alluvium	TP158	1.1-3.0	28,6	196	28,6	7,6	
PH 64	Gravelly Sandy CLAY,Residual Mudstone	TP16	0.4-0.8	26,8	130	26,8	7,2	
PH 65	Clayey Silty SAND,Residual Sandstone	TP164	0.9-1.7	28,4	176	28,4	6,9	
PH 66	Silty GRAVEL,Residual Dolerite	TP166	0.9-2.6	30	230	30,0	6,9	
PH 67	Silty SAND,Residual Sandstone	TP177	1,00	28,2	138	28,2	7,1	
PH 68	Silty CLAY,Residual Mudstone	TP179	2,00	26,8	185	26,8	6,8	
PH 69	Fine Sandy CLAY,Residual Dolerite	TP184	1.3-1.7	27,4	190	27,4	6,8	
PH 70	Silty SAND,Residual Sandstone	TP186	0.7-1.4	26,6	162	26,6	6,4	
PH 71	Calyey Sandy SILT,Residual Mudstone	TP188	1,10	24,8	155	24,8	6,9	
PH 72	Silty CLAY,Residual Musdtone	TP191	1,00	27	163	27,0	6,4	
PH 73	Weathered Sandstone	TP195	0.9-1.2	26,4	128	26,4	6,6	

Remarks :

The samples were subjected to analysis according to TMH 1
The results reported relate only to the sample tested
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Roadlab Job RB7385
Client Mukuna Geotechnics (Pty)Ltd
Project Xhariep Pipeline Feasibility Study

ATTENTION: Mr David Msiza

Test Report : **- pH & CONDUCTIVITY TEST RESULTS**

Clients Marking: N10-9 (36,00 km -72,94km)
Sample delivered to Roadlab Bloemfontein

Date Sampled: Not advised
Date Tested : 14-29 January 2025

Sample Number	Sample Origin	Test Pit Number	Depth mm	Temperature (°C) : Conductivity	Conductivity (ms/m)	Temperature (°C) :	pH Value	Remarks
PH 74	Silty CLAY,Colluvium	TP196	0,70	30,2	220	30,2	6,9	
PH 75	Silty CLAY,Colluvium	TP197	0.2-0.6	29,6	188	29,6	7,3	
PH 76	Silty CLAY,Residual Musdtone	TP199	1,20	28,4	128	28,4	7,2	
PH 77	Sandy clay, Colluvium	TP204	0.0 – 0.8	29,4	124	29,4	6,8	
PH 78	Weathered Mudstone	TP21	0.4-0.5	26,4	196	26,4	7,6	
PH 79	Gravelly sand,Fiill	TP210	0.4– 1.0	26,8	210	26,8	6,9	
PH 80	Silty SAND,Residual Dolerite	TP218	2,20	26,4	155	26,4	7,1	
PH 81	Weathered Dolerite	TP220	1.8-2.8	28,4	230	28,4	7,1	
PH 82	Weathered Shale	TP220	0.8-1.8	27,8	204	27,8	6,8	
PH 83	Weathered Mudstone	TP224	1.1 – 1.3	26,8	111	26,8	7,2	
PH 84	Weathered Mudstone	TP234	0.5 – 1.6	29,4	138	29,4	7,2	
PH 85	Weathered Mudstone	TP244	0.8 – 3.2	26,4	196	26,4	7,3	
PH 86	Sandy CLAY,Colluvium	TP246	0.6 – 2.4	28,4	128	28,4	6,8	
PH 87	Sandy CLAY,Colluvium	TP254	0.8 – 3.0	26,8	144	26,8	6,9	
PH 88	Sandy CLAY,Residual Mudstone	TP256	1.1 – 2.6	25,8	136	25,8	7,6	
PH 89	Sandy CLAY,Residual Mudstone	TP264	0.8 – 1.3	26,4	148	26,4	7,1	
PH 90	Sandy CLAY,Fill	TP271	0.6 – 1.4	26,7	168	26,7	6,6	
PH 91	Clayey SAND,Colluvium	TP277	1.4– 3.2	28,4	204	28,4	6,7	
PH 92	Sandy CLAY,Colluvium	TP293	0.2 – 0.7	29	138	29,0	6,3	

Remarks :

The samples were subjected to analysis according to TMH 1
The results reported relate only to the sample tested
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060 727 8002

Roadlab Job RB7385
Client Mukuna Geotechnics (Pty)Ltd
Project Xhariep Pipeline Feasibility Study

ATTENTION: Mr David Msiza

Test Report : **- pH & CONDUCTIVITY TEST RESULTS**

Clients Marking: N10-9 (36,00 km -72,94km)
Sample delivered Roadlab Bloemfontein

Date Sampled: Not advised
Date Tested : 14-29 January 2025

Sample Number	Sample Origin	Test Pit Number	Depth mm	Temperature (°C) : Conductivity	Conductivity (ms/m)	Temperature (°C) :	pH Value	Remarks
PH 93	Weathered Dolerite	TP296	1.7-2.5	28,4	208	28,4	7,2	
PH 94	Weathered Mudstone	TP311	1.0 – 2.5	26,8	190	26,8	7,6	
PH 95	Silty Clayey SAND,Residual Dolerite	TP344	1.4-2.2	28,4	176	28,4	6,9	
PH 96	Gravelly Sandy CLAY,Residual Mudstone	TP35	0.6-1.1	28,6	166	28,6	6,8	
PH 97	Silty CLAY,Residual Mudstone	TP364	0,50	28,4	158	28,4	6,6	
PH 98	Silty CLAY,Residual Mudstone	TP372	2.4-2.5	26,6	168	26,6	6,5	
PH 99	Sandy Silty CLAY,Reworked Residual Mudstone	TP380	0.8-2.2	28,4	202	28,4	7,1	
PH 100	Silty CLAY,Residual Mudstone	TP390	1.5m	26,8	196	26,8	7,3	
PH 101	Silty SAND,Sandstone	TP396	0,50	27,6	168	27,6	6,3	
PH 102	Gravelly SAND,Residual Sandstone	TP655	0.0 – 0.5	26,8	196	26,8	6,4	
PH 103	Silty SAND,Residual Dolerite	TP66	0.7-1.2	28,6	191	28,6	6,4	
PH 104	Gravelly SAND,Fill	TP68	0.7-1.2	28,4	204	28,4	6,9	
PH 105	Silty SAND,Colluvium	TP9	0.00 – 0.20	27,9	132	27,9	6,8	
PH 106	Silty SAND,Colluvium	TP12	0.00 – 0.30	30	145	30,0	6,6	
PH 107	Silty SAND,Colluvium	TP13	0.00 – 0.30	26,8	168	26,8	6,3	
PH 108	Sandy CLAY,Residual Mudstone	TP21	0.50 – 1.10	26,8	206	26,8	6,6	
PH 109	Silty CLAY,AlluviumResidual Mudstone	TP411	1.5-2.9	27,6	208	27,6	6,8	
PH 110	Silty CLAY, Residual Mudstone	TP413	1,6	29,4	168	28,6	6,4	
PH 111	Silty CLAY,Colluviun	TP419	0.6-1.1	28,6	175	26,4	6,9	

Remarks :

The samples were subjected to analysis according to TMH 1
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060 727 8002

Roadlab Job RB7385
Client Mukuna Geotechnics (Pty)Ltd
Project Xhariep Pipeline Feasibility Study

ATTENTION Mr David Msiza

Test Report : **- pH & CONDUCTIVITY TEST RESULTS**

Clients Mark N10-9 (36,00 km -72,94km)
Sample deliv Roadlab Bloemfontein

Date Sampled: Not advised
Date Tested : 14-29 January 2025

Sample Number	Sample Origin	Test Pit Number	Depth mm	Temperature (°C) : Conductivity	Conductivity (ms/m)	Temperature (°C) :	pH Value	Remarks
PH 112	Silty CLAY, Residual Mudstone	TP452	1,5-2,5	26,8	186	26,8	6,9	
PH 113	SILT/SAND, Interbedded Sandstone/Mudstone	TP490	0,6-1,8	26,2	220	26,2	7,3	
PH 114	Silty SAND, Residual Dolerite	TP499	0,8-1,1	26,6	168	26,6	7,2	
PH 115	Silty CLAY, Residual Mudstone	TP511	1,50	31,0	194	31,0	6,8	
PH 116	Silty CLAY, Alluvium	TP541	1,00	27,0	186	27,0	7,6	
PH 117	Silty CLAY, Residual Mudstone	TP545	1,20	26,4	133	26,4	6,9	
PH 118	Silty CLAY,Alluvium	TP548	1,00	25,8	128	25,8	7,1	
PH 119	Silty SAND,Colluvium		1,20	26,2	196	26,2	7,3	

Remarks :
The samples were subjected to analysis according to TMH 1
The results reported relate only to the sample tested
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Compiled By : M A Tau

Appendix I - Soil Resistivity Test Results

Isinyithi Cathodic Protection

Company Reg # : 2002/002423/07
VAT# : 4570234502

P O Box 2905, Four Ways, 2055
13 Robin Drive, Fourways 2191
T: 011 465-1807
E: pipeline@isinyithi.co.za

CONFIDENTIAL REPORT

CLIENT : **Mukona Group Consulting Engineers**

PROJECT : **Gariep to Bloemfontein Pipeline**

SCOPE : **Soil Resistivity Survey**

DATE : **November 2024**

REFERENCE : **8245/241418**

Responsibility rests with the reader to verify that this is the latest revision

Report by: _____
R Badenhorst

Internal Review: _____
V Sealy - Fisher

Quality Verification

This report / document has been prepared under the quality controls established by Isinyithi's Quality Management System, which meets the requirements of the ISO 9001:2015 standard which has been certified by SACAS Certification under Certificate Number QMS00169 2022.

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No reference to the work or test results in any manner will be discussed or made public without written authorisation from the client;

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Job Title	Gariep to Bloemfontein Pipeline
Document title	**Soil Resistivity Survey**
Project Number	241618
Document Reference	**8245**

Revision	**Date**	**Revision Description**	Issued for Information	
0	November 2024		**Checked by**	**Checked by**
		Name	R Badenhorst	V Sealy - Fisher
		Signature		

List of Documents		
Isinyithi Document Reference number	**Description**	**Date**
8245/241618	Gariep to Bloemfontein Pipeline - Soil Resistivity	This report

List of Abbreviations	
Abbreviation	**Description**
CP	*Cathodic Protection*
GPS	*Global Positioning System*
Km	*Kilometre*
m	*metre*
Ω	*Ohm*
Ω·m	*Ohm metre*

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EXECUTIVE SUMMARY

Isinyithi Cathodic Protection (Pty) Ltd (Isinyithi) was appointed by Mukona Group Consulting Engineers to undertake Soil Corrosivity Surveys along the proposed pipeline route from Gariep Dam to Bloemfontein

- From the soil resistivity survey, it is evident that for almost 83% of the sections surveyed on the pipeline route, the pipelines traverses corrosive soils and cathodic protection is indicated.

Classification of Soil Resistivity				
Resistivity (Ω.m)	**Classification**		**Cathodic Protection Requirements**	**%**
≤ 20 Ω.m	Extremely corrosive		*Definitely required*	17
> 20 Ω.m but ≤ 50 Ω.m	Corrosive		*Definitely required*	42
> 50 Ω.m but ≤ 100 Ω.m	Mildly corrosive		*Usually required*	24
> 100 Ω.m	Not generally corrosive		***May be required*	17

1 INTRODUCTION

Isinyithi Cathodic Protection (Pty) Ltd (Isinyithi) was appointed by Mukona Group Consulting Engineers to undertake Soil Corrosivity Surveys along the proposed pipeline route from Gariep Dam to Bloemfontein in the Free State, South Africa.

In order to determine the corrosivity of the pipeline route, Isinyithi conducted a comprehensive soil resistivity survey along the pipeline route.

This report presents the results of the soil resistivity survey. The soil resistivity survey was conducted by Messrs E Malatji and J Machava of Isinyithi during October/November 2024.

2 APPLICABLE STANDARDS

The survey was conducted as per WB Holtsbaum “Cathodic Protection Survey Techniques” 2009 NACE.

3 LOCATION OF THE WORKS AND DESCRIPTION OF ROUTE

The pipeline route is approximately 260km in length. It starts at the Gariep Dam Hydro Power Station and routes Northeast towards Bloemfontein where it splits into two sections, the first section ending at proposed and existing reservoirs in the City of Bloemfontein and the second section ending at the Rustfontein Dam Water Treatment Works.

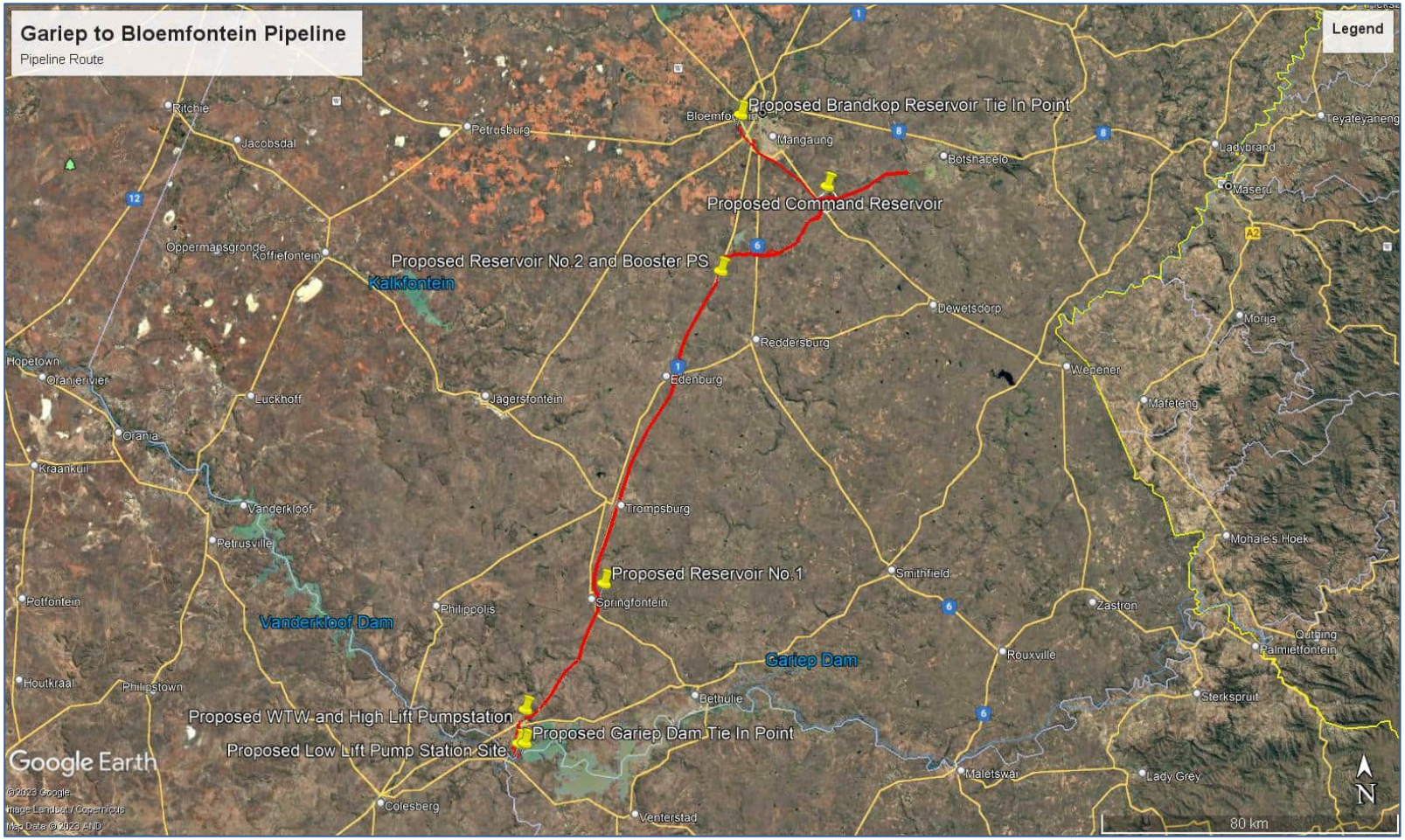

Figure 3-1: Pipeline Route – Gariep to Bloemfontein

4 SOIL RESISTIVITY SURVEY

4.1 Overview Soil Resistivity Survey

A soil resistivity survey is carried out in the field using the 4 - pin or Wenner technique. The method makes use of 4 short steel pins driven into the ground at equal spacings, equivalent to the invert depth of the pipeline being surveyed. Unless the pipeline is of particular large diameter, or is unusually deep, a pin spacing of 1,6m is generally used. A known current is then applied across the outer two pins, and the resultant potential difference is measured across the two inner pins. This can then be converted to a resistance between the two inner pins, which is read directly off the instrument.

The average resistivity of the soil to a depth equivalent to the pin spacings is calculated using the formula: -

$$\rho = 2\pi aR$$

where ρ = *resistivity (Ωm)*

a = *pin spacing (m)*

R = *measured resistance (Ω)*

The survey is normally carried out at between 100m and 500m intervals along the proposed pipeline route. Shorter or larger intervals are used at specific locations depending on site conditions.

4.2 Interpretation of Results

Soil resistivity provides an indication of the ability of the soil to conduct current. In high resistivity soils, corrosion currents are small or negligible; hence corrosion may not be significant. Low resistivity soils not only allow higher corrosion currents, but they are also often associated with high moisture contents and dissolved salts, which may be corrosive in themselves.

When steel pipelines are being considered, soil resistivity provides a reliable indicator regarding the requirement for cathodic protection.

The most commonly used classification for soil resistivity and the requirement for cathodic protection is given in the following table (courtesy: “Corrosion Control in Southern Africa”, 2nd Ed, 2004, Corrosion Institute of Southern Africa)

Table 4-1: Classification of Soil Resistivity

Classification of Soil Resistivity			
Resistivity (Ω.m)	**Classification**		**Cathodic Protection Requirements**
≤ 20 Ω.m	Extremely corrosive		*Definitely required*
> 20 Ω.m but ≤ 50 Ω.m	Corrosive		*Definitely required*
> 50 Ω.m but ≤ 100 Ω.m	Mildly corrosive		*Usually required*
> 100 Ω.m	Not generally corrosive		***May be required*

***Note:** High resistivity soils must still be regarded with caution, particularly if measurements are taken during the dry season. Seasonal ground water, sulphate reducing bacteria (SRB) and stray currents can give rise to significant corrosion problems irrespective of soil resistivity. Local cell action due to high variations in resistivity can also be problematic.

4.3 Soil Resistivity Results

The entire route was sampled at nominal 200m intervals. The results of the Gariep pipeline soil resistivity survey are presented both graphically and in tabulated form in the Appendices of this report. A KMZ with The results may be summarised as follows:

Table 4-2: Classification of Soil Resistivity Results

Classification of Soil Resistivity				
Resistivity (Ω.m)	**Classification**		**Cathodic Protection Requirements**	**%**
≤ 20 Ω.m	Extremely corrosive		*Definitely required*	17
> 20 Ω.m but ≤ 50 Ω.m	Corrosive		*Definitely required*	42
> 50 Ω.m but ≤ 100 Ω.m	Mildly corrosive		*Usually required*	24
> 100 Ω.m	Not generally corrosive		***May be required*	17

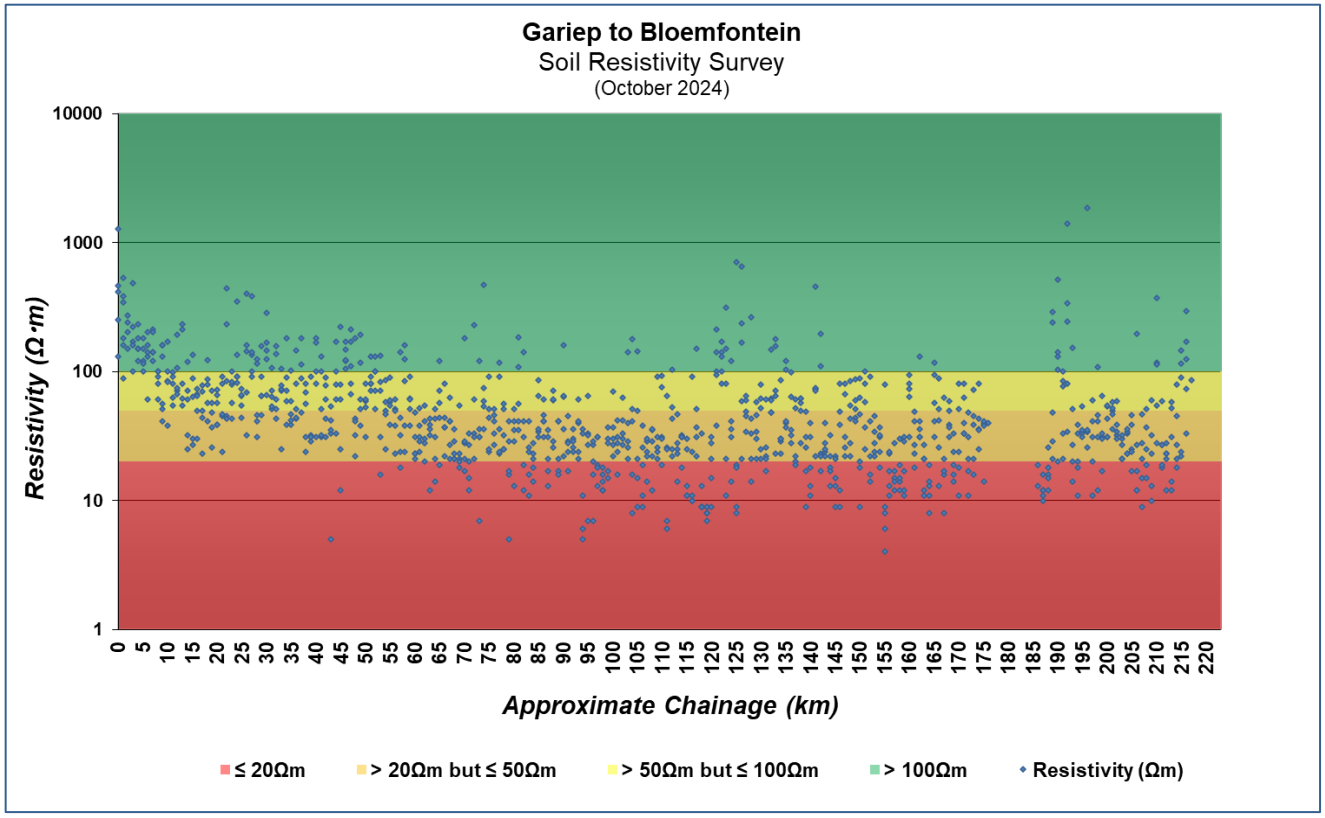

Figure 4-1: Graphical Representation of Soil Resistivity Results

From the data, approximately 83% of the sections surveyed on the pipeline route, traverse soils which can be classified as corrosive to buried steel. Those areas which are classified “not generally corrosive” display a significant variation in resistivity which will give rise to local corrosion.

It should be noted that the locations recorded on site were obtained using a handheld GPS (±1m accuracy). See electronically supplied KMZ file containing survey location, classification of the soil resistivity at a specific location and relevant comments.

5 CONCLUSION

- From the soil resistivity survey, it is evident that for almost 83% of the sections surveyed on the pipeline route, the pipeline traverses corrosive soils and cathodic protection is indicated.

6 APPENDICES

Appendix 1: Tabulated Soil Resistivity Results

Appendix 2: Graphical Representation of Soil Resistivity Data

Appendix 3: Geospatial Representation of Soil Resistivity Data

APPENDIX 1: TABULATED SOIL RESISTIVITY RESULTS

Approx Chainage	Point Reference	Latitude	Longitude	Pin Spacing (m)	Resistance (Ω)	Resistivity (Ω·m)	Comments
0.00	0001	30.625109S	25.500250E	1.6	41.00	413	rocky
0.20	0002	30.625751S	25.498177E	1.6	128.00	1287	rocky
0.40	0003	30.626235S	25.496140E	1.6	25.00	252	brown soil
0.60	0004	30.626660S	25.494006E	1.6	46.00	463	brown soil
0.80	0005	30.626957S	25.491997E	1.6	13.00	131	brown soil
1.00	0006	30.627216S	25.489905E	1.6	53.00	533	brown soil
1.20	0007	30.626473S	25.487972E	1.6	8.72	88	brown soil
1.40	0008	30.625373S	25.486381E	1.6	18.10	182	brown rocky soil
1.60	0009	30.624505S	25.484551E	1.6	38.00	383	brown soil rocky
1.80	0010	30.622737S	10952.376E	1.6	16.00	161	brown soil
2.00	0011	30.620883S	25.484176E	1.6	34.00	342	brown soil
2.20	0012	30.619147S	25.484876E	1.6	24.00	242	brown soil stoney
2.40	0013	30.617347S	25.485990E	1.6	20.00	202	brown soil stoney
2.60	0014	30.615776S	25.486666E	1.6	27.00	272	brown soil
2.80	0015	30.614053S	25.486668E	1.6	15.00	151	brown soil
3.00	0016	30.612608S	25.485373E	1.6	48.00	483	rocky
3.20	0017	30.612076S	25.483187E	1.6	22.00	222	brownish soil
3.40	0018	30.611020S	25.481600E	1.6	10.00	101	brownish soil
3.60	0019	30.609329S	25.480885E	1.6	17.00	171	brownish soil
3.80	0020	30.607457S	25.481119E	1.6	16.00	161	brownish
4.00	0021	30.605655S	25.481434E	1.6	15.00	151	brownish soil
4.20	0022	30.603895S	25.481777E	1.6	12.00	121	brownish soil
4.40	0023	30.602059S	25.482085E	1.6	23.00	232	brownish soil
4.60	0024	30.600254S	25.482696E	1.6	15.00	151	brownish soil
4.80	0025	30.598687S	25.483723E	1.6	18.00	181	brownish soil
5.00	0026	30.597200S	25.484992E	1.6	12.00	121	brown soil
5.20	0027	30.595656S	25.486317E	1.6	15.00	151	brownish soil
5.40	0028	30.594219S	25.487562E	1.6	18.00	181	brown soil
5.60	0029	30.592751S	25.488803E	1.6	10.00	101	brown soil
5.80	0030	30.591012S	25.489533E	1.6	11.42	115	brown soil
6.00	0031	30.589088S	25.489536E	1.6	13.00	131	brown soil
6.20	0032	30.587344S	25.489412E	1.6	6.00	61	Brown soil
6.40	0033	30.585486S	25.489431E	1.6	16.00	161	brown soil
6.60	0034	30.583656S	25.489379E	1.6	14.00	141	brown soil
6.80	0035	30.581814S	25.489341E	1.6	20.00	202	brown soil
7.00	0036	30.579924S	25.489763E	1.6	21.00	212	brown soil
7.20	0037	30.578242S	25.490314E	1.6	12.00	121	brown soil
7.40	0038	30.576436S	25.490946E	1.6	14.00	141	brown soil
7.60	0039	30.574771S	25.491524E	1.6	14.00	141	brown soil
7.80	0040	30.573010S	25.492121E	1.6	20.00	202	brown soil
8.00	0041	30.571232S	25.492736E	1.6	8.00	81	brown soil
8.20	0042	30.569487S	25.493319E	1.6	10.00	101	brown soil

Approx Chainage	Point Reference	Latitude	Longitude	Pin Spacing (m)	Resistance (Ω)	Resistivity (Ω·m)	Comments
8.40	0043	30.567683S	25.493942E	1.6	10.00	101	brown soil
8.60	0044	30.565953S	25.494552E	1.6	9.00	91	brown soil
8.80	0045	30.564070S	25.495197E	1.6	6.00	61	brown soil
9.00	0046	30.562307S	25.495799E	1.6	5.51	56	brown soil
9.20	0047	30.560591S	25.496376E	1.6	16.00	161	brown soil
9.40	0048	30.558885S	25.496974E	1.6	4.00	41	brown soil
9.60	0049	30.557097S	25.497323E	1.6	5.00	51	brown soil
9.80	0050	30.555263S	25.497005E	1.6	16.00	161	Brown soil
10.00	0051	30.553685S	25.496014E	1.6	13.00	131	Brown soil
10.20	0052	30.551978S	25.496158E	1.6	17.00	171	brown rocky area
10.40	0053	30.550202S	25.496821E	1.6	8.30	84	brown soil
10.60	0054	30.548786S	25.498165E	1.6	10.00	101	
10.80	0055	30.547654S	25.499829E	1.6	3.69	38	brown soil
11.00	0056	30.546545S	25.501546E	1.6	8.21	83	brown soil
11.20	0057	30.545519S	25.503273E	1.6	5.44	55	brown soil
11.40	0058	30.544500S	25.505015E	1.6	9.81	99	brown soil
11.60	0059	30.543472S	25.506757E	1.6	8.00	81	brown soil
11.80	0060	30.542438S	25.508494E	1.6	9.00	91	reddish stoney area
12.00	0061	30.541391S	25.510257E	1.6	6.24	63	reddish soil
12.20	0062	30.540349S	25.512036E	1.6	7.00	71	brownish soil
12.40	0063	30.539344S	25.513755E	1.6	10.57	107	brown stoney soil
12.60	0064	30.538343S	25.515483E	1.6	7.39	75	brown soil
12.80	0065	30.537512S	25.517335E	1.6	6.66	67	brownish soil
13.00	0066	30.537025S	25.519338E	1.6	19.00	192	reddish soil
13.20	0067	30.536567S	25.521352E	1.6	21.00	212	mountain roks
13.40	0068	30.536202S	25.523386E	1.6	23.00	232	reddish soil
13.60	0069	30.535777S	25.525400E	1.6	6.07	62	reddish soil
13.80	0070	30.535359S	25.527422E	1.6	8.00	81	reddish soil
14.00	0071	30.534953S	25.529453E	1.6	5.39	55	reddish soil
14.20	0072	30.534535S	25.531466E	1.6	2.47	25	reddish soil
14.40	0073	30.534023S	25.533497E	1.6	5.97	61	reddish soil
14.60	0074	30.533234S	25.535438E	1.6	11.91	120	reddish soil
14.80	0075	30.532125S	25.537144E	1.6	7.00	71	brown clay soil
15.00	0076	30.530855S	25.538727E	1.6	3.17	32	Clay soil
15.20	0077	30.529608S	25.540246E	1.6	8.73	88	clay soil
15.40	0078	30.528332S	25.541813E	1.6	13.23	134	brownish soil
15.60	0079	30.527132S	25.543342E	1.6	6.27	64	brownish soil
15.80	0080	30.525823S	25.544956E	1.6	2.62	27	clay soil
16.00	0081	30.524530S	25.546481E	1.6	2.95	30	reddish soil
16.20	0082	30.523312S	25.548048E	1.6	4.97	50	reddish soil
16.40	0083	30.522081S	25.549572E	1.6	2.91	30	reddish soil
16.60	0084	30.520871S	25.551104E	1.6	7.36	74	reddish soil
16.80	0085	30.519650S	25.552626E	1.6	6.62	67	reddish soil

Approx Chainage	Point Reference	Latitude	Longitude	Pin Spacing (m)	Resistance (Ω)	Resistivity (Ω·m)	Comments
17.00	0086	30.518423S	25.554143E	1.6	6.43	65	reddish soil
17.20	0087	30.517204S	25.555675E	1.6	4.94	50	reddish soil
17.40	0088	30.515980S	25.557219E	1.6	6.88	70	brownish soil
17.60	0089	30.514749S	25.558764E	1.6	2.19	23	reddish soil
17.80	0090	30.513522S	25.560280E	1.6	7.70	78	vlei / reddish soil
18.00	0091	30.512290S	25.561799E	1.6	4.28	44	brownish soil
18.20	0092	30.511056S	25.563372E	1.6	3.99	41	brownish soil
18.40	0093	30.509825S	25.564902E	1.6	12.09	122	brownish soil
18.60	0094	30.508596S	25.566459E	1.6	8.61	87	brownish / on top of hill
18.80	0095	30.507249S	25.567960E	1.6	5.58	57	brownish soil
19.00	0096	30.505853S	25.569299E	1.6	7.88	80	brownish soil
19.20	0097	30.504397S	25.570638E	1.6	7.02	71	brownish soil
19.40	0098	30.502977S	25.571962E	1.6	5.62	57	brownish soil
19.60	0099	30.501549S	25.573258E	1.6	4.77	48	brownish soil / hv cross
19.80	0100	30.500115S	25.574577E	1.6	2.55	26	brownish soil
20.00	0101	30.498648S	25.575908E	1.6	3.61	37	brownish soil
20.20	0102	30.497249S	25.577230E	1.6	5.59	57	brownish soil
20.40	0103	30.495836S	25.578574E	1.6	3.79	39	brownish soil
20.60	0104	30.494428S	25.579904E	1.6	3.87	39	brownish soil
20.80	0105	30.492982S	25.581259E	1.6	7.14	72	brownish soil
21.00	0106	30.491540S	25.582560E	1.6	6.49	66	brownish soil
21.20	0107	30.490118S	25.583920E	1.6	2.34	24	Clay Soil
21.40	0108	30.488719S	25.585260E	1.6	4.44	45	Clay Soil
21.60	0109	30.487299S	25.586540E	1.6	4.62	47	Clay Soil
21.80	0110	30.485888S	25.587861E	1.6	7.96	81	clay soil / rocky are
22.00	0111	30.484378S	25.589205E	1.6	9.00	91	brownish soil
22.20	0112	30.483022S	25.590547E	1.6	44.00	443	brownish soil / mountain ocks
22.40	0113	30.481519S	25.592032E	1.6	4.42	45	brownish soil
22.60	0114	30.480099S	25.593402E	1.6	8.45	85	brownish soil
22.80	0115	30.478341S	25.594259E	1.6	23.00	232	mountain / roks
23.00	0116	30.476741S	25.595295E	1.6	4.22	43	brownish soil
23.20	0117	30.475137S	25.596442E	1.6	10.00	101	brownish soil
23.40	0118	30.473607S	25.597604E	1.6	4.21	43	brownish soil
23.60	0119	30.472088S	25.598726E	1.6	7.78	79	brownish soil
23.80	0120	30.470540S	25.599929E	1.6	5.64	57	brownish soil
24.00	0121	30.468999S	25.601081E	1.6	8.20	83	brownish soil
24.20	0122	30.467457S	25.602268E	1.6	9.00	91	brownish soil
24.40	0123	30.465919S	25.603408E	1.6	8.09	82	brownish soil
24.60	0124	30.464421S	25.604570E	1.6	35.00	352	brownish soil
24.80	0125	30.462863S	25.605762E	1.6	13.52	136	brownish soil
25.00	0126	30.461346S	25.606905E	1.6	9.00	91	brownish soil / stoney

Approx Chainage	Point Reference	Latitude	Longitude	Pin Spacing (m)	Resistance (Ω)	Resistivity (Ω·m)	Comments
25.20	0127	30.459778S	25.608095E	1.6	6.44	65	brownish soil / stoney
25.40	0128	30.458264S	25.609228E	1.6	4.32	44	brownish soil / erodd
25.60	0129	30.456718S	25.610401E	1.6	5.42	55	brownish soil
25.80	0130	30.455168S	25.611573E	1.6	6.47	66	brownish soil
26.00	0131	30.453638S	25.612743E	1.6	7.31	74	brownish soil
26.20	0132	30.452107S	25.613906E	1.6	6.77	69	brownish soil
26.40	0133	30.450309S	25.615257E	1.6	3.13	32	brownish soil
26.60	0134	30.448753S	25.616414E	1.6	40.00	403	Rocky/ foot of mountain
26.80	0135	30.447229S	25.617626E	1.6	16.00	161	rocky
27.00	0136	30.445738S	25.618924E	1.6	14.14	143	brownish / stoney soil
27.20	0137	30.444110S	25.620424E	1.6	9.00	91	brownish soil / next to bridge
27.40	0138	30.442897S	25.621477E	1.6	13.25	134	brownish / stoney soil
27.60	0139	30.441480S	25.622763E	1.6	14.00	141	brownish soil
27.80	0140	30.439927S	25.624187E	1.6	38.00	383	mountain / rocky
28.00	0141	30.438244S	25.625669E	1.6	9.88	100	brownish soil
28.20	0142	30.436750S	25.627058E	1.6	4.00	41	brownish soil
28.40	0143	30.435314S	25.628319E	1.6	3.00	31	brownish soil
28.60	0144	30.433839S	25.629661E	1.6	11.53	116	brownish soil
28.80	0145	30.432397S	25.630953E	1.6	4.56	46	brownish soil
29.00	0146	30.430925S	25.632233E	1.6	12.35	125	brownish soil
29.20	0147	30.429485S	25.633546E	1.6	6.38	65	brownish soil
29.40	0148	30.428032S	25.634825E	1.6	4.52	46	brownish soil
29.60	0149	30.426595S	25.636147E	1.6	9.10	92	brownish soil
29.80	0150	30.425274S	25.637656E	1.6	6.39	65	brownish soil
30.00	0151	30.424131S	25.639250E	1.6	15.79	159	underlying rock
30.20	0152	30.422924S	25.640939E	1.6	28.40	286	brown soil / underlying rock
30.40	0153	30.421762S	25.642568E	1.6	6.53	66	brownish soil
30.60	0154	30.420599S	25.644200E	1.6	14.46	146	brown soil /stoney
30.80	0155	30.419455S	25.645802E	1.6	16.73	169	brown/ underlying rock
31.00	0156	30.418306S	25.647409E	1.6	12.35	125	brown soil/ rocky
31.20	0157	30.417117S	25.649068E	1.6	5.00	51	brownish soil
31.40	0158	30.415960S	25.650715E	1.6	5.32	54	brownish soil
31.60	0159	30.414771S	25.652389E	1.6	10.62	107	brownish soil
31.80	0160	30.413623S	25.653994E	1.6	7.00	71	brownish soil
32.00	0161	30.412460S	25.655624E	1.6	6.30	64	brownish soil
32.20	0162	30.411269S	25.657259E	1.6	15.71	158	brownish soil
32.40	0163	30.410115S	25.658902E	1.6	6.00	61	brownish soil
32.60	0164	30.408954S	25.660546E	1.6	5.00	51	brownish soil
32.80	0165	30.407684S	25.662377E	1.6	4.22	43	brownish soil
33.00	0166	30.406535S	25.663963E	1.6	13.58	137	brown soil/ stoney

Approx Chainage	Point Reference	Latitude	Longitude	Pin Spacing (m)	Resistance (Ω)	Resistivity (Ω·m)	Comments
33.20	0167	30.405370S	25.665551E	1.6	10.47	106	brownish soil/ stoney
33.40	0168	30.404242S	25.667170E	1.6	2.42	25	brownish soil
33.60	0169	30.403056S	25.668833E	1.6	7.03	71	brownish soil
33.80	0170	30.401758S	25.670339E	1.6	7.24	73	brownish soil
34.00	0171	30.400267S	25.671582E	1.6	7.70	78	rocky area/ mountain
34.20	0172	30.398567S	25.672318E	1.6	18.00	181	mountain/ Rocky
34.40	0173	30.396844S	25.672921E	1.6	8.86	90	brownish soil
34.60	0174	30.395087S	25.673454E	1.6	6.99	71	brownish soil
34.80	0175	30.393316S	25.674044E	1.6	3.86	39	brownish soil
35.00	0176	30.391568S	25.674646E	1.6	5.77	59	brownish soil
35.20	0177	30.389834S	25.675265E	1.6	3.87	39	brownish soil
35.40	0178	30.388105S	25.675901E	1.6	4.61	47	brownish soil
35.60	0179	30.386360S	25.676501E	1.6	5.82	59	brownish soil
35.80	0180	30.384588S	25.677116E	1.6	4.14	42	brownish soil
36.00	0181	30.382741S	25.677742E	1.6	10.10	102	brownish soil
36.20	0182	30.380971S	25.678352E	1.6	4.25	43	brownish soil
36.40	0183	30.379173S	25.678998E	1.6	4.28	44	brownish soil
36.60	0184	30.377436S	25.679598E	1.6	8.00	81	brownish soil
36.80	0185	30.375658S	25.680254E	1.6	14.54	147	brownish soil
37.00	0186	30.373925S	25.680832E	1.6	5.00	51	brown soil / rocky
37.20	0187	30.372203S	25.681431E	1.6	11.17	113	brownish soil / rocky
37.40	0188	30.370415S	25.682038E	1.6	4.72	48	brownish soil
37.60	0189	30.368708S	25.682800E	1.6	18.00	181	brown soil / rocky
37.80	0190	30.367001S	25.683617E	1.6	8.85	89	brownish soil
38.00	0191	30.365297S	25.684440E	1.6	6.86	69	brownish soil
38.20	0192	30.363593S	25.685254E	1.6	3.00	31	brownish soil
38.40	0193	30.361843S	25.686117E	1.6	2.34	24	brownish soil
38.60	0194	30.360152S	25.686945E	1.6	8.00	81	brownish soil
38.80	0195	30.358441S	25.687807E	1.6	5.54	56	clay soil
39.00	0196	30.356766S	25.688589E	1.6	9.07	92	brownish soil
39.20	0197	30.355043S	25.689435E	1.6	3.00	31	brownish soil / clay
39.40	0198	30.353352S	25.690231E	1.6	3.13	32	brown soil / clay
39.60	0199	30.351664S	25.691079E	1.6	2.80	29	brownish soil / clay
39.80	0200	30.349965S	25.691922E	1.6	3.00	31	brownish soil
40.00	0201	30.348282S	25.692744E	1.6	3.00	31	brownish soil
40.20	0202	30.346578S	25.693599E	1.6	10.00	101	brownish soil
40.40	0203	30.344938S	25.694424E	1.6	18.00	181	rocks h / hill
40.60	0204	30.343281S	25.695345E	1.6	16.65	168	brown soil / Rocky area
40.80	0205	30.341663S	25.696246E	1.6	8.01	81	brownish soil
41.00	0206	30.340034S	25.697110E	1.6	5.00	51	brownish soil
41.20	0207	30.338367S	25.698029E	1.6	3.00	31	brownish soil

Approx Chainage	Point Reference	Latitude	Longitude	Pin Spacing (m)	Resistance (Ω)	Resistivity (Ω·m)	Comments
41.40	0208	30.336766S	25.698923E	1.6	3.17	32	greyish Soil
41.60	0209	30.335079S	25.699846E	1.6	13.00	131	brown soil / stoney
41.80	0210	30.333453S	25.700759E	1.6	10.01	101	brownish soil / stoney
42.00	0211	30.331788S	25.701653E	1.6	7.68	78	brownish soil / stoney
42.20	0212	30.330119S	25.702578E	1.6	4.26	43	brownish soil
42.40	0213	30.328483S	25.703482E	1.6	8.95	90	brown soil / stoney
42.60	0214	30.326824S	25.704394E	1.6	6.00	61	brownish soil stoney /
42.80	0215	30.325149S	25.705313E	1.6	3.00	31	brownish soil
43.00	0216	30.323502S	25.706231E	1.6	5.36	54	brownish soil
43.20	0217	30.321846S	25.707129E	1.6	0.49	5	brownish / Clay soil
43.40	0218	30.320218S	25.708017E	1.6	3.28	33	brownish / Clay soil
43.60	0219	30.318506S	25.708963E	1.6	3.46	35	brownish / Clay soil
43.80	0220	30.316842S	25.709876E	1.6	4.12	42	brownish soil
44.00	0221	30.315209S	25.710787E	1.6	3.22	33	brownish soil
44.20	0222	30.313497S	25.711839E	1.6	17.00	171	top of hill / rocky
44.40	0223	30.311870S	25.712712E	1.6	10.00	101	brownish soil
44.60	0224	30.310218S	25.713758E	1.6	7.90	80	brownish soil
44.80	0225	30.308671S	25.714776E	1.6	6.00	61	brownish soil
45.00	0226	30.306997S	25.715817E	1.6	6.00	61	Clay soil
45.20	0227	30.305394S	25.716824E	1.6	1.17	12	Clay soil
45.40	0228	30.303806S	25.717813E	1.6	2.48	25	Clay soil
45.60	0229	30.302230S	25.718826E	1.6	7.92	80	brownish soil / stoney
45.80	0230	30.300625S	25.719849E	1.6	22.00	222	brownish soil / under laying rocks
46.00	0231	30.299019S	25.720870E	1.6	12.00	121	brownish soil / under laying rocks
46.20	0232	30.297416S	25.721863E	1.6	14.71	148	brownish soil
46.40	0233	30.295777S	25.722954E	1.6	10.49	106	brownish soil
46.60	0234	30.294142S	25.723943E	1.6	17.00	171	brownish soil
46.80	0235	30.292501S	25.724960E	1.6	12.07	122	brownish soil
47.00	0236	30.290829S	25.725981E	1.6	17.00	171	brownish soil
47.20	0237	30.289237S	25.726799E	1.6	21.00	212	brownish soil
47.40	0238	30.287467S	25.727210E	1.6	8.00	81	brownish soil
47.60	0239	30.285678S	25.727496E	1.6	11.00	111	brownish soil
47.80	0240	30.283889S	25.727772E	1.6	6.63	67	Clay soil
48.00	0241	30.282056S	25.728025E	1.6	4.21	43	Clay soil
48.20	0242	30.280267S	25.728287E	1.6	4.00	41	Clay oil
48.40	0243	30.27848SS	25.728557E	1.6	18.10	182	Clay soil
48.60	0244	30.276688S	25.728802E	1.6	3.12	32	clay sil
48.80	0245	30.274884S	25.729095E	1.6	2.10	22	clay soil
49.00	0246	30.273036S	25.729350E	1.6	6.00	61	clay Stoney soil
49.20	0247	30.271213S	25.729615E	1.6	3.72	38	clay soil
49.40	0248	30.269384S	25.729854E	1.6	11.73	118	clay soil

Approx Chainage	Point Reference	Latitude	Longitude	Pin Spacing (m)	Resistance (Ω)	Resistivity (Ω·m)	Comments
49.60	0249	30.267584S	25.730108E	1.6	5.01	51	brownish soil
49.80	0250	30.265785S	25.730382E	1.6	19.00	192	brownish soil stoney
50.00	0251	30.263946S	25.730617E	1.6	8.00	81	brownish soil
50.20	0252	30.262107S	25.730702E	1.6	5.78	59	brownish soil
50.40	0253	30.260280S	25.730497E	1.6	3.00	31	brownish soil
50.60	0254	30.258488S	25.730035E	1.6	5.18	53	brownish soil
50.80	0255	30.256714S	25.729493E	1.6	6.00	61	brownish soil
51.00	0256	30.251718S	25.728005E	1.6	13.00	131	brownish / spring fontein offtake
51.20	0257	30.250491S	25.729550E	1.6	8.00	81	clay soil
51.40	0258	30.249284S	25.731097E	1.6	8.00	81	clay soil stoney
51.60	0259	30.248073S	25.732634E	1.6	9.00	91	brown rocky soil
51.80	0260	30.247096S	25.734366E	1.6	7.00	71	reddish soil
52.00	0261	30.246281S	25.735839E	1.6	10.00	101	brownish soil
52.20	0262	30.247927S	25.736669E	1.6	13.00	131	reddish soil
52.40	0263	30.249601S	25.737473E	1.6	7.00	71	reddish soil
52.60	0264	30.250071S	25.737709E	1.6	10.00	101	spring field reservoir / reddish soil
52.80	0265	30.254944S	25.728965E	1.6	5.00	51	brownish soil
53.00	0266	30.253180S	25.728417E	1.6	8.23	83	brownish soil
53.20	0267	30.251361S	25.727865E	1.6	7.00	71	brownish soil
53.40	0268	30.249581S	25.727310E	1.6	3.00	31	brownish soil
53.60	0269	30.247811S	25.726757E	1.6	1.59	16	clay soil
53.80	0270	30.246033S	25.726210E	1.6	13.13	132	clay soil
54.00	0271	30.244285S	25.725674E	1.6	2.39	25	clay soil
54.20	0272	30.242509S	25.725142E	1.6	5.75	58	clay soil
54.40	0273	30.240733S	25.724588E	1.6	4.89	50	clay soil
54.60	0274	30.238952S	25.724069E	1.6	4.60	47	clay soil
54.80	0275	30.237173S	25.723501E	1.6	8.50	86	brownish soil
55.00	0276	30.235407S	25.722952E	1.6	5.67	58	brownish soil
55.20	0277	30.233637S	25.722408E	1.6	8.88	90	brownish soil
55.40	0278	30.231897S	25.721898E	1.6	5.87	60	brownish soil
55.60	0279	30.230081S	25.721532E	1.6	5.39	55	brownish soil
55.80	0280	30.228243S	25.721450E	1.6	3.83	39	brownish soil
56.00	0281	30.22644SS	25.721481E	1.6	2.26	23	brownish soil
56.20	0282	30.224631S	25.721556E	1.6	3.71	38	brownish soil
56.40	0283	30.222779S	25.721599E	1.6	5.00	51	brownish soil
56.60	0284	30.220921S	25.721660E	1.6	6.00	61	brownish soil
56.80	0285	30.219088S	25.721714E	1.6	4.93	50	brownish soil
57.00	0286	30.217272S	25.721792E	1.6	1.72	18	wetland
57.20	0287	30.215466S	25.721854E	1.6	3.17	32	brownish soil
57.40	0288	30.213664S	25.721900E	1.6	2.29	24	brownish soil
57.60	0289	30.211818S	25.721964E	1.6	4.34	44	brownish soil

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57.80	0290	30.209981S	25.722010E	1.6	14.01	141	brownish soil
58.00	0291	30.208121S	25.722145E	1.6	15.84	160	brownish soil
58.20	0292	30.206311S	25.722492E	1.6	3.74	38	brownish soil
58.40	0293	30.204553S	25.723003E	1.6	2.34	24	brownish soil
58.60	0294	30.202758S	25.723543E	1.6	8.34	84	brownish soil
58.80	0295	30.200989S	25.724088E	1.6	12.33	124	brownish soil
59.00	0296	30.199212S	25.724615E	1.6	3.77	38	brownish soil
59.20	0297	30.197441S	25.725146E	1.6	5.00	51	brownish soil
59.40	0298	30.195672S	25.725714E	1.6	9.00	91	brownish soil
59.60	0299	30.193877S	25.726242E	1.6	6.12	62	brownish soil
59.80	0300	30.192102S	25.726793E	1.6	6.00	61	brownish soil
60.00	0301	30.190400S	25.727261E	1.6	2.26	23	brownish soil /
60.20	0302	30.188585S	25.727822E	1.6	4.68	48	brownish soil /
60.40	0303	30.186828S	25.728357E	1.6	3.00	31	brownish soil /
60.60	0304	30.185064S	25.728891E	1.6	2.22	23	brownish soil /
60.80	0305	30.183323S	25.729398E	1.6	2.03	21	brownish soil /
61.00	0306	30.181566S	25.729889E	1.6	2.34	24	brownish soil /
61.20	0307	30.179770S	25.730483E	1.6	3.00	31	brownish soil /
61.40	0308	30.178015S	25.731017E	1.6	2.84	29	brownish soil /
61.60	0309	30.176247S	25.731596E	1.6	3.71	38	brownish soil /
61.80	0310	30.174491S	25.732241E	1.6	5.17	52	brownish soil / stoney
62.00	0311	30.172825S	25.733033E	1.6	5.44	55	brownish soil / stoney
62.20	0312	30.171121S	25.733839E	1.6	4.00	41	brownish soil /
62.40	0313	30.169413S	25.734679E	1.6	2.95	30	brownish soil /
62.60	0314	30.167748S	25.735482E	1.6	2.72	28	brownish soil /
62.80	0315	30.166061S	25.736348E	1.6	1.98	20	clay soil /
63.00	0316	30.164353S	25.737195E	1.6	1.13	12	clay soil /
63.20	0317	30.162680S	25.738013E	1.6	3.53	36	Clay soil /
63.40	0318	30.160940S	25.738877E	1.6	3.87	39	reddish soil /
63.60	0319	30.159343S	25.739657E	1.6	4.20	43	brownish soil /
63.80	0320	30.157698S	25.740498E	1.6	3.18	32	brownish soil /
64.00	0321	30.155975S	25.741333E	1.6	2.00	21	brownish soil /
64.20	0322	30.154330S	25.742183E	1.6	3.00	31	brownish soil /
64.40	0323	30.152675S	25.743011E	1.6	1.32	14	brownish soil /
64.60	0324	30.150950S	25.743849E	1.6	5.05	51	brownish soil /
64.80	0325	30.149268S	25.744699E	1.6	4.21	43	brownish soil /
65.00	0326	30.147591S	25.745524E	1.6	4.31	44	brownish soil /
65.20	0327	30.145945S	25.746348E	1.6	1.87	19	brownish soil /
65.40	0328	30.144282S	25.747128E	1.6	7.03	71	brownish soil / stoney
65.60	0329	30.142609S	25.747993E	1.6	11.94	121	brownish soil /
65.80	0330	30.140914S	25.748827E	1.6	5.61	57	brownish soil /
66.00	0331	30.139216S	25.749665E	1.6	4.34	44	brownish soil /

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66.20	0332	30.137528S	25.750501E	1.6	2.18	22	brownish soil /
66.40	0333	30.135858S	25.751325E	1.6	3.61	37	brownish soil /
66.60	0334	30.134149S	25.752175E	1.6	8.04	81	brownish soil /
66.80	0335	30.132458S	25.753019E	1.6	3.63	37	brownish soil /
67.00	0336	30.130788S	25.753852E	1.6	4.00	41	brownish soil /
67.20	0337	30.129122S	25.754676E	1.6	2.62	27	brownish soil /
67.40	0338	30.127408S	25.755494E	1.6	2.00	21	brownish soil /
67.60	0339	30.125697S	25.756307E	1.6	6.24	63	brownish soil /
67.80	0340	30.123979S	25.757038E	1.6	4.00	41	brownish soil /
68.00	0341	30.122253S	25.757747E	1.6	2.87	29	brownish soil /
68.20	0342	30.120521S	25.758485E	1.6	3.52	36	brownish soil /
68.40	0343	30.118816S	25.759228E	1.6	2.27	23	brownish soil /
68.60	0344	30.117077S	25.759962E	1.6	2.00	21	brownish soil /
68.80	0345	30.115346S	25.760686E	1.6	2.07	21	brownish soil /
69.00	0346	30.113594S	25.761417E	1.6	1.77	18	clay soil /
69.20	0347	30.111841S	25.762165E	1.6	2.00	21	Clay soil /
69.40	0348	30.110112S	25.762891E	1.6	2.28	23	clay soil /
69.60	0349	30.108396S	25.763614E	1.6	1.91	20	clay soil /
69.80	0350	30.106674S	25.764333E	1.6	5.42	55	Clay soil /
70.00	0351	30.104928S	25.765062E	1.6	2.76	28	clay soil /
70.20	0352	30.103207S	25.765814E	1.6	2.01	21	clay soil /
70.40	0353	30.101413S	25.766594E	1.6	18.00	181	brown soil / top uphill
70.60	0354	30.099714S	25.767294E	1.6	2.82	29	/
70.80	0355	30.097983S	25.768021E	1.6	1.63	17	brownish soil /
71.00	0356	30.096280S	25.768742E	1.6	1.18	12	brownish soil
71.20	0357	30.094538S	25.769472E	1.6	1.45	15	brownish soil
71.40	0358	30.092803S	25.770195E	1.6	1.98	20	brownish soil
71.60	0359	30.091085S	25.770922E	1.6	2.63	27	brownish soil
71.80	0360	30.089357S	25.771639E	1.6	3.25	33	brownish soil
72.00	0361	30.087645S	25.772361E	1.6	22.70	229	brownish soil for
72.20	0362	30.085945S	25.773077E	1.6	3.22	33	brownish soil
72.40	0363	30.084208S	25.773818E	1.6	2.00	21	brownish soil
72.60	0364	30.082483S	25.774552E	1.6	6.00	61	brownish soil
72.80	0365	30.080747S	25.775272E	1.6	3.00	31	brownish soil
73.00	0366	30.079043S	25.775997E	1.6	12.00	121	brownish soil
73.20	0367	30.077325S	25.776717E	1.6	3.00	31	brownish soil
73.40	0368	30.075605S	25.777442E	1.6	3.00	31	brownish soil
73.60	0369	30.073869S	25.778170E	1.6	0.67	7	brownish soil
73.80	0370	30.072151S	25.778897E	1.6	3.54	36	brownish soil
74.00	0371	30.070434S	25.779642E	1.6	47.00	473	top of hill / rocky
74.20	0372	30.068719S	25.780343E	1.6	7.38	75	brown rocky soil
74.40	0373	30.066988S	25.781081E	1.6	3.52	36	brownish soil
74.60	0374	30.065253S	25.781806E	1.6	5.78	59	brownish soil

Approx Chainage	Point Reference	Latitude	Longitude	Pin Spacing (m)	Resistance (Ω)	Resistivity (Ω·m)	Comments
74.80	0375	30.063509S	25.782527E	1.6	5.32	54	brownish soil
75.00	0376	30.061832S	25.783236E	1.6	9.05	91	brownish soil
75.20	0377	30.060090S	25.783966E	1.6	4.32	44	brownish soil
75.40	0378	30.058395S	25.784677E	1.6	5.00	51	brownish soil
75.60	0379	30.056665S	25.785407E	1.6	2.38	24	brownish soil
75.80	0380	30.054919S	25.786131E	1.6	2.44	25	brownish soil
76.00	0381	30.053221S	25.786861E	1.6	4.52	46	brownish soil
76.20	0382	30.051499S	25.787585E	1.6	3.19	33	brownish soil
76.40	0383	30.049785S	25.788308E	1.6	4.07	41	brownish soil
76.60	0384	30.048058S	25.789036E	1.6	5.00	51	brownish soil
76.80	0385	30.046334S	25.789751E	1.6	2.62	27	brownish soil
77.00	0386	30.044564S	25.790506E	1.6	3.56	36	brownish soil
77.20	0387	30.042853S	25.791246E	1.6	2.23	23	brownish soil
77.40	0388	30.041140S	25.792009E	1.6	2.30	24	brownish soil
77.60	0389	30.039428S	25.792643E	1.6	11.68	118	brownish soil
77.80	0390	30.037729S	25.793310E	1.6	9.00	91	brownish soil
78.00	0391	30.036036S	25.794053E	1.6	5.00	51	brownish soil
78.20	0392	30.034327S	25.794800E	1.6	5.53	56	brownish soil / stoney
78.40	0393	30.032618S	25.795485E	1.6	3.16	32	brownish soil
78.60	0394	30.030891S	25.796200E	1.6	2.39	25	brownish soil
78.80	0395	30.029141S	25.796938E	1.6	2.45	25	brownish soil
79.00	0396	30.027442S	25.797656E	1.6	4.04	41	brownish soil
79.20	0397	30.025693S	25.798386E	1.6	1.55	16	brownish soil
79.40	0398	30.023957S	25.799097E	1.6	0.49	5	brownish soil
79.60	0399	30.022251S	25.799812E	1.6	2.79	29	dark Clay
79.80	0400	30.020547S	25.800509E	1.6	1.60	17	dark Clay soil
80.00	0401	30.018856S	25.801222E	1.6	5.00	51	brownish soil
80.20	0402	30.017105S	25.801967E	1.6	4.00	41	brownish soil
80.40	0403	30.015374S	25.802687E	1.6	1.26	13	clay soil
80.60	0404	30.013646S	25.803399E	1.6	2.79	29	clay soil
80.80	0405	30.011917S	25.804111E	1.6	3.42	35	clay soil
81.00	0406	30.010180S	25.804840E	1.6	10.68	108	brownish soil / stoney
81.20	0407	30.008474S	25.805574E	1.6	18.40	185	brownish soil
81.40	0408	30.006758S	25.806301E	1.6	5.48	56	brownish soil
81.60	0409	30.005016S	25.807012E	1.6	3.47	35	brownish soil
81.80	0410	30.003289S	25.807734E	1.6	4.00	41	brownish soil
82.00	0411	30.001564S	25.808467E	1.6	14.00	141	brownish soil stoney
82.20	0412	29.999838S	25.809143E	1.6	3.98	41	brownish soil
82.40	0413	29.998104S	25.809875E	1.6	1.12	12	brownish soil stoney
82.60	0414	29.996255S	25.810608E	1.6	1.87	19	clay soil
82.80	0415	29.994570S	25.811371E	1.6	2.99	31	clay soil
83.00	0416	29.992812S	25.812107E	1.6	1.01	11	clay soil

Approx Chainage	Point Reference	Latitude	Longitude	Pin Spacing (m)	Resistance (Ω)	Resistivity (Ω·m)	Comments
83.20	0417	29.991097S	25.812823E	1.6	1.57	16	Clay Soil
83.40	0418	29.989366S	25.813545E	1.6	2.29	24	clay soil
83.60	0419	29.987618S	25.814259E	1.6	2.49	26	clay soil
83.80	0420	29.985894S	25.814972E	1.6	4.05	41	clay soil
84.00	0421	29.984119S	25.815709E	1.6	2.05	21	Clay Soil
84.20	0422	29.982400S	25.816426E	1.6	1.71	18	clay soil
84.40	0423	29.980672S	25.817142E	1.6	2.70	28	clay soil
84.60	0424	29.978932S	25.817858E	1.6	1.37	14	clay soil
84.80	0425	29.977241S	25.818559E	1.6	2.23	23	clay soil
85.00	0426	29.975510S	25.819294E	1.6	3.00	31	clay soil
85.20	0427	29.973780S	25.819991E	1.6	3.31	34	brownish soil
85.40	0428	29.972061S	25.820717E	1.6	8.55	86	brownish soil stoney
85.60	0429	29.970347S	25.821453E	1.6	6.42	65	brownish soil / rocky
85.80	0430	29.968628S	25.822154E	1.6	3.55	36	clay soil
86.00	0431	29.966884S	25.822881E	1.6	4.56	46	clay soil
86.20	0432	29.965192S	25.823639E	1.6	2.99	31	clay soil
86.40	0433	29.963487S	25.824294E	1.6	4.00	41	clay soil
86.60	0434	29.961783S	25.824945E	1.6	4.00	41	clay soil
86.80	0435	29.959941S	25.825687E	1.6	6.00	61	brownish soil stoney
87.00	0436	29.958276S	25.826556E	1.6	2.00	21	brownish soil
87.20	0437	29.956552S	25.827201E	1.6	1.23	13	brownish soil / concrete all over
87.40	0438	29.954817S	25.827897E	1.6	3.00	31	brownish soil stoney
87.60	0439	29.953121S	25.828626E	1.6	1.60	17	brownish soil stoney
87.80	0440	29.951380S	25.829333E	1.6	3.42	35	brownish soil
88.00	0441	29.949661S	25.830055E	1.6	7.00	71	brownish soil stoney
88.20	0442	29.947951S	25.830782E	1.6	5.95	60	brownish soil
88.40	0443	29.946211S	25.831493E	1.6	6.00	61	brownish soil
88.60	0444	29.944490S	25.832216E	1.6	2.53	26	brownish soil
88.80	0445	29.942755S	25.832922E	1.6	2.80	29	brownish soil
89.00	0446	29.941050S	25.833614E	1.6	4.00	41	brownish soil
89.20	0447	29.939310S	25.834352E	1.6	4.00	41	brownish soil
89.40	0448	29.937572S	25.835066E	1.6	1.63	17	brownish soil
89.60	0449	29.935873S	25.835884E	1.6	1.54	16	brownish soil
89.80	0450	29.934231S	25.836832E	1.6	2.00	21	brownish soil
90.00	0451	29.932618S	25.837920E	1.6	3.54	36	brownish soil
90.20	0452	29.931041S	25.838909E	1.6	2.18	22	brownish soil
90.40	0453	29.929432S	25.839947E	1.6	6.34	64	brownish soil
90.60	0454	29.927867S	25.840999E	1.6	16.00	161	brownish soil stoney
90.80	0455	29.926304S	25.842005E	1.6	6.38	65	brownish soil
91.00	0456	29.924695S	25.843011E	1.6	4.47	45	Clay soil

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91.20	0457	29.923058S	25.844024E	1.6	2.85	29	clay soil
91.40	0458	29.921463S	25.845046E	1.6	2.72	28	clay soil
91.60	0459	29.919890S	25.846063E	1.6	1.60	17	clay soil
91.80	0460	29.918303S	25.847099E	1.6	2.34	24	clay soil
92.00	0461	29.916698S	25.848112E	1.6	3.53	36	clay soil
92.20	0462	29.915080S	25.849132E	1.6	2.90	30	Clay soil
92.40	0463	29.913472S	25.850201E	1.6	2.86	29	brownish soil stoney
92.60	0464	29.911858S	25.851210E	1.6	2.54	26	brownish soil stoney
92.80	0465	29.910280S	25.852250E	1.6	2.36	24	brownish soil
93.00	0466	29.908710S	25.853236E	1.6	3.96	40	brownish soil
93.20	0467	29.907081S	25.854270E	1.6	4.04	41	brownish soil
93.40	0468	29.905485S	25.855301E	1.6	2.00	21	brownish soil
93.60	0469	29.903847S	25.856338E	1.6	2.32	24	brownish soil
93.80	0470	29.902250S	25.857390E	1.6	6.00	61	brownish soil
94.00	0471	29.900651S	25.858380E	1.6	3.56	36	brownish soil
94.20	0472	29.899048S	25.859427E	1.6	3.27	33	clay soil
94.40	0473	29.897436S	25.860479E	1.6	1.03	11	clay soil
94.60	0474	29.895817S	25.861510E	1.6	0.42	5	Clay soil
94.80	0475	29.894242S	25.862539E	1.6	0.53	6	clay soil
95.00	0476	29.892626S	25.863562E	1.6	0.64	7	clay soil
95.20	0477	29.890983S	25.864615E	1.6	6.46	65	clay soil
95.40	0478	29.889403S	25.865629E	1.6	3.27	33	clay soil
95.60	0479	29.887796S	25.866653E	1.6	2.68	27	clay soil
95.80	0480	29.886193S	25.867684E	1.6	3.09	32	clay soil
96.00	0481	29.884574S	25.868703E	1.6	1.59	16	clay soil
96.20	0482	29.883000S	25.869725E	1.6	2.64	27	clay soil
96.40	0483	29.881364S	25.870778E	1.6	0.64	7	clay soil
96.60	0484	29.879768S	25.871801E	1.6	2.84	29	clay soil
96.80	0485	29.878156S	25.872849E	1.6	1.89	20	clay soil
97.00	0486	29.876561S	25.873859E	1.6	1.81	19	clay soil
97.20	0487	29.874975S	25.874890E	1.6	1.25	13	clay soil
97.40	0488	29.873328S	25.875942E	1.6	1.75	18	clay soil
97.60	0489	29.871730S	25.876930E	1.6	3.00	31	clay soil
97.80	0490	29.870132S	25.877974E	1.6	3.00	31	clay soil
98.00	0491	29.868533S	25.878998E	1.6	1.19	12	clay soil
98.20	0492	29.866956S	25.880018E	1.6	1.12	12	clay soil
98.40	0493	29.865325S	25.881054E	1.6	1.58	16	clay soil
98.60	0494	29.863721S	25.882061E	1.6	1.38	14	clay soil
98.80	0495	29.862098S	25.883111E	1.6	1.75	18	clay soil
99.00	0496	29.860490S	25.884156E	1.6	1.63	17	Clay Soil
99.20	0497	29.858883S	25.885181E	1.6	3.62	37	reddish soil
99.40	0498	29.857316S	25.886189E	1.6	2.91	30	reddish soil

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99.60	0499	29.855715S	25.887215E	1.6	2.76	28	brownish soil
99.80	0500	29.854108S	25.888254E	1.6	1.49	15	clay soil
100.00	0501	29.852540S	25.889374E	1.6	2.15	22	clay soil
100.20	0502	29.851065S	25.890567E	1.6	6.87	70	stoney clay soil
100.40	0503	29.849610S	25.891784E	1.6	3.60	37	clay soil
100.60	0504	29.848150S	25.893017E	1.6	2.91	30	clay soil
100.80	0505	29.846610S	25.894271E	1.6	2.66	27	clay soil stoney
101.00	0506	29.845102S	25.895503E	1.6	2.36	24	Clay soil
101.20	0507	29.843611S	25.896742E	1.6	4.12	42	clay soil stoney
101.40	0508	29.842130S	25.897970E	1.6	2.76	28	clay soil stoney
101.60	0509	29.840596S	25.899229E	1.6	1.53	16	clay soil
101.80	0510	29.839151S	25.900432E	1.6	3.02	31	clay soil
102.00	0511	29.837634S	25.901665E	1.6	2.93	30	brownish soil
102.20	0512	29.836146S	25.902898E	1.6	2.62	27	brownish soil
102.40	0513	29.834646S	25.904143E	1.6	6.26	63	brownish soil
102.60	0514	29.833153S	25.905370E	1.6	4.15	42	brownish soil
102.80	0515	29.831678S	25.906599E	1.6	3.23	33	brownish soil
103.00	0516	29.830190S	25.907817E	1.6	2.86	29	brownish soil
103.20	0517	29.828712S	25.909054E	1.6	2.50	26	brownish soil
103.40	0518	29.827214S	25.910291E	1.6	3.88	40	clay soil
103.60	0519	29.825679S	25.911572E	1.6	14.12	142	brownish stoney soil / 8meters out of fence
103.80	0520	29.824205S	25.912793E	1.6	1.99	21	brownish soil
104.00	0521	29.822688S	25.914048E	1.6	5.00	51	clay soil
104.20	0522	29.821194S	25.915305E	1.6	1.58	16	clay soil
104.40	0523	29.819715S	25.916523E	1.6	0.78	8	clay soil
104.60	0524	29.818243S	25.917702E	1.6	4.00	41	Clay soil
104.80	0525	29.816732S	25.918936E	1.6	17.80	179	reddish soil stoney
105.00	0526	29.815246S	25.920165E	1.6	14.20	143	reddish soil stoney
105.20	0527	29.813759S	25.921410E	1.6	4.89	50	brownish soil
105.40	0528	29.812267S	25.922637E	1.6	2.07	21	brownish soil
105.60	0529	29.810818S	25.923851E	1.6	1.46	15	clay soil
105.80	0530	29.809346S	25.925055E	1.6	0.81	9	clay soil
106.00	0531	29.807844S	25.926317E	1.6	0.86	9	clay soil
106.20	0532	29.806356S	25.927573E	1.6	1.07	11	Clay soil
106.40	0533	29.804856S	25.928796E	1.6	1.84	19	dark clay
106.60	0534	29.803399S	25.930012E	1.6	3.74	38	Clay soil
106.80	0535	29.801966S	25.931380E	1.6	2.55	26	clay soil
107.00	0536	29.800432S	25.932541E	1.6	2.33	24	brownish soil
107.20	0537	29.798897S	25.933690E	1.6	2.87	29	brownish soil
107.40	0538	29.797410S	25.934917E	1.6	2.95	30	brownish soil
107.60	0539	29.795902S	25.936165E	1.6	2.15	22	brownish soil
107.80	0540	29.794423S	25.937355E	1.6	1.34	14	brownish soil

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108.00	0541	29.792905S	25.938604E	1.6	2.86	29	brownish soil
108.20	0542	29.791441S	25.939854E	1.6	2.13	22	brownish soil
108.40	0543	29.789963S	25.941055E	1.6	1.18	12	clay soil
108.60	0544	29.788514S	25.942262E	1.6	3.45	35	brownish soil
108.80	0545	29.787005S	25.943518E	1.6	3.51	36	brownish soil
109.00	0546	29.785507S	25.944751E	1.6	2.34	24	brownish soil
109.20	0547	29.784013S	25.945990E	1.6	2.51	26	brownish soil
109.40	0548	29.782525S	25.947214E	1.6	9.07	92	brownish soil
109.60	0549	29.781047S	25.948447E	1.6	2.00	21	brownish soil
109.80	0550	29.779551S	25.949587E	1.6	3.07	31	brownish soil
110.00	0551	29.777907S	25.950587E	1.6	9.18	93	brownish soil
110.20	0552	29.776291S	25.951559E	1.6	3.00	31	brownish soil
110.40	0553	29.774523S	25.952286E	1.6	2.90	30	Clay soil
110.60	0554	29.772305S	25.952868E	1.6	7.54	76	brownish soil
110.80	0555	29.770985S	25.953450E	1.6	1.83	19	brownish soil
111.00	0556	29.769213S	25.953971E	1.6	2.54	26	brownish soil
111.20	0557	29.767419S	25.954522E	1.6	6.39	65	brownish soil
111.40	0558	29.765643S	25.955039E	1.6	2.42	25	brownish soil
111.60	0559	29.763862S	25.955572E	1.6	0.59	6	brownish soil
111.80	0560	29.762084S	25.956095E	1.6	0.64	7	Clay soil
112.00	0561	29.760298S	25.956615E	1.6	4.21	43	clay soil
112.20	0562	29.758507S	25.957155E	1.6	10.22	103	brownish soil
112.40	0563	29.756770S	25.957682E	1.6	5.22	53	brownish soil
112.60	0564	29.754958S	25.958214E	1.6	2.46	25	clay soil
112.80	0565	29.753167S	25.958756E	1.6	2.11	22	clay soil
113.00	0566	29.751394S	25.959278E	1.6	1.31	14	clay soil
113.20	0567	29.749619S	25.959812E	1.6	4.65	47	brownish soil
113.40	0568	29.747835S	25.960340E	1.6	2.48	25	brownish soil
113.60	0569	29.746077S	25.960871E	1.6	2.75	28	brownish soil
113.80	0570	29.744287S	25.961405E	1.6	2.26	23	brownish soil
114.00	0571	29.742499S	25.961926E	1.6	3.10	32	brownish soil
114.20	0572	29.740699S	25.962461E	1.6	3.04	31	clay soil
114.40	0573	29.738943S	25.963008E	1.6	3.07	31	clay soil
114.60	0574	29.737162S	25.963550E	1.6	1.71	18	clay soil
114.80	0575	29.735423S	25.964092E	1.6	3.00	31	clay soil
115.00	0576	29.733434S	25.964674E	1.6	2.92	30	clay soil
115.20	0577	29.731703S	25.965167E	1.6	2.41	25	clay soil
115.40	0578	29.729992S	25.965758E	1.6	1.03	11	clay soil
115.60	0579	29.728168S	25.966198E	1.6	1.00	11	clay soil
115.80	0580	29.726378S	25.966727E	1.6	1.22	13	Clay soil
116.00	0581	29.724615S	25.967254E	1.6	2.35	24	clay soil
116.20	0582	29.722818S	25.967801E	1.6	0.96	10	clay soil
116.40	0583	29.721056S	25.968334E	1.6	0.93	10	clay soil

Approx Chainage	Point Reference	Latitude	Longitude	Pin Spacing (m)	Resistance (Ω)	Resistivity (Ω·m)	Comments
116.60	0584	29.719281S	25.968839E	1.6	1.03	11	clay soil
116.80	0585	29.717500S	25.969386E	1.6	9.00	91	stoney clay soil
117.00	0586	29.715728S	25.969916E	1.6	3.59	37	brownish soil
117.20	0587	29.713941S	25.970433E	1.6	2.17	22	clay soil
117.40	0588	29.712162S	25.970958E	1.6	3.01	31	clay soil
117.60	0589	29.710441S	25.971301E	1.6	15.00	151	brownish soil stoney
117.80	0590	29.708576S	25.972033E	1.6	5.07	51	brownish soil stoney
118.00	0591	29.706810S	25.972549E	1.6	3.19	33	clay soil
118.20	0592	29.705016S	25.973091E	1.6	0.88	9	clay soil
118.40	0593	29.703233S	25.973609E	1.6	0.88	9	clay soil
118.60	0594	29.701474S	25.974125E	1.6	0.89	9	clay soil
118.80	0595	29.699724S	25.974691E	1.6	1.25	13	clay soil
119.00	0596	29.697967S	25.975160E	1.6	0.88	9	clay soil
119.20	0597	29.696147S	25.975695E	1.6	0.70	8	clay soil
119.40	0598	29.694356S	25.976241E	1.6	0.72	8	clay soil
119.60	0599	29.692599S	25.976768E	1.6	0.61	7	clay soil
119.80	0600	29.690800S	25.977283E	1.6	0.87	9	clay soil
120.00	0601	29.689003S	25.977806E	1.6	0.82	9	clay soil
120.20	0602	29.687203S	25.978339E	1.6	1.99	21	clay soil
120.40	0603	29.685418S	25.978884E	1.6	2.74	28	clay soil
120.60	0604	29.683690S	25.979449E	1.6	3.00	31	stoney clay soil / top of hill
120.80	0605	29.681869S	25.979931E	1.6	1.43	15	stoney clay soil
121.00	0606	29.680129S	25.980468E	1.6	3.73	38	brownish soil
121.20	0607	29.678326S	25.981005E	1.6	10.00	101	brownish soil stoney
121.40	0608	29.676612S	25.981572E	1.6	21.00	212	rocky area / next to hill
121.60	0609	29.674845S	25.982239E	1.6	9.32	94	brownish soil stoney
121.80	0610	29.673099S	25.982945E	1.6	14.07	142	brownish soil stoney
122.00	0611	29.671430S	25.983625E	1.6	10.00	101	brownish soil
122.20	0612	29.669756S	25.984354E	1.6	14.05	142	brownish soil stoney
122.40	0613	29.668084S	25.985085E	1.6	8.00	81	brownish soil stoney
122.60	0614	29.666341S	25.985862E	1.6	12.90	130	brownish soil stoney
122.80	0615	29.664611S	25.986618E	1.6	17.00	171	brownish soil stoney
123.00	0616	29.662952S	25.987364E	1.6	15.00	151	brownish soil stoney
123.20	0617	29.661256S	25.988101E	1.6	8.00	81	brownish soil stoney
123.40	0618	29.659563S	25.98882EE	1.6	31.00	312	brownish soil stoney / btidge
123.60	0619	29.657929S	25.989684E	1.6	1.00	11	brownish soil stoney
123.80	0620	29.656200S	25.990462E	1.6	2.00	21	brownish soil stoney

Approx Chainage	Point Reference	Latitude	Longitude	Pin Spacing (m)	Resistance (Ω)	Resistivity (Ω·m)	Comments
124.00	0621	29.654449S	25.991249E	1.6	1.34	14	brownish soil stoney
124.20	0622	29.652763S	25.991987E	1.6	12.00	121	rocky area / brownish soil
124.40	0623	29.651116S	25.992758E	1.6	4.00	41	brownish soil stoney
124.60	0624	29.649386S	25.993535E	1.6	3.57	36	brownish soil stoney
124.80	0625	29.647674S	25.994289E	1.6	2.99	31	brownish soil
125.00	0626	29.645953S	25.995049E	1.6	0.85	9	brownish soil
125.20	0627	29.644239S	25.995813E	1.6	0.78	8	brownish soil
125.40	0628	29.642524S	25.996554E	1.6	1.86	19	brownish soil
125.60	0629	29.640849S	25.997343E	1.6	1.75	18	brownish soil
125.80	0630	29.639194S	25.998173E	1.6	70.20	706	Rocky ara
126.00	0631	29.637534S	25.999079E	1.6	65.00	654	rocky area
126.20	0632	29.635922S	26.000046E	1.6	23.60	238	brownish soil / Rocky
126.40	0633	29.634356S	26.001154E	1.6	2.00	21	brownish soil
126.60	0634	29.632795S	26.002202E	1.6	5.86	59	brownish soil
126.80	0635	29.631237S	26.003248E	1.6	16.76	169	brownish soil stoney
127.00	0636	29.629634S	26.004368E	1.6	6.37	65	brownish soil
127.20	0637	29.628046S	26.005496E	1.6	4.87	49	brownish soil
127.40	0638	29.626478S	26.006570E	1.6	5.91	60	brownish soil
127.60	0639	29.624926S	26.007687E	1.6	4.43	45	brownish soil
127.80	0640	29.623355S	26.008754E	1.6	3.33	34	brownish soil
128.00	0641	29.621828S	26.009860E	1.6	4.19	43	brownish soil
128.20	0642	29.620229S	26.010964E	1.6	2.03	21	brownish soil
128.40	0643	29.618699S	26.012063E	1.6	1.38	14	brownish soil
128.60	0644	29.617084S	26.013169E	1.6	3.26	33	brownish soil
128.80	0645	29.615517S	26.014261E	1.6	26.20	264	brownish soil
129.00	0646	29.613968S	26.015343E	1.6	5.75	58	brownish soil
129.20	0647	29.612413S	26.016449E	1.6	2.91	30	brownish soil
129.40	0648	29.610846S	26.017581E	1.6	3.35	34	brownish soil
129.60	0649	29.609289S	26.018721E	1.6	2.00	21	brownish soil
129.80	0650	29.606851S	26.021764E	1.6	4.55	46	brownish soil
130.00	0651	S	E	1.6	6.11	62	brownish soil
130.20	0652	29.605067S	26.022541E	1.6	5.11	52	brownish soil
130.40	0653	29.603328S	26.023186E	1.6	7.85	79	brownish soil stoney
130.60	0654	29.601697S	26.024164E	1.6	2.45	25	clay soil
130.80	0655	29.600076S	26.025155E	1.6	2.00	21	clay soil
131.00	0656	29.598486S	26.026209E	1.6	2.57	26	clay soil
131.20	0657	29.596938S	26.027271E	1.6	2.13	22	clay soil
131.40	0658	29.595329S	26.028369E	1.6	1.67	17	clay soil
131.60	0659	29.593775S	26.029464E	1.6	2.00	21	clay soil
131.80	0660	29.592224S	26.030546E	1.6	6.00	61	clay soil

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132.00	0661	29.590642S	26.031645E	1.6	6.16	62	brownish soil stoney
132.20	0662	29.589073S	26.032768E	1.6	5.93	60	clay soil
132.40	0663	29.587515S	26.033862E	1.6	4.73	48	clay soil
132.60	0664	29.585938S	26.034962E	1.6	4.76	48	Clay soil
132.80	0665	29.584379S	26.036030E	1.6	14.79	149	rocky / brownish soil
133.00	0666	29.582817S	26.037138E	1.6	17.80	179	rocky brownish soil
133.20	0667	29.581248S	26.038232E	1.6	15.62	158	rocky area brownish soil
133.40	0668	29.579664S	26.039327E	1.6	6.44	65	rocky area brownish soil
133.60	0669	29.578103S	26.040418E	1.6	6.97	71	rocky brownish soil
133.80	0670	29.576545S	26.041522E	1.6	2.25	23	brownish soil stoney
134.00	0671	29.575001S	26.042607E	1.6	2.26	23	brownish soil
134.20	0672	29.573466S	26.043686E	1.6	2.86	29	brownish soil
134.40	0673	29.571830S	26.044802E	1.6	2.97	30	brownish soil
134.60	0674	29.570296S	26.045890E	1.6	2.93	30	brownish soil
134.80	0675	29.568733S	26.047006E	1.6	8.52	86	up hill / rocky brownish soil
135.00	0676	29.567145S	26.048092E	1.6	10.28	104	stoney brownish soil
135.20	0677	29.565593S	26.049194E	1.6	3.96	40	greyish Soil stoney
135.40	0678	29.564028S	26.050290E	1.6	3.60	37	brownish soil stoney
135.60	0679	29.562435S	26.051377E	1.6	4.03	41	brownish soil stoney
135.80	0680	29.560883S	26.052470E	1.6	12.00	121	brownish soil stoney
136.00	0681	29.559322S	26.053578E	1.6	9.76	99	brownish soil stoney
136.20	0682	29.557791S	26.054682E	1.6	6.27	64	brownish soil / rocky area
136.40	0683	29.556216S	26.055822E	1.6	3.42	35	brownish soil stoney
136.60	0684	29.554674S	26.056967E	1.6	3.14	32	brownish soil stoney
136.80	0685	29.553129S	26.058130E	1.6	2.7	28	brownish soil
137.00	0686	29.551604S	26.059303E	1.6	1.94	20	brownish soil
137.20	0687	29.550081S	26.060485E	1.6	2.15	22	brownish soil
137.40	0688	29.548517S	26.061618E	1.6	1.86	19	brownish soil
137.60	0689	29.546979S	26.062765E	1.6	5.09	52	clay soil
137.80	0690	29.545483S	26.063935E	1.6	6	61	clay soil
138.00	0691	29.543905S	26.065072E	1.6	4.9	50	brownish soil
138.20	0692	29.542328S	26.066217E	1.6	6.16	62	brownish soil stoney
138.40	0693	29.540802S	26.067353E	1.6	5.59	57	brownish soil stoney
138.60	0694	29.539274S	26.068482E	1.6	2.77	28	brownish soil
138.80	0695	29.537730S	26.069621E	1.6	6.16	62	brownish soil
139.00	0696	29.536183S	26.070777E	1.6	1.6	17	dark clay soil
139.20	0697	29.534642S	26.071933E	1.6	4.84	49	dark clay soil

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139.40	0698	29.533119S	26.073083E	1.6	0.87	9	clay soil
139.60	0699	29.531597S	26.074201E	1.6	2.56	26	clay soil
139.80	0700	29.530031S	26.075363E	1.6	3	31	clay soil
140.00	0701	29.528508S	26.076523E	1.6	1.22	13	Clay soil
140.20	0702	29.526978S	26.077675E	1.6	1.75	18	clay soil
140.40	0703	29.525419S	26.078837E	1.6	3.05	31	clay soil
140.60	0704	29.523881S	26.079972E	1.6	1	11	clay soil
140.80	0705	29.522326S	26.081117E	1.6	3.97	40	brownish soil
141.00	0706	29.520800S	26.082276E	1.6	2.17	22	brownish soil
141.20	0707	29.519246S	26.083408E	1.6	7.21	73	brownish soil
141.40	0708	29.517708S	26.084566E	1.6	7.46	75	brownish soil stoney
141.60	0709	29.516954S	26.086433E	1.6	45	453	underlying rock
141.80	0710	29.515284S	26.087202E	1.6	7	71	brownish soil stoney
142.00	0711	29.513785S	26.087779E	1.6	11	111	brownish soil
142.20	0712	29.512026S	26.087331E	1.6	19.4	196	rocky area brownish soil
142.40	0713	29.510311S	26.087985E	1.6	1.62	17	stoney clay soil
142.60	0714	29.508549S	26.088681E	1.6	2.25	23	stoney clay soil
142.80	0715	29.506781S	26.089343E	1.6	2.14	22	clay soil
143.00	0716	29.505052S	26.089971E	1.6	2.32	24	clay soil
143.20	0717	29.503298S	26.090651E	1.6	2.71	28	clay soil
143.40	0718	29.501544S	26.091334E	1.6	3.91	40	clay soil
143.60	0719	29.499836S	26.091981E	1.6	2.42	25	clay soil
143.80	0720	29.498052S	26.092673E	1.6	2.18	22	clay soil
144.00	0721	29.496349S	26.093325E	1.6	3.14	32	clay soil
144.20	0722	29.494625S	26.093990E	1.6	2.12	22	clay soil
144.40	0723	29.492890S	26.094662E	1.6	1.78	18	clay soil
144.60	0724	29.491145S	26.095337E	1.6	1.6	17	clay soil
144.80	0725	29.489412S	26.095980E	1.6	1.22	13	clay soil
145.00	0726	29.487675S	26.096658E	1.6	0.88	9	clay soil
145.20	0727	29.485919S	26.097317E	1.6	2.09	22	clay soil
145.40	0728	29.484201S	26.097984E	1.6	2.08	21	clay soil
145.60	0729	29.482454S	26.098661E	1.6	1.22	13	clay soil
145.80	0730	29.480709S	26.099323E	1.6	1.45	15	Clay soil
146.00	0731	29.478977S	26.099978E	1.6	8	81	stoney clay soil
146.20	0732	29.477242S	26.100663E	1.6	1.19	12	stoney clay soil
146.40	0733	29.475502S	26.101320E	1.6	0.89	9	clay soil
146.60	0734	29.473788S	26.101958E	1.6	3.83	39	clay soil
146.80	0735	29.472064S	26.102592E	1.6	4.83	49	brownish soil stoney
147.00	0736	29.470386S	26.103306E	1.6	6.61	67	rocky area brownish soil
147.20	0737	29.468673S	26.103948E	1.6	2.49	26	rocky area brownish soil
147.40	0738	29.466964S	26.104592E	1.6	3	31	brownish soil stoney

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147.60	0739	29.465252S	26.105245E	1.6	2.12	22	brownish soil
147.80	0740	29.463498S	26.105925E	1.6	8.04	81	brownish soil stoney
148.00	0741	29.461755S	26.106594E	1.6	2.16	22	brownish soil stoney
148.20	0742	29.459990S	26.107261E	1.6	2.73	28	brownish soil stoney
148.40	0743	29.458263S	26.107886E	1.6	4.27	43	brownish soil stoney
148.60	0744	29.456539S	26.108571E	1.6	5.39	55	brownish soil stoney
148.80	0745	29.454780S	26.109288E	1.6	8.4	85	brownish soil
149.00	0746	29.453053S	26.109999E	1.6	4.3	44	brownish soil
149.20	0747	29.451469S	26.111061E	1.6	5	51	brownish soil
149.40	0748	29.450464S	26.112585E	1.6	8.63	87	brownish soil
149.60	0749	29.451226S	26.114427E	1.6	5.94	60	brownish soil
149.80	0750	29.452036S	26.116367E	1.6	4	41	brownish soil
150.00	0751	29.452865S	26.118223E	1.6	4.67	47	brownish soil
150.20	0752	29.453717S	26.120122E	1.6	0.89	9	brownish soil
150.40	0753	29.454699S	26.121846E	1.6	1.92	20	brownish soil
150.60	0754	29.455527S	26.123479E	1.6	1.72	18	brownish soil
150.80	0755	29.454694S	26.125374E	1.6	8.8	89	brownish soil
151.00	0756	29.453854S	26.127230E	1.6	6.22	63	brownish soil
151.20	0757	29.453027S	26.129042E	1.6	5.69	58	brownish soil
151.40	0758	29.452200S	26.130886E	1.6	10.02	101	brownish soil
151.60	0759	29.451346S	26.132764E	1.6	3.67	37	brownish soil stoney
151.80	0760	29.450545S	26.134691E	1.6	7.99	81	brownish soil stoney
152.00	0761	29.450197S	26.136822E	1.6	2.46	25	brownish soil stoney
152.20	0762	29.449884S	26.138796E	1.6	4.02	41	brownish soil stoney
152.40	0763	29.449546S	26.140893E	1.6	9.12	92	brownish soil stoney
152.60	0764	29.449398S	26.142973E	1.6	2.12	22	clay soil
152.80	0765	29.449480S	26.145104E	1.6	1.53	16	clay soil
153.00	0766	29.449555S	26.147198E	1.6	1.31	14	clay soil
153.20	0767	29.449633S	26.149296E	1.6	2.75	28	clay soil
153.40	0768	29.449702S	26.151402E	1.6	4.45	45	clay soil
153.60	0769	29.449926S	26.153469E	1.6	2.32	24	clay soil
153.80	0770	29.450199S	26.155590E	1.6	3.32	34	clay soil
154.00	0771	29.450495S	26.157700E	1.6	2.15	22	clay soil
154.20	0772	29.450770S	26.159731E	1.6	3.02	31	clay soil
154.40	0773	29.451010S	26.161820E	1.6	3.1	32	clay soil
154.60	0774	29.451067S	26.163917E	1.6	3.61	37	clay soil
154.80	0775	29.451112S	26.166016E	1.6	1.79	18	clay soil
155.00	0776	29.451176S	26.168143E	1.6	2.38	24	clay soil
155.20	0777	29.451112S	26.170216E	1.6	0.89	9	clay soil
155.40	0778	29.450395S	26.172141E	1.6	0.54	6	clay soil

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155.60	0779	29.449687S	26.174095E	1.6	0.39	4	clay soil
155.80	0780	29.449086S	26.176064E	1.6	0.79	8	clay soil
156.00	0781	29.448535S	26.178110E	1.6	7.81	79	clay soil
156.20	0782	29.448072S	26.180169E	1.6	1.08	11	clay soil
156.40	0783	29.448968S	26.182034E	1.6	2.28	23	clay soil
156.60	0784	29.450076S	26.183702E	1.6	2.29	24	clay soil
156.80	0785	29.451193S	26.185350E	1.6	1.24	13	clay soil
157.00	0786	29.451970S	26.187159E	1.6	1.64	17	clay soil
157.20	0787	29.452067S	26.189239E	1.6	1.1	12	clay soil
157.40	0788	29.452177S	26.191355E	1.6	1.4	15	clay soil
157.60	0789	29.452283S	26.193441E	1.6	2.75	28	brownish soil stoney
157.80	0790	29.452401S	26.195544E	1.6	1.36	14	clay soil
158.00	0791	29.452509S	26.197628E	1.6	1.64	17	clay soil
158.20	0792	29.452683S	26.199738E	1.6	1.39	14	brownish soil stoney
158.40	0793	29.453067S	26.201809E	1.6	1.84	19	brownish soil
158.60	0794	29.453429S	26.203884E	1.6	2.94	30	brownish soil
158.80	0795	29.453780S	26.205925E	1.6	1.43	15	brownish soil
159.00	0796	29.454128S	26.207977E	1.6	1.14	12	brownish soil
159.20	0797	29.454472S	26.210014E	1.6	1.62	17	brownish soil
159.40	0798	29.455194S	26.211956E	1.6	1.02	11	brownish soil
159.60	0799	29.455708S	26.213912E	1.6	2.84	29	brownish soil
159.80	0800	29.455470S	26.215961E	1.6	3	31	brownish soil
160.00	0801	29.455123S	26.218016E	1.6	1.14	12	brownish soil stoney
160.20	0802	29.454687S	26.219949E	1.6	3	31	brownish soil
160.40	0803	29.453315S	26.221423E	1.6	8	81	brownish soil
160.60	0804	29.451986S	26.222849E	1.6	9.38	95	brownish soil stoney
160.80	0805	29.450447S	26.224036E	1.6	6.35	64	brownish soil stoney
161.00	0806	29.448849S	26.225046E	1.6	7.19	73	brownish soil stoney
161.20	0807	29.447782S	26.226631E	1.6	1.78	18	brownish soil
161.40	0808	29.446911S	26.228489E	1.6	2.62	27	brownish soil
161.60	0809	29.445982S	26.230334E	1.6	2.28	23	brownish soil
161.80	0810	29.445147S	26.232155E	1.6	4	41	brownish soil
162.00	0811	29.444248S	26.234051E	1.6	4.84	49	brownish soil stoney
162.20	0812	29.443385S	26.235848E	1.6	4.01	41	brownish soil stoney
162.40	0813	29.442811S	26.237832E	1.6	13	131	brownish soil stoney
162.60	0814	29.443121S	26.239854E	1.6	3	31	brownish soil
162.80	0815	29.443759S	26.241769E	1.6	3	31	brownish soil
163.00	0816	29.444424S	26.243751E	1.6	3.5	36	brownish soil
163.20	0817	29.445086S	26.245722E	1.6	2	21	brownish soil
163.40	0818	29.445734S	26.247671E	1.6	1	11	brownish soil

Approx Chainage	Point Reference	Latitude	Longitude	Pin Spacing (m)	Resistance (Ω)	Resistivity (Ω·m)	Comments
163.60	0819	29.446380S	26.249589E	1.6	1.13	12	brownish soil
163.80	0820	29.447054S	26.251576E	1.6	2.66	27	brownish soil
164.00	0821	29.447689S	26.253507E	1.6	2.07	21	brownish soil
164.20	0822	29.448341S	26.255466E	1.6	1.23	13	brownish soil
164.40	0823	29.449000S	26.257427E	1.6	1.01	11	brownish soil
164.60	0824	29.449190S	26.259374E	1.6	1.86	19	brownish soil
164.80	0825	29.448339S	26.261281E	1.6	1.3	14	brownish soil
165.00	0826	29.447556S	26.263160E	1.6	0.72	8	clay soil
165.20	0827	29.446767S	26.264999E	1.6	4.03	41	clay soil
165.40	0828	29.445970S	26.266887E	1.6	5.61	57	brownish soil stoney
165.60	0829	29.445317S	26.268837E	1.6	3	31	brownish soil
165.80	0830	29.444681S	26.270767E	1.6	9.27	94	brownish soil
166.00	0831	29.444057S	26.272746E	1.6	11.54	117	brownish soil stoney
166.20	0832	29.443199S	26.274522E	1.6	8.73	88	brownish soil stoney
166.40	0833	29.441856S	26.275968E	1.6	4.14	42	brownish soil stoney
166.60	0834	29.440238S	26.276430E	1.6	5	51	rocky area
166.80	0835	29.438770S	26.276899E	1.6	2.54	26	clay soil
167.00	0836	29.437737S	26.278622E	1.6	1.29	13	clay soil
167.20	0837	29.437015S	26.280563E	1.6	0.71	8	clay soil
167.40	0838	29.437362S	26.282542E	1.6	1.58	16	clay soil
167.60	0839	29.437350S	26.284560E	1.6	1.67	17	clay soil
167.80	0840	29.437051S	26.286588E	1.6	2	21	clay soil
168.00	0841	29.436242S	26.288467E	1.6	6.18	63	Clay soil
168.20	0842	29.435355S	26.290290E	1.6	4.94	50	clay soil
168.40	0843	29.434582S	26.292142E	1.6	5.82	59	clay soil
168.60	0844	29.433750S	26.293990E	1.6	3	31	clay soil stoney
168.80	0845	29.432932S	26.295906E	1.6	3.81	39	clay soil
169.00	0846	29.432138S	26.297761E	1.6	3.68	37	clay soil
169.20	0847	29.431277S	26.299618E	1.6	1.55	16	clay soil
169.40	0848	29.430400S	26.301525E	1.6	1.81	19	clay soil
169.60	0849	29.429554S	26.303373E	1.6	3.21	33	clay soil
169.80	0850	29.428712S	26.305230E	1.6	1.31	14	clay soil
170.00	0851	29.427470S	26.306521E	1.6	2.36	24	clay soil
170.20	0852	29.426671S	26.308367E	1.6	1	11	clay soil
170.40	0853	29.424987S	26.309098E	1.6	2.36	24	clay soil stoney
170.60	0854	29.423323S	26.309886E	1.6	8	81	clay soil stoney
170.80	0855	29.421573S	26.310554E	1.6	5	51	clay soil
171.00	0856	29.419821S	26.311266E	1.6	1.79	18	clay soil
171.20	0857	29.418078S	26.311990E	1.6	6.19	63	clay soil
171.40	0858	29.416339S	26.312709E	1.6	3.24	33	clay soil stoney
171.60	0859	29.414756S	26.313683E	1.6	8	81	brownish soil
171.80	0860	29.413391S	26.315041E	1.6	3.95	40	brownish soil

Approx Chainage	Point Reference	Latitude	Longitude	Pin Spacing (m)	Resistance (Ω)	Resistivity (Ω·m)	Comments
172.00	0861	29.412001S	26.316406E	1.6	3.22	33	clay soil
172.20	0862	29.410551S	26.317847E	1.6	3	31	clay soil
172.40	0863	29.409220S	26.319137E	1.6	1	11	clay soil
172.60	0864	29.407829S	26.320501E	1.6	1.66	17	clay soil
172.80	0865	29.406282S	26.321641E	1.6	2.02	21	clay soil
173.00	0866	29.404707S	26.322721E	1.6	4.75	48	clay soil
173.20	0867	29.403151S	26.323797E	1.6	1.57	16	clay soil
173.40	0868	29.401519S	26.324775E	1.6	2.02	21	clay soil
173.60	0869	29.399960S	26.325885E	1.6	3.86	39	brownish soil
173.80	0870	29.398321S	26.326915E	1.6	4.45	45	brownish soil
174.00	0871	29.396729S	26.327856E	1.6	7.13	72	brownish soil
174.20	0872	29.395106S	26.328841E	1.6	4.18	43	brownish soil
174.40	0873	29.393471S	26.329795E	1.6	3.49	36	clay soil
174.60	0874	29.391779S	26.330735E	1.6	3.47	35	clay soil
174.80	0875	29.390059S	26.331758E	1.6	8	81	clay soil
175.00	0876	29.388366S	26.332514E	1.6	2.4	25	clay soil
175.20	0877	29.386639S	26.333233E	1.6	3.83	39	clay soil
175.40	0878	29.385082S	26.334403E	1.6	3.89	40	clay soil
175.60	0879	29.383540S	26.335586E	1.6	3.7	38	clay soil
175.80	0880	29.382026S	26.336745E	1.6	1.31	14	clay soil
176.00	0881	29.380473S	26.337907E	1.6	4.06	41	clay soil
176.20	0882	29.378869S	26.338719E	1.6	3.9	40	clay soil
No Access from approximate Chainage CH - 176.2 until CH - 186.80							
186.80	0883	29.325361S	26.366377E	1.6	1.23	13	clay soil
187.00	0884	29.323959S	26.364997E	1.6	1.86	19	clay soil stoney
187.20	0885	29.322550S	26.363624E	1.6	1.06	11	clay soil
187.40	0886	29.321163S	26.362256E	1.6	1.17	12	clay soil
187.60	0887	29.319747S	26.360878E	1.6	1.17	12	clay soil
187.80	0888	29.318315S	26.359485E	1.6	0.98	10	clay soil
188.00	0889	29.316988S	26.358176E	1.6	1.52	16	clay soil
188.20	0890	29.315585S	26.356793E	1.6	1.51	16	clay soil
188.40	0891	29.314199S	26.355443E	1.6	1.4	15	clay soil
188.60	0892	29.312799S	26.354072E	1.6	1.74	18	clay soil
188.80	0893	29.311419S	26.352718E	1.6	1.19	12	Clay soil
189.00	0894	29.310012S	26.351349E	1.6	2.55	26	clay soil
189.20	0895	29.308615S	26.349966E	1.6	2.84	29	clay soil
189.40	0896	29.307214S	26.348598E	1.6	2	21	clay soil
189.60	0897	29.305818S	26.347230E	1.6	4.7	48	brownish soil
189.80	0898	29.304367S	26.345972E	1.6	24	242	brownish soil
190.00	0899	29.302885S	26.344721E	1.6	29	292	clay soil
190.20	0900	29.301375S	26.343436E	1.6	51	513	brownish soil
190.40	0901	29.299926S	26.342196E	1.6	13	131	clay soil
190.60	0902	29.298490S	26.340970E	1.6	10.19	103	brownish soil

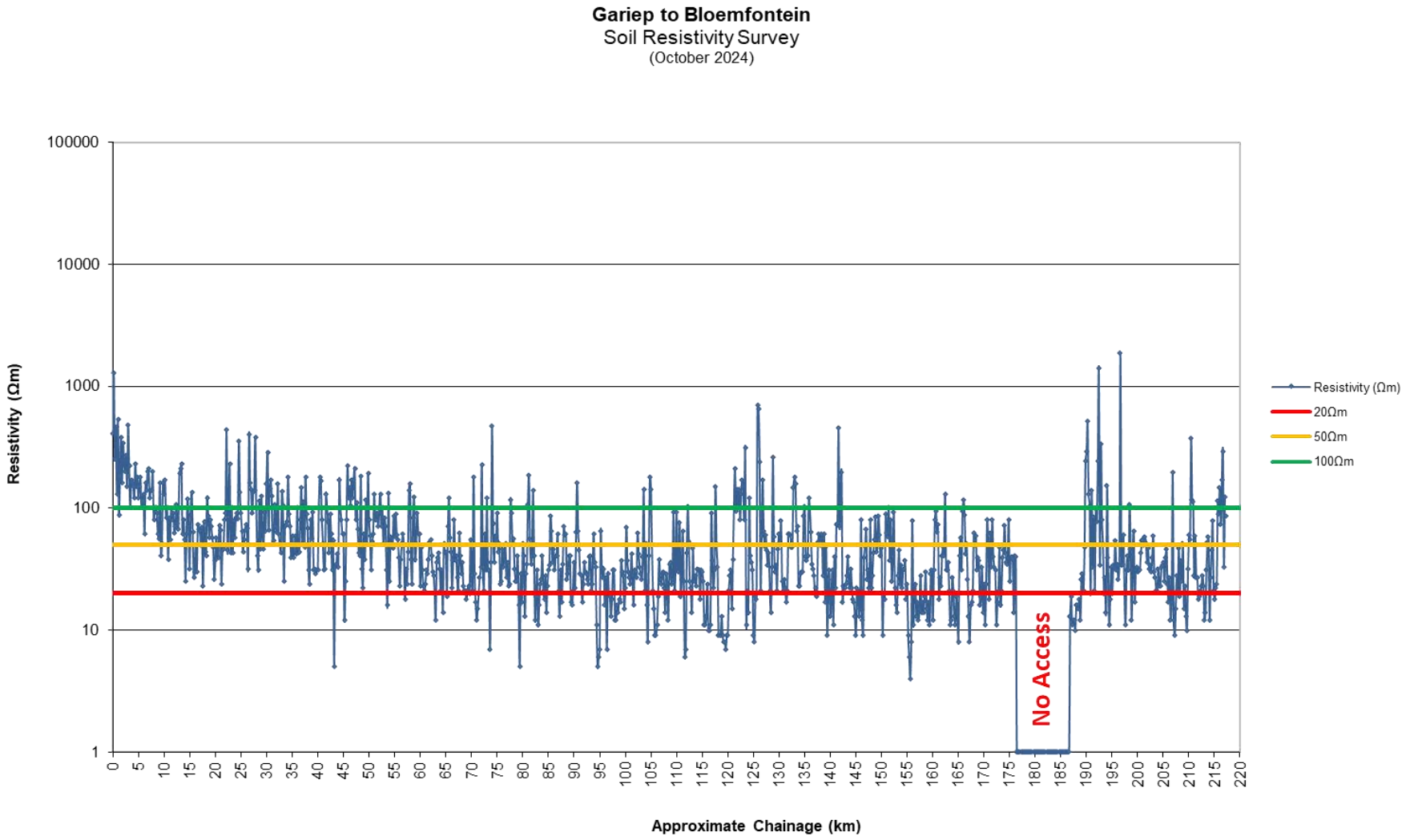
Approx Chainage	Point Reference	Latitude	Longitude	Pin Spacing (m)	Resistance (Ω)	Resistivity (Ω·m)	Comments
190.80	0903	29.297008S	26.339716E	1.6	1.91	20	clay soil
191.00	0904	29.295540S	26.338485E	1.6	14	141	brownish soil
191.20	0905	29.294037S	26.337175E	1.6	3.2	33	clay soil
191.40	0906	29.292607S	26.335965E	1.6	8.38	85	brownish soil
191.60	0907	29.291147S	26.334716E	1.6	2.03	21	brownish soil
191.80	0908	29.289663S	26.333436E	1.6	9.93	100	brownish soil
192.00	0909	29.288203S	26.332187E	1.6	7.56	77	brownish soil
192.20	0910	29.286745S	26.330942E	1.6	24.1	243	brownish soil
192.40	0911	29.285212S	26.329756E	1.6	139	1398	brownish soil rocky area
192.60	0912	29.283563S	26.328754E	1.6	3.36	34	brownish soil
192.80	0913	29.282281S	26.327284E	1.6	33.6	338	rocky area
193.00	0914	29.281218S	26.325563E	1.6	8	81	Rocky area brownish soil
193.20	0915	29.280188S	26.323812E	1.6	5	51	rocky area brownish soil
193.40	0916	29.279046S	26.322163E	1.6	1.92	20	clay soil
193.60	0917	29.277916S	26.320532E	1.6	2.6	27	clay soil
193.80	0918	29.276765S	26.318881E	1.6	1.39	14	clay soil
194.00	0919	29.275612S	26.317244E	1.6	15.3	154	clay soil stoney
194.20	0920	29.274481S	26.315570E	1.6	3.78	39	clay soil
194.40	0921	29.273300S	26.313946E	1.6	1.04	11	clay soil
194.60	0922	29.272128S	26.312275E	1.6	1.76	18	clay soil
194.80	0923	29.270979S	26.310619E	1.6	3.23	33	clay soil
195.00	0924	29.269844S	26.308977E	1.6	1.96	20	clay soil
195.20	0925	29.268682S	26.307341E	1.6	3.29	34	clay soil
195.40	0926	29.267508S	26.305714E	1.6	3.23	33	clay soil
195.60	0927	29.266306S	26.304107E	1.6	5.3	54	clay soil
195.80	0928	29.265223S	26.302394E	1.6	3	31	clay soil
196.00	0929	29.264079S	26.300725E	1.6	3.43	35	clay soil
196.20	0930	29.262917S	26.299075E	1.6	2.55	26	clay soil
196.40	0931	29.261751S	26.297443E	1.6	3.37	34	clay soil
196.60	0932	29.260657S	26.295803E	1.6	185	1860	clay soil
196.80	0933	29.259505S	26.294152E	1.6	3.31	34	clay soil
197.00	0934	29.258371S	26.292495E	1.6	3.4	35	clay soil
197.20	0935	29.257208S	26.290885E	1.6	5.92	60	clay soil
197.40	0936	29.256050S	26.289218E	1.6	1.98	20	clay soil
197.60	0937	29.254910S	26.287576E	1.6	1.02	11	clay soil
197.80	0938	29.253765S	26.285938E	1.6	3.04	31	clay soil
198.00	0939	29.252609S	26.284304E	1.6	4.06	41	clay soil
198.20	0940	29.251429S	26.282721E	1.6	3.03	31	clay soil
198.40	0941	29.250285S	26.281039E	1.6	10.66	108	clay soil
198.60	0942	29.249101S	26.279401E	1.6	4.52	46	clay soil
198.80	0943	29.247887S	26.277821E	1.6	1.11	12	clay soil
199.00	0944	29.246746S	26.276124E	1.6	4	41	clay soil

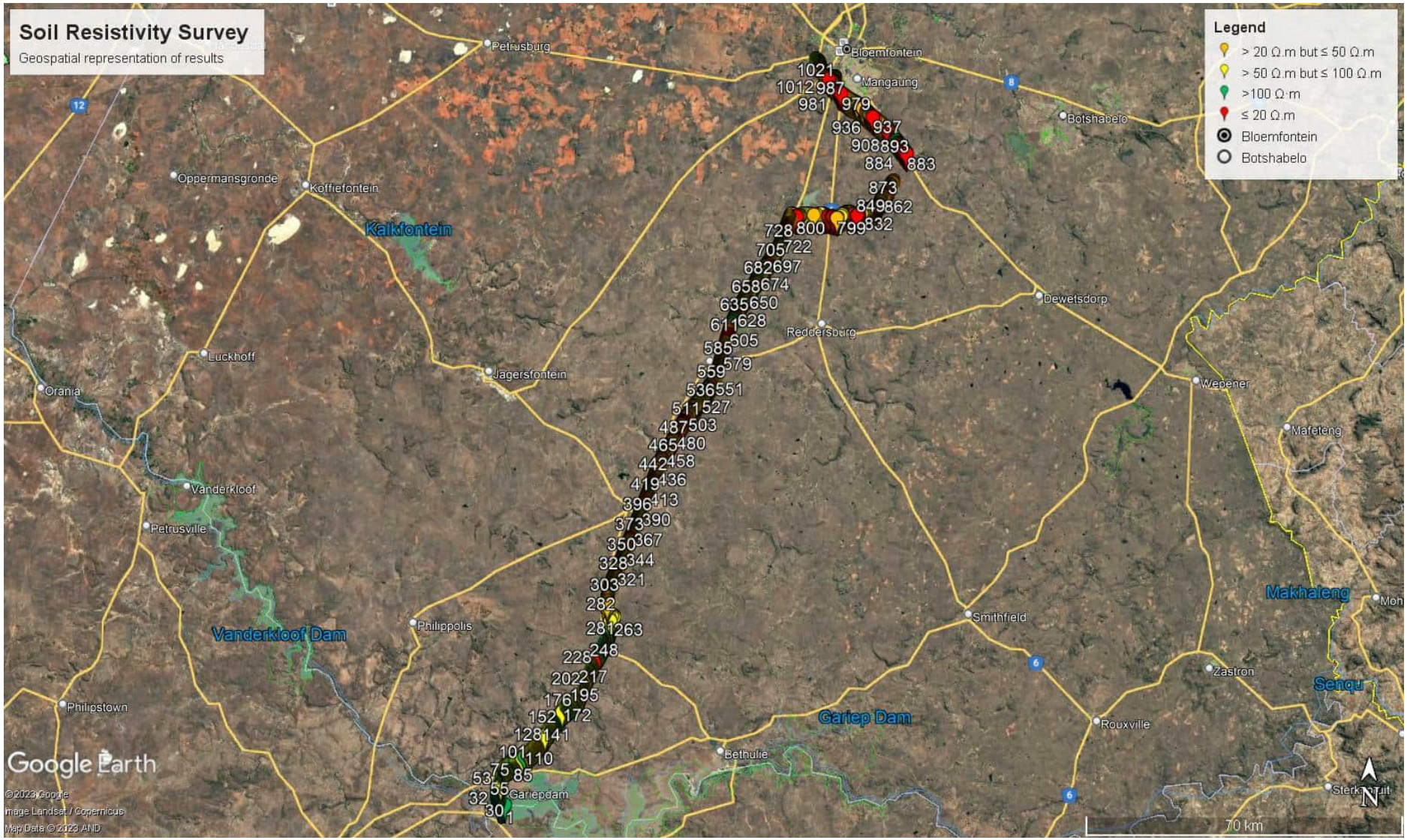
Approx Chainage	Point Reference	Latitude	Longitude	Pin Spacing (m)	Resistance (Ω)	Resistivity (Ω·m)	Comments
199.20	0945	29.245463S	26.274531E	1.6	6.41	65	clay soil
199.40	0946	29.244303S	26.272895E	1.6	1.61	17	clay soil
199.60	0947	29.243122S	26.271258E	1.6	3.06	31	clay soil
199.80	0948	29.241998S	26.269593E	1.6	3.19	33	clay soil
200.00	0949	29.240852S	26.267973E	1.6	2.96	30	clay soil
200.20	0950	29.239698S	26.266306E	1.6	3.02	31	clay soil
200.40	0951	29.238541S	26.264622E	1.6	3.02	31	clay soil
200.60	0952	29.237381S	26.262988E	1.6	4.25	43	clay soil
200.80	0953	29.236253S	26.261309E	1.6	5.34	54	clay soil
201.00	0954	29.235083S	26.259655E	1.6	5.4	55	Clay soil
201.20	0955	29.233919S	26.258035E	1.6	4.95	50	clay soil
201.40	0956	29.232791S	26.256329E	1.6	5.72	58	Clay soil
201.60	0957	29.231635S	26.254676E	1.6	5.12	52	clay soil
201.80	0958	29.230722S	26.252872E	1.6	3.54	36	clay soil stoney
202.00	0959	29.229789S	26.251063E	1.6	4.59	47	clay soil
202.20	0960	29.228841S	26.249253E	1.6	3.13	32	clay soil
202.40	0961	29.227898S	26.247448E	1.6	3.29	34	clay soil
202.60	0962	29.226947S	26.245628E	1.6	2.98	30	clay soil
202.80	0963	29.226039S	26.243824E	1.6	3.78	39	clay soil
203.00	0964	29.225109S	26.242005E	1.6	5.86	59	clay soil
203.20	0965	29.224313S	26.240162E	1.6	2.94	30	clay soil
203.40	0966	29.223872S	26.238115E	1.6	2.66	27	clay soil
203.60	0967	29.223095S	26.236267E	1.6	2	21	brownish soil
203.80	0968	29.222156S	26.234427E	1.6	2	21	brownish soil
204.00	0969	29.221246S	26.232582E	1.6	3.09	32	brownish soil
204.20	0970	29.220314S	26.230765E	1.6	2.24	23	brownish soil
204.40	0971	29.219603S	26.228902E	1.6	2.25	23	brownish soil
204.60	0972	29.218650S	26.227094E	1.6	3.28	33	brownish soil
204.80	0973	29.217706S	26.225282E	1.6	3.37	34	brownish soil
205.00	0974	29.216772S	26.223472E	1.6	3.51	36	brownish soil
205.20	0975	29.215328S	26.223121E	1.6	2.41	25	brownish soil
205.40	0976	29.214403S	26.221291E	1.6	3.78	39	brownish soil
205.60	0977	29.213479S	26.219482E	1.6	4.52	46	clay soil
205.80	0978	29.212557S	26.217662E	1.6	2.38	24	clay soil
206.00	0979	29.211589S	26.215844E	1.6	1.61	17	clay soil
206.20	0980	29.210771S	26.214116E	1.6	2.68	27	clay soil
206.40	0981	29.209807S	26.212271E	1.6	1.17	12	clay soil
206.60	0982	29.208960S	26.210471E	1.6	1.63	17	clay soil
206.80	0983	29.207795S	26.208816E	1.6	19.4	196	brownish rocky area
207.00	0984	29.206169S	26.207793E	1.6	1.16	12	clay soil
207.20	0985	29.204555S	26.206808E	1.6	0.86	9	clay soil
207.40	0986	29.202939S	26.205801E	1.6	1.47	15	clay soil
207.60	0987	29.201334S	26.204833E	1.6	2.77	28	clay soil

Approx Chainage	Point Reference	Latitude	Longitude	Pin Spacing (m)	Resistance (Ω)	Resistivity (Ω·m)	Comments
207.80	0988	29.199723S	26.203779E	1.6	2.07	21	clay soil
208.00	0989	29.198095S	26.202788E	1.6	4.62	47	clay soil
208.20	0990	29.196469S	26.201779E	1.6	1.8	19	clay soil
208.40	0991	29.194862S	26.200803E	1.6	3.6	37	brownish soil
208.60	0992	29.193240S	26.199781E	1.6	2.44	25	brownish soil
208.80	0993	29.191593S	26.198805E	1.6	4.98	51	clay soil
209.00	0994	29.190010S	26.197698E	1.6	1.44	15	clay soil
209.20	0995	29.189030S	26.195903E	1.6	2.23	23	clay soil
209.40	0996	29.187768S	26.197429E	1.6	1.26	13	clay soil
209.60	0997	29.186479S	26.198943E	1.6	0.9	10	clay soil
209.80	0998	29.185186S	26.200454E	1.6	3.16	32	brownish soil
210.00	0999	29.183549S	26.200902E	1.6	5.92	60	brownish soil stoney
210.20	1000	29.181988S	26.199763E	1.6	5.43	55	brownish soil stoney
210.40	1001	29.180303S	26.198904E	1.6	37.2	374	rocky area
210.60	1002	29.178508S	26.199224E	1.6	11.68	118	rocky area
210.80	1003	29.177830S	26.198769E	1.6	11.29	114	rocky area brownish soil
211.00	1004	29.188871S	26.193799E	1.6	2.74	28	clay soil
211.20	1005	29.188459S	26.191765E	1.6	5.86	59	brownish soil
211.40	1006	29.187112S	26.190305E	1.6	2.65	27	brownish soil
211.60	1007	29.185766S	26.188856E	1.6	2.61	27	brownish soil
211.80	1008	29.184414S	26.187403E	1.6	1.77	18	brownish soil
212.00	1009	29.183080S	26.185943E	1.6	1.81	19	clay soil
212.20	1010	29.181718S	26.184507E	1.6	2.03	21	clay soil vlei
212.40	1011	29.180364S	26.183067E	1.6	2.21	23	brownish soil
212.60	1012	29.179005S	26.181640E	1.6	2.76	28	brownish soil
212.80	1013	29.177656S	26.180100E	1.6	2.19	23	brownish soil
213.00	1014	29.176318S	26.178629E	1.6	1.19	12	clay soil
213.20	1015	29.174991S	26.177166E	1.6	1.36	14	clay soil
213.40	1016	29.173684S	26.175688E	1.6	3.01	31	clay soil
213.60	1017	29.171812S	26.175564E	1.6	5.12	52	rocky clay soil
213.80	1018	29.170352S	26.174474E	1.6	5.75	58	brownish soil
214.00	1019	29.169047S	26.172936E	1.6	1.11	12	brownish soil
214.20	1020	29.167693S	26.171489E	1.6	2.63	27	clay soil
214.40	1021	29.166469S	26.169875E	1.6	4.45	45	clay soil
214.60	1022	29.164874S	26.168780E	1.6	7.81	79	brownish soil
214.80	1023	29.163284S	26.167689E	1.6	2.07	21	brownish soil
215.00	1024	29.161663S	26.166669E	1.6	1.7	18	brownish soil
215.20	1025	29.160038S	26.165632E	1.6	2.09	22	brownish soil
215.40	1026	29.158238S	26.165254E	1.6	2.34	24	clay soil
215.60	1027	29.156447S	26.164979E	1.6	11.43	115	Rocky area
215.80	1028	29.154668S	26.164386E	1.6	8.87	90	rocky area hill
216.00	1029	29.152996S	26.163617E	1.6	14.58	147	brownish soil stoney

Approx Chainage	Point Reference	Latitude	Longitude	Pin Spacing (m)	Resistance (Ω)	Resistivity (Ω·m)	Comments
216.20	1030	29.151252S	26.162894E	1.6	7.23	73	brownish soil stoney
216.40	1031	29.149482S	26.162109E	1.6	16.85	170	brownish soil
216.60	1032	29.148217S	26.160564E	1.6	29.1	293	brownish soil rocky
216.80	1033	29.147031S	26.158938E	1.6	3.19	33	clay soil
217.00	1034	29.145829S	26.157323E	1.6	12.33	124	brownish soil stoney
217.20	1035	29.144645S	26.155960E	1.6	8.49	86	clay soil

APPENDIX 2: GRAPHICAL REPRESENTATION OF SOIL RESISTIVITY DATA



APPENDIX 3: GEOSPATIAL REPRESENTATION OF SOIL RESISTIVITY DATA

See electronically supplied KMZ file