GONDWANA GEO SOLUTIONS

Consulting Geotechnical Engineers & Engineering Geologists

Cape Town Office:
13 Rocklands Road
Simonstown
CAPE TOWN
7975

Report to Naidu Consulting on a Geotechnical Investigation carried out for the Reinstatement of Mobeni Reservoir No. 2 in Durban, KwaZulu-Natal

Project No.: 25-030R01 Rev 3

Date Issued: June 2025

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	PREPARED:	APPROVED:
DATE:	**June 2025**	**June 2025**
NAME:	**Sven Richter**	**Mark Richter**
SIGNATURE:		

Report to Naidu Consulting on a Geotechnical Investigation carried out for the Reinstatement of Mobeni Reservoir No. 2 in Durban, KwaZulu-Natal

1. INTRODUCTION AND TERMS OF REFERENCE

Gondwana Geo Solutions (Pty) Ltd (or 'GGS') was appointed by Naidu Consulting on the 3rd March 2025 in a letter referenced "*Letter of Appointment: Geotechnical Investigation for the Design and Construction Supervision for the Reinstatement of Mobeni Reservoir"* to proceed with the geotechnical investigation for the proposed reinstatement of Mobeni Reservoir No. 2 in Mobeni, Durban.

The geotechnical investigation was carried out to define the geotechnical conditions and provide recommendations for the detailed design of the geotechnical elements of the proposed reinstatement works.

The results of the geotechnical investigation are provided in this report. Recommendations for excavations, lateral support, earthworks, bedding materials, drainage & erosion control and trenchless tunnelling methods for pipeline crossings are also provided.

The current follows on the earlier one done by GGS in 2019 referenced 19-150R01, titled "Report *on a Geotechnical Investigation carried out into the Failure of Mobeni Reservoir No 2 in Durban, KwaZulu-Natal".* Some information from the earlier report is reproduced in the current one where relevant.

2. INFORMATION SUPPLIED

The following information, all in electronic format, was used in the preparation of this report:

- Document for awarded tender *"Sub-Contract PSC 2024-003-GEO Mobeni 24.01.2025_Rev 02 signed",*
- Report reference 19-150R01 prepared by GGS titled *"Report on a Geotechnical Investigation carried out into the Failure of Mobeni Reservoir No 2 in Durban, KwaZulu-Natal",* and dated August 2019,
- Drawing referenced *"Appendix 8 - D724-51-4000-A_Stormwater Management Plan",*
- Drawing referenced *"D724-51-1000-A_Site Layout_Option 3A",*
- Topographical survey pack comprising CAD drawings and DTM data by Naidu Consulting.

3. SITE DESCRIPTION AND TOPOGRAPHY

The reservoir site is situated at the Mobeni Depot of the Ethekwini Water and Sanitation Department of Ethekwini Metro Municipality. The general site, encompassing Mobeni Reservoir No. 1 on the northeast and Mobeni Reservoir No. 2 on the southwest, both of 5Ml capacity, is situated on an elevated area. This area is bounded by the Higginson Highway on the south, Alamein Avenue on the east, Glanville Road on the north and jointly by GR Naidoo Investment Trust on the southeast and the existing township development of Carolina Crescent on the northwest. Access to the site is via the EWS security office and boom gate off Alamein Avenue.

Mobeni Reservoir No. 2 was breached on the 4th May 2019. The breach occurred at the western corner and water incorporating mud debris and dislodged sections of concrete etc discharged downslope, cutting a valley or channel through the embankment slope and was deposited onto the adjacent property of Erf 1/3010 which is considerably lower in elevation, being immediately west of the reservoir.

Since the submission of the geotechnical report in 2019 by GGS, the site has become very overgrown with vegetation. The site has been fenced off to prevent access from the north, west and south, with access only possible from the east via the Mobeni Depot security gate.

The layout of the is shown in Figure 1 below as well as the geotechnical tests done.

KEY :

TP 1 1.50	Approximate position of Test Pit showing final depth in metres below existing ground level.
DPL 1 (3.3)	Approximate position of Dynamic Cone Penetrometer Test (Light) showing depth to refusal in metres below existing ground level.
BH 1 (5.80)	Approximate position of Borehole showing final depth in metres below existing ground level.
AH 1 (5.80)	Approximate position of Auger Hole showing final depth in metres below existing ground level.
DPL 1 (3.3)	Historical Approximate position of Dynamic Cone Penetrometer Test (Light) showing depth to refusal in metres below existing ground level. 2019
AH 1 (5.80)	Historical Approximate position of Auger Hole showing final depth in metres below existing ground level. 2019

SITE PLAN

0m 10m 20m 50m

Graphic Scale
1 / 1 000

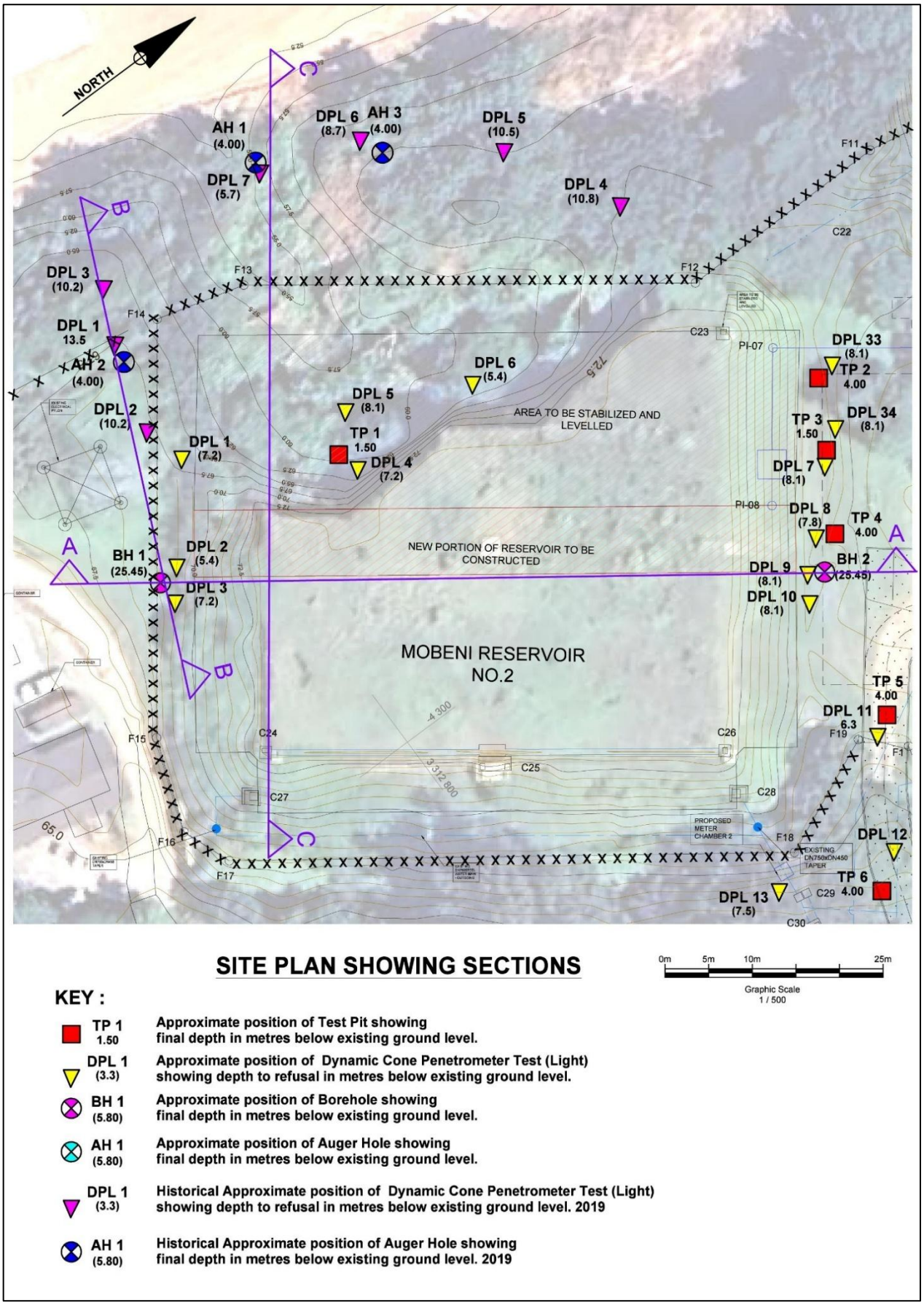
Figure 1: Site Plan showing site layout and Geotechnical Tests carried out

4. FIELDWORK

The fieldwork for the current investigation was carried out during February and March 2025 and comprised the following:

- Geotechnical Boreholes,
- Hand Augered Boreholes,
- Test Pits, and
- Dynamic Cone Penetrometer (Light) Tests

The positions of the tests relevant to the geotechnical investigation of the damaged part of the reservoir are shown in Figure 2 below.



SITE PLAN SHOWING SECTIONS

0m 5m 10m 25m

Graphic Scale 1 / 500

KEY :

TP 1 1.50	Approximate position of Test Pit showing final depth in metres below existing ground level.
DPL 1 (3.3)	Approximate position of Dynamic Cone Penetrometer Test (Light) showing depth to refusal in metres below existing ground level.
BH 1 (5.80)	Approximate position of Borehole showing final depth in metres below existing ground level.
AH 1 (5.80)	Approximate position of Auger Hole showing final depth in metres below existing ground level.
DPL 1 (3.3)	Historical Approximate position of Dynamic Cone Penetrometer Test (Light) showing depth to refusal in metres below existing ground level. 2019
AH 1 (5.80)	Historical Approximate position of Auger Hole showing final depth in metres below existing ground level. 2019

Figure 2: Site Plan showing damaged Reservoir area with Geotechnical Tests carried out and Cross-Section Lines

4.1 Geotechnical Boreholes

Two Geotechnical Boreholes designated BH1 and BH2, were drilled at the approximate positions shown in Figure 1 above.

The drilling was carried out by Geopractica from Durban. The boreholes were advanced by NX washbore and core drilling with Standard Penetration Tests (SPT tests) carried out at 1.5m intervals. The SPT is executed by driving a Raymond spoon into the soil using a 63.5 kg trip hammer dropped through 762 mm. The resistance to penetration is measured by the number of hammer drops or blowcounts (N value) per 300 mm advance.

A summary of the boreholes is given in Table 1 below.

Table 1
Summary of Borehole Results

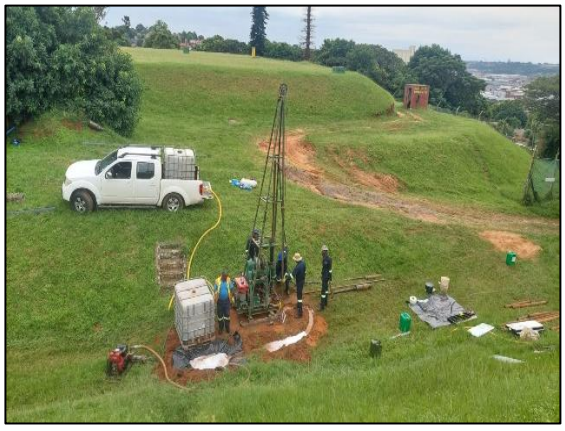
Borehole No	BH1	BH2
Depth to Bedrock (mbegl)	-	-
Final Depth Drilled (mbegl)	25.45	25.45

Note: mbegl = metres below existing ground level

All samples recovered from the boreholes were profiled[1], photographed and sampled by an Engineering Geologist. Representative (disturbed) samples recovered from the SPT tests were submitted for later testing in a commercial soils laboratory.

Detailed logs for the boreholes and core photographs are attached in Appendix A.

Groundwater monitoring piezometers were installed in BH1 and BH2 once the drilling was completed.



Plates 1 & 2: Boreholes BH1 and BH2 drilled along the southwestern and northwestern sides, respectively, of Reservoir 2

[1] Geoterminology Workshop (2002) – Guidelines for Soil and Rock Logging, SAIEG-AEG-SAICE (Geotech Div) pp47

4.2 Hand Augered Boreholes

Eleven augered boreholes, designated AH1 to AH11 were drilled by hand at the approximate positions shown in Figure 1 to provide soil identification and allow the sampling of the insitu materials. The boreholes were drilled to final depths ranging between 3.00 and 4.20 metres below existing ground level (mbegl).

The soil samples recovered from the boreholes were logged[2], and sampled. The borehole information is summarised in Table 2 below and the detailed logs are attached in Appendix B.

Table 2
Summary of Hand Augered Boreholes

AH No.	Depth (mbegl)	Geology
AH1	4.20	0.00-0.70m: Moist brown slightly clayey silty fine grained SAND. Fill 0.70-2.20m: Moist light brown slightly silty fine grained SAND. Berea Formation. 2.20-4.20m: Moist light brown slightly silty clayey fine grained SAND. Berea Formation. **Final depth at 4.20m.** **No groundwater seepage.** **No sidewall collapse.**
AH2	4.00	0.00-0.65m: Moist brown slightly clayey silty fine grained SAND. Fill 0.65-1.70m: Moist light brown slightly silty fine grained SAND. Berea Formation. 1.70-4.00m: Moist light brown slightly silty clayey fine grained SAND. Berea Formation. **Final depth at 4.00m.** **No groundwater seepage.** **No sidewall collapse.**
AH3	4.00	0.00-0.90m: Moist brown slightly clayey silty fine grained SAND. Fill 0.90-1.80m: Moist light brown slightly silty fine grained SAND. Berea Formation. 1.80-4.00m: Moist light brown slightly silty clayey fine grained SAND. Berea Formation. **Final depth at 4.00m.** **No groundwater seepage.** **No sidewall collapse.**
AH4	3.00	0.00-1.40m: Moist reddish brown slightly silty clayey fine grained SAND. Berea Formation. 1.40-3.00m: Moist light brown slightly clayey silty fine grained SAND. Berea Formation. **Final depth at 3.00m.** **No groundwater seepage.**
AH5	3.00	0.00-1.00m: Moist light brown fine grained SAND. Fill. 1.00-3.00m: Moist reddish brown clayey fine grained SAND. Berea Formation. **Final depth at 3.00m.** **No groundwater seepage.**
AH6	3.00	0.00-1.00m: Moist light brown fine grained SAND. Fill. 1.00-3.00m: Moist reddish brown clayey fine grained SAND. Berea Formation. **Final depth at 3.00m.** **No groundwater seepage.**
AH7	3.00	0.00-1.80m: Moist light brown fine grained SAND. Fill. 1.80-3.00m: Moist reddish brown clayey fine grained SAND. Berea Formation. **Final depth at 3.00m.** **No groundwater seepage.**
AH8	3.00	0.00-3.00m: Moist reddish brown clayey fine grained SAND. Fill. **Final depth at 3.00m.** **No groundwater seepage.**
AH9	3.00	0.00-1.60m: Moist light brown fine grained SAND. Fill. 1.60-3.00m: Moist reddish brown clayey fine grained SAND. Berea Formation. **Final depth at 3.00m.** **No groundwater seepage.** **No sidewall collapse.**
AH10	3.00	0.00-1.40m: Moist light brown fine grained SAND. Fill. 1.40-3.00m: Moist reddish brown clayey fine grained SAND. Berea Formation. **Final depth at 3.00m.** **No groundwater seepage.** **No sidewall collapse.**
AH11	3.00	0.00-3.00m: Moist light brown slightly silty fine grained SAND. Fill. **Final depth at 3.00m.** **No groundwater seepage.** **No sidewall collapse.**

Note: mbegl = metres below existing ground level

[2] Geoterminology Workshop (2002) – Guidelines for Soil and Rock Logging, SAIEG-AEG-SAICE (Geotech Div) pp47

4.3 Test Pits

Seven test pits, designated TP1 to TP7 were dug at the approximate positions shown in Figure 1.

The test pits were dug to final depths ranging between 1.50 and 4.00 mbegl. Where depths were taken down beyond 1.50 mbegl a hand augered borehole was advanced to continue to final depth.

The test pits were profiled[3] by an Engineering Geologist. The detailed logs of the test pits are attached in Appendix B and summarised in Table 3 below.

Table 3
Summary of Test Pits

TP No.	Depth (mbegl)	Geology
TP1	1.50	0.00-1.50m: Moist reddish brown clayey fine grained SAND. Berea Formation. **Final depth at 1.50m.** **No groundwater seepage.** **No sidewall collapse.**
TP2	4.00	0.00-3.00m: Moist reddish brown clayey fine grained SAND. Berea Formation. 3.00-4.00m: Moist brown slightly clayey fine grained SAND. Berea Formation. **Final depth at 4.00m.** **No groundwater seepage.** **No sidewall collapse.**
TP3	1.50	0.00-1.50m: Moist brown to reddish brown silty clayey fine grained SAND. Fill. **Final depth at 1.50m.** **No groundwater seepage.** **No sidewall collapse.**
TP4	4.00	0.00-1.50m: Moist light brown fine grained SAND. Fill. 1.50-4.00m: Moist reddish brown clayey fine grained SAND. Berea Formation. **Final depth at 4.00m.** **No groundwater seepage.** **No sidewall collapse.**
TP5	4.00	0.00-1.10m: Moist brown slightly clayey silty fine grained SAND. Fill 1.10-4.00m: Moist light brown slightly silty fine grained SAND. Berea Formation. **Final depth at 4.00m.** **No groundwater seepage.** **No sidewall collapse.**
TP6	4.00	0.00-0.80m: Moist brown slightly clayey silty fine grained SAND. Fill 0.80-4.00m: Moist light brown slightly silty fine grained SAND. Berea Formation. **Final depth at 4.00m.** **No groundwater seepage.** **No sidewall collapse.**
TP7	1.20	0.00- 1.20m: Moist brown slightly clayey silty fine grained SAND. Berea Formation. **Final depth at 1.20m.** **No groundwater seepage.** **No sidewall collapse.**

Note: mbegl = metres below existing ground level

4.4 Dynamic Cone Penetrometer (DPL) Tests

Thirty-nine Dynamic Cone Penetrometer (light), or DPL tests, designated DPL1 to DPL39 were carried out at the positions shown in Figure 1 to determine the consistency of the soils underlying the site. The DPL tests were taken down in selected areas where rock was not present at surface.

The DPL test comprises a 25mm diameter solid steel retractable cone driven vertically into the ground using a 10 kg hammer dropped through a height of 550mm. The resistance to penetration is measured in terms of number of blow counts per 300mm advance. The DPL test can refuse on boulders, cemented layers as well as bedrock. Due to the nature of the test no soil samples are recovered from the DPL equipment.

The DPL tests were advanced to final depths of between 3.60 and 8.10 mbegl.

[3] Geoterminology Workshop (2002) – Guidelines for Soil and Rock Logging - SAIEG-AEG-SAICE (Geotech Div) pp47

The results of the DPL tests, consisting of blow count and inferred consistency against depth are attached in Appendix C and summarised in Table 4 below.

Table 4
Summary of DPL Test Results

DPL No.	Depth (mbegl)	Comments
DPL1	7.20	Very loose to 1.50m Loose to 1.80m Very loose to 2.10m Loose to 3.00m Medium dense to 6.00m Dense to 6.30m Medium dense to 6.60m Dense to 7.20m Refusal
DPL2	5.40	Very loose to 0.60m Loose to 2.10m Medium dense to 4.50m Dense to 5.40m Refusal
DPL3	7.20	Very loose to 2.10m Loose to 3.30m Medium dense to 6.00m Dense to 6.30m Medium dense to 6.60m Dense to 7.20m Refusal
DPL4	7.20	Very loose to 2.10m Loose to 3.00m Medium dense to 6.30m Dense to 7.20m Refusal
DPL5	8.10	Very loose to 1.20m Loose to 2.40m Medium dense to 3.90m Dense to 4.50m Medium dense to 5.10m Dense to 5.40m Medium dense to 5.70m Dense to 6.00m Medium dense to 6.60m Dense to 8.10m Refusal
DPL6	5.40	Very loose to 0.30m Loose to 1.20m Medium dense to 2.70m Dense to 3.00m Medium dense to 3.90m Dense to 5.40m Refusal
DPL7	8.10	Very loose to 0.90m Loose to 3.60m Medium dense to 6.30m Dense to 6.60m Medium dense to 6.90m Dense to 8.10m End
DPL8	7.80	Very loose to 1.50m Loose to 2.70m Medium dense to 7.50m Dense to 7.80m Refusal
DPL9	8.10	Very loose to 0.90m Loose to 3.60m Medium dense to 6.60m Dense to 6.90m Medium dense to 7.20m Dense to 8.10m End

DPL No.	Depth (mbegl)	Comments
DPL10	8.10	Very loose to 1.20m Loose to 3.60m Medium dense to 6.60m Dense to 6.90m Medium dense to 7.50m Dense to 8.10m End
DPL11	6.30	Medium dense to 0.90m Loose to 1.20m Medium dense to 1.50m Loose to 2.10m Medium dense to 2.40m Loose to 2.70m Medium dense to 3.60m Dense to 6.30m Refusal
DPL12	7.20	Medium dense to 0.30m Loose to 1.20m Very loose to 1.50m Loose to 2.10m Medium dense to 4.20m Loose to 4.50m Medium dense to 6.30m Dense to 7.20m Refusal
DPL13	7.50	Very loose to 1.20m Loose to 2.40m Medium dense to 3.00m Loose to 3.30m Medium dense to 3.60m Loose to 3.90m Medium dense to 4.20m Loose to 4.50m Medium dense to 6.90m Dense to 7.50m Refusal
DPL14	7.20	Medium dense to 0.60m Loose to 2.10m Medium dense to 2.70m Loose to 3.00m Medium dense to 5.70m Dense to 7.20m Refusal
DPL15	5.40	Very loose to 0.60m Loose to 1.50m Medium dense to 3.60m Dense to 3.90m Medium dense to 4.20m Dense to 5.40m Refusal
DPL16	3.60	Very loose to 0.60m Medium dense to 1.20m Loose to 1.50m Medium dense to 1.80m Loose to 2.40m Medium dense to 2.70m Loose to 3.00m Medium dense to 3.30m Loose to 3.60m End
DPL17	3.60	Very loose to 0.90m Loose to 1.20m Medium dense to 1.50m Loose to 2.40m Medium dense to 2.70m Loose to 3.00m Medium dense to 3.30m Loose to 3.60m End

DPL No.	Depth (mbegl)	Comments
DPL18	3.60	Very loose to 0.60m Loose to 1.20m Medium dense to 1.50m Loose to 3.00m Medium dense to 3.30m Loose to 3.60m End
DPL19	3.60	Very loose to 0.30m Loose to 0.90m Very loose to 1.20m Loose to 3.60m End
DPL20	3.60	Loose to 0.30m Medium dense to 0.60m Very loose to 0.90m Loose to 1.50m Very loose to 2.10m Loose to 3.00m Medium dense to 3.60m End
DPL21	3.60	Very loose to 0.60m Loose to 1.20m Medium dense to 1.50m Loose to 1.80m Medium dense to 3.60m End
DPL22	3.60	Loose to 0.60m Medium dense to 1.20m Loose to 1.50m Medium dense to 2.70m Loose to 3.30m Medium dense to 3.60m End
DPL23	3.60	Loose to 0.60m Medium dense to 1.50m Loose to 1.80m Medium dense to 2.70m Loose to 3.00m Medium dense to 3.60m End
DPL24	3.60	Loose to 0.30m Medium dense to 0.60m Loose to 2.70m Medium dense to 3.60m End
DPL25	3.60	Loose to 0.60m Medium dense to 1.20m Loose to 1.50m Medium dense to 1.80m Loose to 2.10m Medium dense to 2.70m Loose to 3.00m Medium dense to 3.60m End
DPL26	3.60	Very loose to 0.30m Loose to 1.50m Medium dense to 2.70m Loose to 3.00m Medium dense to 3.30m Loose to 3.60m End
DPL27	3.60	Very loose to 0.30m Loose to 1.50m Medium dense to 2.70m Loose to 3.30m Medium dense to 3.60m End

DPL No.	Depth (mbegl)	Comments
DPL28	3.60	Very loose to 0.30m Loose to 3.00m Medium dense to 3.30m Loose to 3.60m End
DPL29	3.60	Very loose to 0.30m Loose to 2.70m Medium dense to 3.00m Loose to 3.30m Medium dense to 3.60m End
DPL30	3.60	Very loose to 0.60m Loose to 2.10m Medium dense to 2.40m Loose to 3.00m Medium dense to 3.60m End
DPL31	3.60	Very loose to 0.30m Loose to 0.60m Very loose 0.90m Loose to 2.40m Medium dense to 3.00m Loose to 3.30m Medium dense to 3.60m End
DPL32	8.10	Loose to 0.90m Medium dense to 1.50m Loose to 2.40m Medium dense to 2.70m Loose to 3.00m Medium dense to 7.50m Dense to 7.80m Medium dense to 8.10m End
DPL33	8.10	Loose to 0.30m Medium dense to 1.80m Loose to 2.10m Medium dense to 8.10m End
DPL34	8.10	Loose to 0.30m Medium dense to 0.60m Loose to 0.90m Medium dense to 1.80m Loose to 2.10m Medium dense to 8.10m End
DPL35	6.90	Medium dense to 0.90m Loose to 1.50m Medium dense to 1.80m Loose to 2.10m Medium dense to 5.70m Dense to 6.00m Medium dense to 6.30m Dense to 6.90m Refusal
DPL36	6.90	Medium dense to 0.90m Loose to 2.10m Medium dense to 3.00m Loose to 3.30m Medium dense to 5.70m Dense to 6.90m Refusal
DPL37	6.90	Loose to 0.60m Medium dense to 1.20m Loose to 1.80m Medium dense to 6.30m Dense to 6.90m Refusal

DPL No.	Depth (mbegl)	Comments
DPL38	6.90	Medium dense to 0.90m Loose to 1.80m Medium dense to 6.00m Dense to 6.90m Refusal
DPL39	6.90	Medium dense to 0.90m Loose to 1.20m Medium dense to 6.00m Dense to 6.90m Refusal

Note: mbegl = metres below existing ground level

5. SITE GEOLOGY

The general area within which the Mobeni Reservoirs No. 1 & 2 occurs is underlain by the predominantly sandy soils of the Berea Formation. These soils range in composition from silty sands through to slightly clayey silty sands. The reservoirs were constructed on a large, cut platform made into an elevated dune or hill crest area consisting of the Berea Formation dune soils.

From the information provided Reservoir No. 2 is approximately 7m in height. The shell of the reservoir which slopes all round at 45 degrees has a blanket of fill surrounding it which increases in thickness towards the bottom of the sides and merges with the platform. The fill capping layer over the roof slab of the reservoir is approximately 300mm in thickness.

The founding level for the existing reservoir base is at about 66 metres above mean sea level or mamsl. The reservoir has been placed on a very large platform cut into the dune.

The geology encountered in the boreholes, drilled at the sides at the positions shown in Figure 2, is summarized in Table 5 below.

Table 5
Summary of Borehole Geology

BH No.	Final Depth (mbegl)	Geology
BH1	25.45	0.00-3.00m: Moist brown loose silty fine grained SAND. Colluvium. 3.00-6.00m: Reddish brown medium dense silty clayey fine grained SAND. Berea Formation. 6.00-9.00m: Orangish brown medium dense clayey silty fine grained SAND. Berea Formation. 9.00-13.50m: Brown medium dense silty fine grained SAND. Berea Formation. 13.50-18.00m: Orangey brown medium dense silty clayey fine grained SAND. Berea Formation. 18.00-24.00m: Light brown medium dense silty fine grained SAND. Berea Formation. 24.00-25.45m: Light brown dense silty fine grained SAND. Berea Formation. **Borehole terminated at 25.45m.** **Groundwater seepage at 19.30m.**
BH2	25.45	0.00-1.50m: Moist reddish brown clayey fine grained SAND. Colluvium. 1.50-6.00m: Reddish brown loose clayey fine grained SAND. Berea Formation. 6.00-7.50m: Light brown to brown loose silty fine grained SAND. Berea Formation. 7.50-12.00m: Brown medium dense slightly clayey silty fine grained SAND. Berea Formation. 12.00-21.00m: Light brown medium dense fine grained SAND. Berea Formation. 21.00-22.50m: Reddish brown dense slightly clayey silty fine grained SAND. Berea Formation. 22.50-25.45m: Reddish brown to brown very dense clayey silty fine grained SAND. Berea Formation. **Borehole terminated at 25.45m.** **Groundwater seepage at 22.80m.**

Note: mbegl = metres below existing ground level

5.1 Geological Cross-sections

The relationships between the various soil layers beneath the site are shown in the inferred geological cross-sections AA and BB drawn along the section lines in Figure 2.

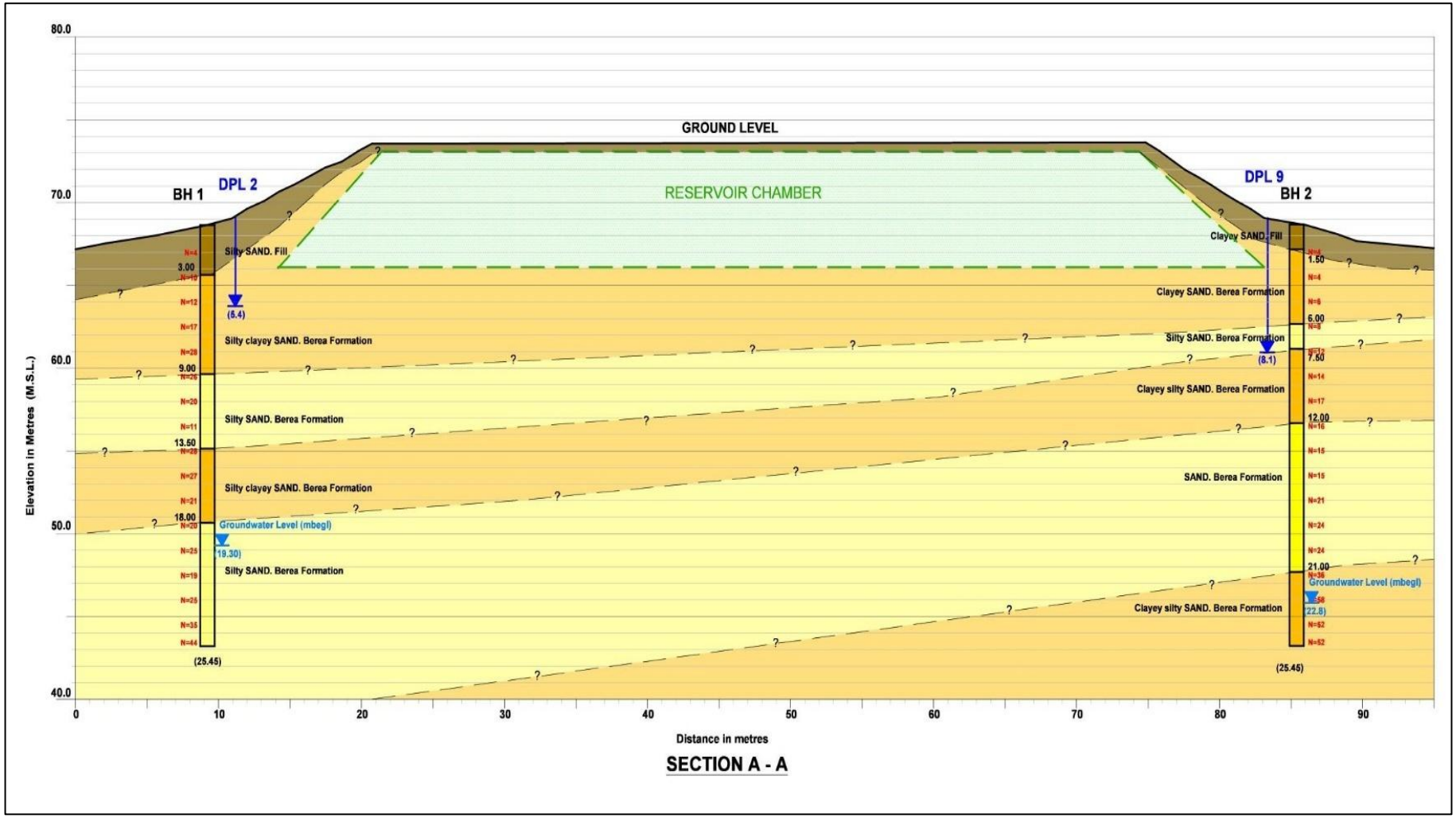


Figure 3: Cross-Section A-A

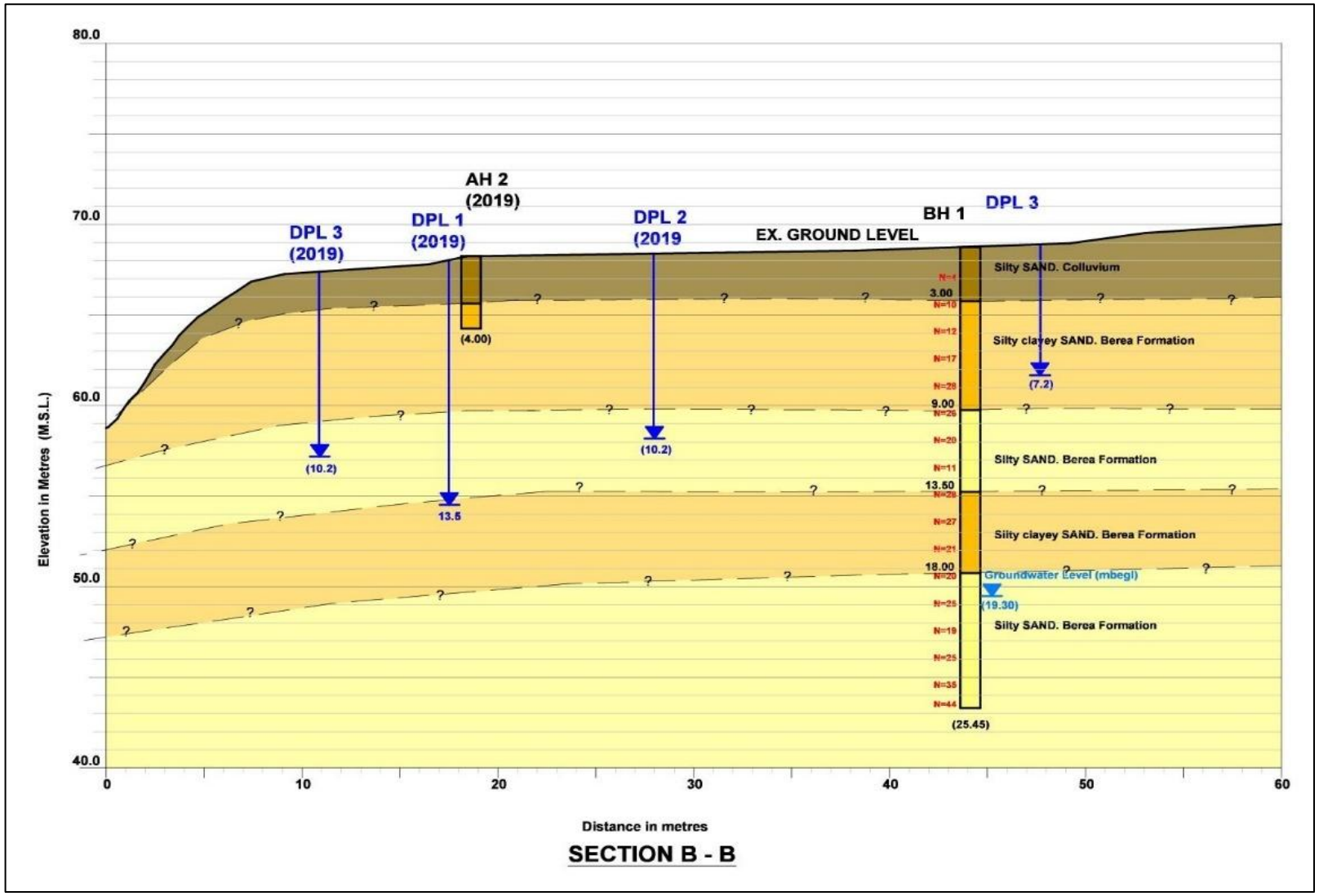


Figure 4: Cross-Section B-B

6. GROUNDWATER

The groundwater level was measured in the borehole piezometers on the 27th March 2025. The depths are presented in Table 6 below.

Table 6
Results of Groundwater Levels measured in Borehole Piezometers

Borehole No	BH1	BH2
Groundwater Level (mbegl)	19.30	22.80
Final Depth (mbegl)	25.45	25.45

Note: mbegl = metres below existing ground level

7. LABORATORY TESTING

Laboratory testing was carried out by a SANAS accredited laboratory on soil samples taken during the fieldwork and comprised the following:

- Foundation Indicator tests (Particle Size Analysis, Atterberg Limit Determination and Hydrometer Analysis),
- Mod AASHTO dry density tests, and
- California Bearing Ratio tests

The laboratory test results are summarised in Table 7 below, and the detailed results are contained in Appendix D.

In addition, the results of some of the laboratory tests carried out for the previous investigation in 2019 are presented in Table 8 and Table 9 below.

Table 7
Summary of Results of Particle Size Distribution Analysis, Atterberg Limit Determinations and CBR tests

Test Pit No.	Depth (mbegl)	Description	Particle Size %				Atterberg Limits			GM	Modified AASHTO		CBR Values (%) Compaction MDD (%)					Swell (%)	Classification & Activity
			Clay	Silt	Sand	Gravel	LL	PI	LS %		MDD (kg/m³)	OMC %	90	93	95	98	100		
AH4	0.00-1.40	Moist reddish brown slightly silty clayey fine grained SAND. Berea Formation.	15.8	0.0	84.2	0.0	-	NP	0.0	0.83									A-2-4(0); SM; Anticipate G8 quality
	1.40-3.00	Moist light brown slightly clayey silty fine grained SAND. Berea Formation.	18.7	1.1	80.1	0.1	-	NP	0.0	0.81									A-2-4(0); SM; Anticipate G8 quality
TP1	0.00-1.50	Moist reddish brown clayey fine grained SAND. Berea Formation.	26.7	3.0	70.1	0.2	-	NP	0.0	0.71	2072	7.8	7.8	14	20	33	45	0.33	A-2-4(0); SM; G8/G9
TP3	0.00-1.50	Moist brown to reddish brown silty clayey fine grained SAND. Fill.	16.2	6.8	75.4	1.6	-	NP	0.0	0.81	2000	8.8	9.3	17	25	37	47	0.27	A-2-4(0); SM; G7
TP5	1.00-1.20	Light yellow brown silty SAND. Berea Formation.	10		87	3	-	NP	0.0	0.97	1805	8.0	11	16	20	26	31	0.00	A-3(0); G7
TP6	1.00-1.20	Light yellow brown silty SAND. Berea Formation.	11		89	0	-	NP	0.0	0.92	1787	9.5	4.7	9.6	15	20	23	0.00	A--4(0); G9
TP7	1.00-1.20	Light yellow brown reddish slightly clayey silty SAND. Berea Formation.	22		78	0	-	NP	0.0	0.79	2015	9.3	14	17	19	24	27	0.3	A-2-4(0); G7
BH1	13.50-15.45	Orangey brown silty clayey fine grained SAND. Berea Formation.	20.7	3.1	76.2	0.0	-	NP	0.0	0.74									A-2-4(0); SM; Anticipate G8 quality
	21.00-22.95	Light brown silty fine grained SAND. Berea Formation.	14.9	1.1	84.0	0.0	-	NP	0.0	0.74									A-2-4(0); SM; Anticipate G8
BH2	3.00-4.95	Reddish brown to brown clayey fine grained SAND. Berea Formation.	26.7	3.0	70.3	0.0	-	NP	0.0	0.71									A-2-4(0); SM; Anticipate G8
	9.00-10.95	Brown silty fine grained SAND. Berea Formation.	14.7	3.1	82.2	0.0	-	NP	0.0	0.82									A-2-4(0); SM; Anticipate G8
	13.50-15.45	Light brown fine grained SAND. Berea Formation.	22.7	3.0	73.8	0.4	-	NP	0.0	0.71									A-2-4(0); SM; Anticipate G8
	24.00-25.45	Reddish brown slightly clayey slightly silty fine grained SAND.	13.9	2.0	84.0	0.2	-	NP	0.0	0.84									A-2-4(0); SM; Anticipate G8

LL	-	Liquid Limit	GM	-	Grading Modulus	Classification in Terms of:	USPRA[4]
PI	-	Plasticity Index	MDD	-	Maximum Dry Density		Unified Soil Classification System[5]
LS	-	Linear Shrinkage	OMC	-	Optimum Moisture Content		COLTO[6]

[4] US Public Roads Administration Classification (Modified from Allen 1945)

[5] ASTM D 2487-06 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System). June 2006

[6] COLTO (1998) – Committee of Land Transport Officials: Standard Specifications for Roads and Bridge Works for State Officials

Table 8
Summary of Results of Particle Size Distribution Analysis, Atterberg Limit Determinations and CBR tests

Sample No.	Area Sampled	Description	Particle Size %			Atterberg Limits			GM	Modified AASHTO		CBR Values (%) Compaction MDD (%)					Swell (%)	Classification
			Clay & Silt	Sand	Gravel	LL	PI	LS %		MDD (kg/m³)	OMC %	90	93	95	98	100		
6	Slip valley bottom	Moist reddish brown slightly silty SAND. Berea Formation	20	80	-	-	NP	0.0	0.81	1994	11.0	10	14	17	23	27	0.1	A-2-4(0); SM; G8; G8
7	Slip face below pylon	Moist reddish to orange brown loose slightly silty SAND. Berea Formation	6	94	-	0	NP	0.0	0.95	1799	10.1	11	14	16	18	19	0.0	A-3(0); SM; G8; G8

Results of tests carried out for 2019 geotechnical investigation

LL	-	Liquid Limit	GM	-	Grading Modulus	Classification in Terms of:	USPRA[7]
PI	-	Plasticity Index	MDD	-	Maximum Dry Density		Unified Soil Classification System[8]
LS	-	Linear Shrinkage	OMC	-	Optimum Moisture Content		TRH14 (1985)[9]
							COLTO[10]

[7] US Public Roads Administration Classification (Modified from Allen 1945)
[8] ASTM D 2487-06 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System). June 2006
[9] TRH 14 (1985) - Guidelines for Road Construction Materials; Technical Recommendations for Highways, South African National Institute for Transport and Road Research
[10] COLTO Standard Specifications for Road and Bridge Works for State Road Authorities (1998)

Table 9
Summary of Results of Slow Drained Shearbox Tests carried out Undisturbed Samples

Sample No	Location	Grading Analysis Cumulative Percentage Passing (%)								Atterberg Limits			Insitu Density and Moisture Content				Shearbox Tests		Materials Classification
		0.002	0.075	0.15	0.425	2.00	4.75	13.2	19	LL	PI	LS	GM	Average Insitu Dry Density (kg/m³)	Average Moisture Content (%) Before Test	Average Moisture Content (%) After Test	Cohesion (kPa)	Friction Angle (degrees)	
U/D1	Below Floor Slab. Fill	22.0	28.6	35.1	98.3	100	100	100	100	21.6	6.9	2	0.73	1697	7.1	19.13	0 2*	34 32*	A-2-4(0); SM-SC
U/D2	Slip Face – below Res floor. Fill	3.6	8.7	10.2	98.8	100	100	100	100	21	NP	0	0.93	1356	6.4	26.49	0 0*	30 28*	A-3(0); SM
U/D3	Slip Face West Valley side. Insitu Berea Formation soils	5.9	9.7	10.6	98.1	100	100	100	100	22.4	NP	0	0.92	1436	4.4	25.78	0 0*	36 34*	A-2-4(0); SM
U/D4	Slip Face. Fill	23.5	29.8	35.5	98.3	100	100	100	100	21	7.5	2	0.72	1554	12.43	21.23	0 0*	34 31*	A-2-4(0); SC
U/D5	Slip Face Below Pylon. Possibly fill	22.6	28.7	35.3	97.3	100	100	100	100	22.5	7.3	2.7	0.74	1611	8.67	22.72	1 1*	33 32*	A-2-4(0); SC

Notes: *** denotes shear reversal**
Results of tests carried out for 2019 geotechnical investigation

LL - Liquid Limit
PI - Plasticity Index
LS - Linear Shrinkage
GM - Grading Modulus
MDD - Maximum Dry Density
OMC - Optimum Moisture Content

Classification in Terms of: USPRA[11]
Unified Soil Classification System[12]

[11] US Public Roads Administration Classification (Modified from Allen 1945)
[12] ASTM D 2487-06 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System). June 2006

8. GEOTECHNICAL ASSESSMENT AND RECOMMENDATIONS

8.1 Proposed Reinstatement of Mobeni Reservoir No. 2

The reinstatement of the reservoir will require the following:

- Demolition and cutting back of the damaged section of reservoir
- Construction of new section on existing platform
- Reinstate fill embankment with retaining structure (if required) to ensure embankment does not encroach on adjacent property

The proposed reinstatement solution is shown in Figures 5 and 6 below.

8.2 Excavations and Lateral Support

Excavation of all materials to the final depths shown by the final depths of the Geotechnical Boreholes, DPL tests and Augered boreholes classify as Soft Excavation[13] (Figures 1 & 2).

The consistency (or strength) of the soils beneath the site are provided by the Boreholes and DPL tests carried out. The general trend in consistency beneath the site is as follows:

Very loose to 2.10m
Loose to 3.0m
Medium dense to 21.0m

Clearly, the soil profile is very weak (i.e. very loose) in the upper 2 to 3m and gradually improves in strength to loose at about 3m depth, indicating a high potential for collapse of open excavations. Thus, support of excavations will require special consideration.

The following is recommended:

- Excavations to 1.5m depth should have slope angles not steeper than 1V:2H. Where this cannot be achieved because of space constraints, then excavations should be supported to ensure the safety of workers inside.
- Excavations deeper than 1.5m depth to a maximum depth of about 3m should be supported with propping, boarding and trench sheeters.
- Excavations for trenches deeper than about 3m may require sheet piling or sheet pile-driven steel pile combinations.
- The stability of the open excavations will be affected significantly by rainfall and shallow groundwater seepage, with unprotected slopes becoming eroded as well as potentially unstable and prone to slumping. Where this situation arises, flatter slopes or lateral support will be required.

Daily inspections by geotechnically competent and experienced site staff should be carried out to assess the stability of excavations.

For deep and very long excavations, such as for pipelines and cable sleeves, trenchless and/or tunnelling technology methods may be considered. These are discussed in detail under Section 8.3 below.

[13] SANS634:2012: Geotechnical Investigations for Townships: pp16, Table 5 - Classification of material for machine excavation

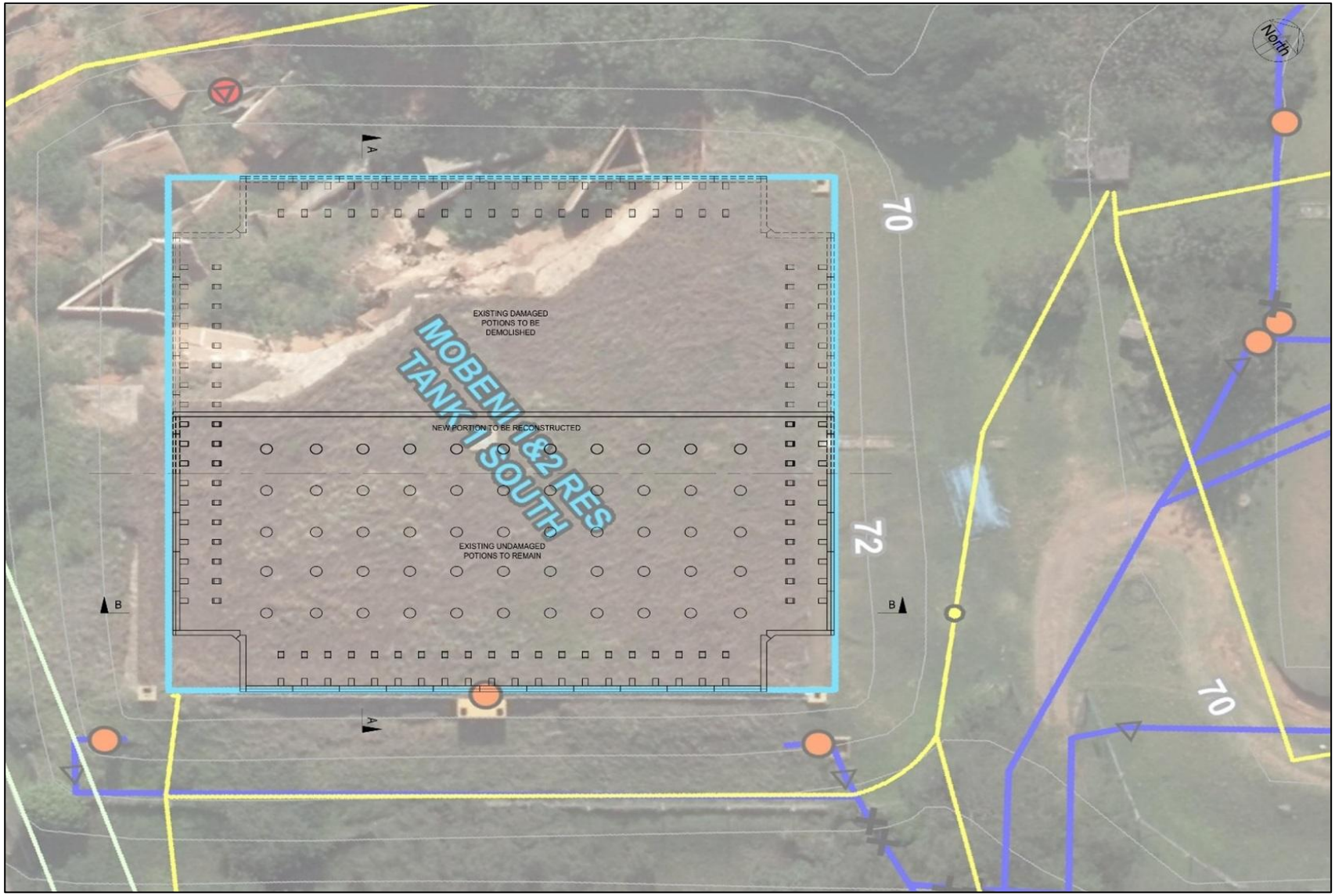


Figure 5: Plan View - Proposed Reinstatement of Reservoir No 2: Damaged portions to be demolished and new section to be built

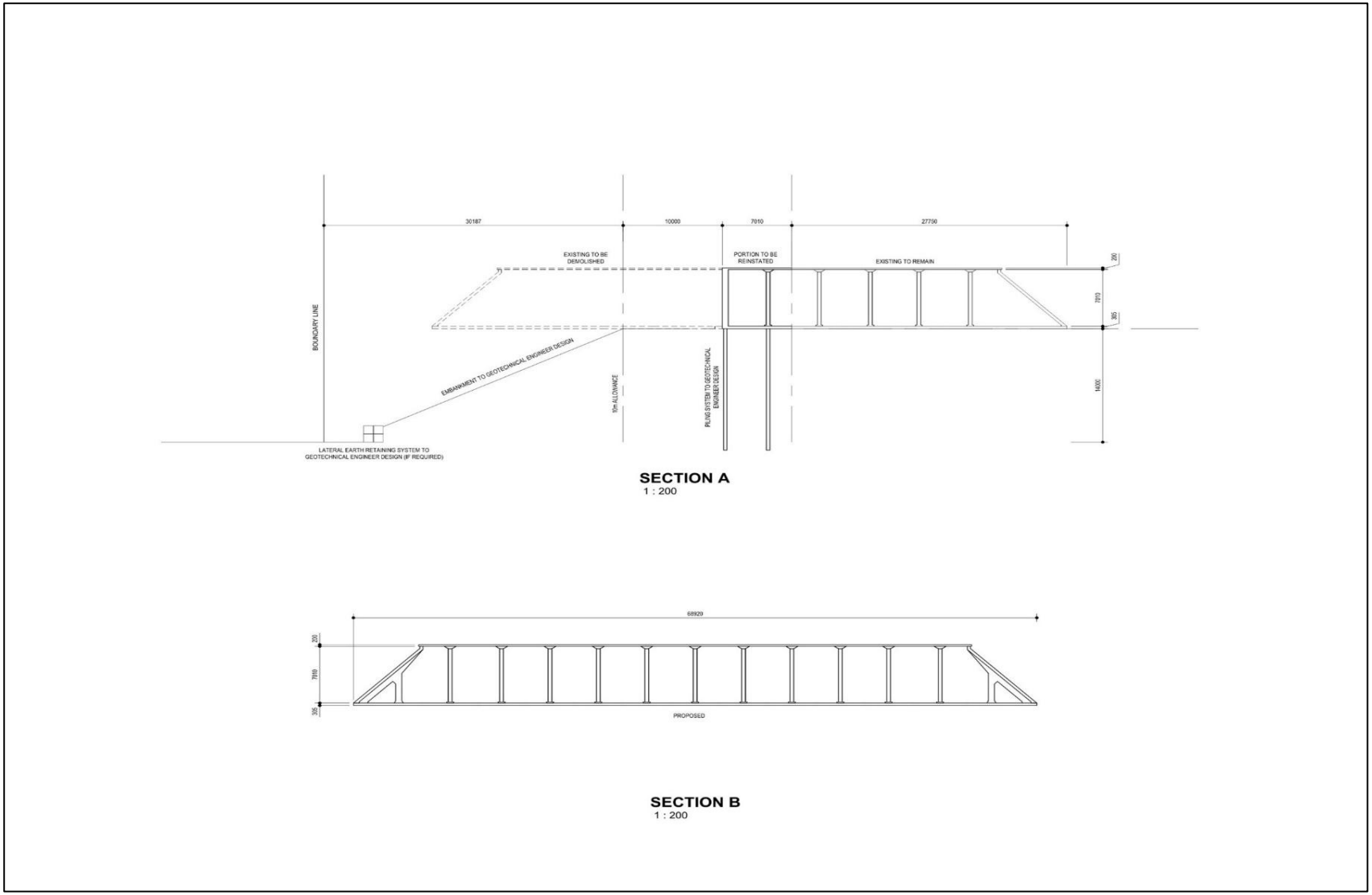


Figure 6: Cross-Section A & B - Proposed Solution for Reinstatement of Reservoir No 2: Damaged portions to be demolished and new section to be built

8.3 Trenchless or Tunnelling Methods for Buried Pipelines

Comment is required on the suitability of the ground conditions beneath the site for the use of trenchless systems for buried pipelines.

The general ground conditions beneath the site, consisting of the sandy soils of the Berea Formation, require only Soft Excavation to depths more than 6m below existing ground level, and are therefore suitable for all types of trenchless systems.

These are mentioned below:

- **Thrust bore**. Thrust boring, also known as auger boring, is used to install underground utilities like pipes and conduits by pushing a steel casing through the ground using hydraulic jacks and a cutting head, minimizing surface disruption. A maximum diameter of about 600mm can be accommodated by this method, The maximum length of a typical thrust bore is generally around 100 meters, though longer bores up to 200 meters are sometimes possible depending on availability of equipment and ground conditions. The thrust bore creates a straight, unbending shaft because of the augering equipment used. It requires a jacking pit at either end of the crossing.

- **Horizontal Directional Drilling**. The geological conditions beneath this site are suited for the HDD method for pipes of up to 1200mm diameter. Maximum length is up to 2050m, but can be varied for projects. The HDD underground tunnel follows an arc line from the entry point, down under road or servitude to be crossed, and then resurfaces on the opposite side. A drill head guides the drilling pipe electronically to ensure the angle, depth, and exit point adhere to carefully designed engineering plans. Throughout the drilling process, the tunnel is kept open and lubricated by circulating a watery mud-slurry mixture, typically composed of about 95% water and 5% bentonite clay. The drilling mud also helps coat the walls of the tunnel and remove drill cuttings.

- **Pipejacking.** Pipejacking is a commonly used method in SA. Note that the minimum concrete pipe diameter required is 0.9m internal diameter (ID) to facilitate entry by workers. Conventional pipe jack methods can also deal with boulders and/or rock. An important factor affecting cost of either method is the depth of the jacking pits required at each end of the crossing alignment. These would need to be between 3 and 6m deep (depending on the pipe invert level). Maximum jacked pipe length is 200m for 0.9m diameter sleave; longer than this may require inter-jack stations. Greater lengths are achievable with larger diameters[14].

- **Micro-Tunnelling** may be considered as well. This method involves the use of a miniature tunnel boring machine (TBM) which can drill diameters 0.9 to 2.8m. However, this method may be relatively expensive due to high establishment costs (and TBM availability) and is better suited for longer tunnels of greater than 3 000m. This method also requires an entry and exit area for the TBM to start tunnelling.

8.4 Site Materials

Fill

A single sample of the fill material taken from TP3, was tested. The results of the laboratory tests yielded the following:

Soil Classifications:

- Description: brown to reddish brown silty sand
- Soil is non-plastic (NP)
- Grading Modulus value of 0.81
- Combined silt & clay content of 23%
- Fine & and medium sand: 75.4%
- Gravel: 1.6%

[14] Pipe Jacking Association; An introduction to Pipe jacking and Microtunnelling. ISBN 978-1-5272-0341-9

- MDD: 2000 kg/m^3
- OMC: 8.8%
- CBR values:
  - 9.3 @ 90% MDD
  - 17 @ 93% MDD
  - 25 @ 95% MDD
  - 37 @ 98% MDD
  - 47 @ 100% MDD
- Material classifies as A-2-4(0) and SM
- In terms of COLTO the sample meets G7 quality
- Potentially very highly erodible

Recommended Usage:

- This material will be suitable for use as a selected material in the construction of roads and paved areas
- It is suitable for use as bedding / blanketing material for buried flexible pipelines, consisting of uPVC., HDPE and GRP, as well as steel and ductile iron pipes.
- It will not meet the strict bedding requirements of a selected granular bedding material in terms SABS 1200LB; such materials must be imported to the site.
- Will be suitable for use as a backfill material to retaining walls and foundations

It must be noted that the sample of fill tested represents material which has presumably been borrowed from other parts of the site. While it is reasonable to assume that all fill on the site will be of similar quality, fills may be variable across the site, and their quality should be verified by inspection and/ or laboratory testing.

Berea Formation

Several samples of the Berea Formation soils were tested. The results of the laboratory tests yielded the following:

- Description: slightly clayey to silty sand
- Soil is non-plastic (NP)
- Grading Modulus value of 0.71 to 0.95
- Combined silt & clay content of 10 to 29.7%,
- Sand: 70.1 to 87%
- Gravel: 0.00 to 0.4%
- MDD: 1799 to 2072 kg/m^3
- OMC: 7.8 to 11.0%
- CBR values:
  - 4 to 14 @ 90% MDD
  - 9 to17 @ 93% MDD
  - 15 to 20 @ 95% MDD
  - 20 to 33 @ 98% MDD
  - 23 to 45 @ 100% MDD
  - CBR swell @ 100%MDD = 0 to 0.33%
- In terms of COLTO the sample classifies generally as G8 quality material, in the range G9 to G7.
- Material classifies as A-2-4(0), occasionally A-3(0); SM, occasionally SC-SM
- Low heave potential
- Potentially very highly erodible

Recommended Usage:

- This material will be suitable for use as a selected material in the construction of roads and paved areas
- It is suitable for use as bedding / blanketing material for buried flexible pipelines, consisting of uPVC., HDPE and GRP, as well as steel and ductile iron pipes.

- It will not meet the strict bedding requirements of a selected granular bedding material in terms SABS 1200LB; such materials must be imported to the site.
- Will be suitable for use as a backfill material to retaining walls and foundations.

8.5 Platform for New Reservoir Section

The proposed reservoir reinstatement will be carried out as shown in Figure 7 (Section C-C) below. The damaged concrete shell will be demolished until there is sufficient space for the construction of the new reservoir section. This will expose the top of the existing platform. Therefore, new fill must be constructed as shown to rebuild the eroded face of the platform and create an extended platform for piling.

The following is recommended:

- Earthworks to follow SABS1200 DM guidelines for construction.
- Imported material is to be of similar (i.e. G8, or better) quality.
- For new fills compaction should not be less than 100% MDD (i.e. cohesionless Berea Formation sands).
- All new fill layers must be benched into the existing slope.

Sources of suitable fill for the new embankment are as follows:

- Existing fill making up the platform beneath the northern part of the damaged reservoir which must be demolished.
- The partially eroded ridge to the west of the reservoir will supply a significant amount of fill, provided it forms part of the site and has the necessary approvals (e.g. environmental) for borrowing.

Shortfalls of fill may need to be imported to the site, however, a detailed earthworks modelling exercise is required to determine this aspect.

Plates 3 & 4: Damaged section of the reservoir near the southern corner, showing the platform abruptly truncated by the breach and the inside of the concrete chamber exposed.

Plates 5 to 7: Remnants of the natural dune on the west of Reservoir 2 will yield borrow material for the new fill embankment

8.6 Retaining Walls

From the results provided in the 2019 geotechnical report (Table 9) and general experience with the Berea Formation soils, the following effective shear strength parameters may be considered for the design of retaining walls, provided compaction of the backfill is 100% MDD:

Φ' = 33°;
c' = 0 kPa
Bulk density = 2 000kg/m^3

Retaining walls to retain the new fill in the necked valley area of the deeply eroded area below the reservoir may comprise any of the following, depending on the required height:

- Traditional gabion walls – gravity retaining structure,
- Gabions mechanically stabilised with geogrid tails, or
- Patented systems such as Terramesh which encourage vegetation growth

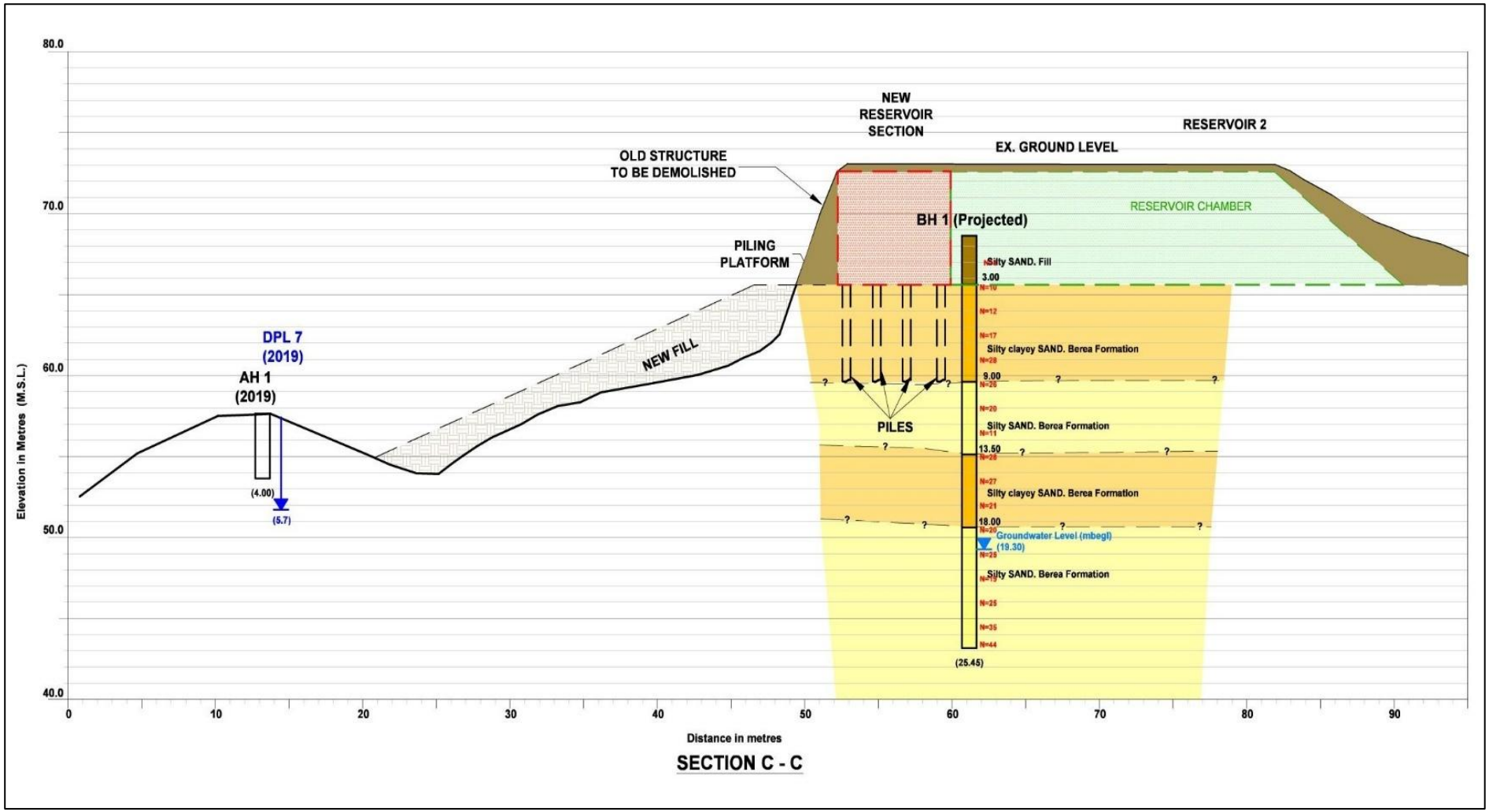


Figure 7: Section C-C: Construction of new fill embankment near the western corner of Reservoir 2 will stabilise the eroded / damaged platform and provide piling platform

8.7 Foundations

8.7.1 Proposed New Reservoir Section

The new reservoir section will be constructed on the existing platform once the damaged structure has been removed. Because it is a new component that will adjoin the existing structure, foundations must be designed to limit differential settlement to 2.5mm.

In that the Berea Formation extends to significant depths below the site, i.e. more than 25m below existing ground level, piles will consist of the Continuous Flight Augered (CFA), grout injected type. These piles support most of their load in skin friction. This piling method has very low ground vibrations during installation of the piles, a feature considered favourable for the site.

The diameter, length and spacing of the piles which must support the new section of the reservoir will be determined by the detailed pile design. Since piles will not be installed through new fill, but rather in the cut area of the original platform, their design will not be required to cater for any down-drag or negative skin friction forces (Figure 7).

8.7.2 Stabilisation of Electrical Pylon

The pylon supporting the high-tension overhead electrical cable is located about 7m from the edge of the slip or erosion face formed by the breaching of the Reservoir No. 2. The excavation face is about 12 to 15m deep and sub-vertical in the upper 8m of the face.

Plates 8 to 10: Pylon within 7m of the edge of the slipped surface

Since the previous geotechnical report was submitted in 2019, the pylon has not shown any signs of tilting or deflection which would be expected if the potentially unstable slope below has moved. It must therefore be concluded that it is relatively stable over the medium term.

It has been indicated by the Client that the Pylon was supported on piled foundations. Detailed information of the piles and foundation system in general were not available at the time of construction.

However, as part of the brief of this project the exposed, potentially unstable face below the pylon must be stabilised to eliminate any risk of failure in the future.

Consideration should be given to constructing the new fill embankment up to the base of the pylon as high as possible. This would provide the necessary passive horizontal load to stabilise the ground supporting the pylon. However, the feasibility of this option would need to be determined by a detailed earthworks modelling exercise.

Regardless, it is recommended that the slip face be stabilised using soil nails with reinforcing mesh and shotcrete cladding to ensure stability over the construction period.

The reasons for this are the following:

- The exposed face has been standing for 6 years and the stability of the upper sub-vertical part of the face, up to 8m in height, can no longer be relied on.
- Experience with unsupported, very steep slopes in Berea Formation soils indicates that they are notorious for sudden, unexpected collapse, even after several years of being apparently stable.
- Slope failures could also be triggered by rain falling on the surface of the slope, seismic events or ground vibrations from construction plant, or similar.

The installation of soil nails etc would involve a temporary fill placed to a level near the top of the slope to create a working platform for the installation of the first row of soil nails, followed by shotcrete sprayed onto the face. New benches are then cut as soil nail rows are installed sequentially down the slope. Temporary soils nails and shotcrete cladding will be installed for the part of the slope that will eventually be covered with new fill. Permanent soil nails and cladding are applicable to the free-standing face above the final fill level. The height of the latter will be determined from the final earthworks design.

8.7.3 Foundations for Manholes, Scour Valves and Chambers

The ground conditions beneath manholes, scour valves and chambers were evaluated by carrying out DPL tests and some augered boreholes to confirm soil identification. These test positions are shown in Figure 1.

A generalised soil profile for the site yields the following consistency values:

Very loose to 2.10m
Loose to 3.00m
Medium dense to 21.0m

As a result, the following general recommendation applies for the founding of these structures:

- A maximum allowable bearing pressure of 30kPa may be adopted.
- Total settlements beneath foundations, assuming a 2m x 2m base would be of the order of 10 to 20mm.
- If this settlement cannot be tolerated, then 500mm of the soil below the required founding level should be excavated and replaced in layers under compaction (minimum 100% MDD) to form an engineered soil mattress on which the structure may be founded. A maximum allowable bearing pressure of 50kPa may then be adopted. Settlement would then be less than 5mm.
- The following soil density values may be used for buoyancy calculations:
  - Insitu (uncompacted) bulk density = 1 550kg/m^3
  - Insitu (uncompacted) saturated density = 1 750kg/m^3
  - Compacted soil (100% MDD) Bulk Density = 2 000kg/m^3

8.7.4 Low Level Retaining Wall - Northern Boundary of Platform

A low-level retaining wall is proposed around the northern edge of the platform incorporating both Reservoir 1 and 2.

The results of DPL tests DPL19 through DPL33 in Figure 1 provide an indication of the founding conditions along the proposed retaining wall. The soils beneath the retaining wall alignment are generally loose from existing ground surface to a depth 2.7m, before improving gradually to medium dense.

The following is recommended for the foundations of the retaining walls:

- Minimum foundation width = 0.8m
- Minimum founding depth = 0.6m below platform level
- Maximum allowable bearing pressure = 50kPa may be used for design
- Anticipated total settlements in the range 10 to 15mm, with differential to be taken as 50%

Higher bearing pressures of 100kPa may be considered if the soil beneath the foundation is improved by compaction to a depth equal to 1.5 x foundation width. The soil under the foundation should be removed to the required depth and replaced under compaction to at least 95% MDD. Total settlements are expected to be less than 5mm where this is carried out.

8.8 Drainage

8.8.1 Surface Water Drainage

An important factor in the promotion of a stable site is the control and removal of surface water from the site. It is important that the design of the stormwater management system allow for the drainage of accumulated surface water towards the existing stormwater infrastructure or natural drainage lines. Disposal of stormwater should in any case conform to the Local Authority's requirements.

The Berea Formation soils are notoriously highly erodible and stormwater measures should aim at reducing flow velocities and discharging stormwater off the site.

8.8.2 Soil Permeability

The permeability of the soil profile beneath the site has been estimated using the results of the laboratory tests contained in Table 7 & 8 above.

The dune soils, which classify as mainly A-2-4(0) and SM, have the following grading characteristics:

- Combined silt & clay content of 0.00 to 26.7%,
- Sand: 70.1 to 94%
- Gravel: 0.0 to 0.4%

In conclusion, the soils therefore may be considered as relatively free-draining[15]. These results fall within the range of typical coefficient of permeability, ***k,*** values for fine to medium grained sands, i.e. 10^{-4} to 10^{-5} m/sec, being of moderate to good permeability. In general, the soils can be classified as having good drainage characteristics.

It should be noted that compaction of these soils will reduce their permeability significantly.

8.8.3 Subsurface Drainage

The sandy soils on site, being relatively permeable, will aid in the subsurface drainage of platforms, roads, parking and paved areas.

Subsoil drainage should be planned for the following:

- The toe area of platform cuttings which will attract groundwater seepage over time
- Road and paving layer-works which could become exposed to seasonally high groundwater or perched seepage conditions
- Retaining walls

[15] Look, B (2007). Handbook of Geotechnical Investigation and Design Tables pp 91

8.9 Subgrade preparation beneath Roads, Paved and Parking Areas

The proposed new access road to the reservoir site will have the following layerworks:

25mm Asphalt	Surfacing
200mm G2	Crushed Stone Base
100mm G7	Subbase / Upper selected Layer
150mm G9	Lower Selected Layer
G10 (Insitu subgrade)	

From the laboratory test results (Tables 7 & 8), the natural or insitu subgrade generally meets G8 quality (COLTO) on average.

The following is recommended for the subgrade treatment beneath the road:

- Rip insitu subgrade to 300mm below level of base of upper selected or G7 layer, or determined by the Engineer, wet and recompact to 93% MDD
- Provided this is done a CBR of 10 may be used to yield a G8 insitu layer

While most soils beneath the site are non-plastic, any subgrade soils encountered that are predominantly clayey and give rise to compaction problems should be undercut below the top of the subgrade layer and replaced with G8 quality material borrowed from other parts of the site.

It is recommended that additional centreline test pitting be carried on all roads, parking and paved areas to confirm material quality.

9. SUMMARY AND CONCLUSIONS

This report contains the results of a geotechnical investigation carried out for the proposed reinstatement of Mobeni Reservoir No 2 which was breached in May 2019, resulting in major damage to the western half of the reservoir.

The fieldwork for the geotechnical investigations consisting of geotechnical (deep) and augered (shallow) boreholes, test pits and DPL tests. Selected samples were submitted for testing in a commercial soils laboratory.

The general area within which the Mobeni Reservoirs No. 1 & 2 occurs is underlain by the soils of the Berea Formation. The reservoir was constructed on a large platform cut into an elevated dune consisting of the Berea Formation soils which range in composition from silty sands through to slightly clayey silty sands.

The proposed reinstatement of Reservoir 2 will require the demolition and cutting back of the damaged section of reservoir, construction of the new reservoir section on the existing platform, and reconstruction of the fill embankment, possibly with retaining wall structure to ensure embankment does not encroach on adjacent property.

Recommendations are given for earthworks, excavations, lateral support, materials usage and the founding of the new section of the reservoir as well as ancillary structures such as buried chambers for valves and manholes.

Finally, the ground conditions described in this report refer specifically to those encountered in the boreholes, DPL tests and test pits logged on site. It is therefore quite possible that conditions at variance with those discussed above can be encountered elsewhere. It is therefore important GGS carry out periodic inspections of the earthworks and open excavations during construction. Any change from the anticipated ground conditions could then be taken into account to avoid unnecessary expense or hardship to the contract. In this regard it is important that the construction phase of the project be treated as an augmentation of the geotechnical investigation.

APPENDIX A

HOLE No: BH1
Sheet 1 of 2

JOB NUMBER: 25-030

ROCK FABRIC
MF -massive
BF -bedded
FF -foliated
CF -cleaved
SF -schistose
GF -gneissose
LF -laminated

GRAIN SIZE
FG -fine grained
MG -medium grain
CG -coarse grain

JOINT SPACING
VCJ-very close spacg
CJ -close spacing
MJ -medium spacing
WJ -wide spacing
VWJ-very wide spacng

JOINT ROUGHNESS
SLJ-slickensided
SJ -smooth
RJ -rough

JOINT SHAPE
CUR-curvilinear
PLA-planar
UND-undulating
STE-stepped
IRR-irregular

ROCK HARDNESS
EHR-extremely hard rock
VHR-very hard rock
HR -hard rock
MHR-medium hard rock
SR -soft rock
VSR-very soft rock

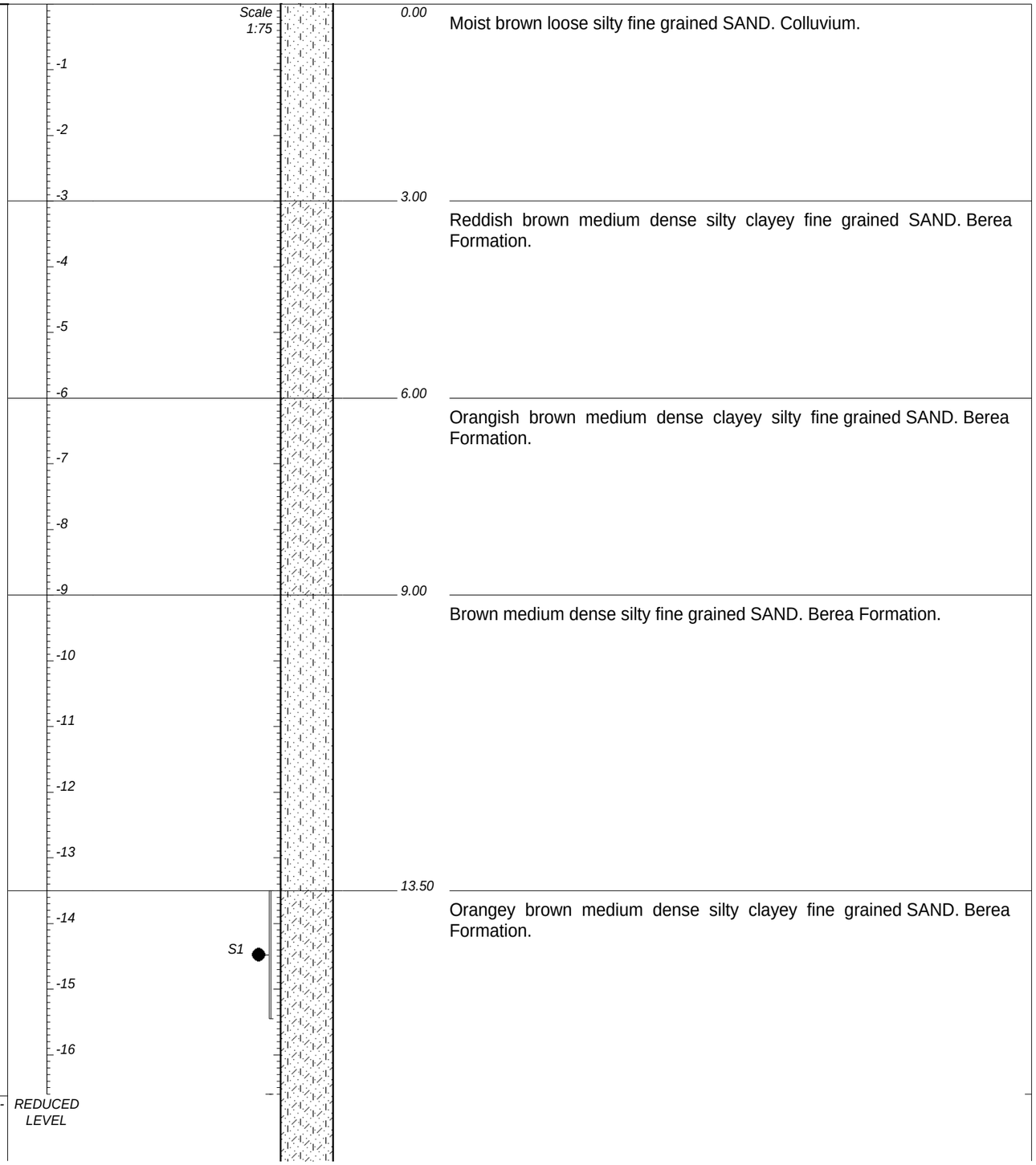
GONDWANA GEO SOLUTIONS

NAIDU CONSULTING
REINSTATEMENT OF MOBENI RESERVOIR 2
DURBAN

HOLE No: BH1
Sheet 1 of 2

JOB NUMBER: 25-030

Drilling Method	Core Recovery (%)	RQD (%)	SPT-N PLI(IS50)	UCS (MPa)	Frac. Freq.	Joint No of Sets	Joint Inclin (deg)	Joint Spacing	Joint Shape	Joint Rough-ness	Joint Filling & Thickness	Weath-ering	REDUCED LEVEL
DXC	0												
SPT	100		N=4										
Wash	0												
SPT	100		N=10										
Wash	0												
SPT	100		N=12										
Wash	0												
SPT	100		N=17										
Wash	0												
SPT	100		N=28										
Wash	0												
SPT	100		N=26										
Wash	0												
SPT	100		N=20										
Wash	0												
SPT	87		N=11										
Wash	0												
SPT	67		N=28										
Wash	0												
SPT	87		N=27										
Wash	0												



0.00 Moist brown loose silty fine grained SAND. Colluvium.

3.00 Reddish brown medium dense silty clayey fine grained SAND. Berea Formation.

6.00 Orangish brown medium dense clayey silty fine grained SAND. Berea Formation.

9.00 Brown medium dense silty fine grained SAND. Berea Formation.

13.50 Orangey brown medium dense silty clayey fine grained SAND. Berea Formation.

HOLE No: **BH1**
Sheet 2 of 2

JOB NUMBER: 25-030

ROCK FABRIC
MF -massive
BF -bedded
FF -foliated
CF -cleaved
SF -schistose
GF -gneissose
LF -laminated

GRAIN SIZE
FG -fine grained
MG -medium grain
CG -coarse grain

JOINT SPACING
VCJ-very close spacg
CJ -close spacing
MJ -medium spacing
WJ -wide spacing
VWJ-very wide spacng

JOINT ROUGHNESS
SLJ-slickensided
SJ -smooth
RJ -rough

JOINT SHAPE
CUR-curvilinear
PLA-planar
UND-undulating
STE-stepped
IRR-irregular

ROCK HARDNESS
EHR-extremely hard rock
VHR-very hard rock
HR -hard rock
MHR-medium hard rock
SR -soft rock
VSR-very soft rock

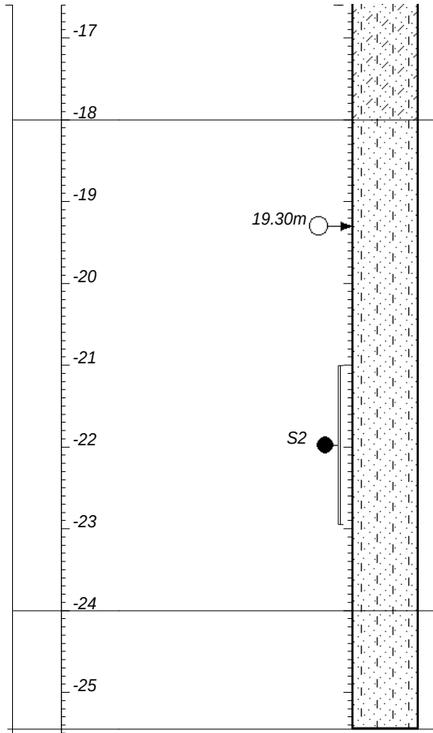
GONDWANA GEO SOLUTIONS

NAIDU CONSULTING
REINSTATEMENT OF MOBENI RESERVOIR 2
DURBAN

HOLE No: **BH1**
Sheet 2 of 2

JOB NUMBER: 25-030

SPT	89		N=21											
Wash	0													
SPT	100		N=20											
Wash	0													
SPT	89		N=25											
Wash	0													
SPT	87		N=19											
Wash	0													
SPT	67		N=25											
Wash	0													
SPT	82		N=35											
Wash	0													
SPT	76		N=44											



18.00 Light brown medium dense silty fine grained SAND. Berea Formation.

24.00 Light brown dense silty fine grained SAND. Berea Formation.

25.45

NOTES

1) Borehole terminated at 25.45m.

2) Groundwater seepage at 19.30m.

3) Samples taken :
S1 13.50--15.45m (1 x Small)
S2 21.00--22.95m (1 x Small)

Drilling Method	*Core Recovery (%)*	*RQD (%)*	*SPT-N PLI(IS50)*	*UCS (MPa)*	*Frac. Freq.*	*Joint No of Sets*	*Joint Inclin (deg)*	*Joint Spacing*	*Joint Shape*	*Joint Rough-ness*	*Joint Filling & Thickness*	*Weath-ering*	*REDUCED LEVEL*

CONTRACTOR : Geopractica
MACHINE : DR90
DRILLED BY :
PROFILED BY : SR
TYPE SET BY : MC
SETUP FILE : GGS-BH~1.SET

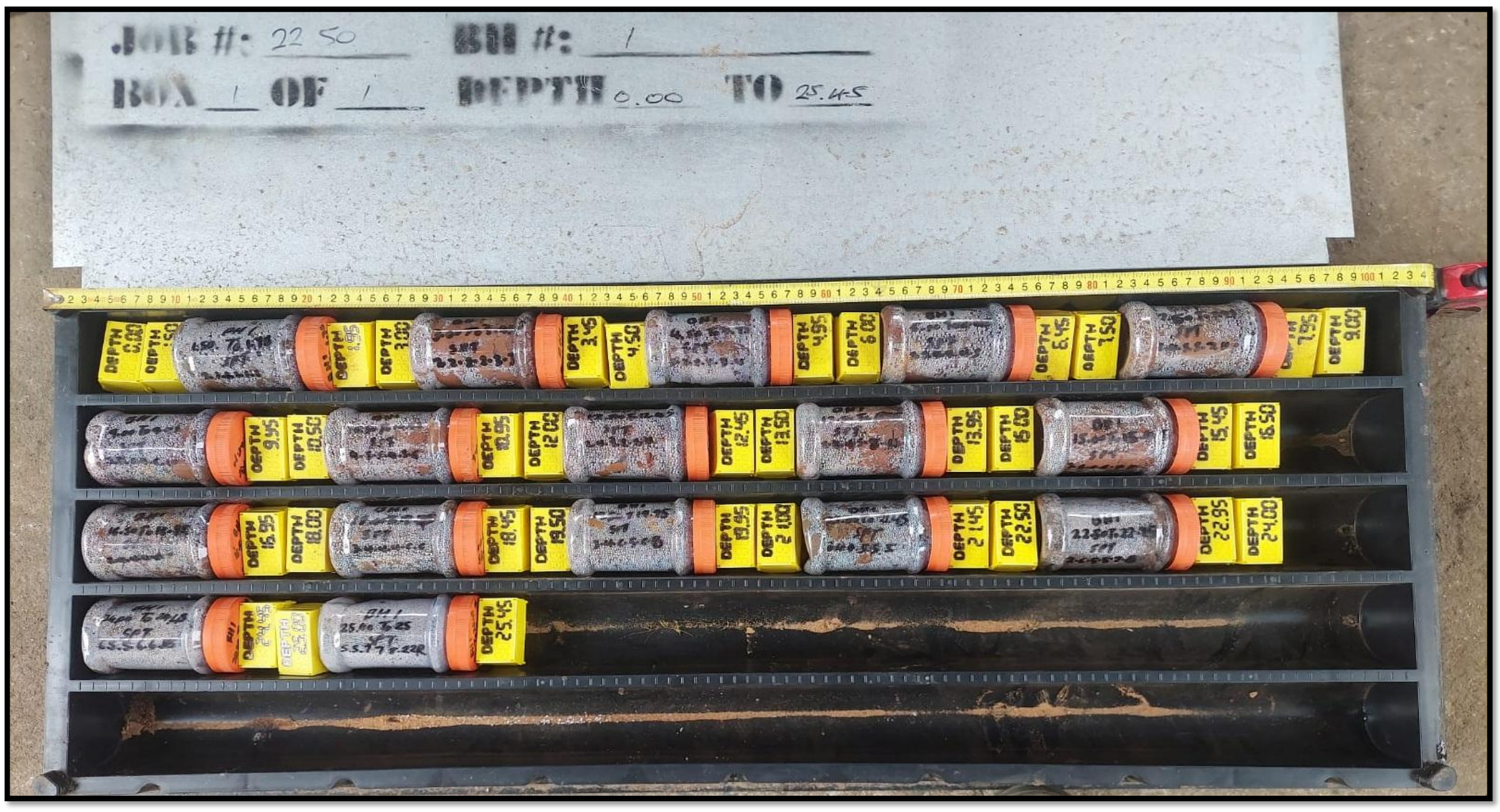
INCLINATION :
DIAM :
DATE :
DATE : 28/03/2025
DATE : 11/04/2025 10:57
TEXT : ..rvoir2\Bholelogs\BH1.doc

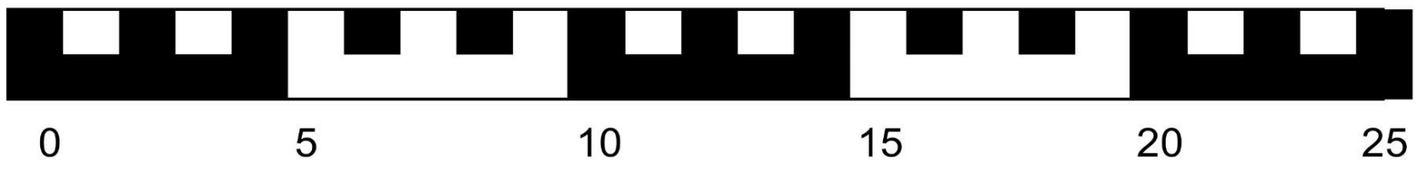
ELEVATION :
X-COORD :
Y-COORD :

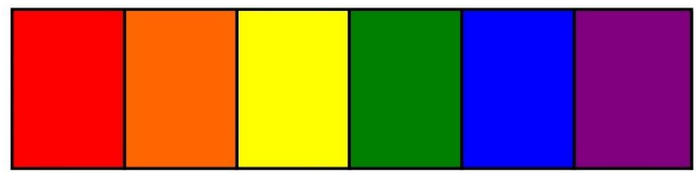
HOLE No: **BH1**

GONDWANA
GEO SOLUTIONS

CLIENT	NAIDU CONSULTING	**DATE DRILLED**	March 2025
PROJECT	Reinstatement of Mobeni Reservoir No. 2, Durban	**DEPTH (m)**	0,00-25,45
BOREHOLE	BH1	**BOX**	1 of 1







HOLE No: BH2
Sheet 1 of 2

JOB NUMBER: 25-030

ROCK FABRIC
MF -massive
BF -bedded
FF -foliated
CF -cleaved
SF -schistose
GF -gneissose
LF -laminated

GRAIN SIZE
FG -fine grained
MG -medium grain
CG -coarse grain

JOINT SPACING
VCJ-very close spacg
CJ -close spacing
MJ -medium spacing
WJ -wide spacing
VWJ-very wide spacng

JOINT ROUGHNESS
SLJ-slickensided
SJ -smooth
RJ -rough

JOINT SHAPE
CUR-curvilinear
PLA-planar
UND-undulating
STE-stepped
IRR-irregular

ROCK HARDNESS
EHR-extremely hard rock
VHR-very hard rock
HR -hard rock
MHR-medium hard rock
SR -soft rock
VSR-very soft rock

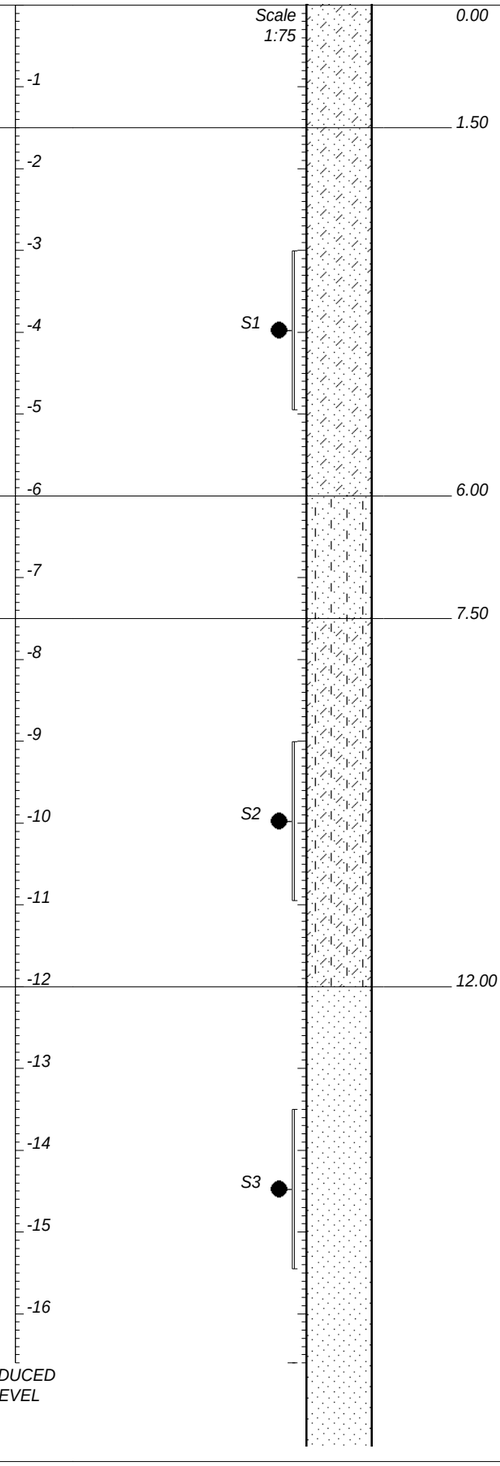
GONDWANA GEO SOLUTIONS

NAIDU CONSULTING
REINSTATEMENT OF MOBENI RESERVOIR 2
DURBAN

HOLE No: BH2
Sheet 1 of 2

JOB NUMBER: 25-030

Drilling Method	Core Recovery (%)	RQD (%)	SPT-N PLI(IS50)	UCS (MPa)	Frac. Freq.	Joint No of Sets	Joint Inclin (deg)	Joint Spacing	Joint Shape	Joint Rough-ness	Joint Filling & Thickness	Weath-ering	REDUCED LEVEL
DXC	23												
SPT	100		N=4										
Wash	0												
SPT	100		N=4										
Wash	0												
SPT	67		N=6										
Wash	0												
SPT	78		N=8										
Wash	0												
SPT	100		N=12										
Wash	0												
SPT	100		N=14										
Wash	0												
SPT	89		N=17										
Wash	0												
SPT	93		N=16										
Wash	0												
SPT	100		N=15										
Wash	0												
SPT	89		N=15										
Wash	0												



Moist reddish brown clayey fine grained SAND. Colluvium.

Reddish brown loose clayey fine grained SAND. Berea Formation.

Light brown to brown loose silty fine grained SAND. Berea Formation.

Brown medium dense slightly clayey silty fine grained SAND. Berea Formation.

Light brown medium dense fine grained SAND. Berea Formation.

HOLE No: **BH2**
Sheet 2 of 2

JOB NUMBER: 25-030

ROCK FABRIC
MF -massive
BF -bedded
FF -foliated
CF -cleaved
SF -schistose
GF -gneissose
LF -laminated

GRAIN SIZE
FG -fine grained
MG -medium grain
CG -coarse grain

JOINT SPACING
VCJ-very close spacg
CJ -close spacing
MJ -medium spacing
WJ -wide spacing
VWJ-very wide spacng

JOINT ROUGHNESS
SLJ-slickensided
SJ -smooth
RJ -rough

JOINT SHAPE
CUR-curvilinear
PLA-planar
UND-undulating
STE-stepped
IRR-irregular

ROCK HARDNESS
EHR-extremely hard rock
VHR-very hard rock
HR -hard rock
MHR-medium hard rock
SR -soft rock
VSR-very soft rock

GONDWANA GEO SOLUTIONS

NAIDU CONSULTING
REINSTATEMENT OF MOBENI RESERVOIR 2
DURBAN

HOLE No: **BH2**
Sheet 2 of 2

JOB NUMBER: 25-030

SPT	100		N=21										-17	
Wash	0												-18	
SPT	100		N=24										-19	
Wash	0												-20	
SPT	93		N=24										-21	21.00
Wash	0												-22	
SPT	100		N=36											22.50
Wash	0												-23	22.80m
SPT	100		N=58										-24	
Wash	0												S4	
SPT	89		N=52										-25	
Wash	0													
SPT	84		N=52											25.45

Reddish brown dense slightly clayey silty fine grained SAND. Berea Formation.

Reddish brown to brown very dense clayey silty fine grained SAND. Berea Formation.

NOTES

1) Borehole terminated at 25.45m.

2) Groundwater seepage at 22.80m.

3) Samples taken :
S1 3.00--4.95m (1 x Small)
S2 9.00--10.95m (1 x Small)
S3 13.50--15.45m (1 x Small)
S4 24.00--25.45m (1 x Small)

Drilling Method	*Core Recovery (%)*	*RQD (%)*	*SPT-N PLI(IS50)*	*UCS (MPa)*	*Frac. Freq.*	*Joint No of Sets*	*Joint Inclin (deg)*	*Joint Spacing*	*Joint Shape*	*Joint Rough-ness*	*Joint Filling & Thickness*	*Weath-ering*	*REDUCED LEVEL*

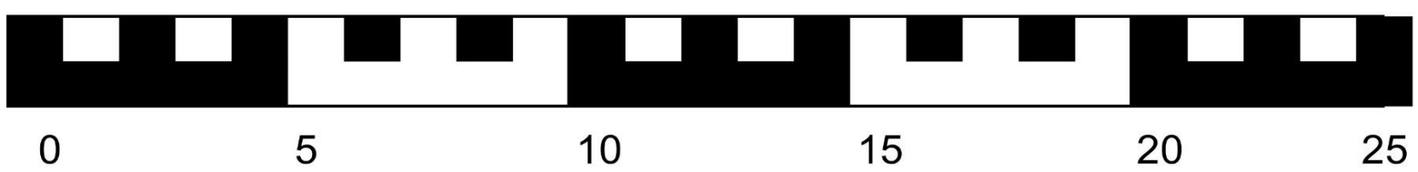
CONTRACTOR : Geopractica
MACHINE : DR90
DRILLED BY :
PROFILED BY : SR
TYPE SET BY : MC
SETUP FILE : GGS-BH~1.SET

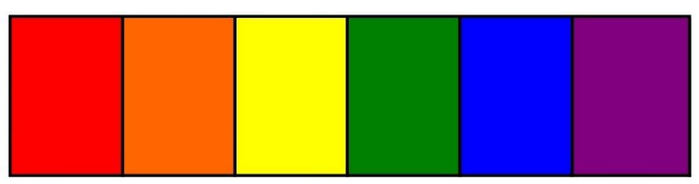
INCLINATION :
DIAM :
DATE : 17 - 19/03/2025
DATE : 24/03/2025
DATE : 11/04/2025 10:58
TEXT : ..rvoir2\Bholelogs\BH2.doc

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **BH2**

CLIENT	NAIDU CONSULTING	**DATE DRILLED**	March 2025
PROJECT	Reinstatement of Mobeni Reservoir No. 2, Durban	**DEPTH (m)**	0,00-25,45
BOREHOLE	BH2	**BOX**	1 of 1





APPENDIX B

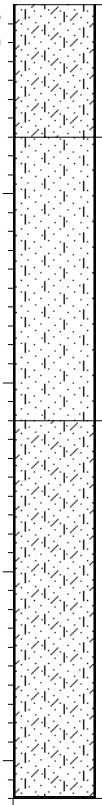
GONDWANA GEO SOLUTIONS

NAIDU CONSULTING
Reinstatement of Mobeni Reservoir No. 2
Durban

HOLE No: **AH1**
Sheet 1 of 1

JOB NUMBER: 25-030

Scale 1:40



0.00	Moist brown slightly clayey silty fine grained SAND. Fill
0.70	Moist light brown slightly silty fine grained SAND. Berea Formation.
2.20	Moist light brown slightly silty clayey fine grained SAND. Berea Formation.
4.20	

NOTES

1) Final depth at 4.20m.
2) No groundwater seepage.
3) No sidewall collapse.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : SR

INCLINATION :
DIAM :
DATE : March 2025
DATE : March 2025

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **AH1**

TYPE SET BY : MC
SETUP FILE : GGS-ST~1.SET

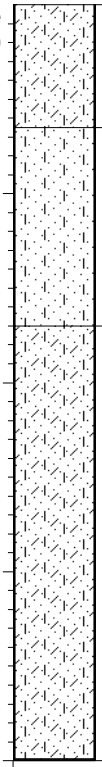
DATE : 03/04/2025 12:34
TEXT : ..voir2\Logs\NewAHlogs.doc

NAIDU CONSULTING
Reinstatement of Mobeni Reservoir No. 2
Durban

HOLE No: **AH2**
Sheet 1 of 1

JOB NUMBER: 25-030

Scale 1:40



0.00	Moist brown slightly clayey silty fine grained SAND. Fill
0.65	Moist light brown slightly silty fine grained SAND. Berea Formation.
1.70	Moist light brown slightly silty clayey fine grained SAND. Berea Formation.
4.00	

NOTES

1) Final depth at 4.00m.
2) No groundwater seepage.
3) No sidewall collapse.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : SR

INCLINATION :
DIAM :
DATE : March 2025
DATE : March 2025

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **AH2**

TYPE SET BY : MC
SETUP FILE : GGS-ST~1.SET

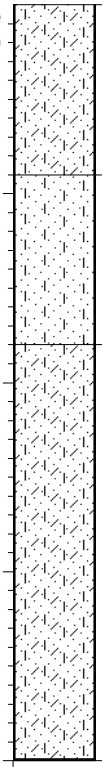
DATE : 03/04/2025 12:34
TEXT : ..voir2\Logs\NewAHlogs.doc

NAIDU CONSULTING
Reinstatement of Mobeni Reservoir No. 2
Durban

HOLE No: **AH3**
Sheet 1 of 1

JOB NUMBER: 25-030

Scale 1:40



0.00	Moist brown slightly clayey silty fine grained SAND. Fill
0.90	Moist light brown slightly silty fine grained SAND. Berea Formation.
1.80	Moist light brown slightly silty clayey fine grained SAND. Berea Formation.
4.00	

NOTES

1) Final depth at 4.00m.
2) No groundwater seepage.
3) No sidewall collapse.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : SR

INCLINATION :
DIAM :
DATE : March 2025
DATE : March 2025

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **AH3**

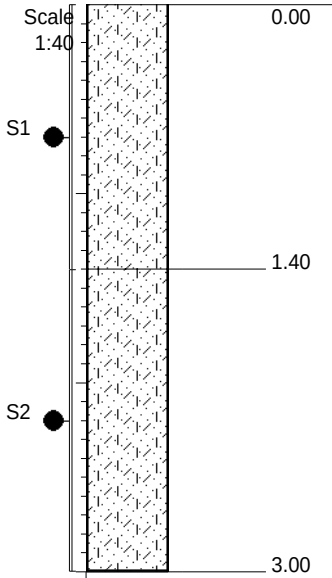
TYPE SET BY : MC
SETUP FILE : GGS-ST~1.SET

DATE : 03/04/2025 12:34
TEXT : ..voir2\Logs\NewAHlogs.doc

NAIDU CONSULTING
Reinstatement of Mobeni Reservoir No. 2
Durban

HOLE No: **AH4**
Sheet 1 of 1

JOB NUMBER: 25-030



0.00 Moist reddish brown slightly silty clayey fine grained SAND. Berea Formation.

1.40 Moist light brown slightly clayey silty fine grained SAND. Berea Formation.

3.00

NOTES

1) Final depth at 3.00m.

2) No groundwater seepage.

3) Samples taken :
S1 0.00--1.40m (1 x Small)
S2 1.40--3.00m (1 x Small)

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : SR

INCLINATION :
DIAM :
DATE : March 2025
DATE : March 2025

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **AH4**

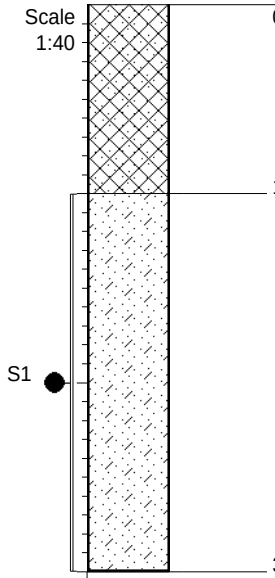
TYPE SET BY : MC
SETUP FILE : GGS-ST~1.SET

DATE : 03/04/2025 12:34
TEXT : ..voir2\Logs\NewAHlogs.doc

NAIDU CONSULTING
Reinstatement of Mobeni Reservoir No. 2
Durban

HOLE No: **AH5**
Sheet 1 of 1

JOB NUMBER: 25-030



0.00 Moist light brown fine grained SAND. Fill.

1.00 Moist reddish brown clayey fine grained SAND. Berea Formation.

3.00

NOTES

1) Final depth at 3.00m.

2) No groundwater seepage.

3) Samples taken :
S1 1.00--3.00m (1 x Small)

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : SR

TYPE SET BY : MC
SETUP FILE : GGS-ST~1.SET

INCLINATION :
DIAM :
DATE : March 2025
DATE : March 2025

DATE : 03/04/2025 12:34
TEXT : ..voir2\Logs\NewAHlogs.doc

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **AH5**

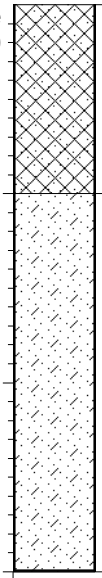
GONDWANA GEO SOLUTIONS

NAIDU CONSULTING
Reinstatement of Mobeni Reservoir No. 2
Durban

HOLE No: **AH6**
Sheet 1 of 1

JOB NUMBER: 25-030

Scale 1:40



0.00 Moist light brown fine grained SAND. Fill.

1.00 Moist reddish brown clayey fine grained SAND. Berea Formation.

3.00

NOTES

1) Final depth at 3.00m.
2) No groundwater seepage.
3) No samples taken.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : SR

TYPE SET BY : MC
SETUP FILE : GGS-ST~1.SET

INCLINATION :
DIAM :
DATE : March 2025
DATE : March 2025

DATE : 03/04/2025 12:34
TEXT : ..voir2\Logs\NewAHlogs.doc

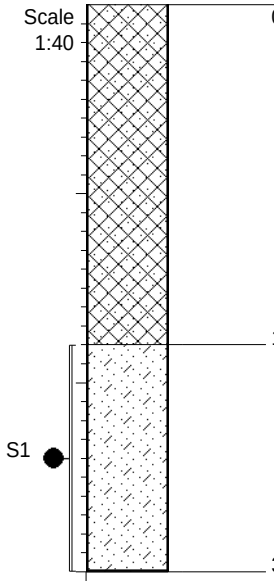
ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **AH6**

NAIDU CONSULTING
Reinstatement of Mobeni Reservoir No. 2
Durban

HOLE No: **AH7**
Sheet 1 of 1

JOB NUMBER: 25-030



0.00 Moist light brown fine grained SAND. Fill.

1.80 Moist reddish brown clayey fine grained SAND. Berea Formation.

3.00

NOTES

1) Final depth at 3.00m.

2) No groundwater seepage.

3) Samples taken :
S1 1.80--3.00m (1 x Small)

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : SR

TYPE SET BY : MC
SETUP FILE : GGS-ST~1.SET

INCLINATION :
DIAM :
DATE : March 2025
DATE : March 2025

DATE : 03/04/2025 12:34
TEXT : ..voir2\Logs\NewAHlogs.doc

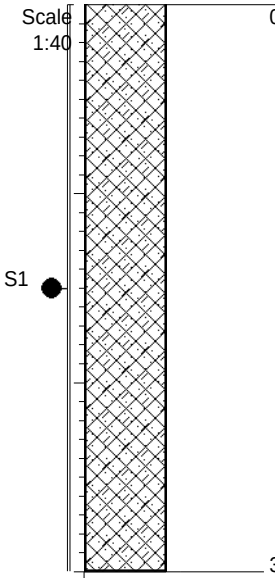
ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **AH7**

NAIDU CONSULTING
Reinstatement of Mobeni Reservoir No. 2
Durban

HOLE No: **AH8**
Sheet 1 of 1

JOB NUMBER: 25-030



0.00 Moist reddish brown clayey fine grained SAND. Fill.

3.00

NOTES

1) Final depth at 3.00m.

2) No groundwater seepage.

3) Samples taken :
S1 0.00--3.00m (1 x Small)

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : SR

TYPE SET BY : MC
SETUP FILE : GGS-ST~1.SET

INCLINATION :
DIAM :
DATE : March 2025
DATE : March 2025

DATE : 03/04/2025 12:34
TEXT : ..voir2\Logs\NewAHlogs.doc

ELEVATION :
X-COORD :
Y-COORD :

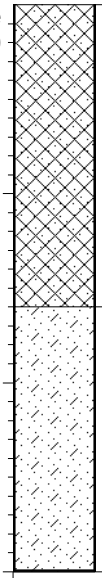
HOLE No: **AH8**

NAIDU CONSULTING
Reinstatement of Mobeni Reservoir No. 2
Durban

HOLE No: **AH9**
Sheet 1 of 1

JOB NUMBER: 25-030

Scale 1:40



0.00 Moist light brown fine grained SAND. Fill.

1.60 Moist reddish brown clayey fine grained SAND. Berea Formation.

3.00

NOTES

1) Final depth at 3.00m.
2) No groundwater seepage.
3) No sidewall collapse.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : SR

TYPE SET BY : MC
SETUP FILE : GGS-ST~1.SET

INCLINATION :
DIAM :
DATE : March 2025
DATE : March 2025

DATE : 03/04/2025 12:34
TEXT : ..voir2\Logs\NewAHlogs.doc

ELEVATION :
X-COORD :
Y-COORD :

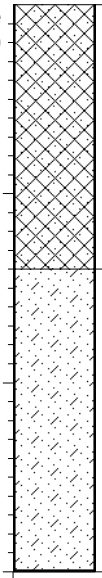
HOLE No: **AH9**

NAIDU CONSULTING
Reinstatement of Mobeni Reservoir No. 2
Durban

HOLE No: **AH10**
Sheet 1 of 1

JOB NUMBER: 25-030

Scale 1:40



0.00 Moist light brown fine grained SAND. Fill.

1.40 Moist reddish brown clayey fine grained SAND. Berea Formation.

3.00

NOTES

1) Final depth at 3.00m.
2) No groundwater seepage.
3) No sidewall collapse.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : SR

INCLINATION :
DIAM :
DATE : March 2025
DATE : March 2025

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **AH10**

TYPE SET BY : MC
SETUP FILE : GGS-ST~1.SET

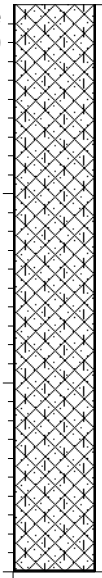
DATE : 03/04/2025 12:34
TEXT : ..voir2\Logs\NewAHlogs.doc

NAIDU CONSULTING
Reinstatement of Mobeni Reservoir No. 2
Durban

HOLE No: **AH11**
Sheet 1 of 1

JOB NUMBER: 25-030

Scale 1:40



0.00 Moist light brown slightly silty fine grained SAND. Fill.

3.00

NOTES

1) Final depth at 3.00m.
2) No groundwater seepage.
3) No sidewall collapse.

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY : SR

INCLINATION :
DIAM :
DATE : March 2025
DATE : March 2025

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **AH11**

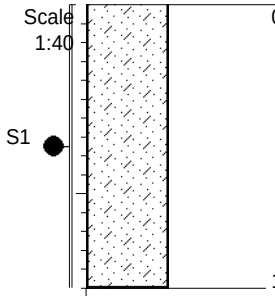
TYPE SET BY : MC
SETUP FILE : GGS-ST~1.SET

DATE : 03/04/2025 12:34
TEXT : ..voir2\Logs\NewAHlogs.doc

NAIDU CONSULTING
Reinstatement of Mobeni Reservoir No. 2
Durban

HOLE No: **TP1**
Sheet 1 of 1

JOB NUMBER: 25-030



0.00 Moist reddish brown clayey fine grained SAND. Berea Formation.

1.50

NOTES

1) Final depth at 1.50m.

2) No groundwater seepage.

3) No sidewall collapse.

4) Samples taken :
S1 0.00--1.50m (3 x Bulk)

CONTRACTOR :
MACHINE : Hand dug
DRILLED BY :
PROFILED BY : SR

TYPE SET BY : MC
SETUP FILE : GGS-ST~1.SET

INCLINATION :
DIAM :
DATE : March 2025
DATE : March 2025

DATE : 28/05/2025 11:36
TEXT : ..servoir2\Logs\TP1TP7.doc

ELEVATION :
X-COORD :
Y-COORD :

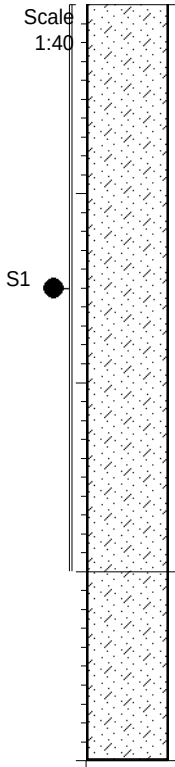
HOLE No: **TP1**

NAIDU CONSULTING
Reinstatement of Mobeni Reservoir No. 2
Durban

HOLE No: **TP2**
Sheet 1 of 1

JOB NUMBER: 25-030

Scale 1:40



0.00 Moist reddish brown clayey fine grained SAND. Berea Formation.

3.00 Moist brown slightly clayey fine grained SAND. Berea Formation.

4.00

NOTES

1) Final depth at 4.00m.
2) No groundwater seepage.
3) No sidewall collapse.
4) Samples taken :
   S1 0.00--3.00m (1 x Small)

CONTRACTOR :
MACHINE : Hand dug
DRILLED BY :
PROFILED BY : SR

TYPE SET BY : MC
SETUP FILE : GGS-ST~1.SET

INCLINATION :
DIAM :
DATE : March 2025
DATE : March 2025

DATE : 28/05/2025 11:36
TEXT : ..servoir2\Logs\TP1TP7.doc

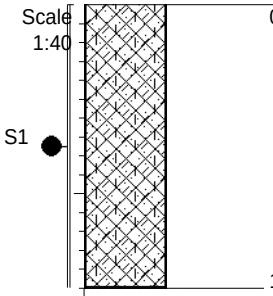
ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP2**

NAIDU CONSULTING
Reinstatement of Mobeni Reservoir No. 2
Durban

HOLE No: **TP3**
Sheet 1 of 1

JOB NUMBER: 25-030



0.00 Moist brown to reddish brown silty clayey fine grained SAND. Fill.

1.50

NOTES

1) Final depth at 1.50m.

2) No groundwater seepage.

3) No sidewall collapse.

4) Samples taken :
S1 0.00--1.50m (3 x Bulk)

CONTRACTOR :
MACHINE : Hand dug
DRILLED BY :
PROFILED BY : SR

TYPE SET BY : MC
SETUP FILE : GGS-ST~1.SET

INCLINATION :
DIAM :
DATE : March 2025
DATE : March 2025

DATE : 28/05/2025 11:36
TEXT : ..servoir2\Logs\TP1TP7.doc

ELEVATION :
X-COORD :
Y-COORD :

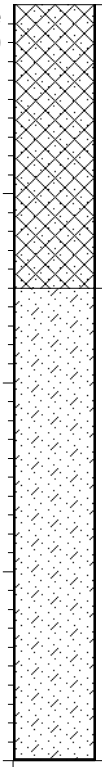
HOLE No: **TP3**

NAIDU CONSULTING
Reinstatement of Mobeni Reservoir No. 2
Durban

HOLE No: **TP4**
Sheet 1 of 1

JOB NUMBER: 25-030

Scale 1:40



0.00 Moist light brown fine grained SAND. Fill.

1.50 Moist reddish brown clayey fine grained SAND. Berea Formation.

4.00

NOTES

1) Final depth at 4.00m.
2) No groundwater seepage.
3) No sidewall collapse.

CONTRACTOR :
MACHINE : Hand dug
DRILLED BY :
PROFILED BY : SR

INCLINATION :
DIAM :
DATE : March 2025
DATE : March 2025

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP4**

TYPE SET BY : MC
SETUP FILE : GGS-ST~1.SET

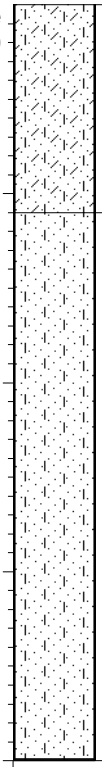
DATE : 28/05/2025 11:36
TEXT : ..servoir2\Logs\TP1TP7.doc

NAIDU CONSULTING
Reinstatement of Mobeni Reservoir No. 2
Durban

HOLE No: **TP5**
Sheet 1 of 1

JOB NUMBER: 25-030

Scale 1:40



0.00 Moist brown slightly clayey silty fine grained SAND. Fill

1.10 Moist light brown slightly silty fine grained SAND. Berea Formation.

4.00

NOTES

1) Final depth at 4.00m.
2) No groundwater seepage.
3) No sidewall collapse.

CONTRACTOR :
MACHINE : Hand dug
DRILLED BY :
PROFILED BY : SR

INCLINATION :
DIAM :
DATE : March 2025
DATE : March 2025

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP5**

TYPE SET BY : MC
SETUP FILE : GGS-ST~1.SET

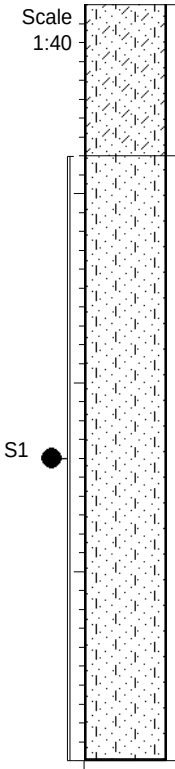
DATE : 28/05/2025 11:36
TEXT : ..servoir2\Logs\TP1TP7.doc

NAIDU CONSULTING
Reinstatement of Mobeni Reservoir No. 2
Durban

HOLE No: **TP6**
Sheet 1 of 1

JOB NUMBER: 25-030

Scale 1:40



0.00 Moist brown slightly clayey silty fine grained SAND. Fill

0.80 Moist light brown slightly silty fine grained SAND. Berea Formation.

4.00

NOTES

1) Final depth at 4.00m.
2) No groundwater seepage.
3) No sidewall collapse.
4) Samples taken :
   S1 0.80--4.00m (1 x Small)

CONTRACTOR :
MACHINE : Hand dug
DRILLED BY :
PROFILED BY : SR

INCLINATION :
DIAM :
DATE : March 2025
DATE : March 2025

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP6**

TYPE SET BY : MC
SETUP FILE : GGS-ST~1.SET

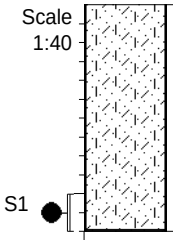
DATE : 28/05/2025 11:36
TEXT : ..servoir2\Logs\TP1TP7.doc

NAIDU CONSULTING
Reinstatement of Mobeni Reservoir No. 2
Durban

HOLE No: **TP7**
Sheet 1 of 1

JOB NUMBER: 25-030

Scale 1:40



0.00 Moist brown slightly clayey silty fine grained SAND. Berea Formation.

1.20

NOTES

1) Final depth at 1.20m.

2) No groundwater seepage.

3) No sidewall collapse.

4) Samples taken :
S1 1.00--1.20m (3 x Bulk)

CONTRACTOR :
MACHINE : Hand dug
DRILLED BY :
PROFILED BY : SR

INCLINATION :
DIAM :
DATE : March 2025
DATE : March 2025

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP7**

TYPE SET BY : MC
SETUP FILE : GGS-ST~1.SET

DATE : 28/05/2025 11:36
TEXT : ..servoir2\Logs\TP1TP7.doc

APPENDIX C

GONDWANA GEO SOLUTIONS

Consulting Geotechnical Engineers & Engineering Geologists

Cape Town Office:
13 Rocklands Road
Simonstown
CAPE TOWN
7975

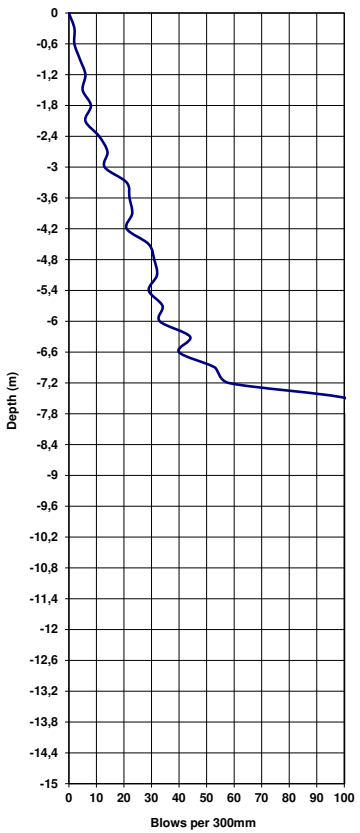
Client: NAIDU CONSULTING
Project: Reinstatement of Mobeni Reservoir 2
Section:

Ref.No. 25-030
Date: March 2025
Operator: SR

Light Dynamic Penetrometer Probe ---------- Test No. DPL 1

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

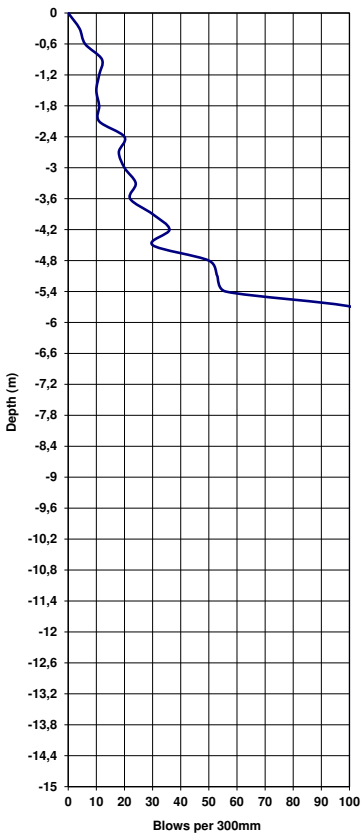
Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	2	Very Loose
0,6	2	Very Loose
0,9	4	Very Loose
1,2	6	Very Loose
1,5	5	Very Loose
1,8	8	Loose
2,1	6	Very Loose
2,4	11	Loose
2,7	14	Loose
3	13	Loose
3,3	21	Med.Dense
3,6	22	Med.Dense
3,9	23	Med.Dense
4,2	21	Med.Dense
4,5	29	Med.Dense
4,8	31	Med.Dense
5,1	32	Med.Dense
5,4	29	Med.Dense
5,7	34	Med.Dense
6	33	Med.Dense
6,3	44	Dense
6,6	40	Med.Dense
6,9	53	Dense
7,2	58	Dense
	Ref	



Light Dynamic Penetrometer Probe ---------- Test No. DPL 2

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

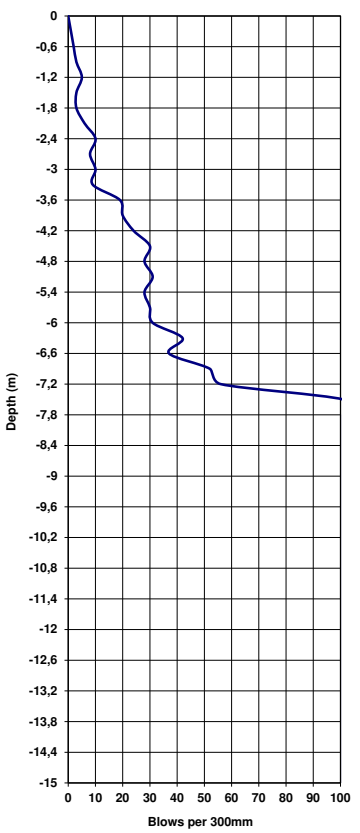
Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	4	Very Loose
0,6	6	Very Loose
0,9	12	Loose
1,2	11	Loose
1,5	10	Loose
1,8	11	Loose
2,1	11	Loose
2,4	20	Med.Dense
2,7	18	Med.Dense
3	20	Med.Dense
3,3	24	Med.Dense
3,6	22	Med.Dense
3,9	30	Med.Dense
4,2	36	Med.Dense
4,5	30	Med.Dense
4,8	50	Dense
5,1	53	Dense
5,4	56	Dense
	Ref	



Light Dynamic Penetrometer Probe ---------- Test No. DPL 3

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	1	Very Loose
0,6	2	Very Loose
0,9	3	Very Loose
1,2	5	Very Loose
1,5	3	Very Loose
1,8	3	Very Loose
2,1	6	Very Loose
2,4	10	Loose
2,7	8	Loose
3	10	Loose
3,3	9	Loose
3,6	19	Med.Dense
3,9	20	Med.Dense
4,2	24	Med.Dense
4,5	30	Med.Dense
4,8	28	Med.Dense
5,1	31	Med.Dense
5,4	28	Med.Dense
5,7	30	Med.Dense
6	31	Med.Dense
6,3	42	Dense
6,6	37	Med.Dense
6,9	52	Dense
7,2	56	Dense
	Ref	



THE INSITU STRENGTH DEPENDS ON SOIL MOISTURE CONTENT AND GRAIN STRUCTURE WHICH HAVE NOT BEEN ASSESSED AND MAY CHANGE. THE VALUES GIVEN ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

GONDWANA GEO SOLUTIONS

Consulting Geotechnical Engineers & Engineering Geologists

Cape Town Office:
13 Rocklands Road
Simonstown
CAPE TOWN
7975

Client: NAIDU CONSULTING
Project: Reinstatement of Mobeni Reservoir 2
Section:

Ref.No. 25-030
Date: March 2025
Operator: SR

Light Dynamic Penetrometer Probe ---------- **Test No. DPL 4**

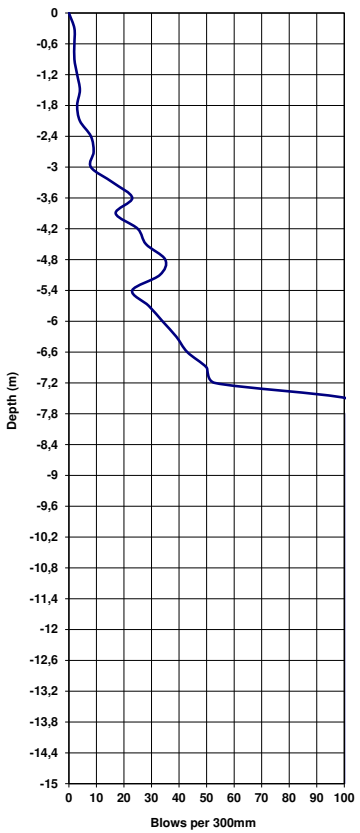
Light Dynamic Penetrometer Probe ---------- **Test No. DPL 5**

Light Dynamic Penetrometer Probe ---------- **Test No. DPL 6**

THE INSITU STRENGTH DEPENDS ON SOIL MOISTURE CONTENT AND GRAIN STRUCTURE WHICH HAVE NOT BEEN ASSESSED AND MAY CHANGE. THE VALUES GIVEN ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

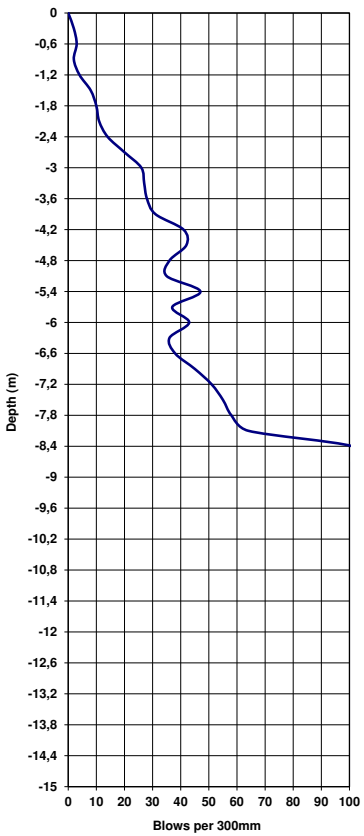
Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	2	Very Loose
0,6	2	Very Loose
0,9	2	Very Loose
1,2	3	Very Loose
1,5	4	Very Loose
1,8	3	Very Loose
2,1	4	Very Loose
2,4	8	Loose
2,7	9	Loose
3	8	Loose
3,3	16	Med.Dense
3,6	23	Med.Dense
3,9	17	Med.Dense
4,2	25	Med.Dense
4,5	28	Med.Dense
4,8	35	Med.Dense
5,1	33	Med.Dense
5,4	23	Med.Dense
5,7	29	Med.Dense
6	34	Med.Dense
6,3	39	Med.Dense
6,6	43	Dense
6,9	50	Dense
7,2	53	Dense
	Ref	



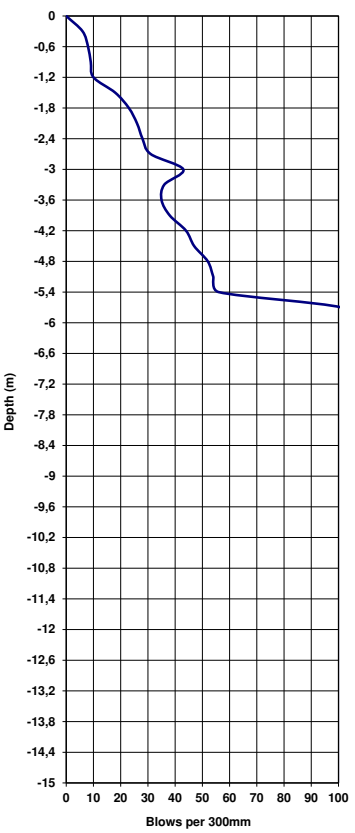
Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	2	Very Loose
0,6	3	Very Loose
0,9	2	Very Loose
1,2	4	Very Loose
1,5	8	Loose
1,8	10	Loose
2,1	11	Loose
2,4	14	Loose
2,7	20	Med.Dense
3	26	Med.Dense
3,3	27	Med.Dense
3,6	28	Med.Dense
3,9	31	Med.Dense
4,2	41	Dense
4,5	42	Dense
4,8	36	Med.Dense
5,1	35	Med.Dense
5,4	47	Dense
5,7	37	Med.Dense
6	43	Dense
6,3	36	Med.Dense
6,6	38	Med.Dense
6,9	45	Dense
7,2	51	Dense
7,5	55	Dense
7,8	58	Dense
8,1	64	Dense
	Ref	



Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	6	Very Loose
0,6	8	Loose
0,9	9	Loose
1,2	10	Loose
1,5	18	Med.Dense
1,8	23	Med.Dense
2,1	26	Med.Dense
2,4	28	Med.Dense
2,7	31	Med.Dense
3	43	Dense
3,3	36	Med.Dense
3,6	35	Med.Dense
3,9	38	Med.Dense
4,2	44	Dense
4,5	47	Dense
4,8	52	Dense
5,1	54	Dense
5,4	56	Dense
	Ref	



GONDWANA GEO SOLUTIONS

Consulting Geotechnical Engineers & Engineering Geologists

Cape Town Office:
13 Rocklands Road
Simonstown
CAPE TOWN
7975

Client: NAIDU CONSULTING
Project: Reinstatement of Mobeni Reservoir 2
Section:

Ref.No. 25-030
Date: March 2025
Operator: SR

Light Dynamic Penetrometer Probe ---------- **Test No. DPL 7**

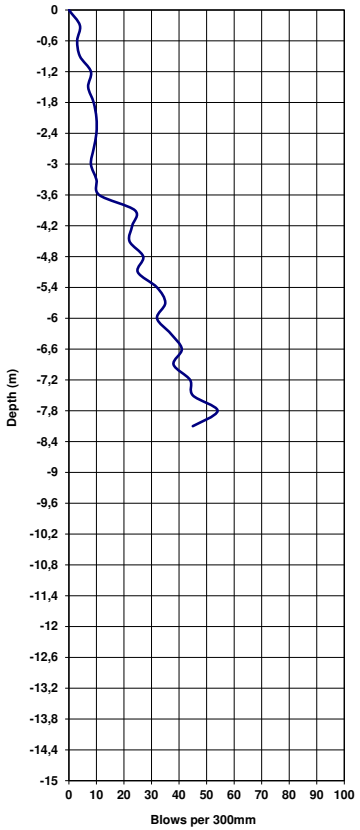
Light Dynamic Penetrometer Probe ---------- **Test No. DPL 8**

Light Dynamic Penetrometer Probe ---------- **Test No. DPL 9**

THE INSITU STRENGTH DEPENDS ON SOIL MOISTURE CONTENT AND GRAIN STRUCTURE WHICH HAVE NOT BEEN ASSESSED AND MAY CHANGE. THE VALUES GIVEN ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

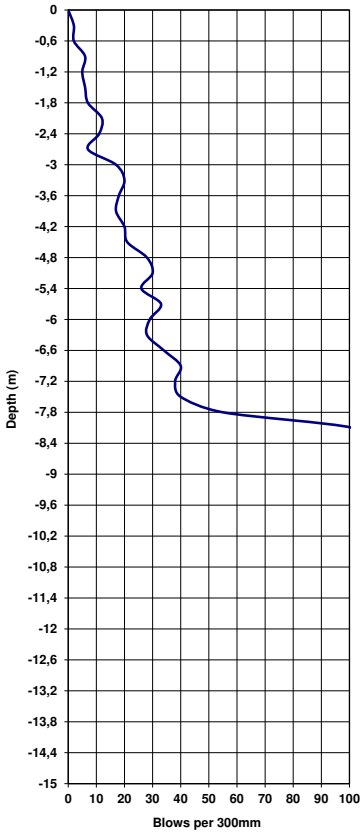
Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	4	Very Loose
0,6	3	Very Loose
0,9	4	Very Loose
1,2	8	Loose
1,5	7	Loose
1,8	9	Loose
2,1	10	Loose
2,4	10	Loose
2,7	9	Loose
3	8	Loose
3,3	10	Loose
3,6	11	Loose
3,9	24	Med.Dense
4,2	23	Med.Dense
4,5	22	Med.Dense
4,8	27	Med.Dense
5,1	25	Med.Dense
5,4	32	Med.Dense
5,7	35	Med.Dense
6	32	Med.Dense
6,3	37	Med.Dense
6,6	41	Dense
6,9	38	Med.Dense
7,2	44	Dense
7,5	45	Dense
7,8	54	Dense
8,1	45	Dense
	End	



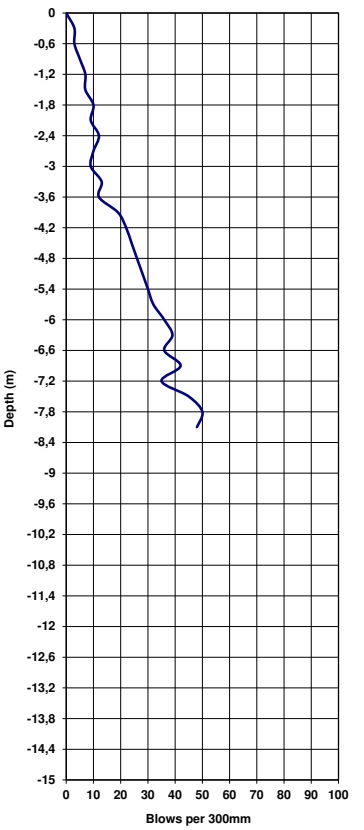
Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	2	Very Loose
0,6	2	Very Loose
0,9	6	Very Loose
1,2	5	Very Loose
1,5	6	Very Loose
1,8	7	Loose
2,1	12	Loose
2,4	11	Loose
2,7	7	Loose
3	17	Med.Dense
3,3	20	Med.Dense
3,6	18	Med.Dense
3,9	17	Med.Dense
4,2	20	Med.Dense
4,5	21	Med.Dense
4,8	28	Med.Dense
5,1	30	Med.Dense
5,4	26	Med.Dense
5,7	33	Med.Dense
6	29	Med.Dense
6,3	28	Med.Dense
6,6	34	Med.Dense
6,9	40	Med.Dense
7,2	38	Med.Dense
7,5	40	Med.Dense
7,8	55	Dense
	Ref	



Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	3	Very Loose
0,6	3	Very Loose
0,9	5	Very Loose
1,2	7	Loose
1,5	7	Loose
1,8	10	Loose
2,1	9	Loose
2,4	12	Loose
2,7	10	Loose
3	9	Loose
3,3	13	Loose
3,6	12	Loose
3,9	19	Med.Dense
4,2	22	Med.Dense
4,5	24	Med.Dense
4,8	26	Med.Dense
5,1	28	Med.Dense
5,4	30	Med.Dense
5,7	32	Med.Dense
6	36	Med.Dense
6,3	39	Med.Dense
6,6	36	Med.Dense
6,9	42	Dense
7,2	35	Med.Dense
7,5	45	Dense
7,8	50	Dense
8,1	48	Dense
	End	



GONDWANA GEO SOLUTIONS

Consulting Geotechnical Engineers & Engineering Geologists

Cape Town Office:
13 Rocklands Road
Simonstown
CAPE TOWN
7975

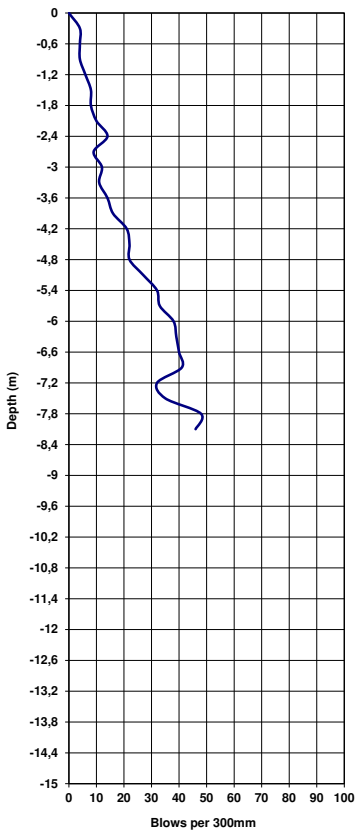
Client: NAIDU CONSULTING
Project: Reinstatement of Mobeni Reservoir 2
Section:

Ref.No. 25-030
Date: March 2025
Operator: SR

Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 10***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

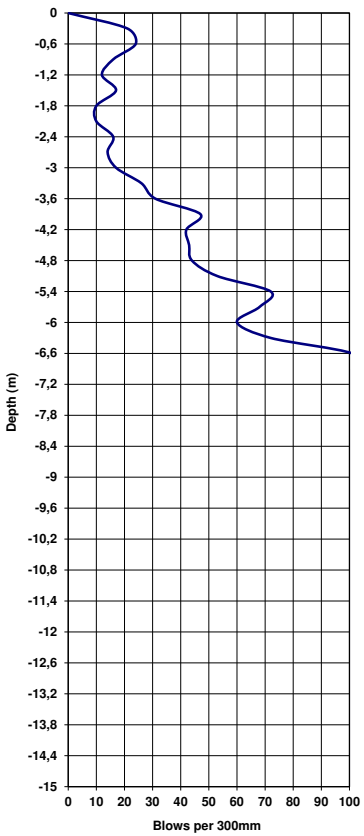
Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	4	Very Loose
0,6	4	Very Loose
0,9	4	Very Loose
1,2	6	Very Loose
1,5	8	Loose
1,8	8	Loose
2,1	10	Loose
2,4	14	Loose
2,7	9	Loose
3	12	Loose
3,3	11	Loose
3,6	14	Loose
3,9	16	Med.Dense
4,2	21	Med.Dense
4,5	22	Med.Dense
4,8	22	Med.Dense
5,1	27	Med.Dense
5,4	32	Med.Dense
5,7	33	Med.Dense
6	38	Med.Dense
6,3	39	Med.Dense
6,6	40	Med.Dense
6,9	41	Dense
7,2	32	Med.Dense
7,5	35	Med.Dense
7,8	48	Dense
8,1	46	Dense
	End	



Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 11***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

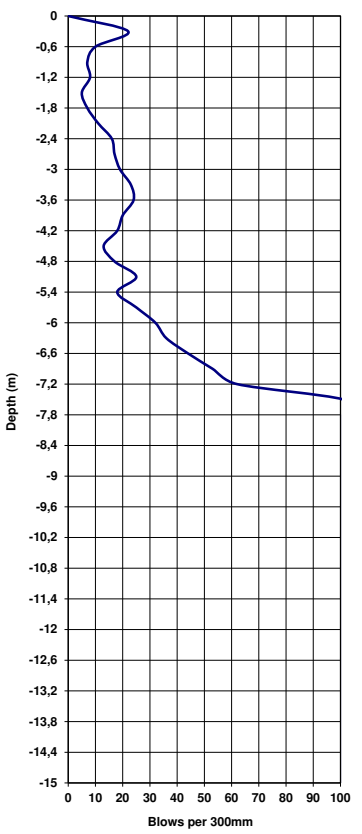
Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	21	Med.Dense
0,6	24	Med.Dense
0,9	16	Med.Dense
1,2	12	Loose
1,5	17	Med.Dense
1,8	10	Loose
2,1	10	Loose
2,4	16	Med.Dense
2,7	14	Loose
3	17	Med.Dense
3,3	26	Med.Dense
3,6	31	Med.Dense
3,9	47	Dense
4,2	42	Dense
4,5	43	Dense
4,8	44	Dense
5,1	53	Dense
5,4	72	Dense
5,7	68	Dense
6	60	Dense
6,3	72	Dense
	Ref	



Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 12***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	22	Med.Dense
0,6	10	Loose
0,9	7	Loose
1,2	8	Loose
1,5	5	Very Loose
1,8	7	Loose
2,1	11	Loose
2,4	16	Med.Dense
2,7	17	Med.Dense
3	19	Med.Dense
3,3	23	Med.Dense
3,6	24	Med.Dense
3,9	20	Med.Dense
4,2	18	Med.Dense
4,5	13	Loose
4,8	17	Med.Dense
5,1	25	Med.Dense
5,4	18	Med.Dense
5,7	25	Med.Dense
6	32	Med.Dense
6,3	36	Med.Dense
6,6	44	Dense
6,9	53	Dense
7,2	62	Dense
	Ref	



THE INSITU STRENGTH DEPENDS ON SOIL MOISTURE CONTENT AND GRAIN STRUCTURE WHICH HAVE NOT BEEN ASSESSED AND MAY CHANGE. THE VALUES GIVEN ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

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Section:

Ref.No. 25-030
Date: March 2025
Operator: SR

Light Dynamic Penetrometer Probe ---------- **Test No. DPL 13**

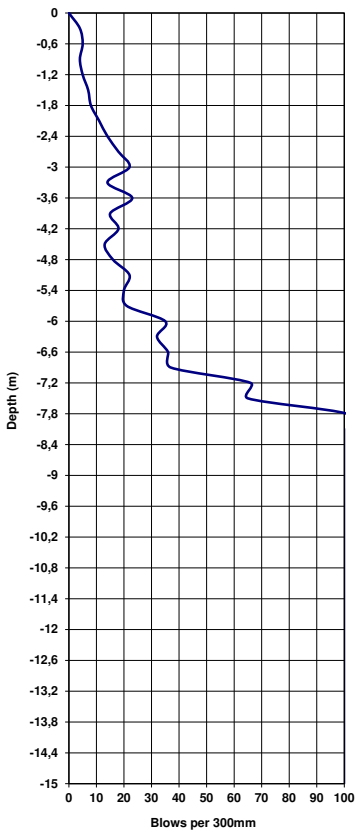
Light Dynamic Penetrometer Probe ---------- **Test No. DPL 14**

Light Dynamic Penetrometer Probe ---------- **Test No. DPL 15**

THE INSITU STRENGTH DEPENDS ON SOIL MOISTURE CONTENT AND GRAIN STRUCTURE WHICH HAVE NOT BEEN ASSESSED AND MAY CHANGE. THE VALUES GIVEN ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

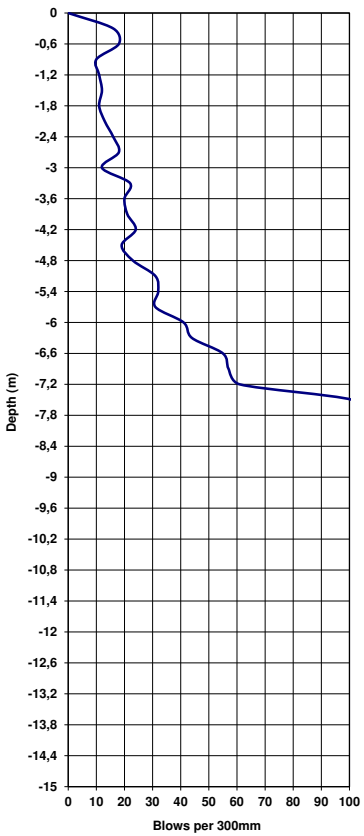
Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	4	Very Loose
0,6	5	Very Loose
0,9	4	Very Loose
1,2	5	Very Loose
1,5	7	Loose
1,8	8	Loose
2,1	11	Loose
2,4	14	Loose
2,7	18	Med.Dense
3	22	Med.Dense
3,3	14	Loose
3,6	23	Med.Dense
3,9	15	Loose
4,2	18	Med.Dense
4,5	13	Loose
4,8	16	Med.Dense
5,1	22	Med.Dense
5,4	20	Med.Dense
5,7	21	Med.Dense
6	35	Med.Dense
6,3	32	Med.Dense
6,6	36	Med.Dense
6,9	37	Med.Dense
7,2	66	Dense
7,5	65	Dense
	Ref	



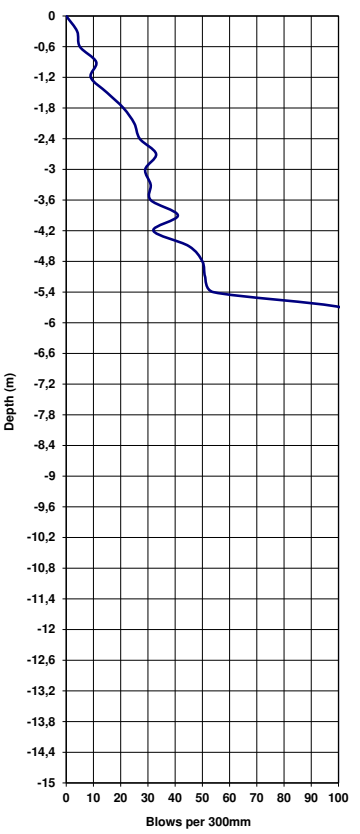
Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	16	Med.Dense
0,6	18	Med.Dense
0,9	10	Loose
1,2	11	Loose
1,5	12	Loose
1,8	11	Loose
2,1	13	Loose
2,4	16	Med.Dense
2,7	18	Med.Dense
3	12	Loose
3,3	22	Med.Dense
3,6	20	Med.Dense
3,9	21	Med.Dense
4,2	24	Med.Dense
4,5	19	Med.Dense
4,8	23	Med.Dense
5,1	31	Med.Dense
5,4	32	Med.Dense
5,7	31	Med.Dense
6	41	Dense
6,3	44	Dense
6,6	55	Dense
6,9	57	Dense
7,2	61	Dense
	Ref	



Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	4	Very Loose
0,6	5	Very Loose
0,9	11	Loose
1,2	9	Loose
1,5	15	Loose
1,8	21	Med.Dense
2,1	25	Med.Dense
2,4	27	Med.Dense
2,7	33	Med.Dense
3	29	Med.Dense
3,3	31	Med.Dense
3,6	31	Med.Dense
3,9	41	Dense
4,2	32	Med.Dense
4,5	45	Dense
4,8	50	Dense
5,1	51	Dense
5,4	54	Dense
	Ref	



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Simonstown
CAPE TOWN
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Section:

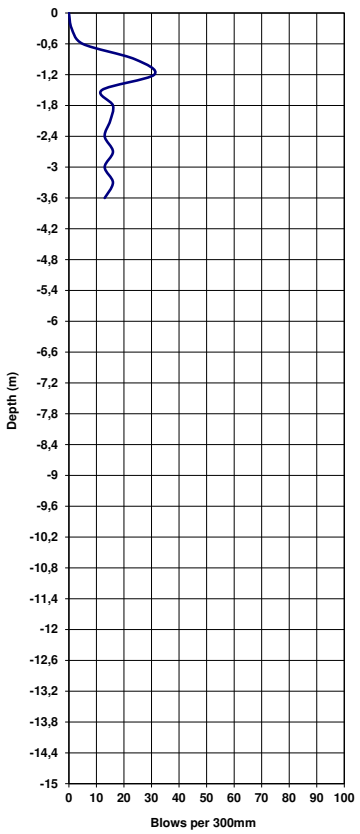
Ref.No. 25-030
Date: March 2025
Operator: SR

Light Dynamic Penetrometer Probe ---------- Test No. DPL 16

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	1	Very Loose
0,6	5	Very Loose
0,9	24	Med.Dense
1,2	31	Med.Dense
1,5	12	Loose
1,8	16	Med.Dense
2,1	15	Loose
2,4	13	Loose
2,7	16	Med.Dense
3	13	Loose
3,3	16	Med.Dense
3,6	13	Loose
	End	

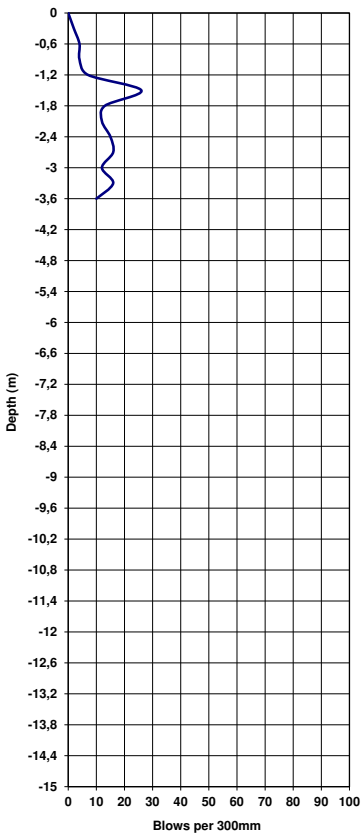


Light Dynamic Penetrometer Probe ---------- Test No. DPL 17

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	2	Very Loose
0,6	4	Very Loose
0,9	4	Very Loose
1,2	7	Loose
1,5	26	Med.Dense
1,8	13	Loose
2,1	12	Loose
2,4	15	Loose
2,7	16	Med.Dense
3	12	Loose
3,3	16	Med.Dense
3,6	10	Loose
	End	

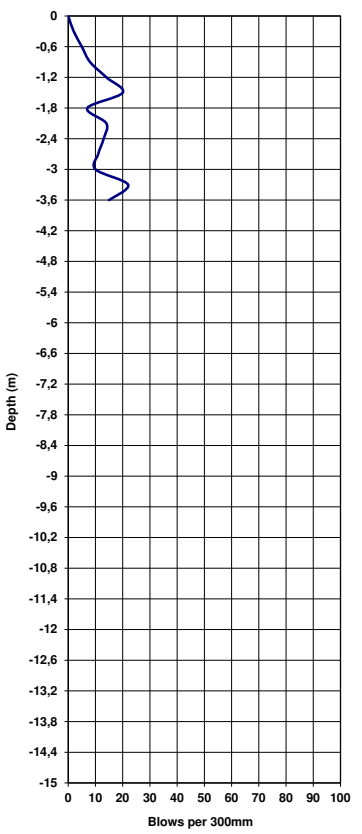


Light Dynamic Penetrometer Probe ---------- Test No. DPL 18

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	2	Very Loose
0,6	5	Very Loose
0,9	8	Loose
1,2	14	Loose
1,5	20	Med.Dense
1,8	7	Loose
2,1	14	Loose
2,4	13	Loose
2,7	11	Loose
3	10	Loose
3,3	22	Med.Dense
3,6	15	Loose
	End	



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7975

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Section:

Ref.No. 25-030
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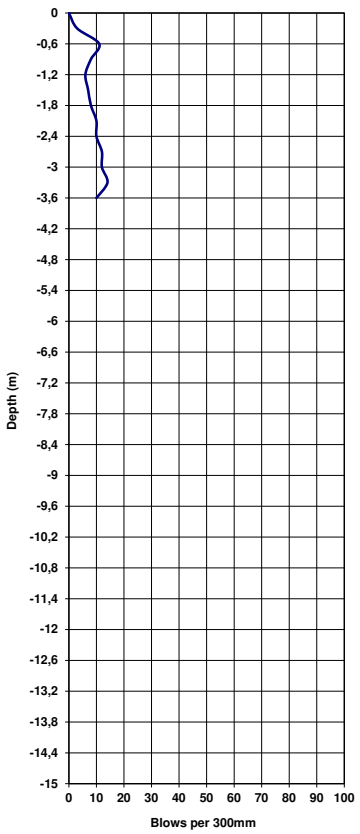
Operator: SR

Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 19***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	3	Very Loose
0,6	11	Loose
0,9	8	Loose
1,2	6	Very Loose
1,5	7	Loose
1,8	8	Loose
2,1	10	Loose
2,4	10	Loose
2,7	12	Loose
3	12	Loose
3,3	14	Loose
3,6	10	Loose
	End	

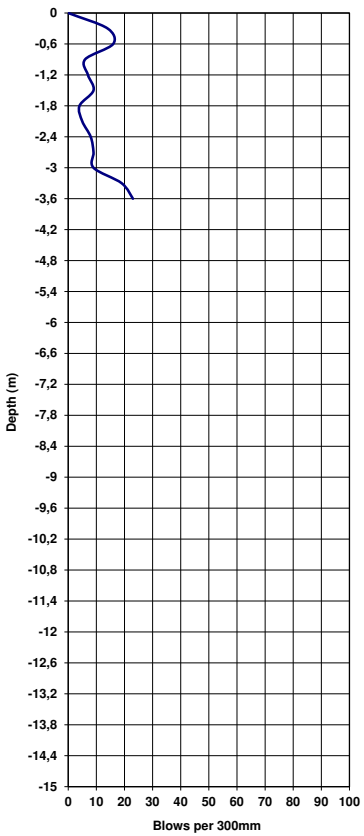


Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 20***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	14	Loose
0,6	16	Med.Dense
0,9	6	Very Loose
1,2	7	Loose
1,5	9	Loose
1,8	4	Very Loose
2,1	5	Very Loose
2,4	8	Loose
2,7	9	Loose
3	9	Loose
3,3	19	Med.Dense
3,6	23	Med.Dense
	End	

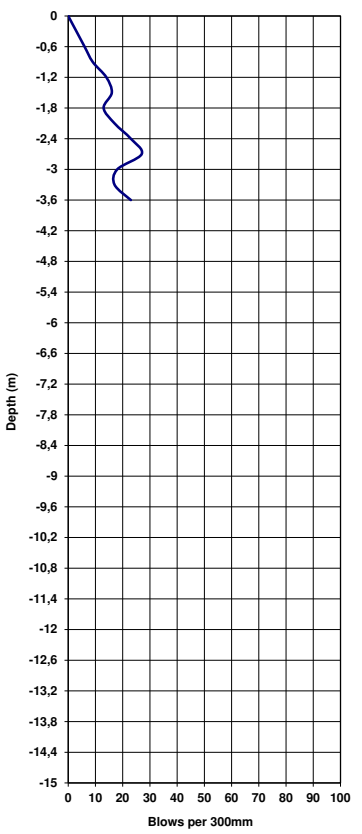


Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 21***

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	3	Very Loose
0,6	6	Very Loose
0,9	9	Loose
1,2	14	Loose
1,5	16	Med.Dense
1,8	13	Loose
2,1	17	Med.Dense
2,4	23	Med.Dense
2,7	27	Med.Dense
3	18	Med.Dense
3,3	17	Med.Dense
3,6	23	Med.Dense
	End	



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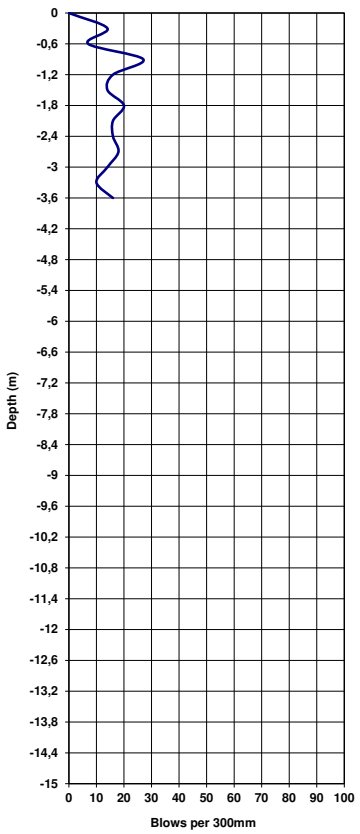
Light Dynamic Penetrometer Probe ---------- Test No. DPL 22

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	14	Loose
0,6	7	Loose
0,9	27	Med.Dense
1,2	16	Med.Dense
1,5	14	Loose
1,8	20	Med.Dense
2,1	16	Med.Dense
2,4	16	Med.Dense
2,7	18	Med.Dense
3	14	Loose
3,3	10	Loose
3,6	16	Med.Dense
	End	

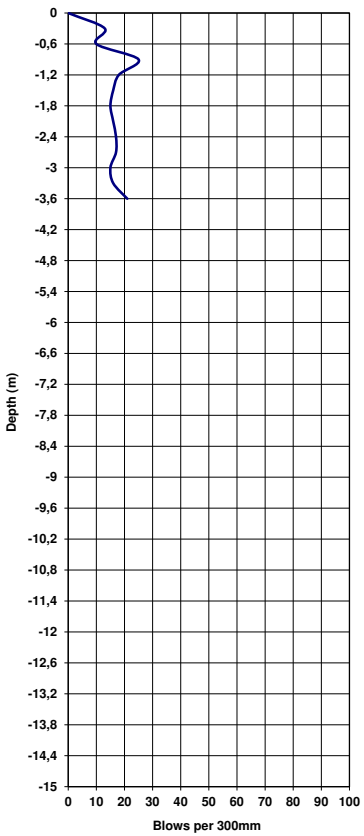


Light Dynamic Penetrometer Probe ---------- Test No. DPL 23

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	13	Loose
0,6	10	Loose
0,9	25	Med.Dense
1,2	18	Med.Dense
1,5	16	Med.Dense
1,8	15	Loose
2,1	16	Med.Dense
2,4	17	Med.Dense
2,7	17	Med.Dense
3	15	Loose
3,3	16	Med.Dense
3,6	21	Med.Dense
	End	

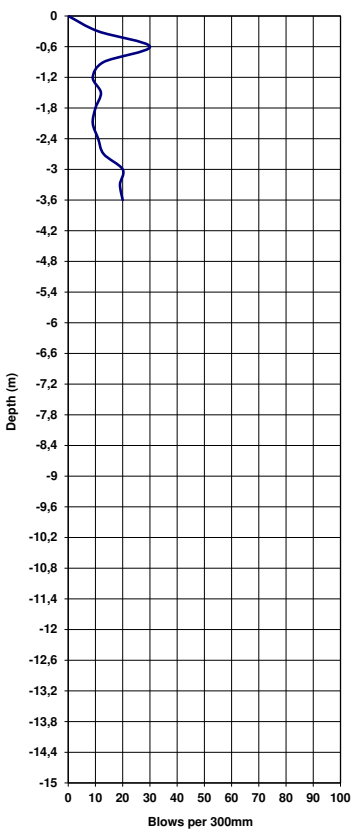


Light Dynamic Penetrometer Probe ---------- Test No. DPL 24

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	11	Loose
0,6	30	Med.Dense
0,9	13	Loose
1,2	9	Loose
1,5	12	Loose
1,8	10	Loose
2,1	9	Loose
2,4	11	Loose
2,7	13	Loose
3	20	Med.Dense
3,3	19	Med.Dense
3,6	20	Med.Dense
	End	



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Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 25***

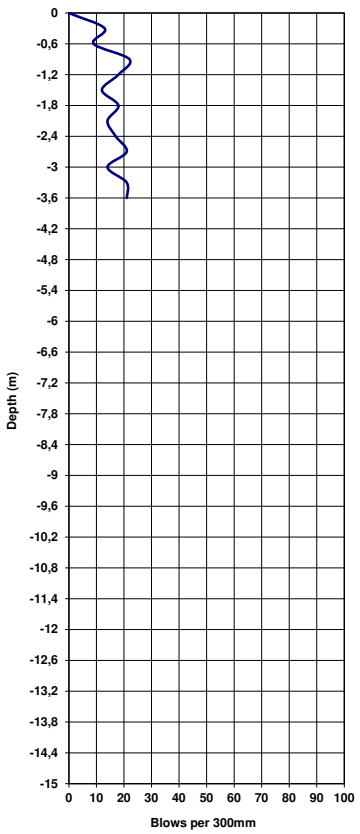
Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 26***

Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 27***

THE INSITU STRENGTH DEPENDS ON SOIL MOISTURE CONTENT AND GRAIN STRUCTURE WHICH HAVE NOT BEEN ASSESSED AND MAY CHANGE. THE VALUES GIVEN ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

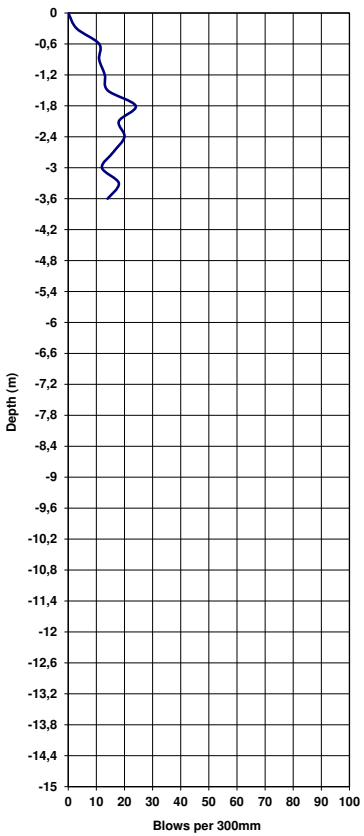
Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	13	Loose
0,6	9	Loose
0,9	22	Med.Dense
1,2	18	Med.Dense
1,5	12	Loose
1,8	18	Med.Dense
2,1	14	Loose
2,4	17	Med.Dense
2,7	21	Med.Dense
3	14	Loose
3,3	21	Med.Dense
3,6	21	Med.Dense
	End	



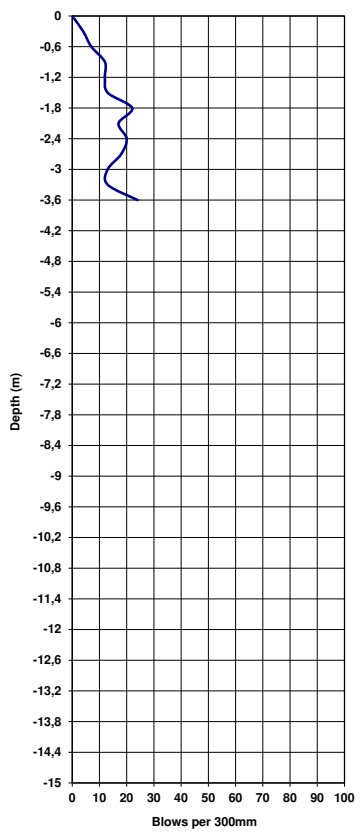
Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	3	Very Loose
0,6	11	Loose
0,9	11	Loose
1,2	13	Loose
1,5	14	Loose
1,8	24	Med.Dense
2,1	18	Med.Dense
2,4	20	Med.Dense
2,7	16	Med.Dense
3	12	Loose
3,3	18	Med.Dense
3,6	14	Loose
	End	



Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	4	Very Loose
0,6	7	Loose
0,9	12	Loose
1,2	12	Loose
1,5	13	Loose
1,8	22	Med.Dense
2,1	17	Med.Dense
2,4	20	Med.Dense
2,7	18	Med.Dense
3	13	Loose
3,3	13	Loose
3,6	24	Med.Dense
	End	



GONDWANA GEO SOLUTIONS

Consulting Geotechnical Engineers & Engineering Geologists

Cape Town Office:
13 Rocklands Road
Simonstown
CAPE TOWN
7975

Client: NAIDU CONSULTING
Project: Reinstatement of Mobeni Reservoir 2
Section:

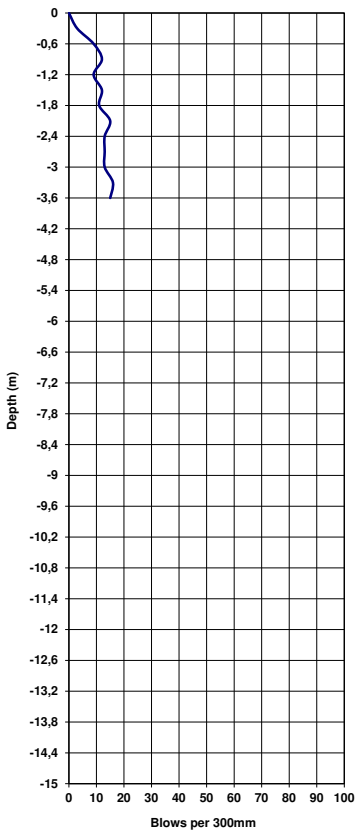
Ref.No. 25-030
Date: March 2025
Operator: SR

Light Dynamic Penetrometer Probe ---------- **Test No. DPL 28**

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	3	Very Loose
0,6	9	Loose
0,9	12	Loose
1,2	9	Loose
1,5	12	Loose
1,8	11	Loose
2,1	15	Loose
2,4	13	Loose
2,7	13	Loose
3	13	Loose
3,3	16	Med.Dense
3,6	15	Loose
	End	

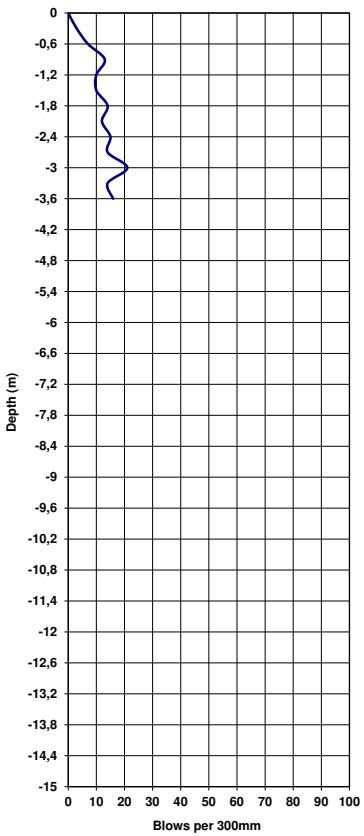


Light Dynamic Penetrometer Probe ---------- **Test No. DPL 29**

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	3	Very Loose
0,6	7	Loose
0,9	13	Loose
1,2	10	Loose
1,5	10	Loose
1,8	14	Loose
2,1	12	Loose
2,4	15	Loose
2,7	14	Loose
3	21	Med.Dense
3,3	14	Loose
3,6	16	Med.Dense
	End	

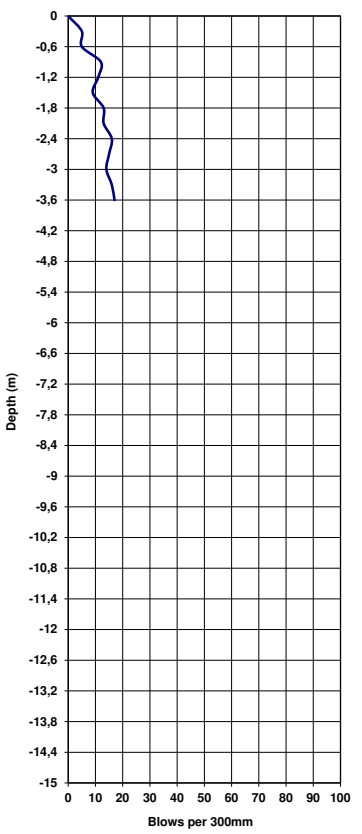


Light Dynamic Penetrometer Probe ---------- **Test No. DPL 30**

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	5	Very Loose
0,6	5	Very Loose
0,9	12	Loose
1,2	11	Loose
1,5	9	Loose
1,8	13	Loose
2,1	13	Loose
2,4	16	Med.Dense
2,7	15	Loose
3	14	Loose
3,3	16	Med.Dense
3,6	17	Med.Dense
	End	



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Cape Town Office:
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CAPE TOWN
7975

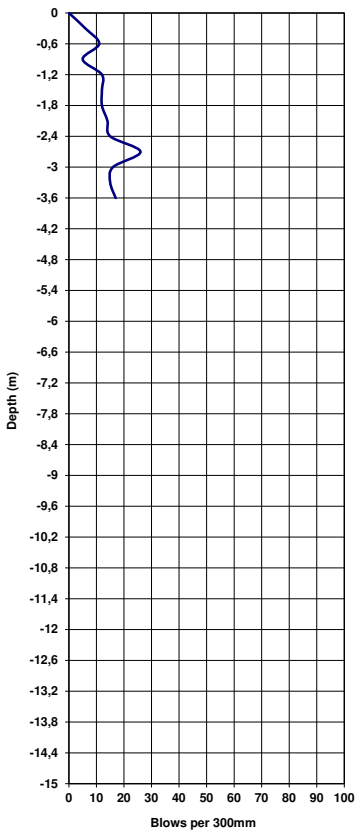
Client: NAIDU CONSULTING
Project: Reinstatement of Mobeni Reservoir 2
Section:

Ref.No. 25-030
Date: March 2025
Operator: SR

Light Dynamic Penetrometer Probe ---------- Test No. DPL 31

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

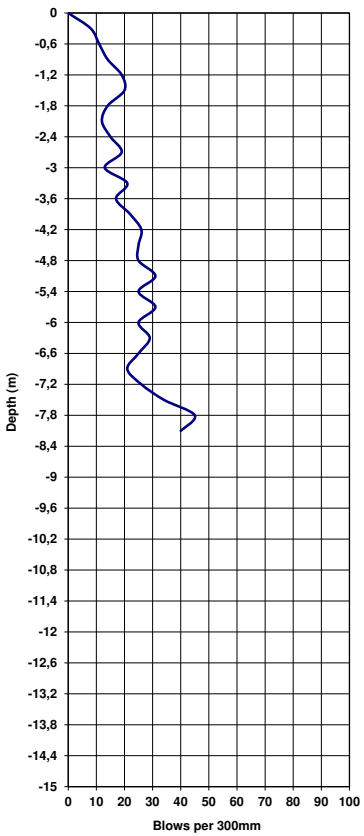
Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	6	Very Loose
0,6	11	Loose
0,9	5	Very Loose
1,2	12	Loose
1,5	12	Loose
1,8	12	Loose
2,1	14	Loose
2,4	15	Loose
2,7	26	Med.Dense
3	16	Med.Dense
3,3	15	Loose
3,6	17	Med.Dense
	End	



Light Dynamic Penetrometer Probe ---------- Test No. DPL 32

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

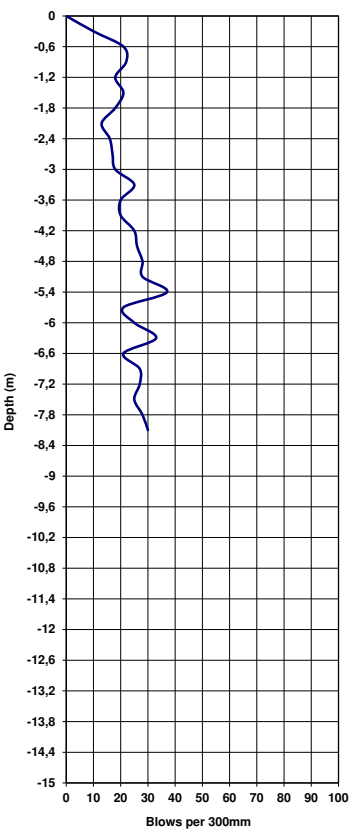
Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	8	Loose
0,6	11	Loose
0,9	14	Loose
1,2	19	Med.Dense
1,5	20	Med.Dense
1,8	14	Loose
2,1	12	Loose
2,4	15	Loose
2,7	19	Med.Dense
3	13	Loose
3,3	21	Med.Dense
3,6	17	Med.Dense
3,9	22	Med.Dense
4,2	26	Med.Dense
4,5	25	Med.Dense
4,8	25	Med.Dense
5,1	31	Med.Dense
5,4	25	Med.Dense
5,7	31	Med.Dense
6	25	Med.Dense
6,3	29	Med.Dense
6,6	25	Med.Dense
6,9	21	Med.Dense
7,2	26	Med.Dense
7,5	34	Med.Dense
7,8	45	Dense
8,1	40	Med.Dense
	End	



Light Dynamic Penetrometer Probe ---------- Test No. DPL 33

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	10	Loose
0,6	21	Med.Dense
0,9	22	Med.Dense
1,2	18	Med.Dense
1,5	21	Med.Dense
1,8	18	Med.Dense
2,1	13	Loose
2,4	16	Med.Dense
2,7	17	Med.Dense
3	18	Med.Dense
3,3	25	Med.Dense
3,6	20	Med.Dense
3,9	20	Med.Dense
4,2	25	Med.Dense
4,5	26	Med.Dense
4,8	28	Med.Dense
5,1	28	Med.Dense
5,4	37	Med.Dense
5,7	21	Med.Dense
6	25	Med.Dense
6,3	33	Med.Dense
6,6	21	Med.Dense
6,9	27	Med.Dense
7,2	27	Med.Dense
7,5	25	Med.Dense
7,8	28	Med.Dense
8,1	30	Med.Dense
	End	



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7975

Client: NAIDU CONSULTING
Project: Reinstatement of Mobeni Reservoir 2
Section:

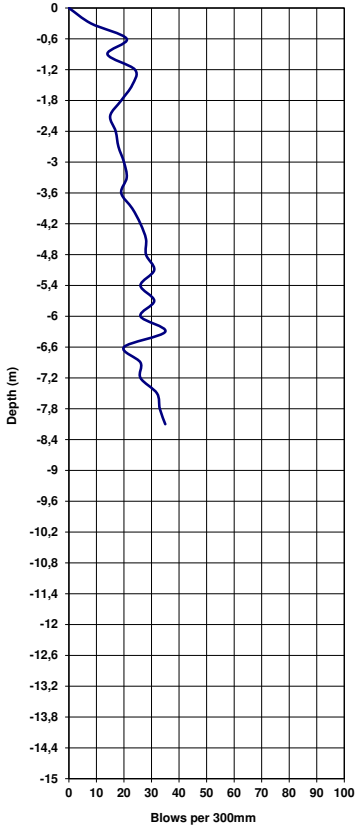
Ref.No. 25-030
Date: March 2025
Operator: SR

Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 34***

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	8	Loose
0,6	21	Med.Dense
0,9	14	Loose
1,2	24	Med.Dense
1,5	23	Med.Dense
1,8	19	Med.Dense
2,1	15	Loose
2,4	17	Med.Dense
2,7	18	Med.Dense
3	20	Med.Dense
3,3	21	Med.Dense
3,6	19	Med.Dense
3,9	23	Med.Dense
4,2	26	Med.Dense
4,5	28	Med.Dense
4,8	28	Med.Dense
5,1	31	Med.Dense
5,4	26	Med.Dense
5,7	31	Med.Dense
6	26	Med.Dense
6,3	35	Med.Dense
6,6	20	Med.Dense
6,9	26	Med.Dense
7,2	26	Med.Dense
7,5	32	Med.Dense
7,8	33	Med.Dense
8,1	35	Med.Dense
	End	

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

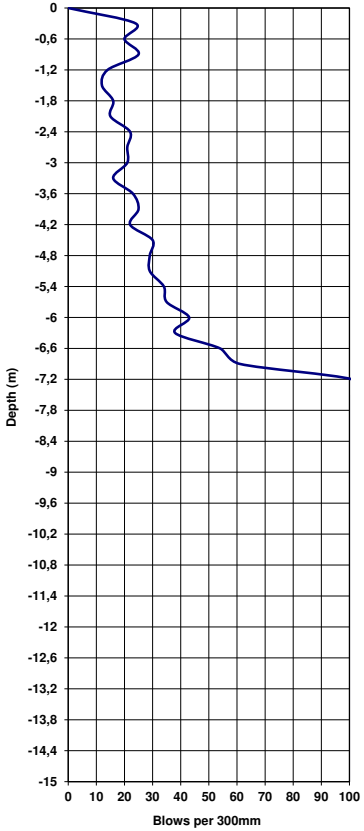


Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 35***

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	24	Med.Dense
0,6	20	Med.Dense
0,9	25	Med.Dense
1,2	14	Loose
1,5	12	Loose
1,8	16	Med.Dense
2,1	15	Loose
2,4	22	Med.Dense
2,7	21	Med.Dense
3	21	Med.Dense
3,3	16	Med.Dense
3,6	23	Med.Dense
3,9	25	Med.Dense
4,2	22	Med.Dense
4,5	30	Med.Dense
4,8	29	Med.Dense
5,1	29	Med.Dense
5,4	34	Med.Dense
5,7	35	Med.Dense
6	43	Dense
6,3	38	Med.Dense
6,6	54	Dense
6,9	61	Dense
	Ref	

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0

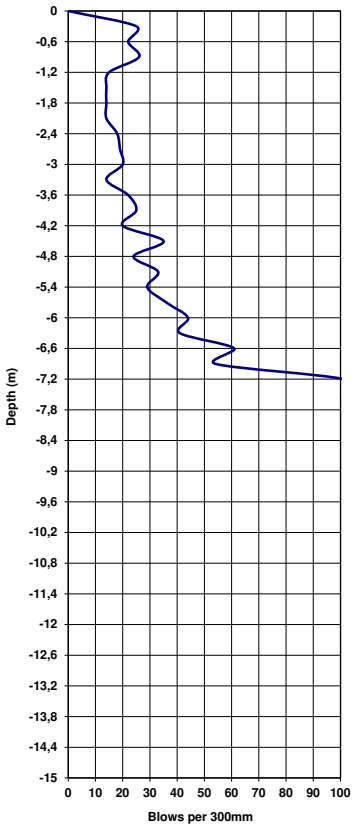


Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 36***

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	25	Med.Dense
0,6	22	Med.Dense
0,9	26	Med.Dense
1,2	15	Loose
1,5	14	Loose
1,8	14	Loose
2,1	14	Loose
2,4	18	Med.Dense
2,7	19	Med.Dense
3	20	Med.Dense
3,3	14	Loose
3,6	22	Med.Dense
3,9	25	Med.Dense
4,2	20	Med.Dense
4,5	35	Med.Dense
4,8	24	Med.Dense
5,1	33	Med.Dense
5,4	29	Med.Dense
5,7	36	Med.Dense
6	44	Dense
6,3	41	Dense
6,6	61	Dense
6,9	54	Dense
	Ref	

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings

C=1
Phi=0



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GONDWANA GEO SOLUTIONS

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Cape Town Office:
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CAPE TOWN
7975

Client: NAIDU CONSULTING
Project: Reinstatement of Mobeni Reservoir 2
Section:

Ref.No. 25-030
Date: March 2025
Operator: SR

Light Dynamic Penetrometer Probe ---------- **Test No. DPL 37**

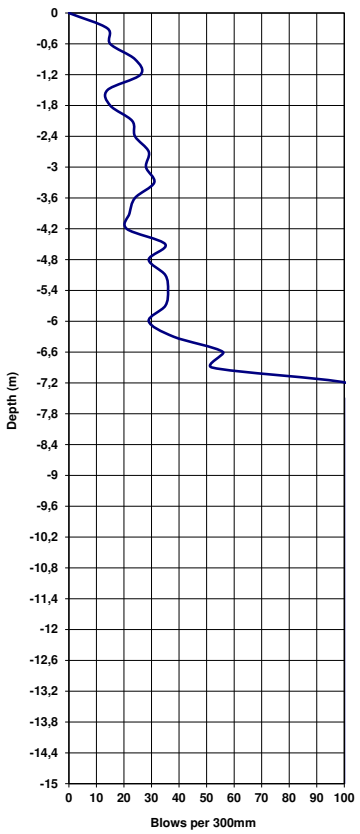
Light Dynamic Penetrometer Probe ---------- **Test No. DPL 38**

Light Dynamic Penetrometer Probe ---------- **Test No. DPL 39**

THE INSITU STRENGTH DEPENDS ON SOIL MOISTURE CONTENT AND GRAIN STRUCTURE WHICH HAVE NOT BEEN ASSESSED AND MAY CHANGE. THE VALUES GIVEN ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

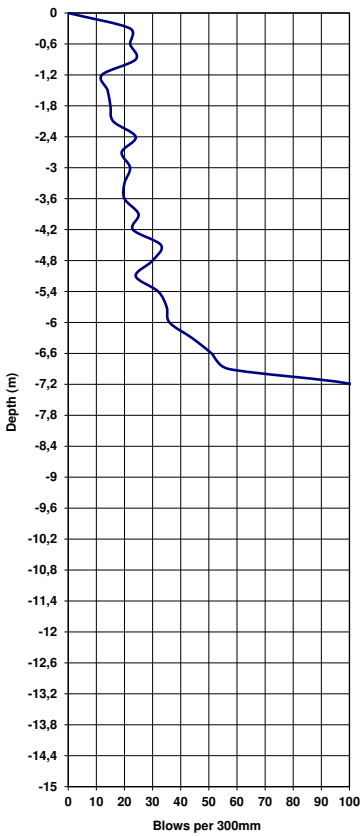
Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	14	Loose
0,6	15	Loose
0,9	24	Med.Dense
1,2	26	Med.Dense
1,5	14	Loose
1,8	15	Loose
2,1	23	Med.Dense
2,4	24	Med.Dense
2,7	29	Med.Dense
3	28	Med.Dense
3,3	31	Med.Dense
3,6	24	Med.Dense
3,9	22	Med.Dense
4,2	21	Med.Dense
4,5	35	Med.Dense
4,8	29	Med.Dense
5,1	35	Med.Dense
5,4	36	Med.Dense
5,7	35	Med.Dense
6	29	Med.Dense
6,3	38	Med.Dense
6,6	56	Dense
6,9	52	Dense
	Ref	



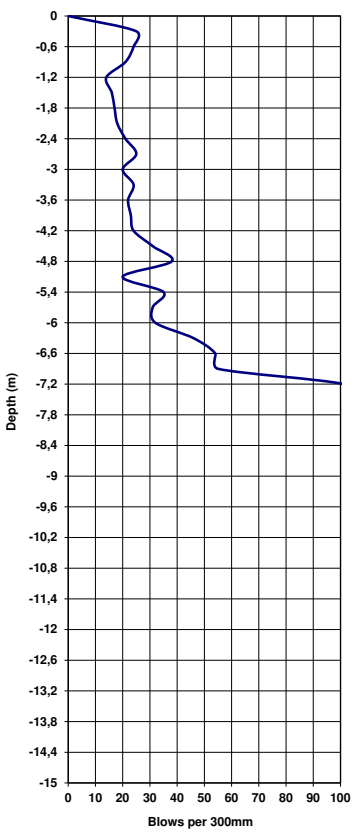
Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	22	Med.Dense
0,6	22	Med.Dense
0,9	24	Med.Dense
1,2	12	Loose
1,5	14	Loose
1,8	15	Loose
2,1	16	Med.Dense
2,4	24	Med.Dense
2,7	19	Med.Dense
3	22	Med.Dense
3,3	20	Med.Dense
3,6	20	Med.Dense
3,9	25	Med.Dense
4,2	23	Med.Dense
4,5	33	Med.Dense
4,8	30	Med.Dense
5,1	24	Med.Dense
5,4	32	Med.Dense
5,7	35	Med.Dense
6	36	Med.Dense
6,3	44	Dense
6,6	51	Dense
6,9	57	Dense
	Ref	



Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angle
Rods: 16mm diameter, 22mm diameter couplings
C=1
Phi=0

Depth metres	Blows per 300mm	Inferred Consistency
0		
0,3	25	Med.Dense
0,6	24	Med.Dense
0,9	21	Med.Dense
1,2	14	Loose
1,5	16	Med.Dense
1,8	17	Med.Dense
2,1	18	Med.Dense
2,4	21	Med.Dense
2,7	25	Med.Dense
3	20	Med.Dense
3,3	24	Med.Dense
3,6	22	Med.Dense
3,9	23	Med.Dense
4,2	24	Med.Dense
4,5	31	Med.Dense
4,8	38	Med.Dense
5,1	20	Med.Dense
5,4	35	Med.Dense
5,7	31	Med.Dense
6	32	Med.Dense
6,3	46	Dense
6,6	54	Dense
6,9	55	Dense
	Ref	



APPENDIX D

SGS MATROLAB

sanas Testing Laboratory T 0239

SGS MATROLAB (PTY) LTD
- CIVIL ENGINEERING SERVICES -
Reg.No.: 2003/029180/07 - VAT. Reg.No.: 4040210587
a SANAS Accredited Testing Laboratory, No. T 0239

60 Columbine Place, Glen Anil, Durban North, 4051

Tel. : (031) 579 1220/1
Fax : (031) 579 1344
Email : ronald.ramdeen@sgs.com

CLIENT :	Gondwana Geo Solutions (Pty) Ltd	OUR REF.:	55544/25
ADDRESS :	17 Kingmead Drive Westville, Durban 3629	YOUR REF.:	
ATTENTION :	Mr Sven	DATE :	03.04.2025

PROJECT : Reinstatement of Mobeni Reservoir

SGS MATROLAB

a SANAS Accredited Testing Laboratory, No. T 0239

Tests marked * "Not SANAS Accredited" in this Report are not included in the SANAS Schedule of Accreditation for the laboratory.

TEST REPORT / RESULTS

Sample/s:

Sampled by :
Date Received / Sampled :
Date Tested : 02.04.2025

Sampling method :

Section / Position tested identified by : Customer

Number of pages in this Report : 5

General : Number of Sketches in this Report: 0

Technical Signatory : Rasalis Bhikam

SGS MATROLAB (PTY) LTD
- CIVIL ENGINEERING SERVICES -
Reg.No.: 2003/029180/07 - VAT. Reg.No.: 4040210587
a SANAS Accredited Testing Laboratory, No. T 0239

60 Columbine Place, Glen Anil, Durban North, 4051

Tel. : (031) 579 1220/1
Fax : (031) 579 1344
Email : ronald.ramdeen@sgs.com

sanas Testing Laboratory T 0239

TEST RESULTS

Gondwana Geo Solutions (Pty) Ltd
17 Kingmead Drive
Westville, Durban
3629
Attention: Mr Sven

Project : Reinstatement of Mobeni Reservoir

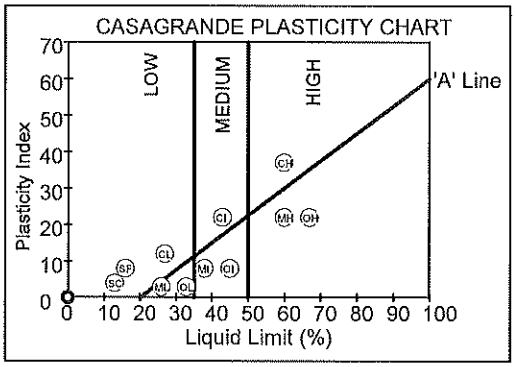
Your Ref :
Our Ref : 55544/25
Date Reported : 03.04.2025

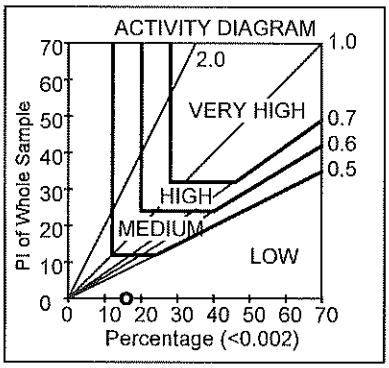
FOUNDATION INDICATOR (ASTM: D422)

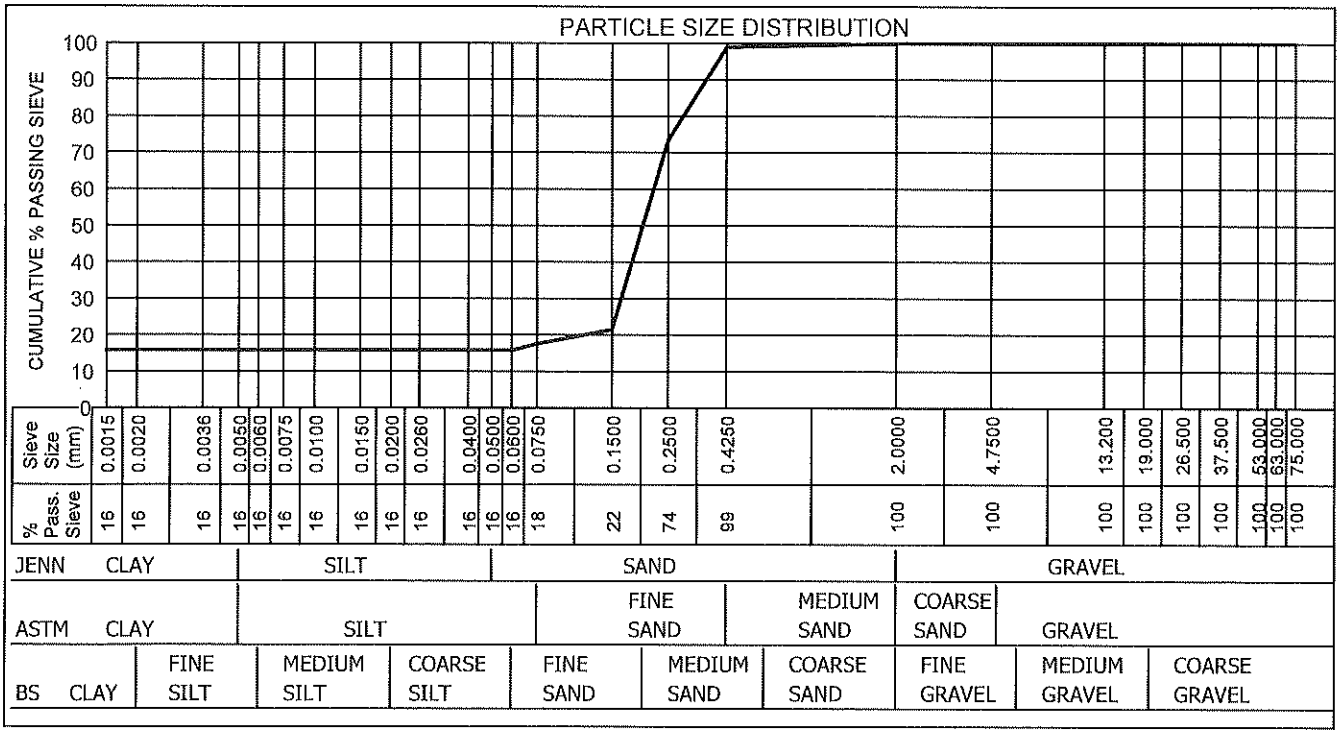
Sample No.	: 2293
Hole No.	: AH4
Depth	: 0.00 - 1.40
Liquid Limit (%)	: -
Plasticity Index	: NP
Linear Shrinkage (%)	: 0,0
PI of Whole Sample	: 0
P.R.A. Classification	: A-2-4(0)
Unified Soil Classificati	: SC
Activity	: 0,00
Heave Classification	: LOW
Grading Modulus	: 0,83
Percentage (<0.002)	: 16,0
Moisture Content (%)	: 0,2

Material Description : Moist Reddish Brown Slightly Silty Clayey Fine Grained Sand

	Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Classification
Jennings	15,8	0,0	84,2	0,0	SAND
Astm	15,8	1,7	82,4	0,0	SAND
British Standard	15,8	0,0	84,2	0,0	SAND







Sieve Size (mm)	0.0015	0.0020	0.0036	0.0050	0.0060	0.0075	0.0100	0.0150	0.0200	0.0260	0.0400	0.0500	0.0600	0.0750	0.1500	0.2500	0.4250	2.0000	4.7500	13.200	19.000	26.500	37.500	53.000	63.000	75.000
% Pass. Sieve	16	16	16	16	16	16	16	16	16	16	16	16	16	18	22	74	99	100	100	100	100	100	100	100	100	100

JENN	CLAY		SILT		SAND				GRAVEL		
ASTM	CLAY		SILT			FINE SAND		MEDIUM SAND	COARSE SAND	GRAVEL	
BS	CLAY	FINE SILT	MEDIUM SILT	COARSE SILT	FINE SAND	MEDIUM SAND	COARSE SAND		FINE GRAVEL	MEDIUM GRAVEL	COARSE GRAVEL

Remarks : Berea Formation

FORM: A6

4.4.1(SGS)(2019.12.04)

Technical Signatory : Rasalis Bhikam

SGS MATROLAB (PTY) LTD
- CIVIL ENGINEERING SERVICES -
Reg.No.: 2003/029180/07 - VAT. Reg.No.: 4040210587
a SANAS Accredited Testing Laboratory, No. T 0239

60 Columbine Place, Glen Anil, Durban North, 4051

Tel. : (031) 579 1220/1
Fax : (031) 579 1344
Email : ronald.ramdeen@sgs.com

sanas Testing Laboratory T 0239

TEST RESULTS

Gondwana Geo Solutions (Pty) Ltd
17 Kingmead Drive
Westville, Durban
3629
Attention: Mr Sven

Project : Reinstatement of Mobeni Reservoir

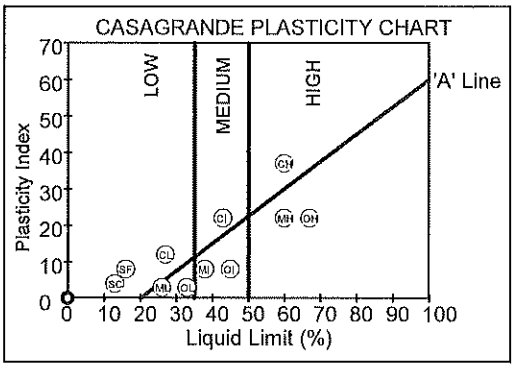
Your Ref :
Our Ref : 55544/25
Date Reported : 03.04.2025

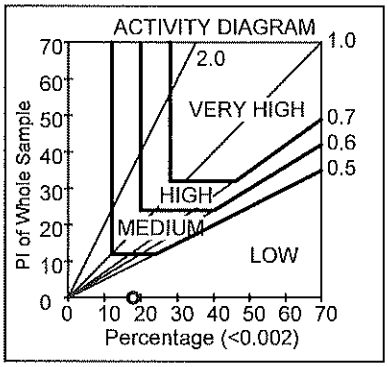
FOUNDATION INDICATOR (ASTM: D422)

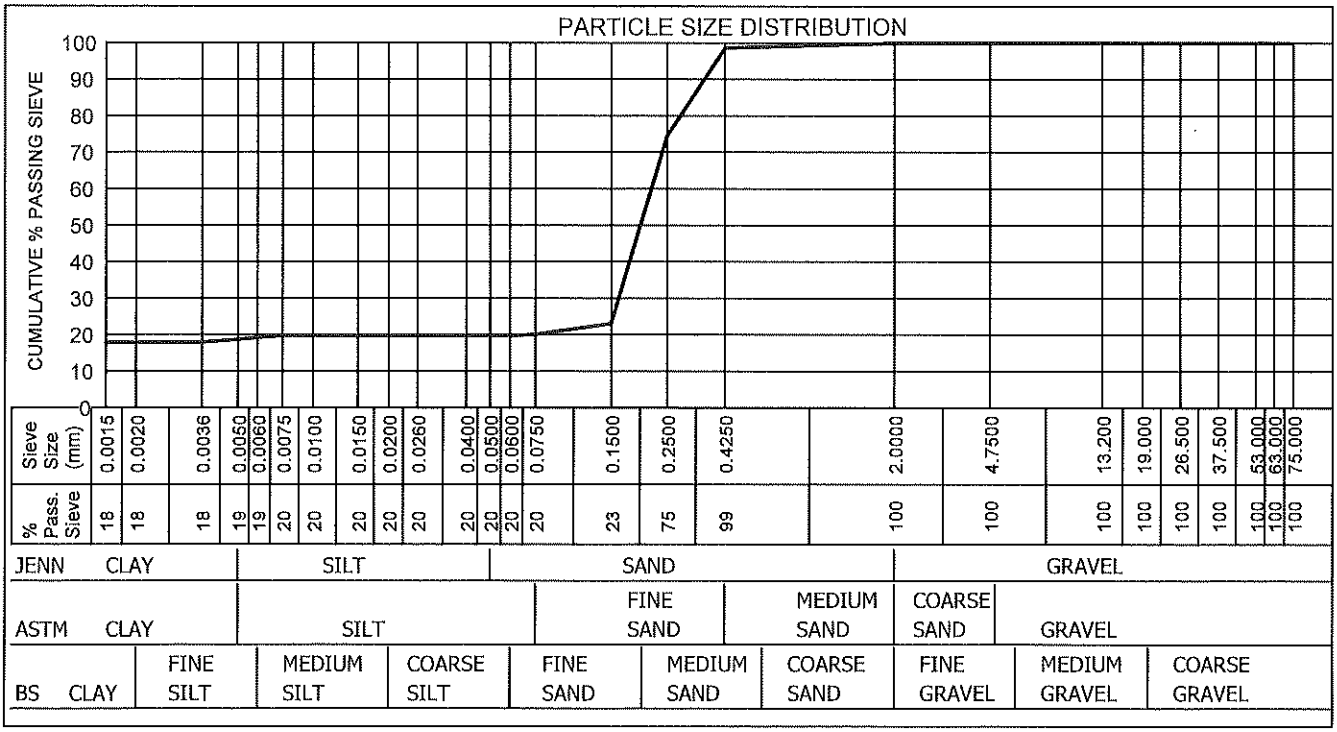
Sample No.	: 2294
Hole No.	: AH4
Depth	: 1.40 - 3.00
Liquid Limit (%)	: -
Plasticity Index	: NP
Linear Shrinkage (%)	: 0,0
PI of Whole Sample	: 0
P.R.A. Classification	: A-2-4(0)
Unified Soil Classificati	: SC
Activity	: 0,00
Heave Classification	: LOW
Grading Modulus	: 0,81
Percentage (<0.002)	: 18,0
Moisture Content (%)	: 0,5

Material Description : Moist Light Brown Slightly Clayey Silty Fine Grained Sand

	Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Classification
Jennings	18,7	1,1	80,1	0,1	SAND
Astm	18,7	1,4	79,9	0,0	SILTY SAND
British Standard	17,8	2,0	80,1	0,1	SAND







Sieve Size (mm)	0.0015	0.0020	0.0036	0.0050	0.0060	0.0075	0.0100	0.0150	0.0200	0.0260	0.0400	0.0500	0.0600	0.0750	0.1500	0.2500	0.4250	2.0000	4.7500	13.200	19.000	26.500	37.500	53.000	63.000	75.000
% Pass. Sieve	18	18	18	19	19	20	20	20	20	20	20	20	20	20	23	75	99	100	100	100	100	100	100	100	100	100

JENN	CLAY	SILT		SAND			GRAVEL			
ASTM	CLAY	SILT		FINE SAND	MEDIUM SAND	COARSE SAND	GRAVEL			
BS	CLAY	FINE SILT	MEDIUM SILT	COARSE SILT	FINE SAND	MEDIUM SAND	COARSE SAND	FINE GRAVEL	MEDIUM GRAVEL	COARSE GRAVEL

Remarks : Berea Formation

FORM: A6

4.4.1(SGS)(2019.12.04)

Technical Signatory : Rasalis Bhikam

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Email : ronald.ramdeen@sgs.com

sanas Testing Laboratory T 0239

TEST RESULTS

Gondwana Geo Solutions (Pty) Ltd
17 Kingmead Drive
Westville, Durban
3629
Attention: Mr Sven

Project : Reinstatement of Mobeni Reservoir

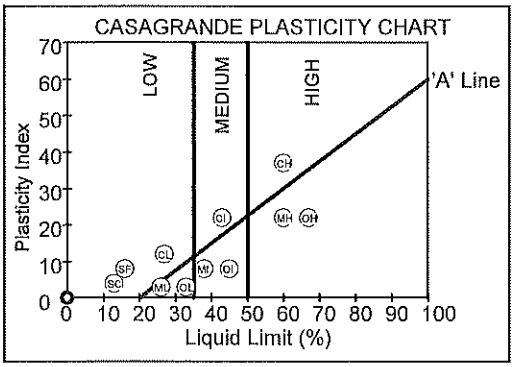
Your Ref :
Our Ref : 55544/25
Date Reported : 03.04.2025

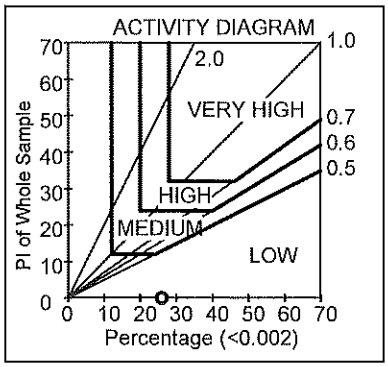
FOUNDATION INDICATOR (ASTM: D422)

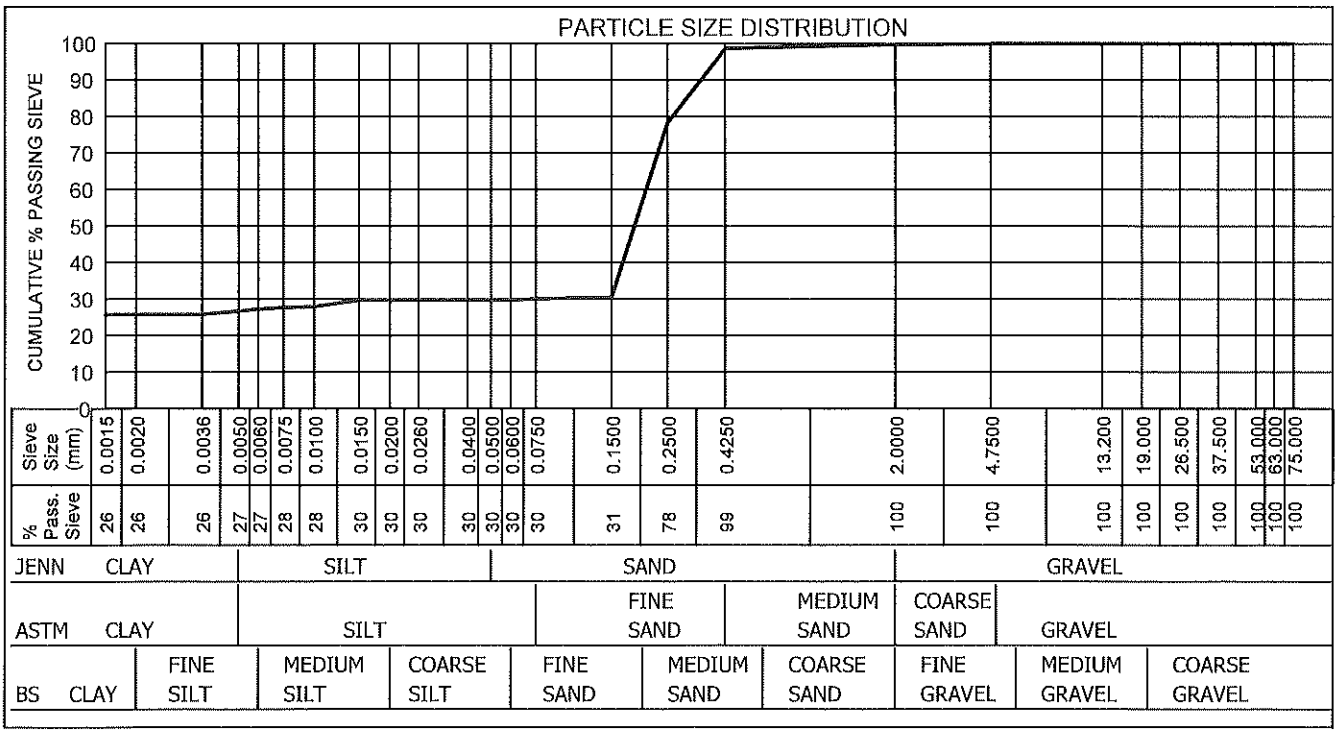
Sample No.	: 2295
Hole No.	: TP1
Depth	: 0.00 - 1.50
Liquid Limit (%)	: -
Plasticity Index	: NP
Linear Shrinkage (%)	: 0,0
PI of Whole Sample	: 0
P.R.A. Classification	: A-2-4(0)
Unified Soil Classificati	: SC
Activity	: 0,00
Heave Classification	: LOW
Grading Modulus	: 0,71
Percentage (<0.002)	: 26,0
Moisture Content (%)	: 1,7

Material Description : Moist Reddish Brown Clayey Fine Grained Sand

	Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Classification
Jennings	26,7	3,0	70,1	0,2	CLAYEY SAND
Astm	26,7	3,4	69,9	0,1	CLAYEY SAND
British Standard	25,7	4,0	70,1	0,2	CLAYEY SAND







Sieve Size (mm)	0.0015	0.0020	0.0036	0.0050	0.0060	0.0075	0.0100	0.0150	0.0200	0.0260	0.0400	0.0500	0.0600	0.0750	0.1500	0.2500	0.4250	2.0000	4.7500	13.200	19.000	26.500	37.500	53.000	63.000	75.000
% Pass. Sieve	26	26	26	27	27	28	28	30	30	30	30	30	30	30	31	78	99	100	100	100	100	100	100	100	100	100

JENN	CLAY	SILT			SAND			GRAVEL			
ASTM	CLAY	SILT			FINE SAND		MEDIUM SAND	COARSE SAND	GRAVEL		
BS	CLAY	FINE SILT	MEDIUM SILT	COARSE SILT	FINE SAND	MEDIUM SAND	COARSE SAND	FINE GRAVEL	MEDIUM GRAVEL	COARSE GRAVEL	

Remarks : Berea Formation

FORM: A6

4.4.1(SGS)(2019.12.04)

Technical Signatory : Rasalis Bhikam

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Fax : (031) 579 1344
Email : ronald.ramdeen@sgs.com

T 0239

TEST RESULTS

Gondwana Geo Solutions (Pty) Ltd 17 Kingmead Drive Westville, Durban 3629 Attention: Mr Sven	Project : Reinstatement of Mobeni Reservoirr Your Ref : Our Ref : 55544/25 Date Reported : 02.04.2025

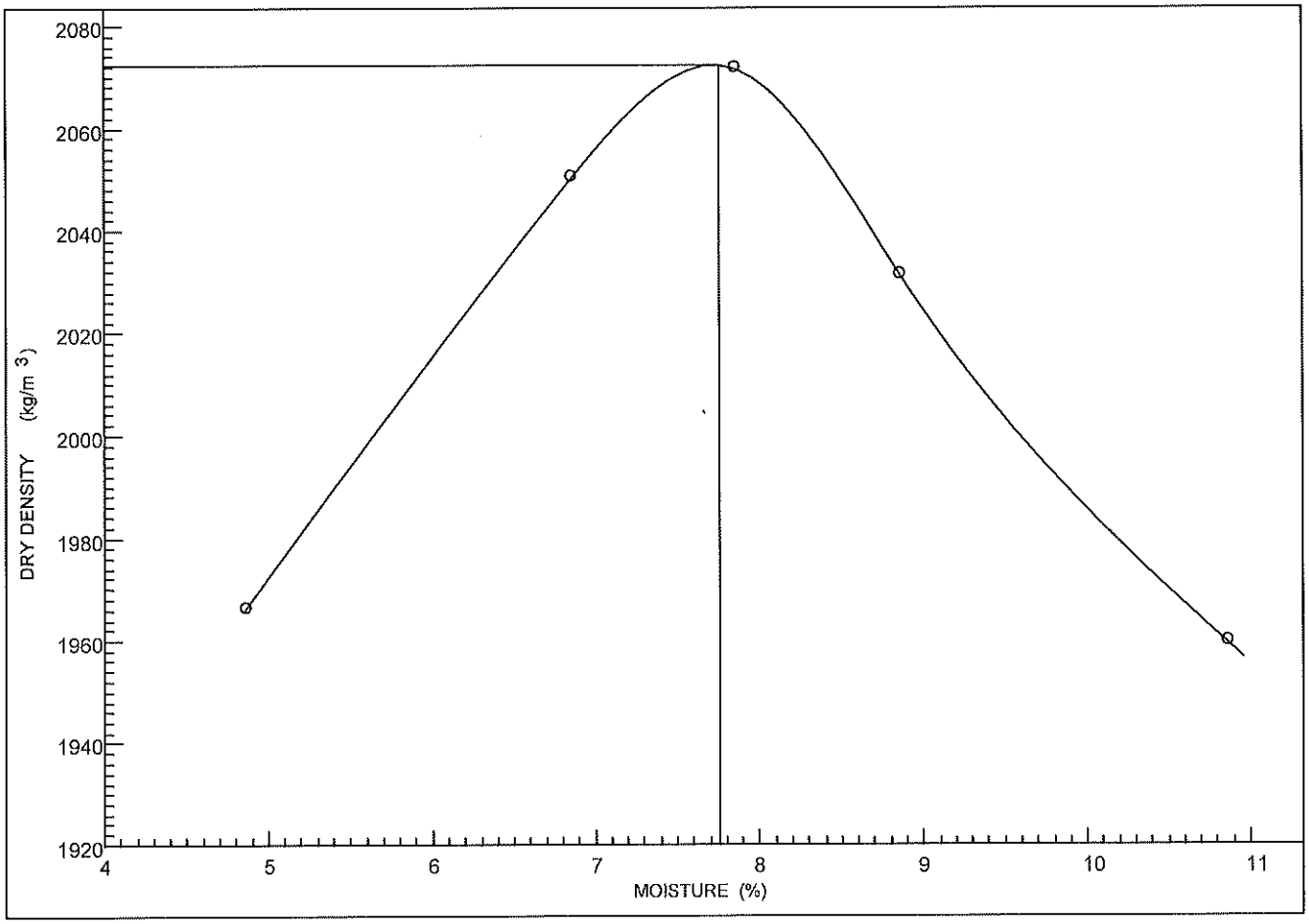
MOISTURE / DENSITY RELATIONSHIP(SANS 3001: GR30)

Sample No.: 2295	Hole No. : TP1	Depth (mm) : 0.00 - 1.50
Origin : Berea Formation	Stabilized With : Natural	Compaction Energy : MDD
Material Description : Moist Reddish Brown Clayey Fine Grained Sand		

Maximum Dry Density (kg/m^3): 2072

Optimum Moisture Content (%) : 7,8

Point No.	1	2	3	4	5			
Moisture (%)	4,9	6,9	7,9	8,9	10,9			
Density (kg/m^3)	1966	2050	2072	2031	1960			



Remarks :

FORM: GR30

4.4.1(SGS)(2019.12.04)

Technical Signatory : Rasalis Bhikam

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Email : ronald.ramdeen@sgs.com

TEST RESULTS

Gondwana Geo Solutions (Pty) Ltd 17 Kingmead Drive Westville, Durban 3629 Attention: Mr Sven	Project : Reinstatement of Mobeni Reservoir Your Ref : Our Ref : 55544/25 Date Reported : 03.04.2025

SIEVE ANALYSIS, ATTERBERG LIMITS, CBR(SANS 3001:GR1,GR10,GR12,GR20,GR30,GR40)

SAMPLE NO.	2295				Preparation Method:
HOLE NO.	TP 1				
ROAD NO.	-				
DEPTH	0.00 - 1.50				
CHAINAGE	Berea Formation				
LAYER TYPE	-				
STABILISED WITH	Natural				
SUPPLIER	-				
CURING METHOD	-				
DATE TESTED	03.04.2025				
DESCRIPTION	Moist Reddish Br Clayey sand				- Specification COTO:2020
SIEVE ANALYSIS (% PASSING)					
100.0 mm					
75.00 mm					
63.00 mm					
50.00 mm					
37.50 mm					
28.00 mm					
20.00 mm					
14.00 mm	100				
5.000 mm	99				
2.000 mm	99				
0.425 mm	98				
0.075 mm	30				
SOIL MORTAR					
COARSE SAND <2.0mm >0.425mm	1				
FINE SAND <0.425mm >0.075mm	69				
MATERIAL <0.075mm	30				
CONSTANTS					
GRADING MODULUS	0,73				
PRA CLASSIFICATION	A-2-4(0)				
COLTO CLASSIFICATION	---				
TRH Class.(INSITU |93%|90%|)	G8|G9				
LIQUID LIMIT (%)	-				
PLASTICITY INDEX (0.425mm)	NP				
LINEAR SHRINKAGE (%)	0,0				
MDD					
MAXIMUM DRY DENSITY (kg/m^3)	2072				
OPTIMUM MOISTURE CONTENT(%)	7,8				
MOULDING MOISTURE (%)	7,5				
TYPE OF TEST	CBR				
CBR-UCS @ 100% MDD	45				
CBR-UCS @ 98% MDD	33				
CBR-UCS @ 97% MDD	28				
CBR-UCS @ 95% MDD	20				
CBR-UCS @ 93% MDD	14				
CBR-UCS @ 90% MDD	7,8				

CBR-UCS @ % MDD derived from calculation.

% SWELL MOULD [A][B][C]	0,30	0,30	0,40										

Remarks :

FORM: GR40

4.4.1(SGS)(2019.12.04)

Technical Signatory : Rasalis Bhikam

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sanas Testing Laboratory T 0239

TEST RESULTS

Gondwana Geo Solutions (Pty) Ltd
17 Kingmead Drive
Westville, Durban
3629
Attention: Mr Sven

Project : Reinstatement of Mobeni Reservoir

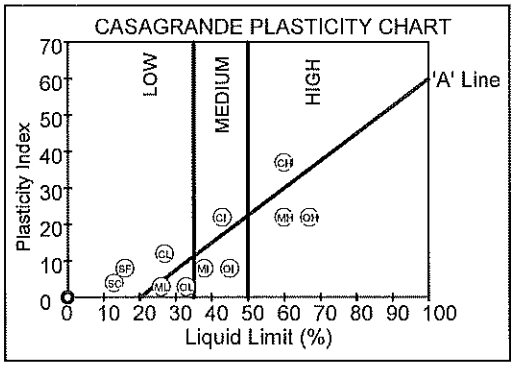
Your Ref :
Our Ref : 55544/25
Date Reported : 03.04.2025

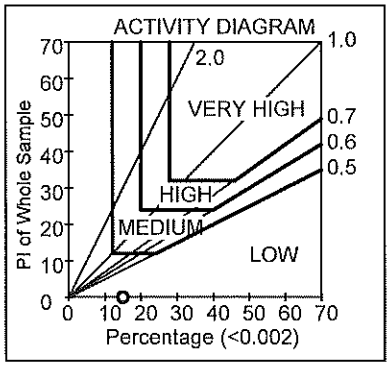
FOUNDATION INDICATOR (ASTM: D422)

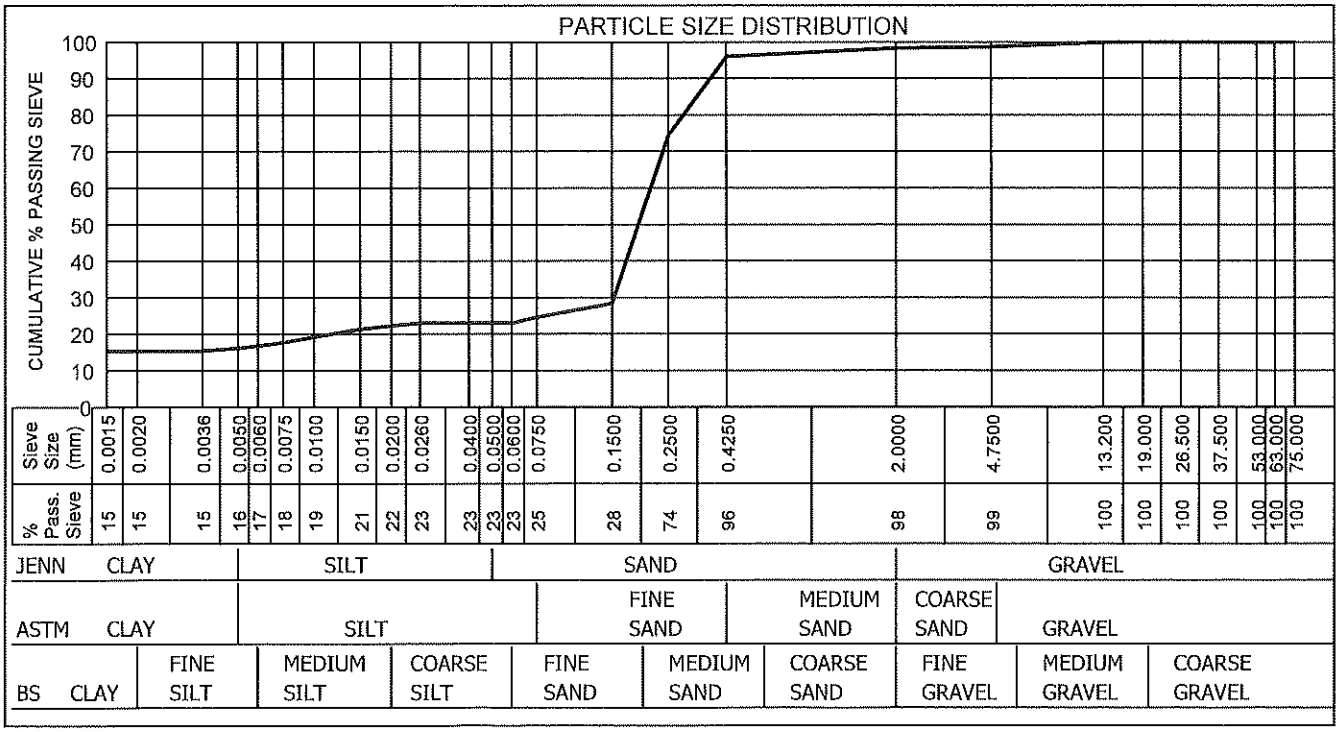
Sample No.	: 2296
Hole No.	: TP3
Depth	: 0.00 - 1.50
Liquid Limit (%)	: -
Plasticity Index	: NP
Linear Shrinkage (%)	: 0,0
PI of Whole Sample	: 0
P.R.A. Classification	: A-2-4(0)
Unified Soil Classificati	: SC
Activity	: 0,00
Heave Classification	: LOW
Grading Modulus	: 0,81
Percentage (<0.002)	: 15,0
Moisture Content (%)	: 1,5

Material Description : Moist Brown to Reddish Brown Silty Clayey Fine Grained Sand

	Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Classification
Jennings	16,2	6,8	75,4	1,6	SILTY SAND
Astm	16,2	8,4	74,2	1,2	SILTY SAND
British Standard	15,4	7,7	75,4	1,6	SILTY SAND







Sieve Size (mm)	0.0015	0.0020	0.0036	0.0050	0.0060	0.0075	0.0100	0.0150	0.0200	0.0260	0.0400	0.0500	0.0600	0.0750	0.1500	0.2500	0.4250	2.0000	4.7500	13.200	19.000	26.500	37.500	53.000	63.000	75.000
% Pass. Sieve	15	15	15	16	17	18	19	21	22	23	23	23	23	25	28	74	96	98	99	100	100	100	100	100	100	100

JENN	CLAY	SILT			SAND			GRAVEL		
ASTM	CLAY	SILT			FINE SAND	MEDIUM SAND	COARSE SAND	GRAVEL		
BS	CLAY	FINE SILT	MEDIUM SILT	COARSE SILT	FINE SAND	MEDIUM SAND	COARSE SAND	FINE GRAVEL	MEDIUM GRAVEL	COARSE GRAVEL

Remarks : Fill

FORM: A6

4.4.1(SGS)(2019.12.04)

Technical Signatory : Rasalis Bhikam

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TEST RESULTS

Gondwana Geo Solutions (Pty) Ltd 17 Kingmead Drive Westville, Durban 3629 Attention: Mr Sven	Project : Reinstatement of Mobeni Reservoir Your Ref : Our Ref : 55544/25 Date Reported : 02.04.2025

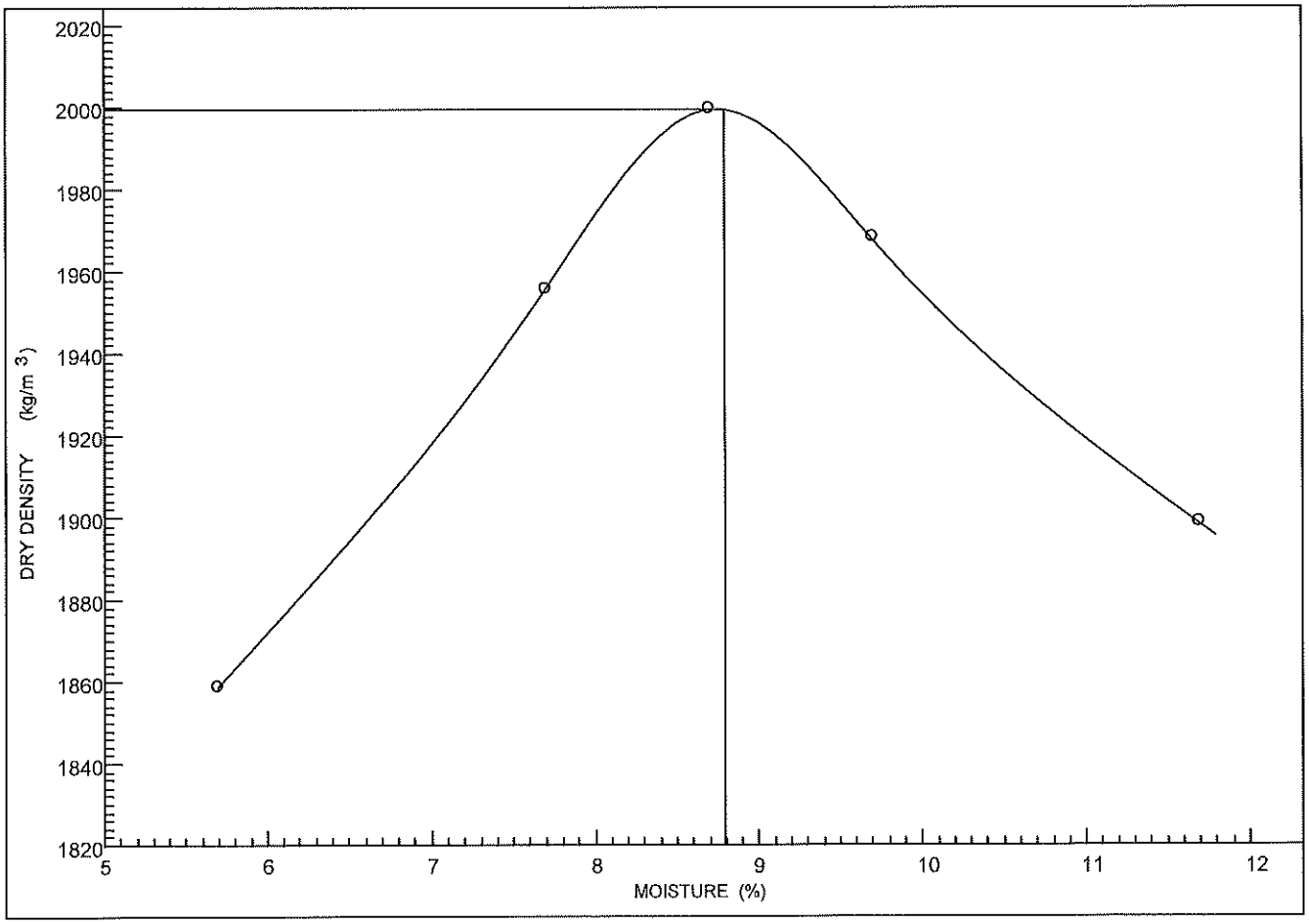
MOISTURE / DENSITY RELATIONSHIP(SANS 3001: GR30)

Sample No.: 2296	Hole No. : TP3	Depth (mm) : 0.00-1.50
Origin : Fill	Stabilized With : Natural	Compaction Energy : MDD
Material Description : Moist Brown to Reddish Brown Silty Clayey Fine Grained Sand		

Maximum Dry Density (kg/m^3): 2000

Optimum Moisture Content (%) : 8,8

Point No.	1	2	3	4	5			
Moisture (%)	5,7	7,7	8,7	9,7	11,7			
Density (kg/m^3)	1859	1955	1999	1968	1899			



Remarks :

FORM: GR30

4.4.1(SGS)(2019.12.04)

Technical Signatory : Rasalis Bhikam

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SGS MATROLAB

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sanas Testing Laboratory T 0239

TEST RESULTS

Gondwana Geo Solutions (Pty) Ltd 17 Kingmead Drive Westville, Durban 3629 Attention: Mr Sven	Project : Reinstatement of Mobeni Reservoir Your Ref : Our Ref : 55544/25-B Date Reported : 03.04.2025

SIEVE ANALYSIS, ATTERBERG LIMITS, CBR(SANS 3001:GR1,GR10,GR12,GR20,GR30,GR40)

SAMPLE NO.	2296				Preparation Method:
HOLE NO.	TP3				
ROAD NO.	-				
DEPTH	0.00 - 1.50				
CHAINAGE	Fill				
LAYER TYPE	-				
STABILISED WITH	Natural				
SUPPLIER	-				
CURING METHOD	-				
DATE TESTED	03.04.2025				
DESCRIPTION	Moist Br to Reddish Br Silty Clayey Sand				- Specification COTO:2020
SIEVE ANALYSIS (% PASSING)					
100.0 mm					
75.00 mm					
63.00 mm					
50.00 mm					
37.50 mm					
28.00 mm					
20.00 mm					
14.00 mm	100				
5.000 mm	99				
2.000 mm	97				
0.425 mm	93				
0.075 mm	24				
SOIL MORTAR					
COARSE SAND <2.0mm >0.425mm	4				
FINE SAND <0.425mm >0.075mm	71				
MATERIAL <0.075mm	25				
CONSTANTS					
GRADING MODULUS	0,86				
PRA CLASSIFICATION	A-2-4(0)				
COLTO CLASSIFICATION	G7				
TRH CLASSIFICATION	G7				
LIQUID LIMIT (%)	-				
PLASTICITY INDEX (0.425mm)	NP				
LINEAR SHRINKAGE (%)	0,0				
MDD					
MAXIMUM DRY DENSITY (kg/m^3)	2000				
OPTIMUM MOISTURE CONTENT(%)	8,8				
MOULDING MOISTURE (%)	8,5				
TYPE OF TEST	CBR				
CBR-UCS @ 100% MDD	47				
CBR-UCS @ 98% MDD	37				
CBR-UCS @ 97% MDD	32				
CBR-UCS @ 95% MDD	25				
CBR-UCS @ 93% MDD	17				
CBR-UCS @ 90% MDD	9,3				

CBR-UCS @ % MDD derived from calculation.

% SWELL MOULD [A][B][C]	0,20	0,30	0,30										

Remarks :

FORM: GR40

4.4.1(SGS)(2019.12.04)

Technical Signatory : Rasalis Bhikam

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T 0239

TEST RESULTS

Gondwana Geo Solutions (Pty) Ltd
17 Kingmead Drive
Westville, Durban
3629
Attention: Mr Sven

Project : Reinstatement of Mobeni Reservoir

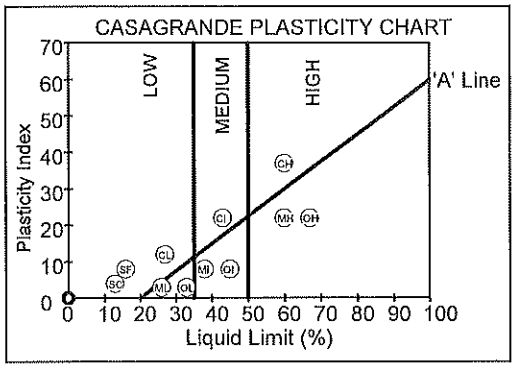
Your Ref :
Our Ref : 55563/25
Date Reported : 10.04.2025

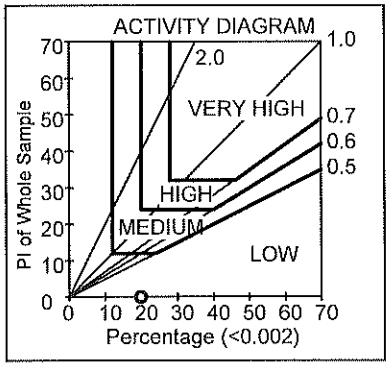
FOUNDATION INDICATOR (ASTM: D422)

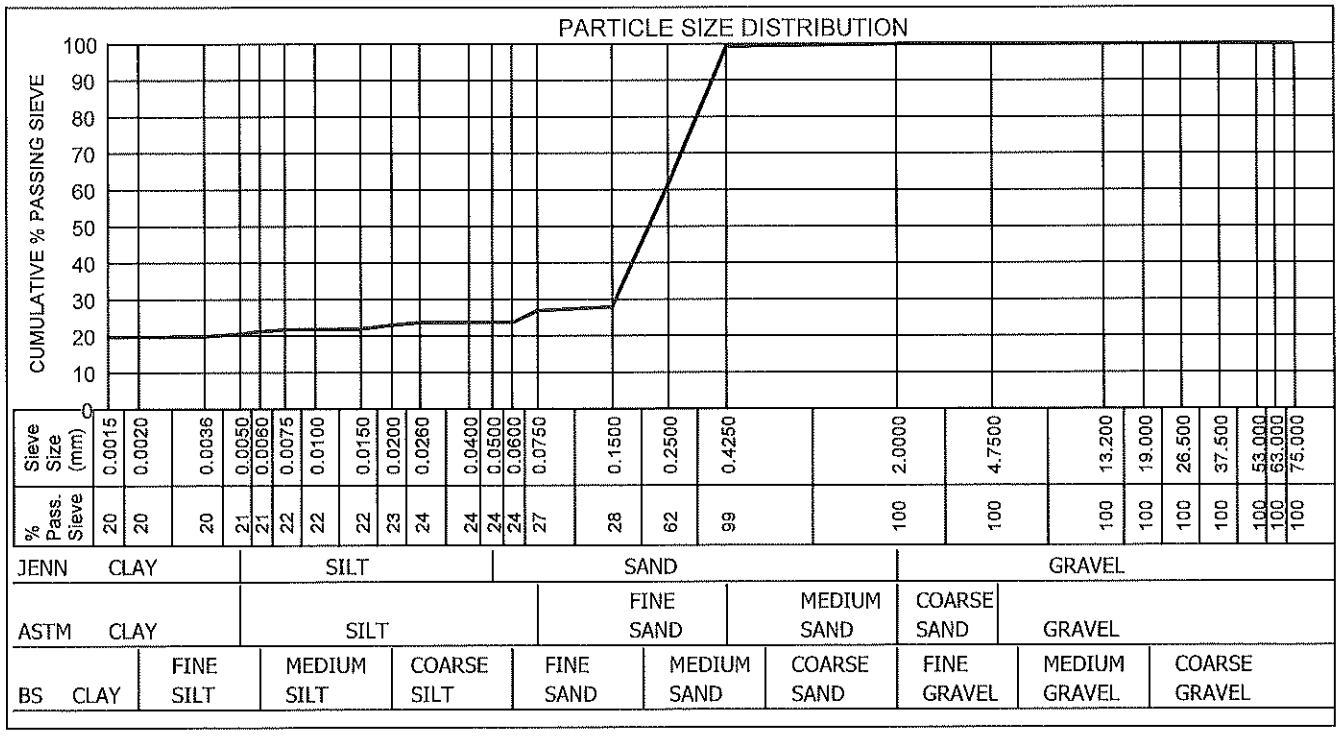
Sample No.	: 2314
Hole No.	: -
Depth	: 13.50 - 15.45
Liquid Limit (%)	: -
Plasticity Index	: NP
Linear Shrinkage (%)	: 0,0
PI of Whole Sample	: 0
P.R.A. Classification	: A-2-4(0)
Unified Soil Classificati	: SC
Activity	: 0,00
Heave Classification	: LOW
Grading Modulus	: 0,74
Percentage (<0.002)	: 20,0
Moisture Content (%)	: 2,1

Material Description : Orangey Brown Silty Clayey Fine Grained Sand

	Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Classification
Jennings	20,7	3,1	76,2	0,0	CLAYEY SAND
Astm	20,7	6,2	73,1	0,0	CLAYEY SAND
British Standard	19,8	4,0	76,2	0,0	SILTY SAND







Sieve Size (mm)	0.0015	0.0020	0.0036	0.0050	0.0060	0.0075	0.0100	0.0150	0.0200	0.0260	0.0400	0.0500	0.0600	0.0750	0.1500	0.2500	0.4250	2.0000	4.7500	13.200	19.000	26.500	37.500	53.000	63.000	75.000
% Pass. Sieve	20	20	20	21	21	22	22	22	23	24	24	24	24	27	28	62	99	100	100	100	100	100	100	100	100	100

JENN	CLAY		SILT			SAND			GRAVEL		
ASTM	CLAY		SILT			FINE SAND		MEDIUM SAND	COARSE SAND	GRAVEL	
BS	CLAY	FINE SILT	MEDIUM SILT	COARSE SILT	FINE SAND	MEDIUM SAND	COARSE SAND	FINE GRAVEL	MEDIUM GRAVEL	COARSE GRAVEL	

Remarks :

FORM: A6

4.4.1(SGS)(2019.12.04)

Technical Signatory : Rasalis Bhikam

SGS MATROLAB (PTY) LTD
- CIVIL ENGINEERING SERVICES -
Reg.No.: 2003/029180/07 - VAT. Reg.No.: 4040210587
a SANAS Accredited Testing Laboratory, No. T 0239

60 Columbine Place, Glen Anil, Durban North, 4051

Tel. : (031) 579 1220/1
Fax : (031) 579 1344
Email : ronald.ramdeen@sgs.com

T 0239

TEST RESULTS

Gondwana Geo Solutions (Pty) Ltd
17 Kingmead Drive
Westville, Durban
3629
Attention: Mr Sven

Project : Reinstatement of Mobeni Reservoir

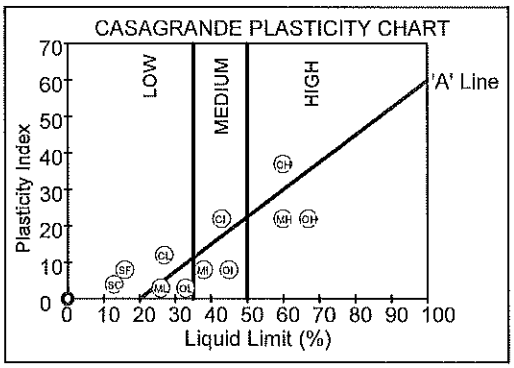
Your Ref :
Our Ref : 55563/25
Date Reported : 10.04.2025

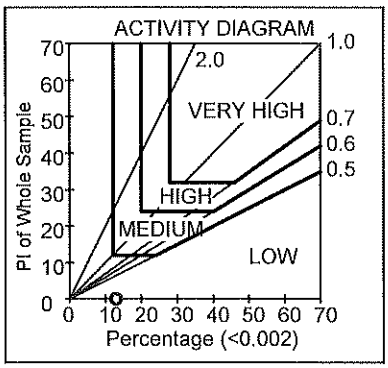
FOUNDATION INDICATOR (ASTM: D422)

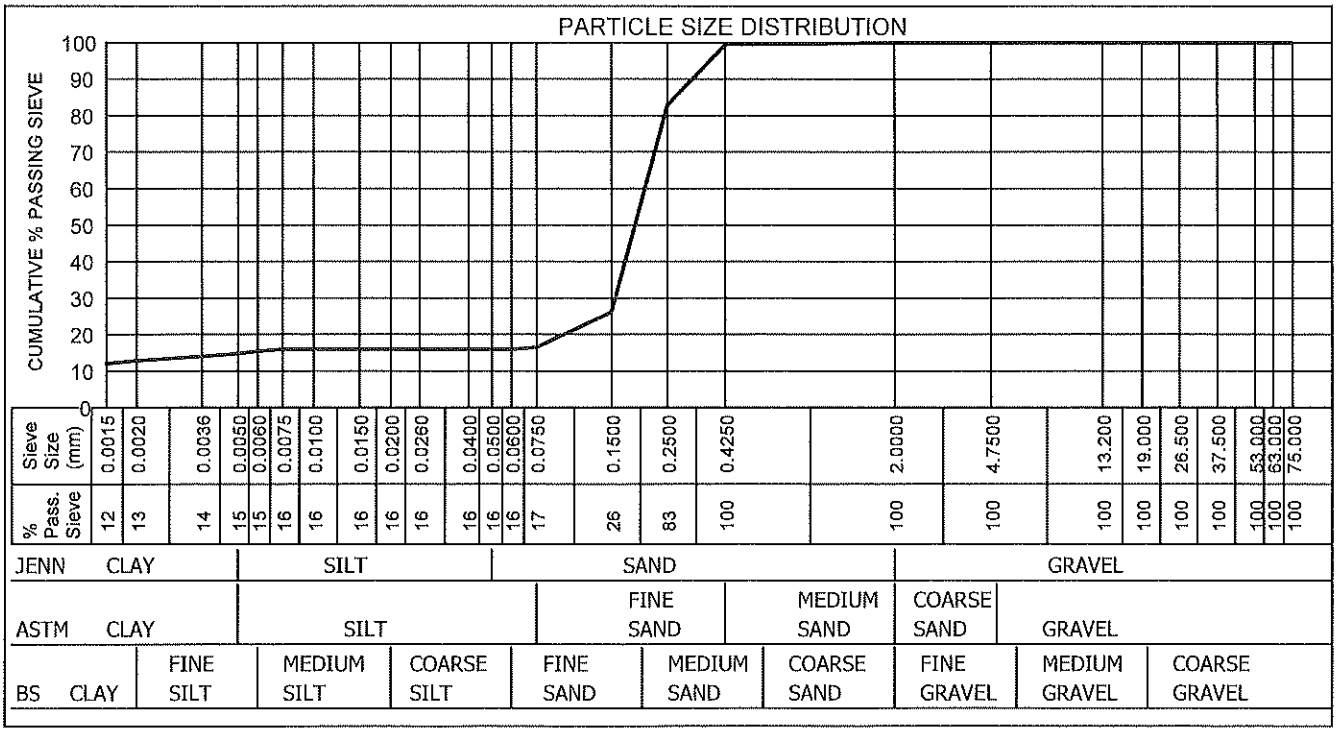
Sample No.	: 2315
Hole No.	: -
Depth	: 21.00 - 22.95
Liquid Limit (%)	: -
Plasticity Index	: NP
Linear Shrinkage (%)	: 0,0
PI of Whole Sample	: 0
P.R.A. Classification	: A-2-4(0)
Unified Soil Classificati	: SC
Activity	: 0,00
Heave Classification	: LOW
Grading Modulus	: 0,83
Percentage (<0.002)	: 13,0
Moisture Content (%)	: 5,2

Material Description : Light Brown Silty Fine Grained Sand

	Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Classification
Jennings	14,9	1,1	84,0	0,0	SAND
Astm	14,9	1,7	83,5	0,0	SAND
British Standard	12,9	3,1	84,0	0,0	SAND







Sieve Size (mm)	0.0015	0.0020	0.0036	0.0050	0.0060	0.0075	0.0100	0.0150	0.0200	0.0260	0.0400	0.0500	0.0600	0.0750	0.1500	0.2500	0.4250	2.0000	4.7500	13.200	19.000	26.500	37.500	53.000	63.000	75.000
% Pass. Sieve	12	13	14	15	15	16	16	16	16	16	16	16	16	17	26	83	100	100	100	100	100	100	100	100	100	100

JENN	CLAY		SILT		SAND			GRAVEL		
ASTM	CLAY		SILT			FINE SAND	MEDIUM SAND	COARSE SAND	GRAVEL	
BS	CLAY	FINE SILT	MEDIUM SILT	COARSE SILT	FINE SAND	MEDIUM SAND	COARSE SAND	FINE GRAVEL	MEDIUM GRAVEL	COARSE GRAVEL

Remarks :

FORM: A6

4.4.1(SGS)(2019.12.04)

Technical Signatory : Rasalis Bhikam

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sanas Testing Laboratory T 0239

TEST RESULTS

Gondwana Geo Solutions (Pty) Ltd
17 Kingmead Drive
Westville, Durban
3629
Attention: Mr Sven

Project : Reinstatement of Mobeni Reservoir

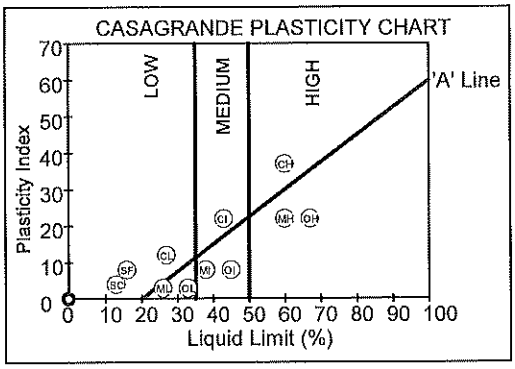
Your Ref :
Our Ref : 55555/25
Date Reported : 07.04.2025

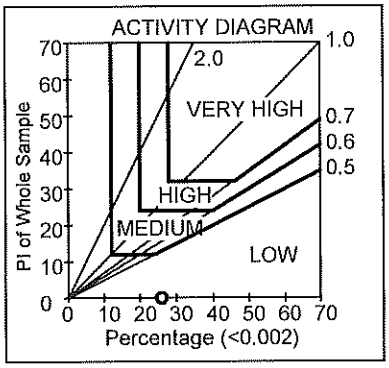
FOUNDATION INDICATOR (ASTM: D422)

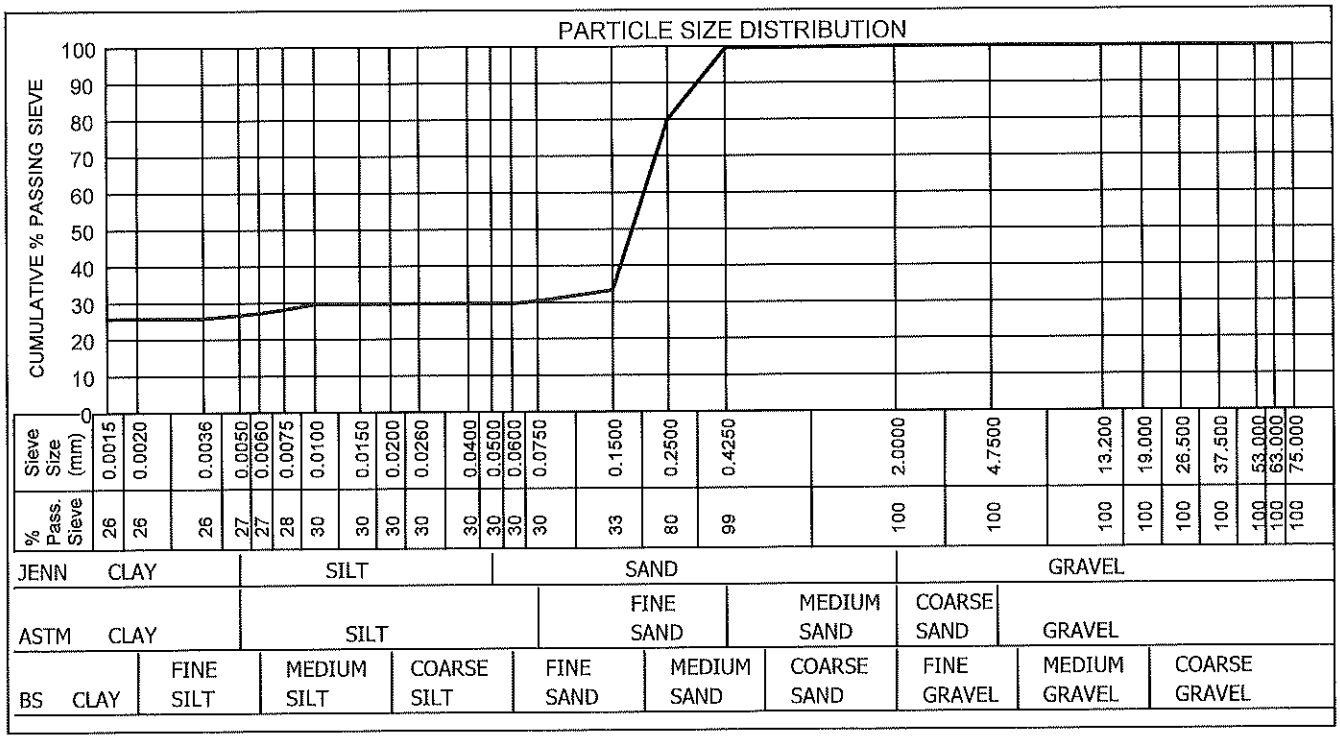
Sample No.	: 2298
Hole No.	: -
Depth	: 3.00 - 4.95
Liquid Limit (%)	: -
Plasticity Index	: NP
Linear Shrinkage (%)	: 0,0
PI of Whole Sample	: 0
P.R.A. Classification	: A-2-4(0)
Unified Soil Classificati	: SC
Activity	: 0,00
Heave Classification	: LOW
Grading Modulus	: 0,71
Percentage (<0.002)	: 26,0
Moisture Content (%)	: 0,7

Material Description : Reddish Brown Clayey Fine Grained Sand

	Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Classification
Jennings	26,7	3,0	70,3	0,0	CLAYEY SAND
Astm	26,7	3,7	69,7	0,0	CLAYEY SAND
British Standard	25,7	4,0	70,3	0,0	CLAYEY SAND







Sieve Size (mm)	0.0015	0.0020	0.0036	0.0050	0.0060	0.0075	0.0100	0.0150	0.0200	0.0260	0.0400	0.0500	0.0600	0.0750	0.1500	0.2500	0.4250	2.0000	4.7500	13.200	19.000	26.500	37.500	53.000	63.000	75.000
% Pass. Sieve	26	26	26	27	27	28	30	30	30	30	30	30	30	30	33	80	99	100	100	100	100	100	100	100	100	100

JENN	CLAY	SILT			SAND			GRAVEL		
ASTM	CLAY	SILT			FINE SAND	MEDIUM SAND	COARSE SAND	GRAVEL		
BS	CLAY	FINE SILT	MEDIUM SILT	COARSE SILT	FINE SAND	MEDIUM SAND	COARSE SAND	FINE GRAVEL	MEDIUM GRAVEL	COARSE GRAVEL

Remarks :

FORM: A6

4.4.1(SGS)(2019.12.04)

Technical Signatory : Rasalis Bhikam

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sanas Testing Laboratory T 0239

TEST RESULTS

Gondwana Geo Solutions (Pty) Ltd
17 Kingmead Drive
Westville, Durban
3629
Attention: Mr Sven

Project : Reinstatement of Mobeni Reservoir

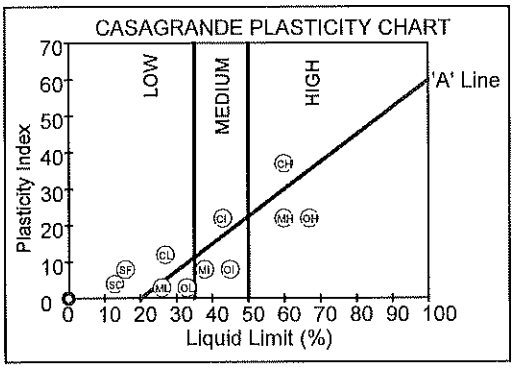
Your Ref :
Our Ref : 55555/25
Date Reported : 07.04.2025

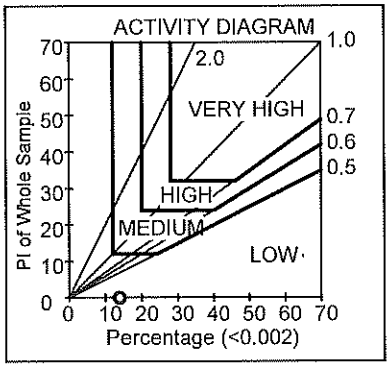
FOUNDATION INDICATOR (ASTM: D422)

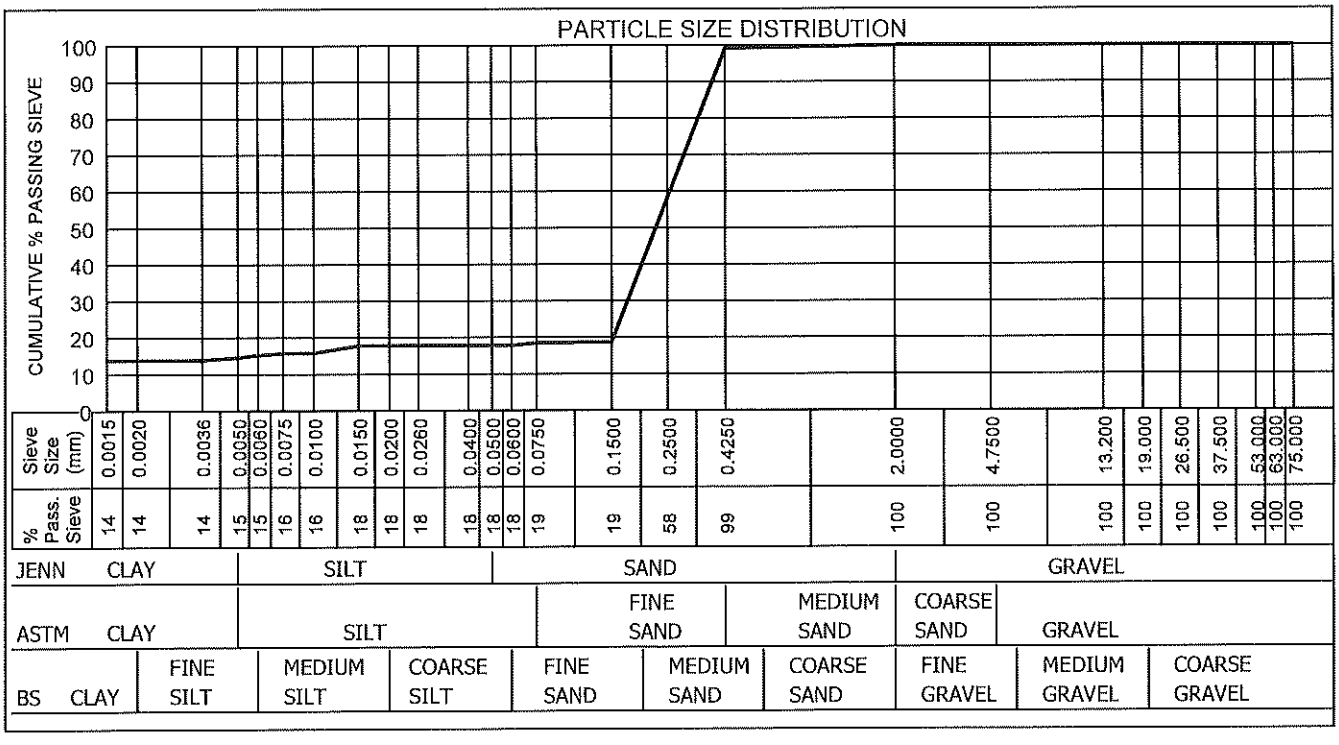
Sample No.	: 2299
Hole No.	: -
Depth	: 9.00 - 10.95
Liquid Limit (%)	: -
Plasticity Index	: NP
Linear Shrinkage (%)	: 0,0
PI of Whole Sample	: 0
P.R.A. Classification	: A-2-4(0)
Unified Soil Classificati	: SC
Activity	: 0,00
Heave Classification	: LOW
Grading Modulus	: 0,82
Percentage (<0.002)	: 14,0
Moisture Content (%)	: 0,4

Material Description : Brown Slightly Silty Fine to Medium Grained Sand

	Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Classification
Jennings	14,7	3,1	82,2	0,0	SAND
Astm	14,7	3,8	81,4	0,0	SAND
British Standard	13,9	4,0	82,2	0,0	SAND







Sieve Size (mm)	0.0015	0.0020	0.0036	0.0050	0.0060	0.0075	0.0100	0.0150	0.0200	0.0260	0.0400	0.0500	0.0600	0.0750	0.1500	0.2500	0.4250	2.0000	4.7500	13.200	19.000	26.500	37.500	53.000	63.000	75.000
% Pass. Sieve	14	14	14	15	15	16	16	18	18	18	18	18	18	19	19	58	99	100	100	100	100	100	100	100	100	100

JENN	CLAY	SILT			SAND			GRAVEL		
ASTM	CLAY	SILT			FINE SAND	MEDIUM SAND	COARSE SAND	GRAVEL		
BS	CLAY	FINE SILT	MEDIUM SILT	COARSE SILT	FINE SAND	MEDIUM SAND	COARSE SAND	FINE GRAVEL	MEDIUM GRAVEL	COARSE GRAVEL

Remarks :

FORM: A6

4.4.1(SGS)(2019.12.04)

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sanas Testing Laboratory T 0239

TEST RESULTS

Gondwana Geo Solutions (Pty) Ltd
17 Kingmead Drive
Westville, Durban
3629
Attention: Mr Sven

Project : Reinstatement of Mobeni Reservoir

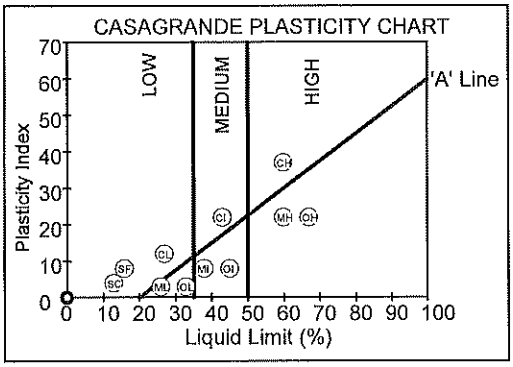
Your Ref :
Our Ref : 55555/25
Date Reported : 07.04.2025

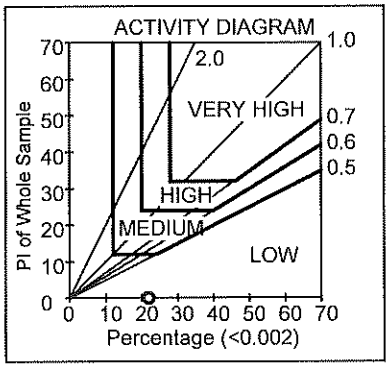
FOUNDATION INDICATOR (ASTM: D422)

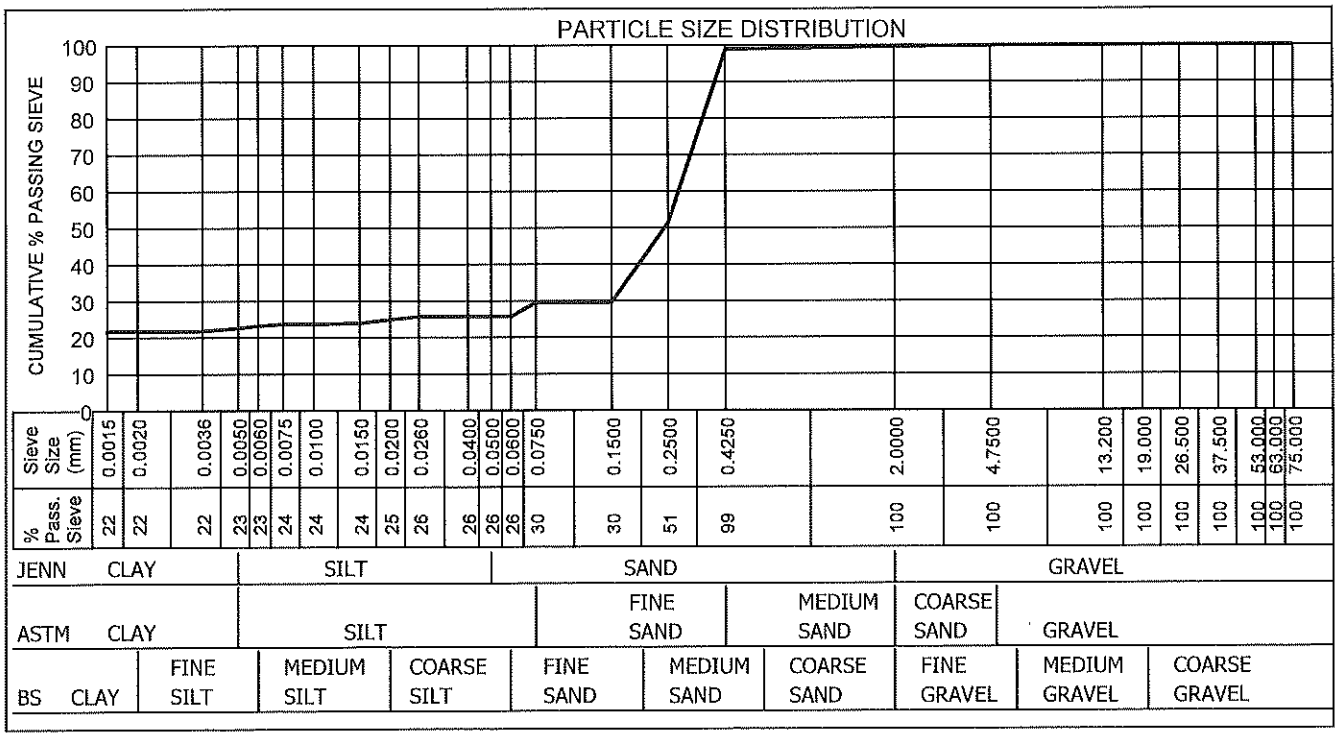
Sample No.	: 2300
Hole No.	:
Depth	: 13.50 - 15.45
Liquid Limit (%)	: -
Plasticity Index	: NP
Linear Shrinkage (%)	: 0,0
PI of Whole Sample	: 0
P.R.A. Classification	: A-2-4(0)
Unified Soil Classificati	: SC
Activity	: 0,00
Heave Classification	: LOW
Grading Modulus	: 0,71
Percentage (<0.002)	: 22,0
Moisture Content (%)	: 0,3

Material Description : Light Brown Fine Grained Sand

	Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Classification
Jennings	22,7	3,0	73,8	0,4	CLAYEY SAND
Astm	22,7	6,8	70,4	0,1	CLAYEY SAND
British Standard	21,8	4,0	73,8	0,4	CLAYEY SAND







Sieve Size (mm)	0.0015	0.0020	0.0036	0.0050	0.0060	0.0075	0.0100	0.0150	0.0200	0.0260	0.0400	0.0500	0.0600	0.0750	0.1500	0.2500	0.4250	2.0000	4.7500	13.200	19.000	26.500	37.500	53.000	63.000	75.000
% Pass. Sieve	22	22	22	23	23	24	24	24	25	26	26	26	26	30	30	51	99	100	100	100	100	100	100	100	100	100

JENN	CLAY	SILT			SAND			GRAVEL		
ASTM	CLAY	SILT			FINE SAND	MEDIUM SAND	COARSE SAND	GRAVEL		
BS	CLAY	FINE SILT	MEDIUM SILT	COARSE SILT	FINE SAND	MEDIUM SAND	COARSE SAND	FINE GRAVEL	MEDIUM GRAVEL	COARSE GRAVEL

Remarks :

FORM: A6

4.4.1(SGS)(2019.12.04)

Technical Signatory : Rasalis Bhikam

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sanas Testing Laboratory T 0239

TEST RESULTS

Gondwana Geo Solutions (Pty) Ltd
17 Kingmead Drive
Westville, Durban
3629
Attention: Mr Sven

Project : Reinstatement of Mobeni Reservoir

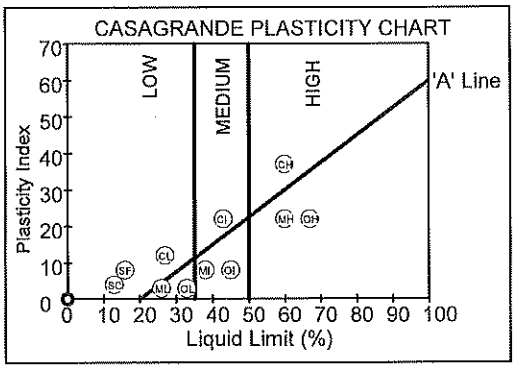
Your Ref :
Our Ref : 55555/25
Date Reported : 07.04.2025

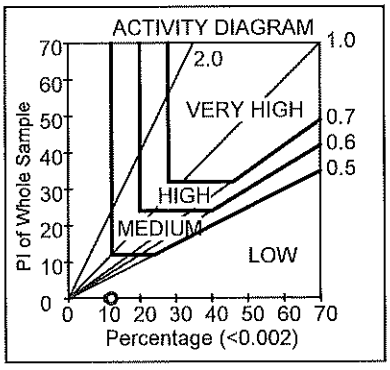
FOUNDATION INDICATOR (ASTM: D422)

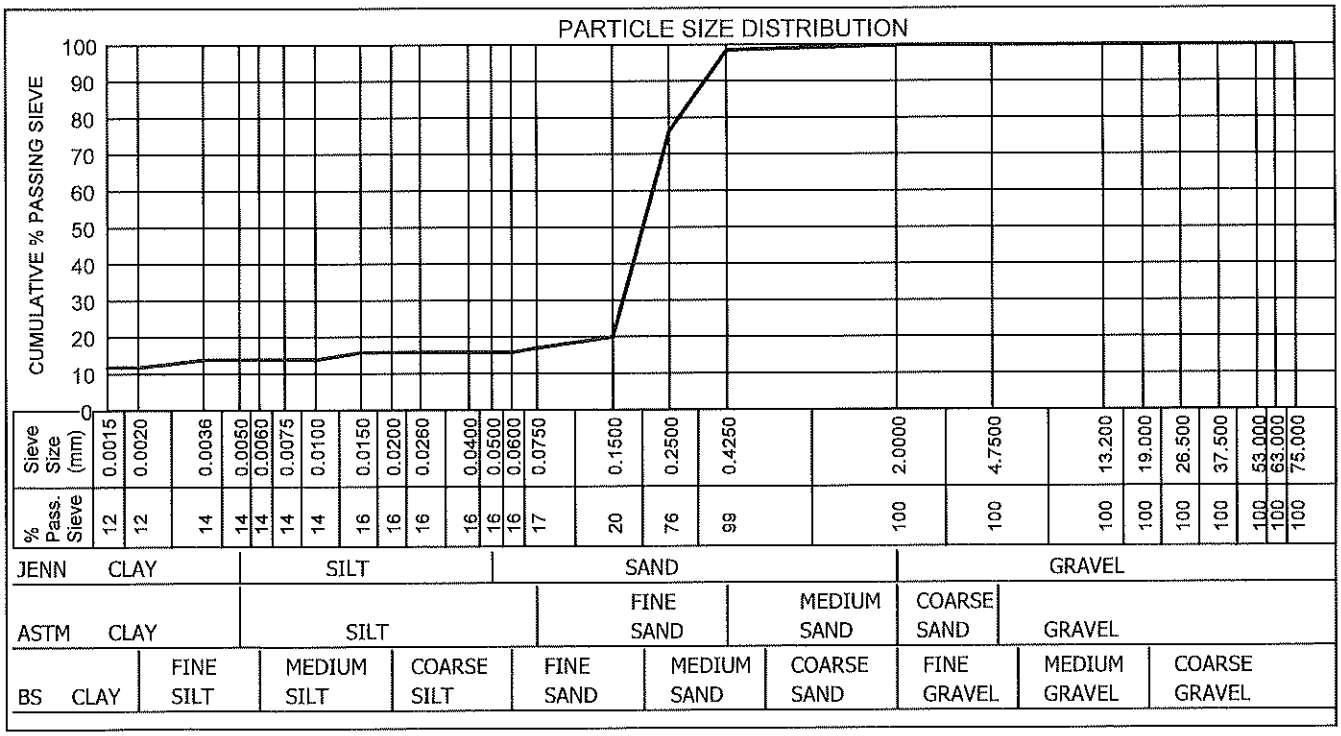
Sample No.	: 2301
Hole No.	: -
Depth	: 24.00 - 25.45
Liquid Limit (%)	: -
Plasticity Index	: NP
Linear Shrinkage (%)	: 0,0
PI of Whole Sample	: 0
P.R.A. Classification	: A-2-4(0)
Unified Soil Classificati	: SC
Activity	: 0,00
Heave Classification	: LOW
Grading Modulus	: 0,84
Percentage (<0.002)	: 12,0
Moisture Content (%)	: 0,6

Material Description : Reddish Brown Clayey Fine Grained Sand

	Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Classification
Jennings	13,9	2,0	84,0	0,2	SAND
Astm	13,9	3,1	83,0	0,1	SAND
British Standard	11,9	4,0	84,0	0,2	SAND







Sieve Size (mm)	0.0015	0.0020	0.0036	0.0050	0.0060	0.0075	0.0100	0.0150	0.0200	0.0260	0.0400	0.0500	0.0600	0.0750	0.1500	0.2500	0.4250	2.0000	4.7500	13.200	19.000	26.500	37.500	53.000	63.000	75.000
% Pass. Sieve	12	12	14	14	14	14	14	16	16	16	16	16	16	17	20	76	99	100	100	100	100	100	100	100	100	100

JENN	CLAY	SILT			SAND			GRAVEL			
ASTM	CLAY	SILT			FINE SAND		MEDIUM SAND	COARSE SAND	GRAVEL		
BS	CLAY	FINE SILT	MEDIUM SILT	COARSE SILT	FINE SAND	MEDIUM SAND	COARSE SAND	FINE GRAVEL	MEDIUM GRAVEL	COARSE GRAVEL	

Remarks :

FORM: A6

4.4.1(SGS)(2019.12.04)

Technical Signatory : Rasalis Bhikam

SGS MATROLAB

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Email : ronald.ramdeen@sgs.com

sanas Testing Laboratory T 0239

TEST RESULTS

Gondwana Geo Solutions (Pty) Ltd 17 Kingmead Drive Westville, Durban 3629 Attention: Mr Sven	Project : Mobeni Reservoir Your Ref : Our Ref : 55716/25 Date Reported : 26.05.2025

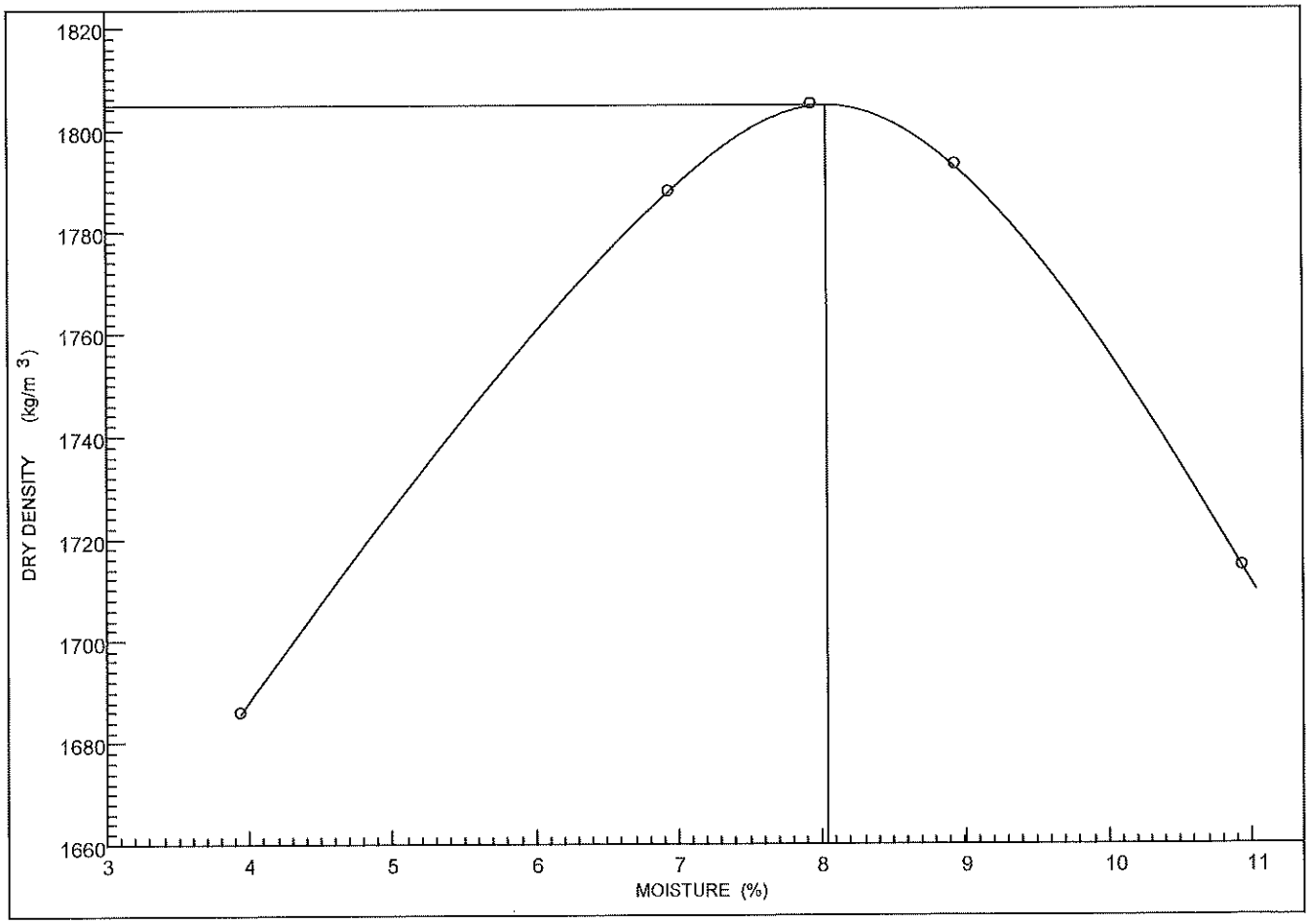
MOISTURE / DENSITY RELATIONSHIP(SANS 3001: GR30)

Sample No.: 2387	Hole No. : TP 05	Depth (mm) : 1000 - 1200
Origin : -	Stabilized With : Natural	Compaction Energy : MDD
Material Description : Light Yellow Brown Silty Sand		

Maximum Dry Density (kg/m^3): 1805

Optimum Moisture Content (%) : 8,0

Point No.	1	2	3	4	5			
Moisture (%)	3,9	6,9	7,9	8,9	10,9			
Density (kg/m^3)	1686	1788	1805	1793	1714			



Remarks :

FORM: GR30

4.4.1(SGS)(2019.12.04)

Technical Signatory: Ronald Ramdeen

SGS MATROLAB

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TEST RESULTS

Gondwana Geo Solutions (Pty) Ltd
17 Kingmead Drive
Westville, Durban
3629
Attention: Mr Sven

Project : Mobeni Reservoir

Your Ref :
Our Ref : 55716/25
Date Reported : 25.05.2025

SIEVE ANALYSIS, ATTERBERG LIMITS, CBR(SANS 3001:GR1,GR10,GR12,GR20,GR30,GR40)

SAMPLE NO.	2387				Preparation Method:
HOLE NO.	TP 05				
ROAD NO.	-				
DEPTH	1000 - 1200				
CHAINAGE	-				
LAYER TYPE	-				
STABILISED WITH	Natural				
SUPPLIER	-				
CURING METHOD	-				
DATE TESTED	24.05.2025				
DESCRIPTION	Light Yellow Brown Silty Sand				- Specification
SIEVE ANALYSIS (% PASSING)					
100.0 mm					
75.00 mm					
63.00 mm					
50.00 mm					
37.50 mm	100				
28.00 mm	100				
20.00 mm	99				
14.00 mm	98				
5.000 mm	98				
2.000 mm	97				
0.425 mm	96				
0.075 mm	10				
SOIL MORTAR					
COARSE SAND <2.0mm >0.425mm	1				
FINE SAND <0.425mm >0.075mm	88				
MATERIAL <0.075mm	11				
CONSTANTS					
GRADING MODULUS	0,97				
PRA CLASSIFICATION	A-3(0)				
COLTO CLASSIFICATION	G7				
TRH CLASSIFICATION	G7				
LIQUID LIMIT (%)	-				
PLASTICITY INDEX (0.425mm)	NP				
LINEAR SHRINKAGE (%)	0,0				
MDD					
MAXIMUM DRY DENSITY (kg/m^3)	1805				
OPTIMUM MOISTURE CONTENT(%)	8,0				
MOULDING MOISTURE (%)	8,3				
TYPE OF TEST	CBR				
CBR-UCS @ 100% MDD	31				
CBR-UCS @ 98% MDD	26				
CBR-UCS @ 97% MDD	24				
CBR-UCS @ 95% MDD	20				
CBR-UCS @ 93% MDD	16				
CBR-UCS @ 90% MDD	11				

CBR-UCS @ % MDD derived from calculation.

% SWELL MOULD [A][B][C]	0,00	0,00	0,00											

Remarks :

FORM: GR40

4.4.1(SGS)(2019.12.04)

Technical Signatory : Ronald Ramdeen

SGS MATROLAB

SGS MATROLAB (PTY) LTD
- CIVIL ENGINEERING SERVICES -
Reg.No.: 2003/029180/07 - VAT. Reg.No.: 4040210587
a SANAS Accredited Testing Laboratory, No. T 0239

60 Columbine Place, Glen Anil, Durban North, 4051

Tel. : (031) 579 1220/1
Fax : (031) 579 1344
Email : ronald.ramdeen@sgs.com

sanas Testing Laboratory T 0239

TEST RESULTS

Gondwana Geo Solutions (Pty) Ltd
17 Kingmead Drive
Westville, Durban
3629
Attention: Mr Sven

Project : Mobeni Reservoir

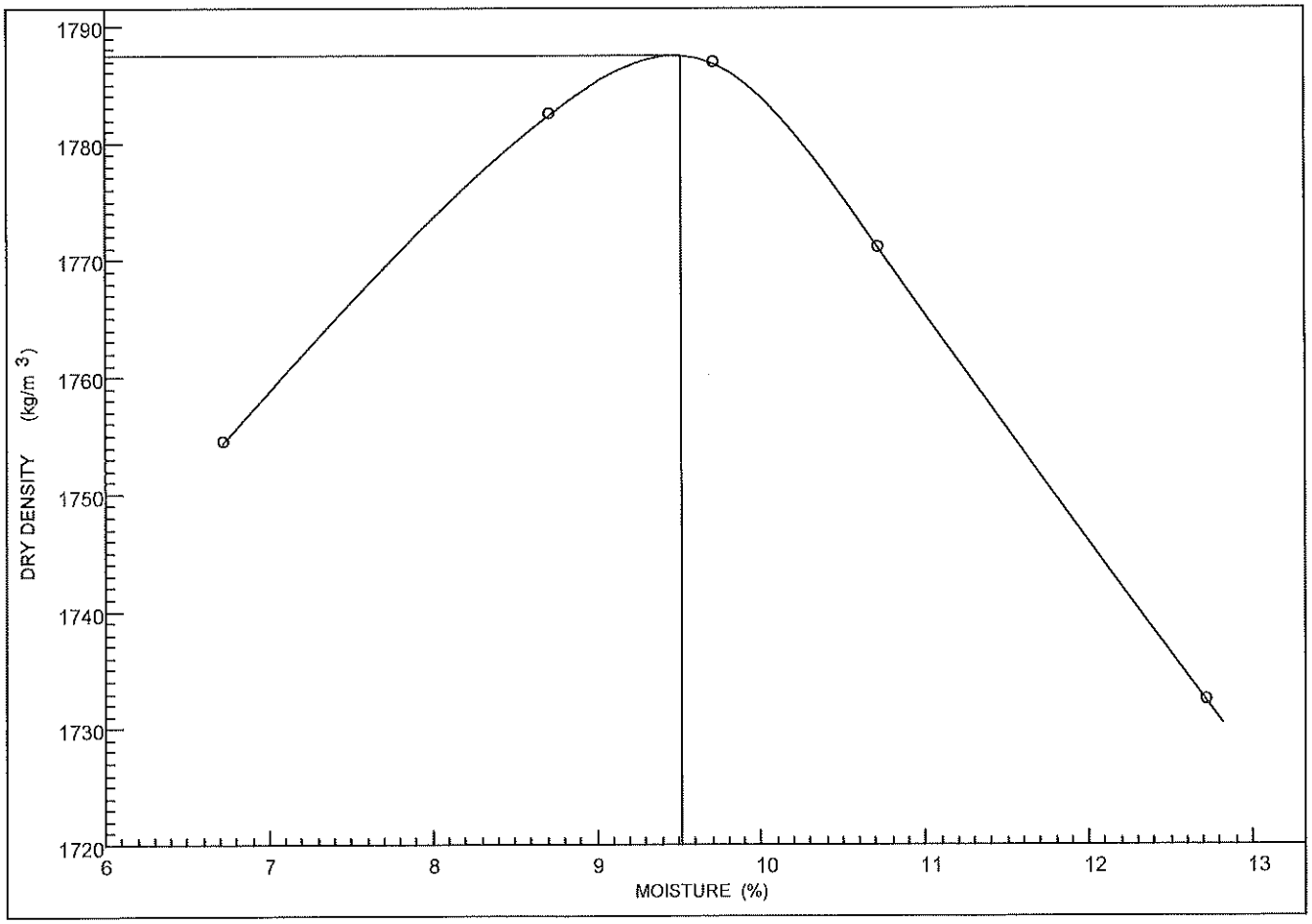
Your Ref :
Our Ref : 55716/25
Date Reported : 26.05.2025

MOISTURE / DENSITY RELATIONSHIP(SANS 3001: GR30)

Sample No.: 2388	Hole No. : TP 06	Depth (mm) : 1000 - 1200
Origin : -	Stabilized With : Natural	Compaction Energy : MDD
Material Description : Light Yellow Brown Silty Sand		

Maximum Dry Density (kg/m^3): 1787
Optimum Moisture Content (%) : 9,5

Point No.	1	2	3	4	5			
Moisture (%)	6,7	8,7	9,7	10,7	12,7			
Density (kg/m^3)	1754	1782	1787	1771	1732			



Remarks :
FORM: GR30

4.4.1(SGS)(2019.12.04)

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sanas Testing Laboratory T 0239

TEST RESULTS

Gondwana Geo Solutions (Pty) Ltd
17 Kingmead Drive
Westville, Durban
3629
Attention: Mr Sven

Project : Mobeni Reservoir

Your Ref :
Our Ref : 55716/25-B
Date Reported : 26.05.2025

SIEVE ANALYSIS, ATTERBERG LIMITS, CBR(SANS 3001:GR1,GR10,GR12,GR20,GR30,GR40)

SAMPLE NO.	2388				Preparation Method:
HOLE NO.	TP 06				
ROAD NO.	-				
DEPTH	1000 - 1200				
CHAINAGE	-				
LAYER TYPE	-				
STABILISED WITH	Natural				
SUPPLIER	-				
CURING METHOD	-				
DATE TESTED	24.05.2025				
DESCRIPTION	Light Yellow Brown Silty Sand				- Specification
SIEVE ANALYSIS (% PASSING)					
100.0 mm					
75.00 mm					
63.00 mm					
50.00 mm					
37.50 mm					
28.00 mm					
20.00 mm					
14.00 mm	100				
5.000 mm	100				
2.000 mm	100				
0.425 mm	98				
0.075 mm	11				
SOIL MORTAR					
COARSE SAND <2.0mm >0.425mm	2				
FINE SAND <0.425mm >0.075mm	88				
MATERIAL <0.075mm	10				
CONSTANTS					
GRADING MODULUS	0,92				
PRA CLASSIFICATION	A-2-4(0)				
COLTO CLASSIFICATION	G9				
TRH Class.(INSITU |93%|90%|)	G9|G10				
LIQUID LIMIT (%)	-				
PLASTICITY INDEX (0.425mm)	NP				
LINEAR SHRINKAGE (%)	0,0				
MDD					
MAXIMUM DRY DENSITY (kg/m^3)	1787				
OPTIMUM MOISTURE CONTENT(%)	9,5				
MOULDING MOISTURE (%)	9,8				
TYPE OF TEST	CBR				
CBR-UCS @ 100% MDD	23				
CBR-UCS @ 98% MDD	20				
CBR-UCS @ 97% MDD	18				
CBR-UCS @ 95% MDD	15				
CBR-UCS @ 93% MDD	9,6				
CBR-UCS @ 90% MDD	4,7				

CBR-UCS @ % MDD derived from calculation.

% SWELL MOULD [A][B][C]	0,00	0,00	0,00										

Remarks :

FORM: GR40

4.4.1(SGS)(2019.12.04)

Technical Signatory : Ronald Ramdeen

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Fax : (031) 579 1344
Email : ronald.ramdeen@sgs.com

sanas Testing Laboratory T 0239

TEST RESULTS

Gondwana Geo Solutions (Pty) Ltd
17 Kingmead Drive
Westville, Durban
3629
Attention: Mr Sven

Project : Mobeni Reservoir

Your Ref :
Our Ref : 55716/25
Date Reported : 26.05.2025

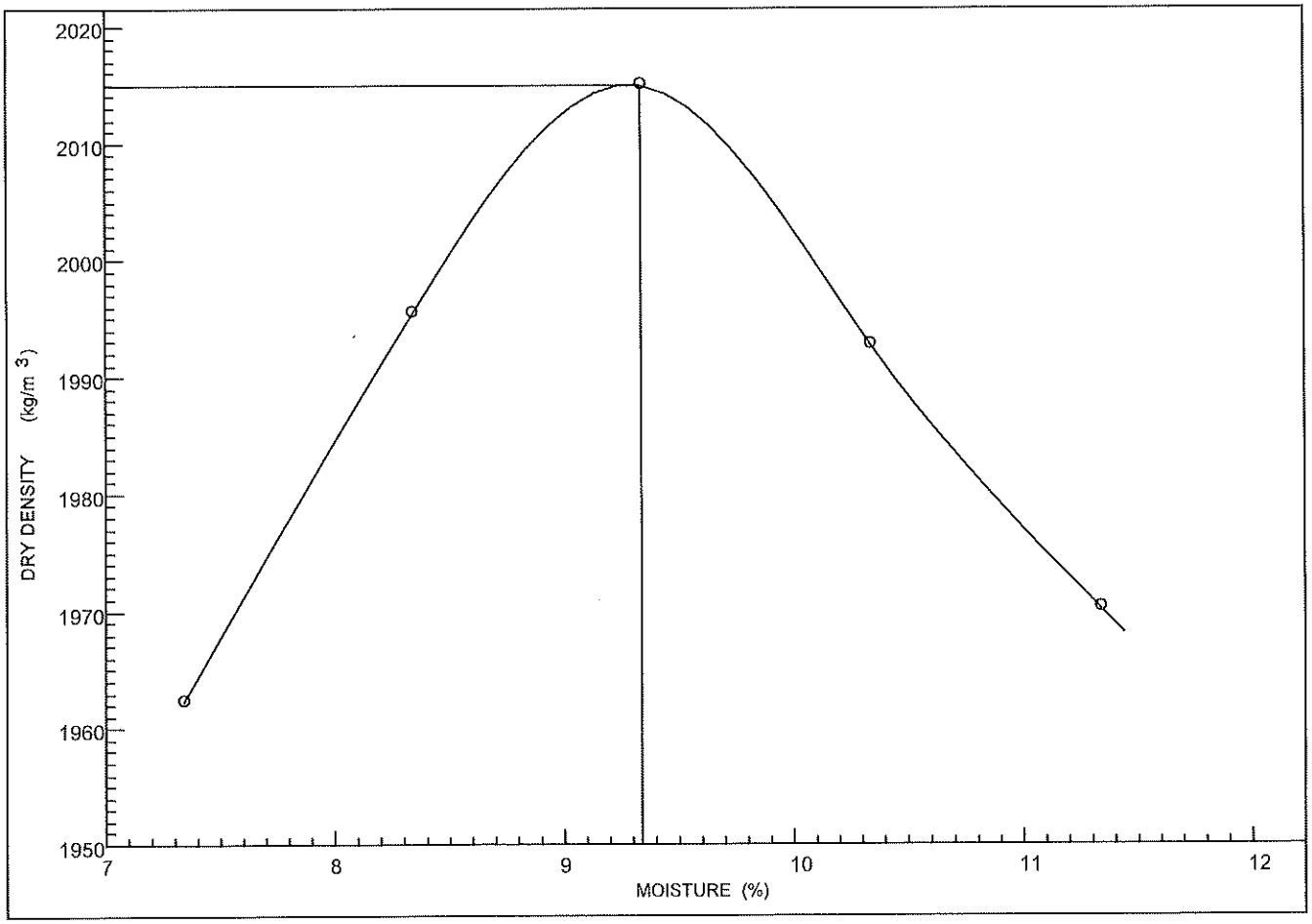
MOISTURE / DENSITY RELATIONSHIP(SANS 3001: GR30)

Sample No.: 2389	Hole No. : TP 07	Depth (mm) : 1000 - 1200
Origin : -	Stabilized With : Natural	Compaction Energy : MDD
Material Description : Light Yellow Brown Reddish Silty Sand - Slightly Clayey		

Maximum Dry Density (kg/m^3): 2015

Optimum Moisture Content (%) : 9,3

Point No.	1	2	3	4	5			
Moisture (%)	7,3	8,3	9,3	10,3	11,3			
Density (kg/m^3)	1962	1995	2015	1993	1970			



Remarks :

FORM: GR30

4.4.1(SGS)(2019.12.04)

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sanas Testing Laboratory T 0239

TEST RESULTS

Gondwana Geo Solutions (Pty) Ltd 17 Kingmead Drive Westville, Durban 3629 Attention: Mr Sven	Project : Mobeni Reservoir Your Ref : Our Ref : 55716/25-C Date Reported : 26.05.2025

SIEVE ANALYSIS, ATTERBERG LIMITS, CBR(SANS 3001:GR1,GR10,GR12,GR20,GR30,GR40)

SAMPLE NO.	2389				Preparation Method:
HOLE NO.	TP 07				
ROAD NO.	-				
DEPTH	1000 - 1200				
CHAINAGE	-				
LAYER TYPE	-				
STABILISED WITH	Natural				
SUPPLIER	-				
CURING METHOD	-				
DATE TESTED	24.05.2025				
DESCRIPTION	Lt Yel Br Reddish Silty Sand-Sl/Clayey				- Specification
SIEVE ANALYSIS (% PASSING)					
100.0 mm					
75.00 mm					
63.00 mm					
50.00 mm					
37.50 mm					
28.00 mm					
20.00 mm					
14.00 mm	100				
5.000 mm	100				
2.000 mm	100				
0.425 mm	99				
0.075 mm	22				
SOIL MORTAR					
COARSE SAND <2.0mm >0.425mm	1				
FINE SAND <0.425mm >0.075mm	77				
MATERIAL <0.075mm	22				
CONSTANTS					
GRADING MODULUS	0,79				
PRA CLASSIFICATION	A-2-4(0)				
COLTO CLASSIFICATION	G7				
TRH CLASSIFICATION	G7				
LIQUID LIMIT (%)	-				
PLASTICITY INDEX (0.425mm)	NP				
LINEAR SHRINKAGE (%)	0,0				
MDD					
MAXIMUM DRY DENSITY (kg/m^3)	2015				
OPTIMUM MOISTURE CONTENT(%)	9,3				
MOULDING MOISTURE (%)	9,0				
TYPE OF TEST	CBR				
CBR-UCS @ 100% MDD	27				
CBR-UCS @ 98% MDD	24				
CBR-UCS @ 97% MDD	22				
CBR-UCS @ 95% MDD	19				
CBR-UCS @ 93% MDD	17				
CBR-UCS @ 90% MDD	14				

CBR-UCS @ % MDD derived from calculation.

% SWELL MOULD [A][B][C]	0,20	0,30	0,40										

Remarks :

FORM: GR40

4.4.1(SGS)(2019.12.04)

Technical Signatory : Ronald Ramdeen