OUTENIQUA
GEOTECHNICAL SERVICES

Consulting Geotechnical Engineers and Engineering Geologists
Reg. No. 1999/062743/23

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GEOTECHNICAL SOIL TEST REPORT

Client: Mr Coetzee
Project: Erf 2003, Wilderness
Date of test: 23.7.2021

Geotechnical Constraint	Risk			NHBRC Classification
	Low	Medium	High	
Active clay	X			H
Compressible soil		X		
Collapsible soil		X		C1
Imported/uncontrolled fill	X			
Chemically aggressive soils	X			
Saturated soils/ groundwater seepage		X		
Shallow hard rock/ difficult excavations		X		R
Slope stability problems	X			
Flood potential	X			
Seismicity	X			
Dolomitic land	X			

Disclaimer:The above classification is provided as a guideline and is true for the specific locations that were tested and may not be true for the entire site.

Site description:

The topography of the property is quite variable and is characterised by a south- and southeast-facing moderate slope which becomes steeper towards a natural drainage line in the middle of the property. The proposed development consists of 4 chalets and a main residence along the northern and north-eastern side of the site. At the time of the investigation, the site was covered in thick indigenous vegetation and entry onto the site was restricted to access on foot (see Figure 1). The ground surface conditions in the proposed development area were generally dry with no signs of groundwater seepage or any significant slope stability problems.

Figure 1: View of site from the access point on the NE corner

Geology & Soil profile:

The site is underlain by phyllite, schist and feldspathic quartzite of the Soetkraal Formation of the Kaaimans Group. The geology is not visible in outcrop on the site, but this formation is well exposed on Whites Road to the east of the site and on the Kaaimans pass between Wilderness and George. The Kaaimans Formation rocks in the area were intruded by the George granite pluton and are generally southward-dipping at angles varying from 40-70°.

The soil profile that underlies the site was investigated by way of four shallow test pits, and found to consist of the following general horizons:

0-0.3m: Dark brown, firm, gravelly sandy clay/clayey sand – ***colluvium (topsoil)***

0.3-0.8m: Dark reddish brown, stiff, shattered, sandy silty clay - ***colluvium***

0.8-1.0m: Light grey to dark brown, dense to very dense, silty clayey gravel - ***residual completely weathered phyllite***

>1.0m: Light grey, very highly fractured, highly weathered, very soft to soft rock – ***phyllite bedrock***

The test pits were terminated due to difficult excavations or refusal on phyllite bedrock (see Fig 2). The depth to the bedrock is variable, and becomes shallower towards the west, but generally occurs at a depth of 0.8-1.5m. Large boulders or fragments of bedrock may also be encountered at this depth. No groundwater was encountered in test pits, but seepage can be expected in wet weather periods.

Observations in test pits and subsequent lab tests indicates a slightly expansive nature of the clayey soil cover above the bedrock, but this horizon is generally limited in thickness and the overall heave potential of the site is low.

Insitu DCP tests conducted next to test pits from NGL indicate that the upper ~0.4m of the soil profile is loose, but firms up quickly below this depth and most tests refused on rock or boulders at a max depth of 1.5m. The DCP at TP1 penetrated in stiff material to 2m depth, indicating deeper rock at this position.

The founding conditions appear to be favourable with good bearing capacity on stiff/dense soil or rock at fairly shallow founding depths of 0.8m where EASBP ~ 125kPa, but variable rock levels may have an influence on final foundation levels.

Figure 3: Soil types encountered in test pits

Recommendations:

Earthworks & materials: The site is moderately sloping, becoming steep towards the west, and access/vegetation clearing will be challenging unless and minimal footprint area is adopted. Earthworks required to create level platforms (if any) may encounter shallow rock, mainly on the western side of the proposed development. Shallow excavations for the proposed development are unlikely to have any significant effect on the general stability of the site, but excavations should be assessed by a competent person as excavations progress. Excavations shallower than 1.5m are likely to be fairly stable at near-vertical angles for short periods (temporary works).

Insitu granular soils (sandy/gravelly soils, not clay), less any large rock fragments >150mm diameter, obtained from excavations may be suitable for reuse as bulk filling material under floors and behind retaining walls but should be approved by the engineer before placement. Any unsuitable soil obtained from excavations should be spoiled in suitable location on site (e.g. as landscaping fill). Allowance should be made for imported high quality materials (e.g. G5) for final selected fill layers under concrete surface beds. Imported free-draining fill material (coarse sand/crusher run/stone) will be required for drainage medium behind retaining walls (if any).

Foundations & floors: The recommended foundation type for single or double storey masonry or timber structures is reinforced strip and/or pad foundations placed on dense/stiff soil horizons or preferably bedrock at minimum nominal depth of 0.8m below NGL. The recommended maximum bearing pressure for foundations is 125kPa. Structures founded at the correct levels on suitable bedrock or stiff/dense soil horizons are unlikely to induce or become susceptible to slope instability. Competent supervision in this regard is important. All foundations should be inspected by the engineer before placing reinforcement.

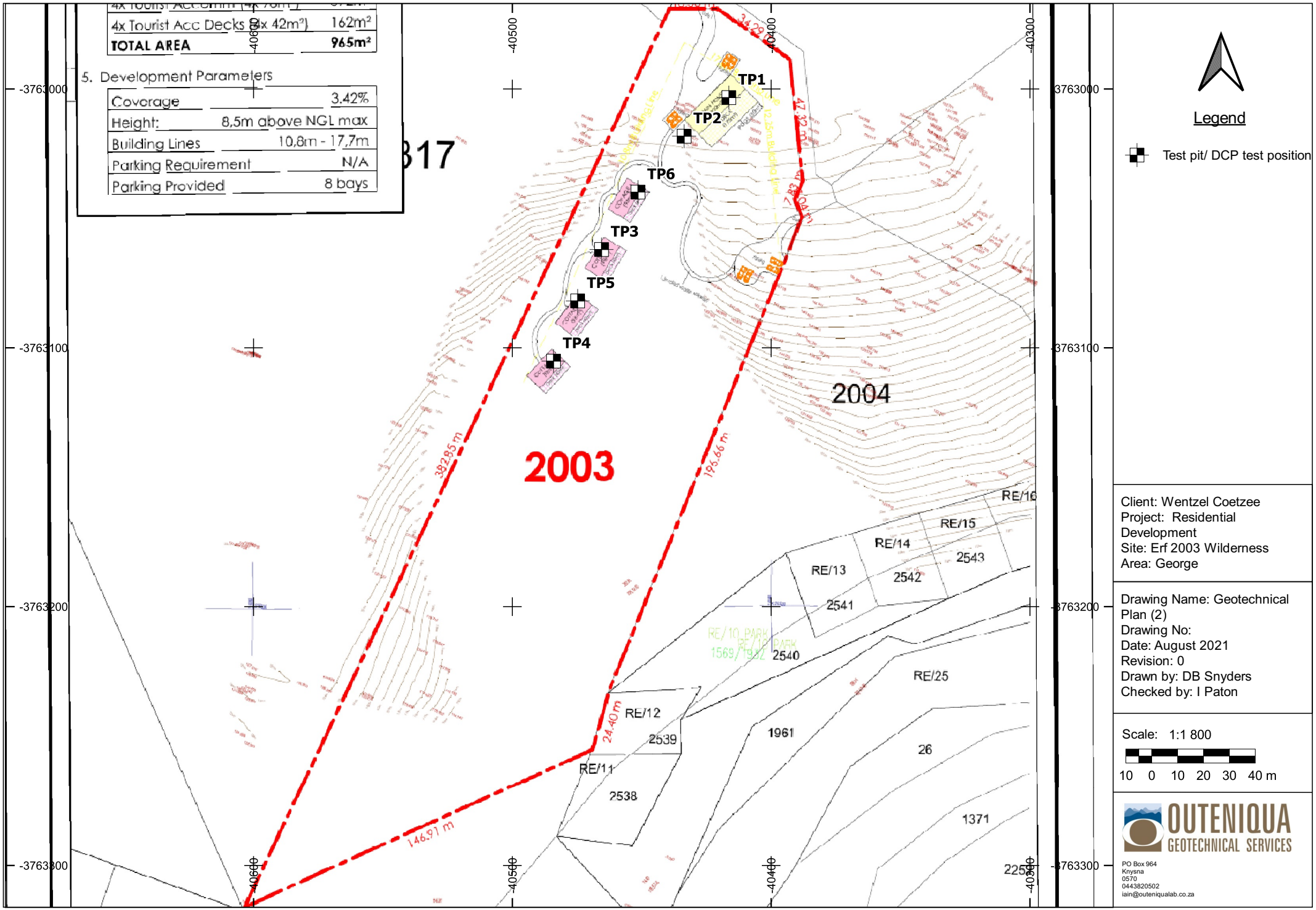
Driveway & parking areas: The proposed driveway onto the site with parking area will be a challenge due to the dense indigenous vegetation, which may be environmentally sensitive. Construction of the driveway may involve minor cutting and filling to achieve the correct line and levels. The insitu soils are generally poor quality in terms of road-building and it is recommended that an allowance is made for the importation of SSG gravel material to improve access during construction, in addition to the final subbase and paving layerworks.

Drainage: The soil has a low permeability and vertical infiltration will be restricted by the presence of shallow rock and dense soils, so stormwater will tend run off site after heavy rainfall. Effective stormwater management systems are required to collect and discharge stormwater in controlled manner down slopes. Subsoil drains are recommended behind retaining walls as standard.

Conclusions:

The investigation indicates that the site is potentially suitable for development but there are some geotechnical constraints, such as difficult access, restricted construction space, steep slopes and shallow/irregular rock, which may have an impact on the engineering design and construction costs. Some recommendations are offered for consideration by the structural engineer.

Iain Paton Pr Sci Nat Pr Tech Eng


4x Tourist Acc Decks (4x 42m²) 162m²
TOTAL AREA 965m²
5. Development Parameters
Coverage 3.42%
Height: 8,5m above NGL max
Building Lines 10,8m - 17,7m
Parking Requirement N/A
Parking Provided 8 bays
TP1
TP2
TP3
TP4
TP5
TP6
2003
2004
392.85 m
196.66 m
146.91 m
24.40 m
RE/10 PARK
RE/11 PARK
RE/11
RE/12
RE/13
RE/14
RE/15
RE/16
RE/25
2538
2539
2540
2541
2542
2543
1961
26
1371
-3763000
-3763100
-3763200
-3763300
40500
40400
40300
40600
40700
40800
40900
Legend
Test pit/ DCP test position
Client: Wentzel Coetzee
Project: Residential Development
Site: Erf 2003 Wilderness
Area: George
Drawing Name: Geotechnical Plan (2)
Drawing No:
Date: August 2021
Revision: 0
Drawn by: DB Snyders
Checked by: I Paton
Scale: 1:1 800
10 0 10 20 30 40 m
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Legend

- Test pit/ DCP test position
- Farm Portions
- Erf
- Contours 5m

Client: Wentzel Coetzee
Project: Residential Development
Site: Erf 2003 Wilderness
Area: George

Drawing Name: Geotechnical Plan
Drawing No:
Date: August 2021
Revision: 0
Drawn by: DB Snyders
Checked by: I Paton

Scale: 1:1 800

10 0 10 20 30 40 m

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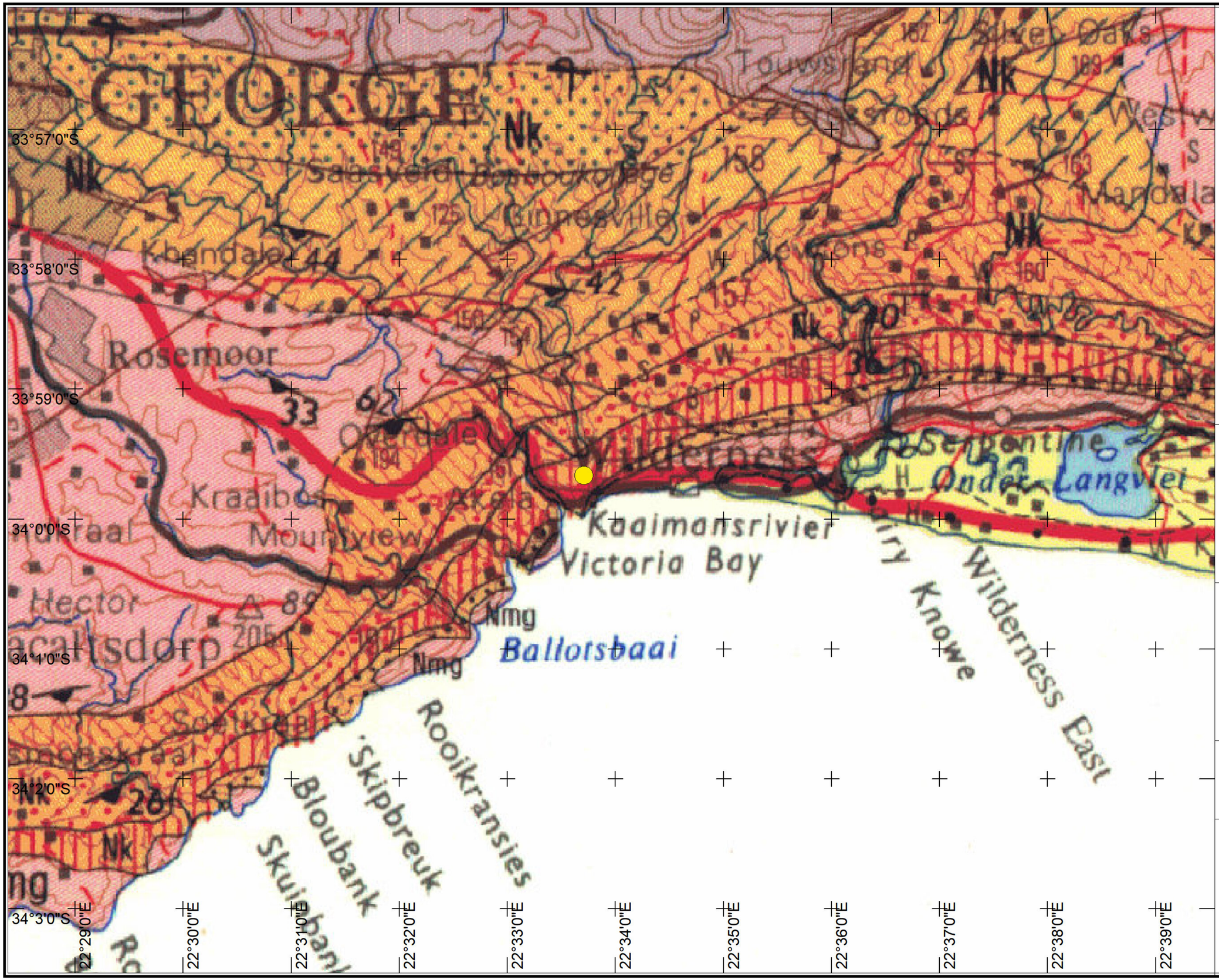

N

Legend

Site locality

Client: Mr Coetzee
Project: New development
Site: Erf 2003
Area: Wilderness

Drawing Name: Geology
Drawing No:
Date: July 2021
Revision: 0
Drawn By: S Ngema
Checked By: I Paton

Scale 1:75000

0 0.6 1.2 km

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Geotechnical Soil Profile

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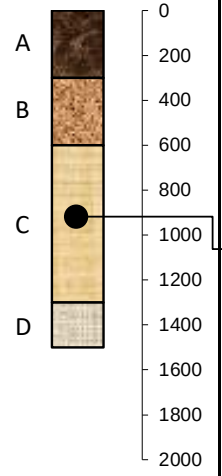
Client:	Wentzel Coetzee
Project:	Erf 2003 Wilderness
Area:	George
Date:	23.07.2021
Excavator:	By Hand

TP 1

Datum: NGL | Co-ords: 23 Y0040416 X3763003

Key to symbols: ● Sample taken | Groundwater



(0 to 300) Slightly moist, dark brown to dark reddish brown, firm, shattered/pinholed, **SANDY SILT & CLAY**, colluvial/topsoil (with abundant roots & organic material)

(300 to 600) Slightly moist, dark reddish brown, stiff, micro-shattered, **SANDY SILTY CLAY**, colluvial (with traces of fine to coarse gravel)

(600 to 1300) Slightly moist, dark red, stiff to very stiff, micro-shattered, **SLIGHTLY SANDY SILTY CLAY**, colluvial (with traces of fine to coarse gravel)

Foundation Indicator

(1300 to 1500) Slightly moist, dark reddish & yellowish orange, very stiff, intact/fissured, **SILTY CLAY**, residual phyllite (with some fragments of very soft rock phyllite)

TP stopped
No water seepage

Dynamic Cone Penetrometer (DCP)

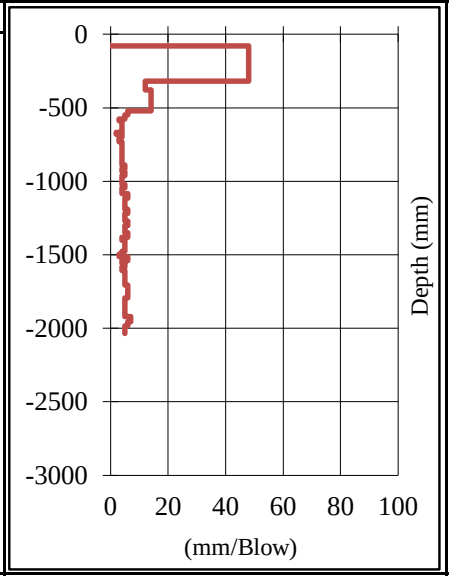
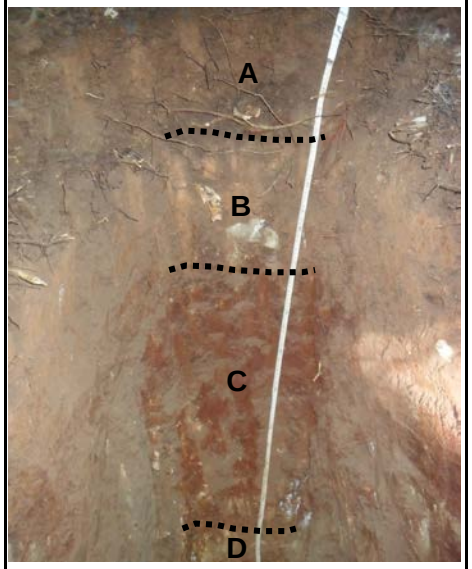


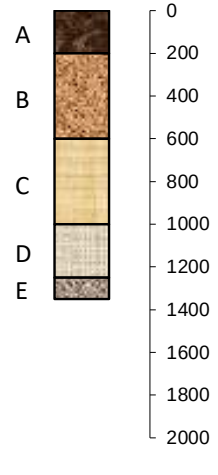
Photo of Test Pit



TP 2

Datum: NGL | Co-ords: 23 Y0040434 X3763018

Key to symbols: ● Sample taken | Groundwater



(0 to 200) Slightly moist, dark brown to dark reddish brown, firm, shattered/pinholed, **SANDY SILTY CLAY**, colluvial/topsoil (with abundant roots & organic material)

(200 to 600) Slightly moist, dark reddish brown, stiff, micro-shattered, **SANDY SILTY CLAY**, colluvial (with some roots & traces of gravel)

(600 to 1000) Slightly moist, dark red, very stiff, shattered/micro-shattered, **SANDY SILTY CLAY**, colluvial (with scattered weathered gravel)

(1000 to 1250) Slightly moist, dark reddish & yellowish orange, very stiff to hard, shattered/fissured, **GRAVELLY SILTY CLAY**, residual (with some very soft rock to soft rock remnants)

(1250 to 1350) Light brown to light olive, highly weathered to completely weathered, foliated, very highly fractured, very soft to soft rock **PHYLLITE**.

Near refusal on very soft to soft rock
No water seepage

Dynamic Cone Penetrometer (DCP)

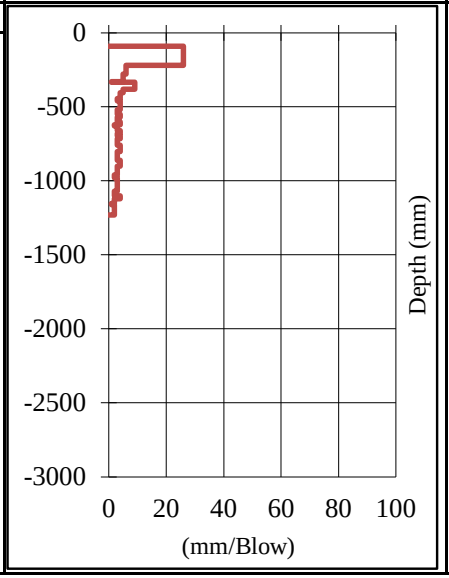
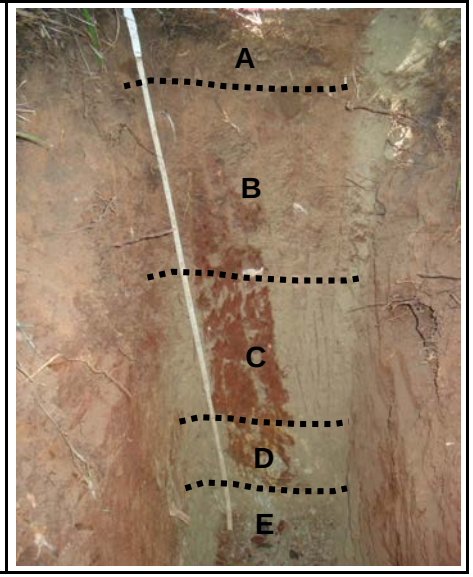


Photo of Test Pit



OUTENIQUA GEOTECHNICAL SERVICES

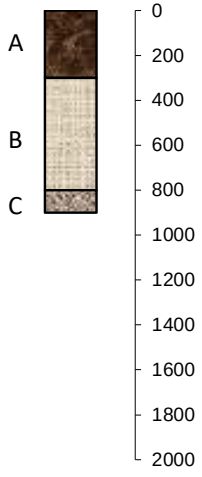
Geotechnical Soil Profile

Client:	Wentzel Coetzee
Project:	Erf 2003 Wilderness
Area:	George
Date:	23.07.2021
Excavator:	By Hand

TP 3

Datum: NGL | Co-ords: 23 Y0040466 X3763062

Key to symbols: ● Sample taken | Groundwater



(0 to 300) Slightly moist, dark brown to dark reddish brown, firm, shattered/pinholed, **SANDY SILTY CLAY**, colluvial/topsoil (with abundant roots & organic material)

(300 to 800) Slightly moist, light grey to light olive & dark red bands, very dense, fissured/intact, **SILTY CLAYEY GRAVEL**, residual/completely weathered phyllite.

(800 to 900) Light grey to light olive, highly weathered, foliated, very highly fractured, very soft rock to soft rock, **PHYLLITE** (dipping steeply at 70° southwards)

Refusal on soft rock phyllite
No water seepage

Dynamic Cone Penetrometer (DCP)

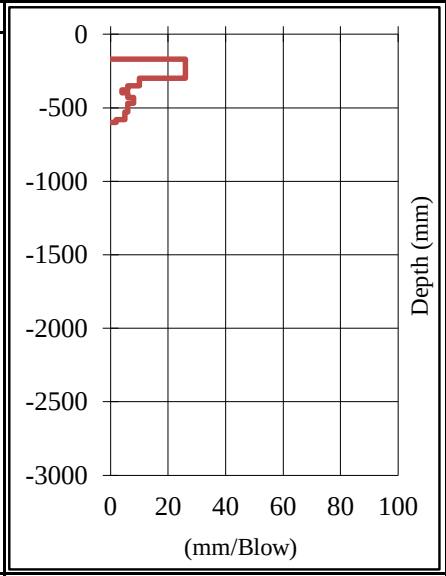
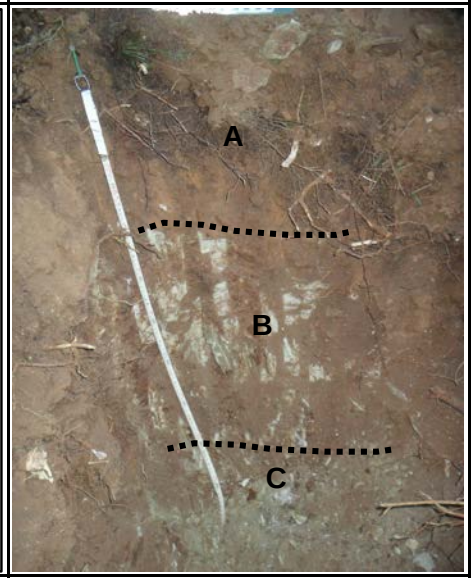


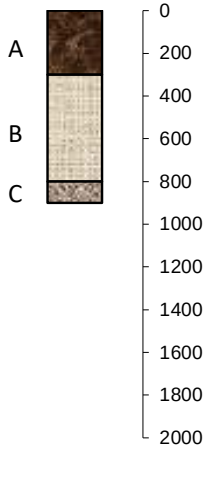
Photo of Test Pit



TP 4

Datum: NGL | Co-ords: 23 Y0040484 X3763105

Key to symbols: ● Sample taken | Groundwater



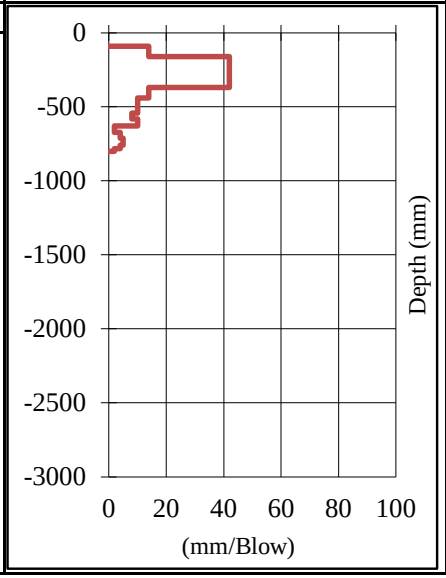
(0 to 300) Slightly moist, dark brown, soft to firm, shattered/pinholed, **GRAVELLY SILTY CLAY**, colluvial/topsoil (with abundant roots & organic material)

(300 to 800) Slightly moist, dark brown & light olive, dense to very dense, fissured, **CLAYEY & SILTY GRAVEL**, residual/completely weathered phyllite.

(800 to 900) Light grey to light olive, highly weathered, foliated, very highly fractured, very soft rock to soft rock, **PHYLLITE**.

Refusal on very soft rock to soft rock phyllite
No water seepage
Relative steep natural slope (25-30°)

Dynamic Cone Penetrometer (DCP)



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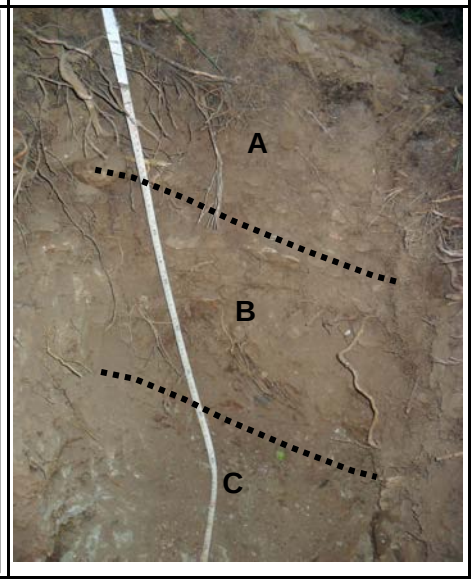

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Materials Testing Laboratory
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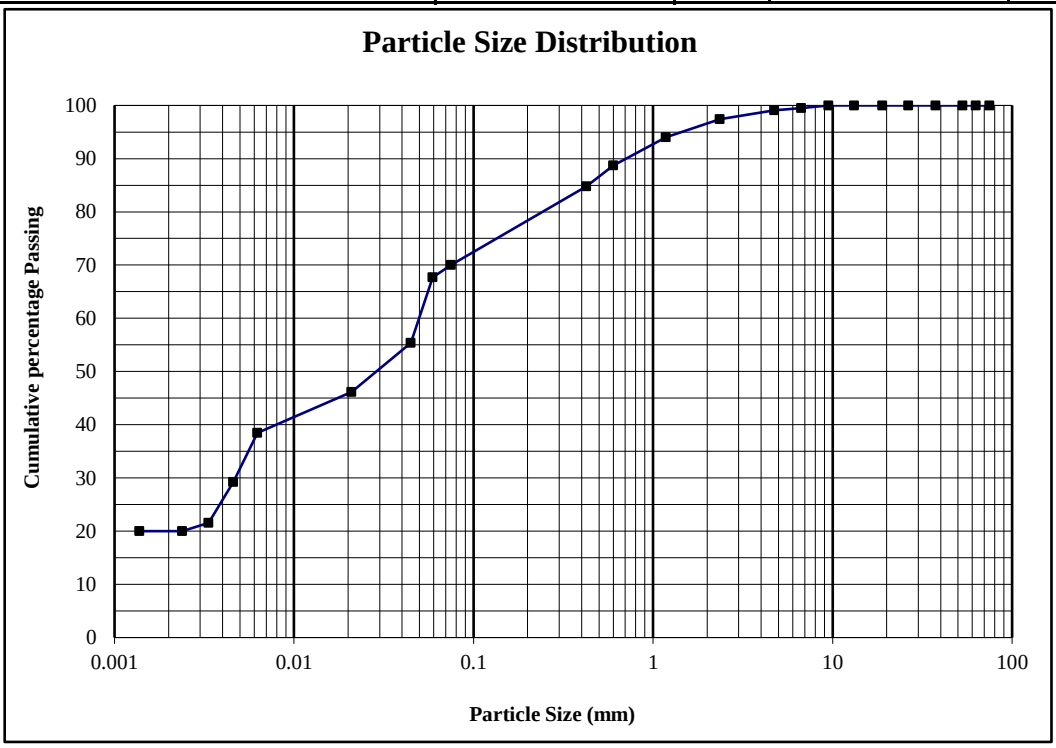
6 Mirrorball Street, George : PO Box 3186, George Industria, 6536
Tel: 044 8743274 : Fax: 044 8745779 : e-mail: llewelyn@outeniqualab.co.za

Customer :	Outeniqua Geotechnical Services	Project :	Erf 2003 - Wilderness
	P O Box 964	Date Received :	26/07/21
	Knysna	Date Reported :	30/07/21
	6570	Req. Number :	2548/21
Attention :	Iain Paton	No. of Pages :	1

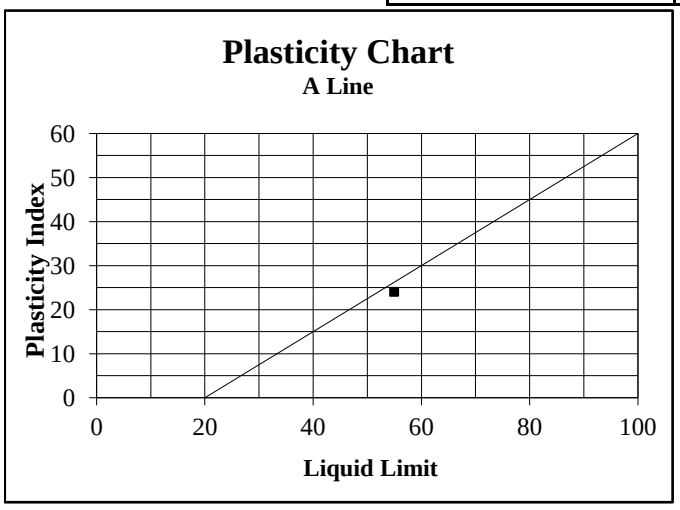
TEST REPORT
FOUNDATION INDICATOR - (TMH 1 Method A1(a),A2,A3,A4,A5) & (ASTM Method D422)

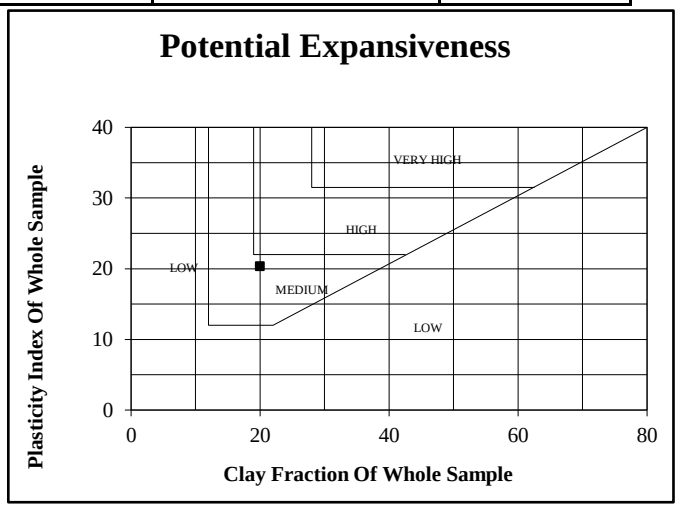
Material Description:	Dark Red Clayey Sandy Silt	Sample Number:	81971			
Position:	TP1 - Layer 2	Liquid Limit	55	Linear Shrinkage	12	
Depth:	600-1300	Plasticity Index	24	Insitu M/C%	22	

Sieve Size(mm)	% Passing
75.0	100
63.0	100
53.0	100
37.5	100
26.5	100
19.0	100
13.2	100
9.5	100
6.7	100
4.75	99
2.36	97
1.18	94
0.600	89
0.425	85
0.075	70
0.0591	68
0.0447	55
0.0209	46
0.0062	38
0.0046	29
0.0033	22
0.0024	20
0.0014	20



% Clay	20	% Silt	48	% Sand	28	% Gravel	4
Unified Soil Classification	MH			PRA Soil Classification		A-7-5	





Notes:

- **Specimens delivered to Outeniqua Lab in good order.**

1. **Sampling falls outside the scope of Outeniqua Lab's SANAS accreditation.**
2. The test results are reported with an approximate 95% level of confidence.
3. This report (with attachments) is the correct record of all measurements made, and may not be reproduced other than with full written approval from the Technical Director of Outeniqua Lab (Pty) Ltd.
4. Results reported in this Test Report relate only to the items tested and are an indication only of the sample provided and/or taken.
5. Measuring Equipment, traceable to National Standards is used where applicable.
6. While every care is taken to ensure the correctness of all tests and reports, neither Outeniqua Lab nor its employees shall be liable in any way whatever for any error made in the execution or reporting of tests or any erroneous conclusions drawn therefrom or for any consequence thereof.

For Outeniqua Lab (Pty) Ltd.

Outeniqua Geotechnical Services cc.

Geotechnical Engineering Consultants

Registration No. 1999/062743/23

18 Clyde Street, Knysna : PO Box 964, Knysna, 6570

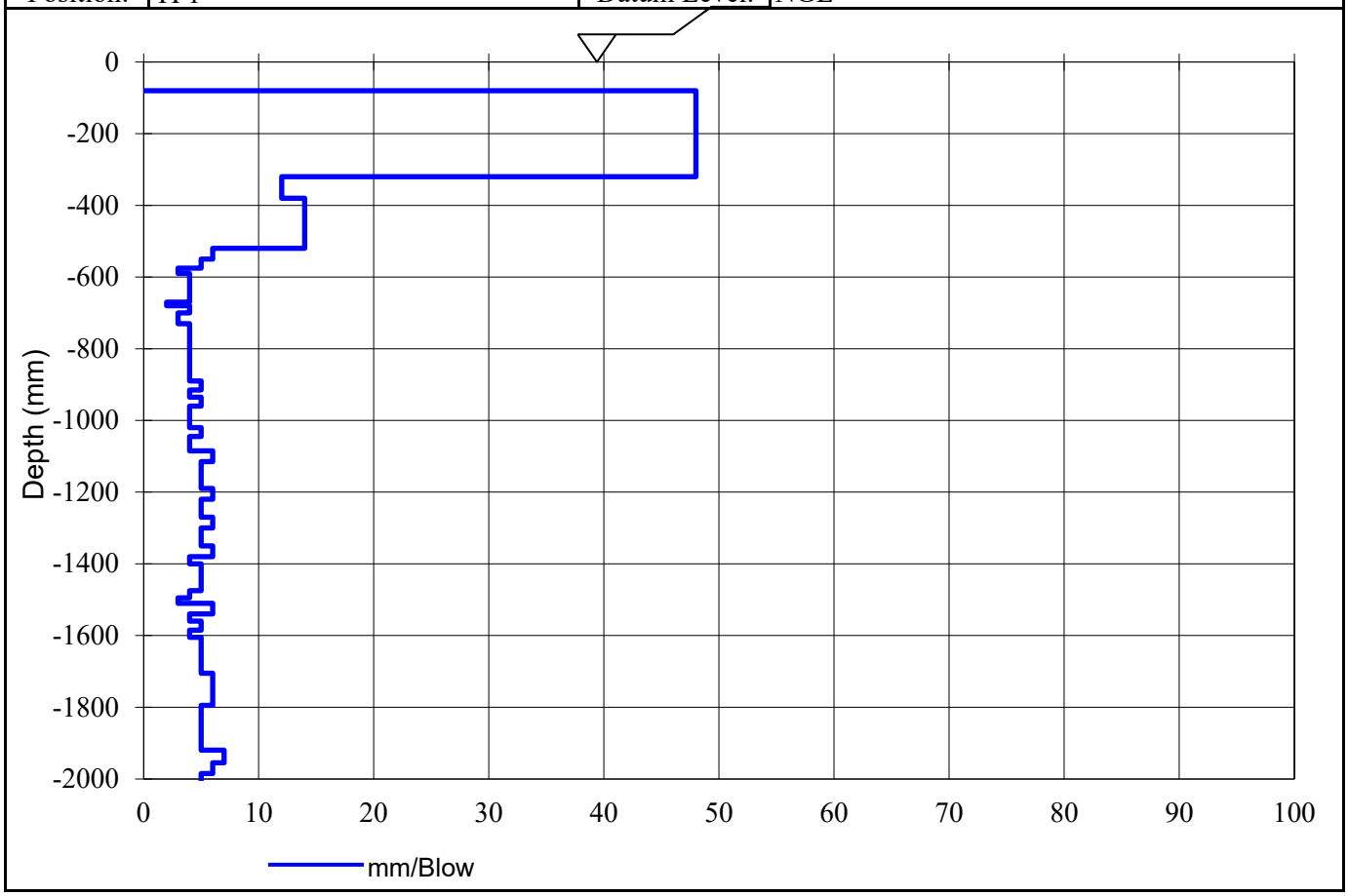
Tel: 044 3820502 : Fax: 044 3820503 : e-mail: iain@outeniqualab.co.za

Customer :	Wentzel Coetzee P.O. Box 401780 Gabrone Botswana	Project :	Erf 2003 Wilderness
		Date Received :	19.07.2021
		Date Reported :	23.07.2021
		Req. Number :	
Attention :	Wentzel Coetzee	No. of Pages :	1 of 6

TEST REPORT

Dynamic Cone Penetrometer (DCP) - (TMH 6 Method ST6)

Position:	TP1	Datum Level:	NGL



I Paton (Member)
For Outeniqua Geotech. Services cc.
Technical Signatory

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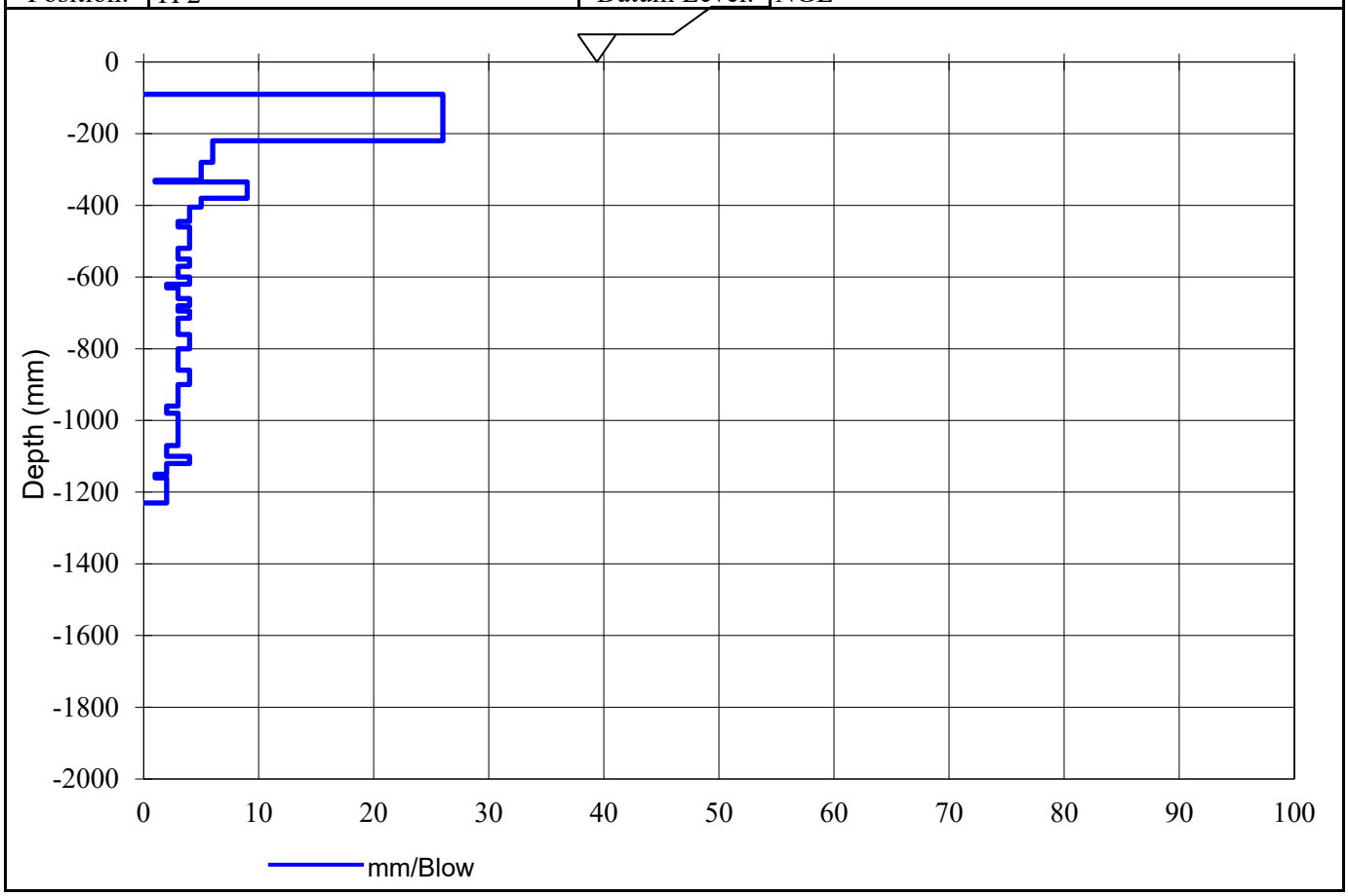
Customer :	Wentzel Coetzee P.O. Box 401780 Gabrone Botswana	Project :	Erf 2003 Wilderness
		Date Received :	19.07.2021
		Date Reported :	23.07.2021
		Req. Number :	
Attention :	Wentzel Coetzee	No. of Pages :	2 of 6

TEST REPORT

Dynamic Cone Penetrometer (DCP) - (TMH 6 Method ST6)

Position:	TP2	Datum Level:	NGL



I Paton (Member)
For Outeniqua Geotech. Services cc.
Technical Signatory

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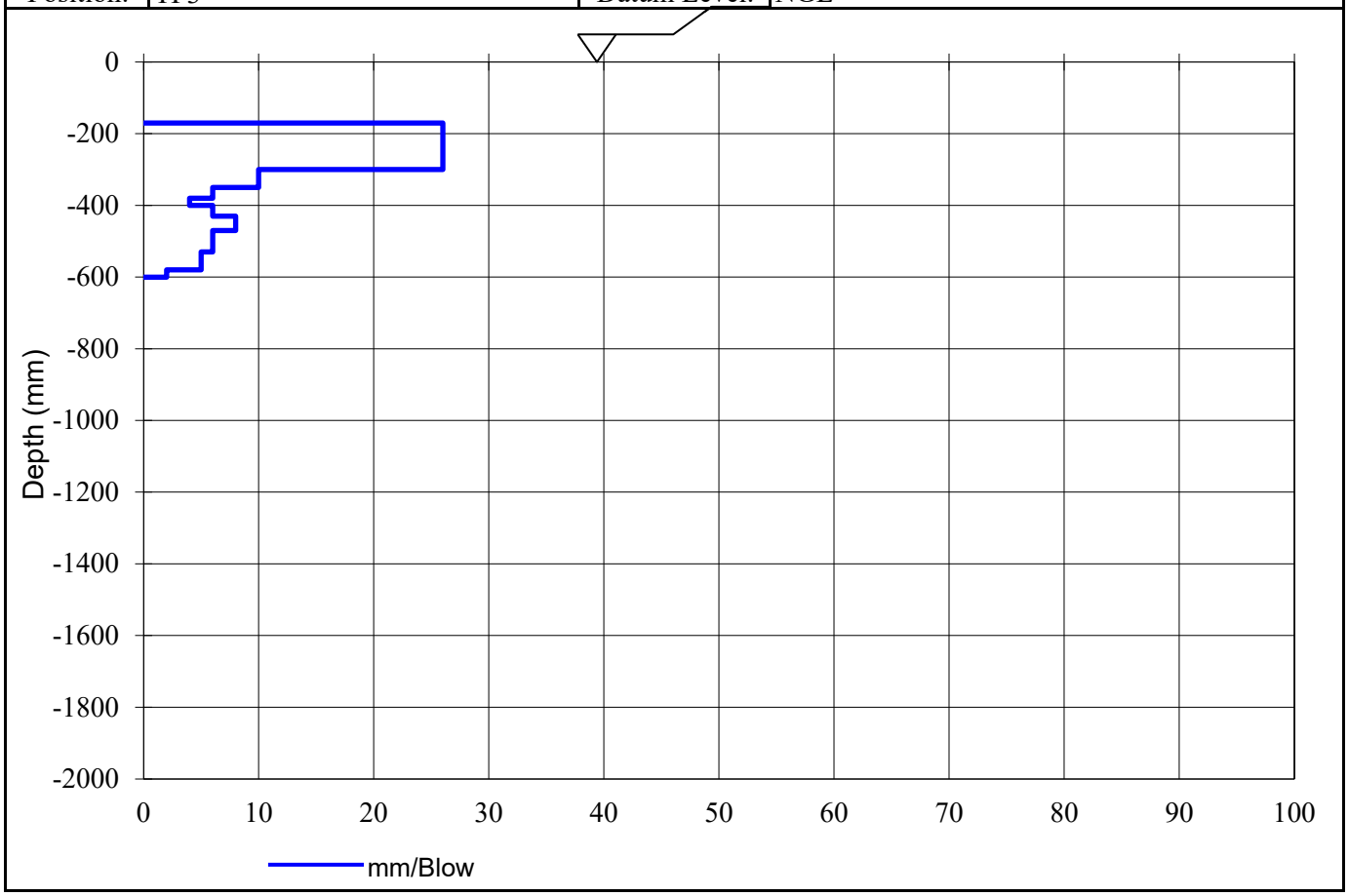
		Date Received :	19.07.2021
		Date Reported :	23.07.2021
		Req. Number :	
Attention :	Wentzel Coetzee	No. of Pages :	3 of 6

TEST REPORT

Dynamic Cone Penetrometer (DCP) - (TMH 6 Method ST6)

Position:	TP3	Datum Level:	NGL



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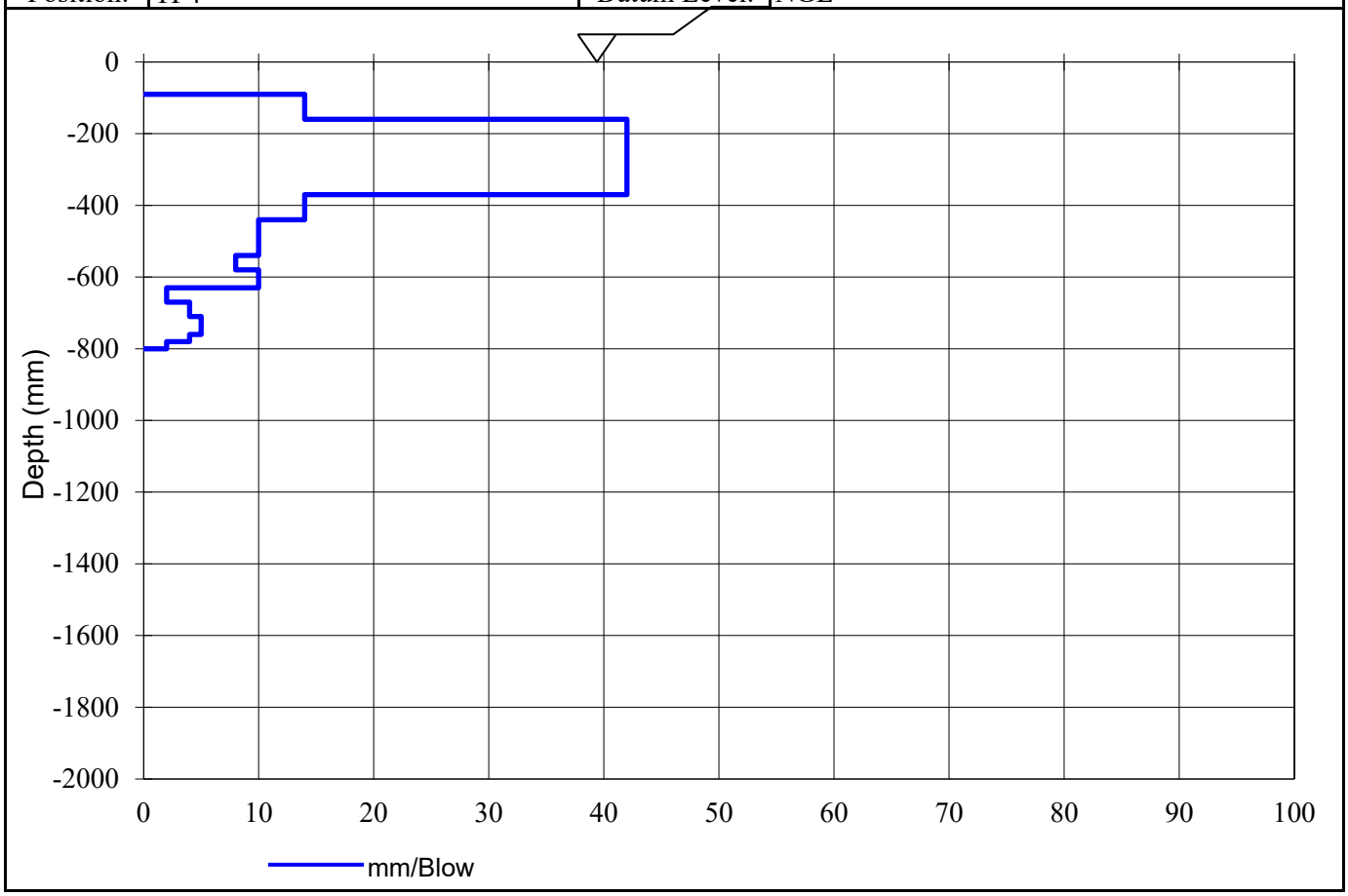
		Date Received :	19.07.2021
		Date Reported :	23.07.2021
		Req. Number :	
Attention :	Wentzel Coetzee	No. of Pages :	4 of 6

TEST REPORT

Dynamic Cone Penetrometer (DCP) - (TMH 6 Method ST6)

Position:	TP4	Datum Level:	NGL



I Paton (Member)
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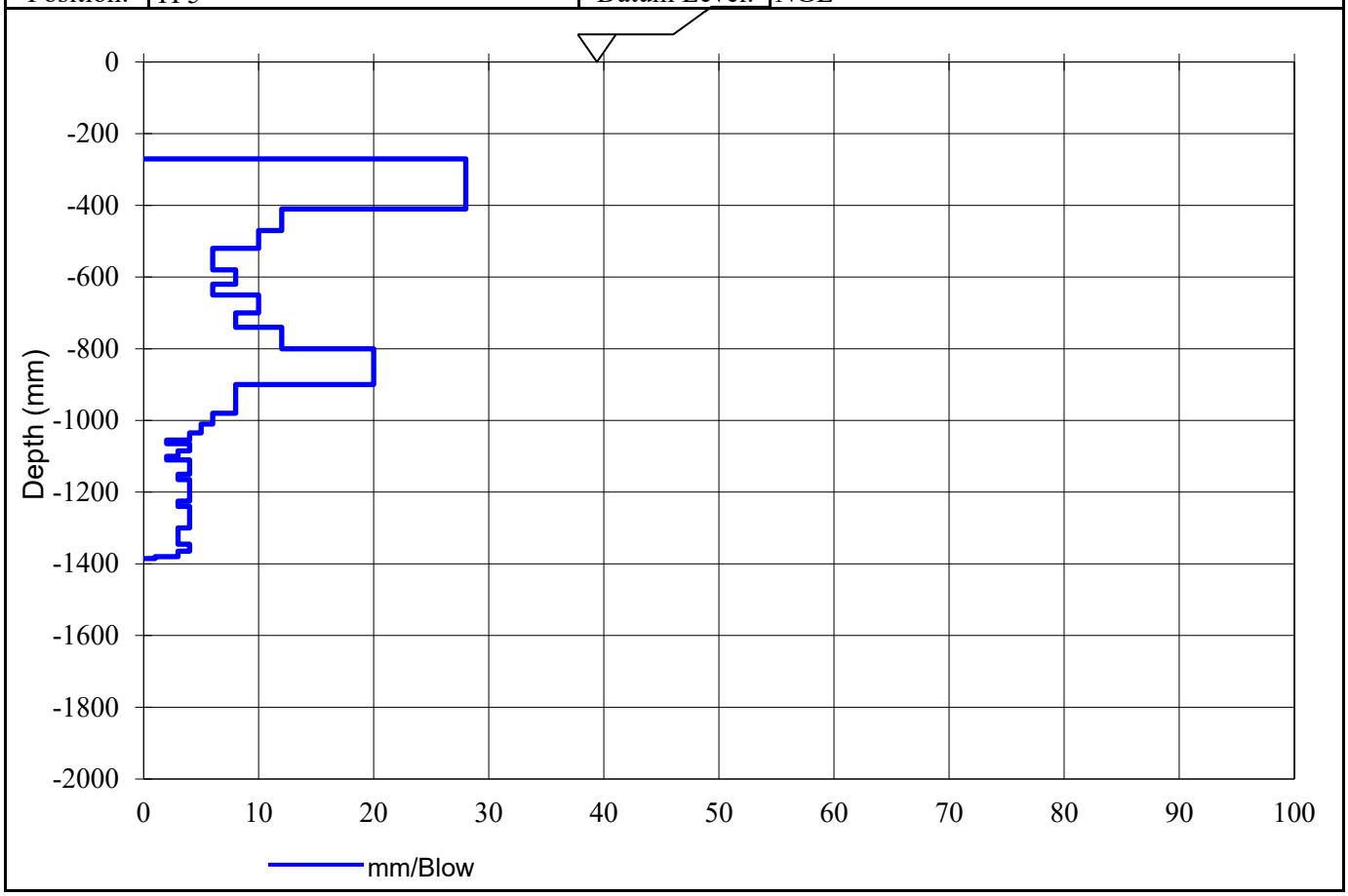
		Date Received :	19.07.2021
		Date Reported :	23.07.2021
		Req. Number :	
Attention :	Wentzel Coetzee	No. of Pages :	5 of 6

TEST REPORT

Dynamic Cone Penetrometer (DCP) - (TMH 6 Method ST6)

Position:	TP5	Datum Level:	NGL



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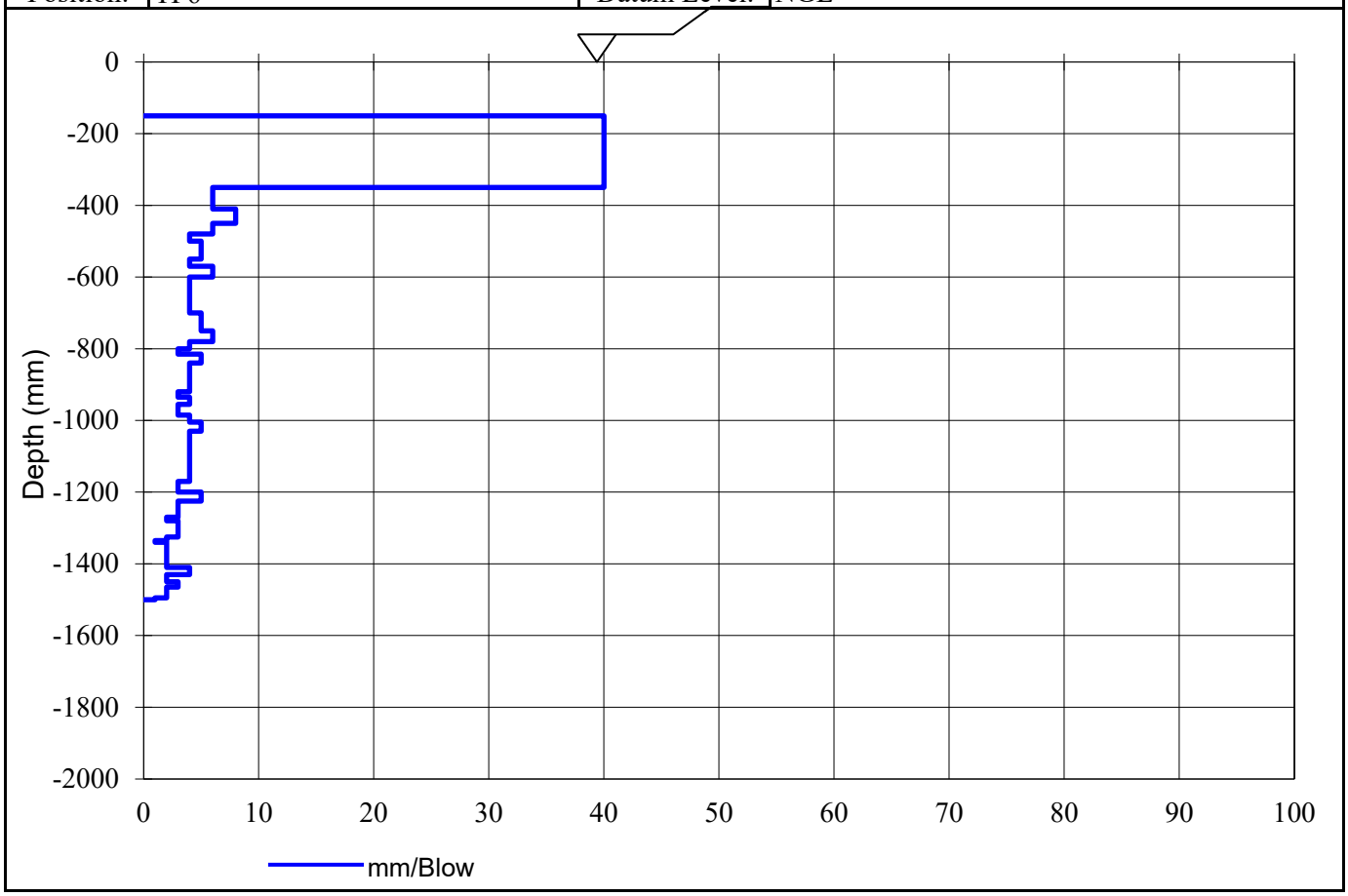
		Date Reported :	23.07.2021
		Req. Number :	
Attention :	Wentzel Coetzee	No. of Pages :	6 of 6

TEST REPORT

Dynamic Cone Penetrometer (DCP) - (TMH 6 Method ST6)

Position:	TP6	Datum Level:	NGL



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