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Ref: 2114T-03_GEO

Date: 25/10/2022

The Board of Directors
Cederberg Farming Trawal (Pty) Ltd
P.O. Box 50
TRAWAL
8147

Attention: Mr Jaco Tredoux

REACTION ON THE COMMENT OF THE PRE-APPLICATION SCOPING REPORT AND PLAN OF STUDY ("SR&POS") IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT NO. 107 OF 1998) ("NEMA") AND THE ENVIRONMENTAL IMPACT ASSESSMENT ("EIA") REGULATIONS, 2014 (AS AMENDED) WITH RESPECT TO THE PROPOSED DEVELOPMENT OF THE NEW WAVE DAM AND ASSOCIATED INFRASTRUCTURE ON PORTIONS 101 AND 168 OF THE FARM MELKBOOM NO. 384, VANRHYNSDORP.

Your comment regarding the letter dated 4 August 2022 **(Ref: 16/3/3/6/7/2/F3/16/3058/22)** refers.

This report is an addendum to be read with report **2114DDR-S2** by Sarel Bester Engineers.

1) ATTACHED HEREWITH

- **Appendix A** – *USCS Soil Classification*
- ***Appendix B*** – *Test Pit Layout (Dwg nr : 2114-S2-03)*

2) PURPOSE

Department of Environmental Affairs and Development Planning acknowledged receipt of the per-application for New Wave dam and made comments in respect. This report deals with ***clause 2.8.2*** with regards to the *Geotechnical Related Impacts* mentioned within the letter referenced above.

3) GEOTECHNICAL

3.1) FORMATION

The dam site is located on what is known as the Peninsula, Pakhuis and Cedarberg Formation according to available Geological data of the area, which is composed mostly of red Aeolian sand, Ancient Alluvium as well as Calcareous and gypsiferious soil.

3.2) TEST PIT PROFILES

A total of 10 trial pits have been dug on the proposed dam site with 5 along the center line of the footprint of the wall and 5 inside the basin, see ***Appendix B***. The aim and purpose of this part of the exercise is to assess the soil profile with regard to expected foundation conditions and sealing potential underneath the dam wall and basin as well as exploration with regard to the types and quantity of material available for use in construction of the embankment.

These soil profiles show a brown topsoil layer of which the thickness varies between ±0,3m and ±1 m underlain by red, brown and yellow layers of sandy to loamy material between ±0,5m and ±4m deep.

The material is of weathered sandstone formation with a sandy to silty texture upon a grey colored bank toward the southern side of the site.

There are no outstanding geological features or special conditions indicated on the geological maps that might require special attention at his this stage notwithstanding the fact that such features might be exposed during construction which will have to be dealt with at the time.

3.3) MATERIALS INVESTIGATION

This part of the investigation focuses on the soil properties of the available material on site earmarked for construction purposes by looking at properties such as moisture/density ratios, behavior of material in the presence of water, particle size distribution, dispersiveness, permeability, etc, with the design of the dam in mind.

Representative soil samples from the intended borrow areas have been taken and analyzed by *Geotechnical Laboratory Somerset West* with the respective results summarized in ***Table 1*** below and the laboratory results itself available on request.

The results were then evaluated according to the "*Unified Soil Classification System (USCS)"* classification method in order to gain understanding about the soil characteristics and potential application or use in construction, as presented below.

Table 1: Summary of Soil Analyses

Sample	TP 5-6	TP 7	TP 8	TP 9	TP 10
Description	Red, brown, yellow silty sand matrix	Red, brown, yellow silty sand matrix	Red, brown, yellow silty sand mixture with small boulders	Red, brown, yellow silty sand mixture with small boulders	Red, brown, yellow silty sand matrix
Origin	North-basin	South-basin	South-basin	Central-basin	North-basin
Proposed Application	U/S Mass Fill	U/S Mass Fill	D/S Mass-fill	Core/ U/S Fill	D/S Mass-fill
Permeability @ 95% (m/s)	$7{,}8 \times 10^{-8}$	$4{,}8 \times 10^{-8}$	$6{,}3 \times 10^{-9}$	$3{,}7 \times 10^{-9}$	$1{,}7 \times 10^{-9}$
Liquid Limit (%)	0	19	22	22	0
Plasticity Index (%)	0	1	2	5	0
Linear Crimping (%)	0	1,5	1,5	3,5	0
Dispersiveness (% SCS)	0	0	0	0	85,7
Clay+Silt Content (%)	11+30	14+38	11+18	19+46	9+19
Sand+Gravel Content (%)	57+1	48+0	54+18	35+1	72+0
Max Dry Density (kg/m³)	1755	1825	1745	1795	1780
Optimum moisture (%)	12,2	9,4	13,8	11,7	10,2
USCS Classification	**ML**	**ML**	**SM**	**CL-ML**	**SM**

According to the USCS classification, the bulk of all the material falls within the finer sandy-silty range with very little clay content and also low plasticity. All materials are very similar with very limited variation in type and character.

It is also noticed that one of the samples have shown signs of dispersiveness. This is however not considered a pertinent risk at this stage given the design considerations discussed elsewhere.

4) CONCLUSION

The proposed New Wave Dam is an off-stream dam located against the Olifants River which is a drainage system in the Western Cape winter rainfall region flowing in a north-western direction where it drains into the sea near Strandfontein.

The geotechnical investigation for purposes of the concept design included three components or focus areas, namely a desktop study of publicly available geological data, digging of profile holes on site plus soil sample testing, all of which will be used and expanded upon in the final design.

From the geological information it is gathered that the site is mostly on weathered sand of a sandstone formation type as well as alluvium adjacent to the river coarse. There are no geological features or conditions noted at this stage which might require special attention in the design.

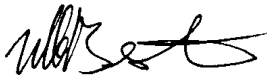
The profile holes have firstly exposed and confirmed the expected absence of a suitable foundation or sealing sub-layer within reachable depths. Consequentially it confirms the proposed design approach of using an HDPE liner instead of the traditional clay core configuration. Further to this, it has also provided information about the quantity of material available for construction from within the basin at an estimated average excavation depth in the order of 3-4 meters.

The soil test results have exposed that the bulk of the available material from within the basin of the dam being earmarked for construction is of similar type with very limited variation. It also confirmed the absence of quality clay for use in a typical clay cut-off. Consequently this confirms the design approach of using a homogeneous wall profile in combination with a liner as sealing mechanism instead of the typical clay core approach. Sand for use in sand filters and drains will also have to be imported from commercial sources.

In summary, the proposed design will entail a homogeneous type embankment with a fully lined basin including a subsoil drainage to prevent the liner from floating.

We trust that you would find this in order. Please contact us if any uncertainty arise.

Yours Faithfully



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M Charl Bester (Pr Eng)

Copies to:	Mr B. de Witt (EnviroAfrica, Somerset West)

USCS MATERIAL INVESTIGATION & CLASSIFICATION FOR USE IN EMBANKMENTS

Client:	Ceresberg Farming Trawal (Pty) Ltd	***Project Nr:***	*2114*	*Version: Feb 2017*
Address:	Trawal 8147	***By:***	*H Hall*	
Project:	New Wave Dam	***Date:***	*25 Oct 2022*	
Notes:				

SITE GEOLOGY:

Formation:	Peninsula, Pakhuis and Cedarberg Formation
Local Characteristics:	
Classification:	

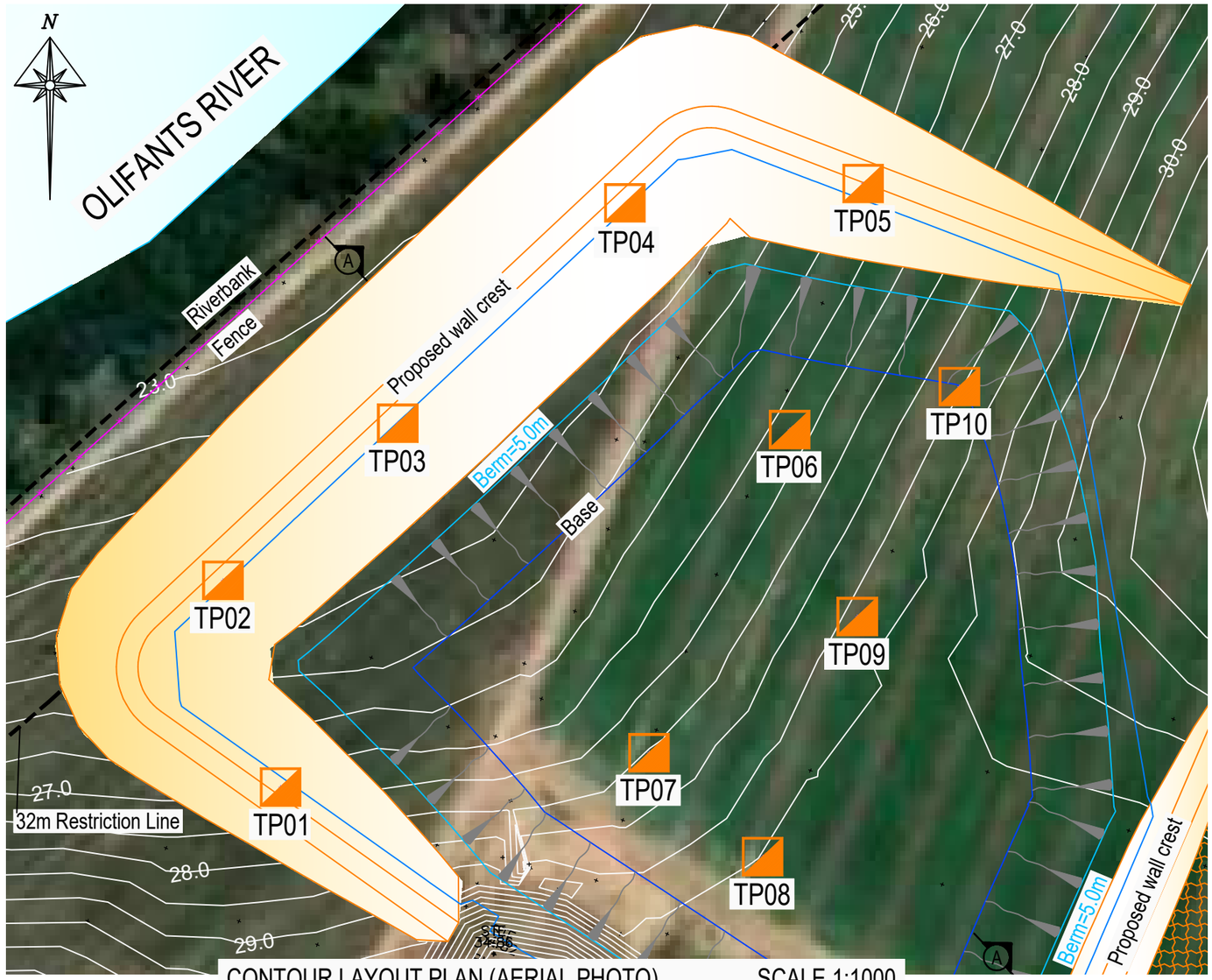
Soil Sample:		TP5-6	TP7	TP8	TP9	TP10
Description		Red, brown, yellow silty sand formation	Red, brown, yellow silty sand formation	Red, brown, yellow silty sand with small boulders on a gritty silt sand on a grey shale formation	Red, brown, yellow silty sand with small boulders on a silty sand formation	Red, brown, yellow silty sand formation
Origin		North-bank	South-basin	South-basin	Central-basin	North-basin
Proposed Use or Application						
Liquid Limit [dry]	(%)	0,0%	19,0%	22,0%	22,0%	0,0%
Liquid Limit [wet] ~ Organics	(%)					
Plasticity Index	(%)	0,0%	1,0%	2,0%	5,0%	0,0%
Linear Shrinkage	(%)	0,0%	1,5%	1,5%	3,5%	0,0%
Clay [< 0.002]	(%)	11%	14%	11%	19%	9%
Silt [0.002 - 0.05]	(%)	30%	38%	18%	46%	19%
Sand [0.05 - 4.75]	(%)	57%	49%	54%	35%	72%
Gravel [> 4.75]	(%)	1%	0%	18%	1%	0%
Organic/Putty/Odour [>5%]	(%)	0%	0%	0%	0%	0%
GradingTest >>		*OK*	*OK*	*OK*	*OK*	*OK*
USCS Parameters:						
Sieve (#200) [0,075mm]	(%)	57%	71%	39%	82%	40%
Sieve (#4) [4,75mm]	(%)	98%	100%	82%	100%	100%
D_{10}	(mm)	0,0010	0,0010	0,0010	0,0010	0,0070
D_{30}	(mm)	0,0080	0,0218	0,0500	0,0080	0,0500
D_{60}	(mm)	0,0400	0,0580	0,1500	0,0400	0,1300

Classification & Application

USDA Classification	**Silt Loam /Silt**	**Silt Loam /Silt**	**Loamy Sand / Sandy Loam / Sandy Clay Loam / Silt Loam**	**Silt Loam / Silt / Loam / Clay Loam / Silty Clay Loam**	**Loamy Sand / Sandy Loam / Sandy Clay Loam / Silt Loam**
USCS Classification	**ML**	**ML**	**SM**	**CL-ML**	**SM**
USCS Description	Inorganic silts and very fine sands, rock flour, silty or clay fine sands, or clayey silts with slight plasticity	Inorganic silts and very fine sands, rock flour, silty or clay fine sands, or clayey silts with slight plasticity	Silty sands, sand-silt mixtures	Inorganic clayey and sandy silts of low plasticity	Silty sands, sand-silt mixtures
Value for Embankment	Poor stability, may be used for embankments with proper control	Poor stability, may be used for embankments with proper control	Fairly stable, not particularly suited to shells, but may be used for impervious cores or dikes	Reasonable stability, may be used for impervious zones with proper control	Fairly stable, not particularly suited to shells, but may be used for impervious cores or dikes
Permeability (K) [m/s]	10-5 to 10-8	10-5 to 10-8	10-5 to 10-8	10-7 to 10-9	10-5 to 10-8
Compaction Characteristics	Good to poor, close control essential, rubber-tired or sheepsfoot roller	Good to poor, close control essential, rubber-tired or sheepsfoot roller	Good, with close control, rubber-tired or sheepsfoot roller	Fair, sheepsfoot roller, rubber-tired roller	Good, with close control, rubber-tired or sheepsfoot roller
Max Dry Density [kg/m³]	1520 – 1920	1520 – 1920	1760 – 2000	1520 – 1920	1760 – 2000
Value for Foundations	Very poor, susceptible to liquefaction	Very poor, susceptible to liquefaction	Good to poor bearing value depending on density	Poor, susceptible to liquefaction	Good to poor bearing value depending on density
Requirements for Seepage Control	Toe trench to none	Toe trench to none	Upstream blanket and toe drainage or wells	Toe trench to none	Upstream blanket and toe drainage or wells

Classification Coding:

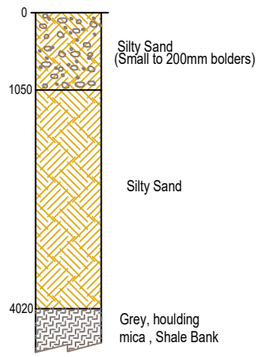
1st Letter	Definition	2nd Letter	Definition
G	Gravel	**P**	Poorly graded
S	Sand	**W**	Well-graded
M	Silt	**H**	High plasticity
C	Clay	**L**	Low plasticity
O	Organic		



CONTOUR LAYOUT PLAN (AERIAL PHOTO) SCALE 1:1000

TEST PIT PROFILES

Test Pit 1



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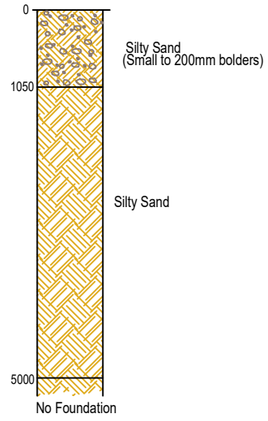

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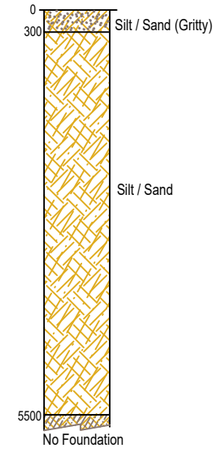

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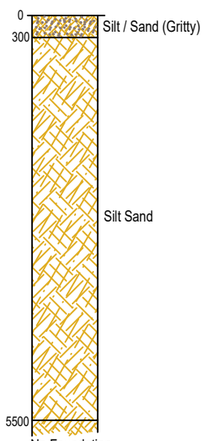

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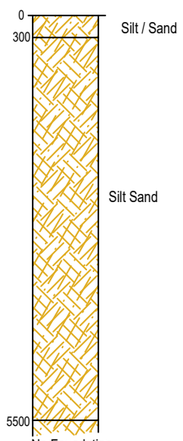

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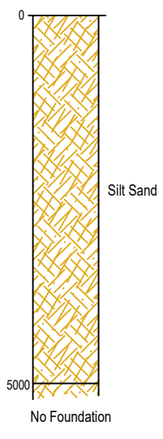

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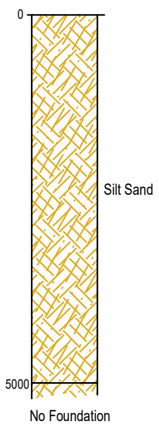
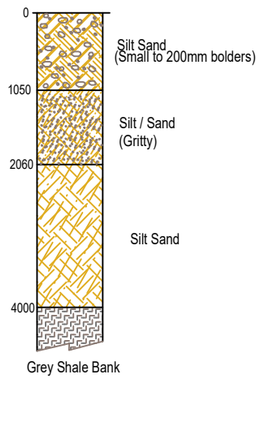


Test Pit 8



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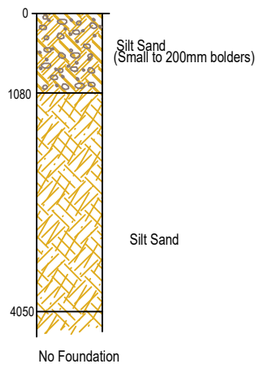

Test Pit 10

REVISION

SAREL BESTER ENGINEERS
Consulting Civil Engineers
Architectural Services

..... Date:21/10/2022
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OWNER
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P.O. Box 50
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8147

PROJECT
PROPOSED NEW WAVE DAM ON THE FARM MELKBOOM 384, TRAWAL, CLANWILLIAM RD

DETAIL
Contour Layout Plan (Aerial Photo):
Test Pit Positions & Profiles

DRAWN	DATE	SCALE	SHEET
SC Hartzenberg M Liebenberg	OCT. 2022	as shown	3 of 3
SURVEYED	**DESIGNED**	**DWG. NUMBER**	**REV.**
D Willemse C Bester	Sarel Bester Engineers	2114-S2-03	

 A3