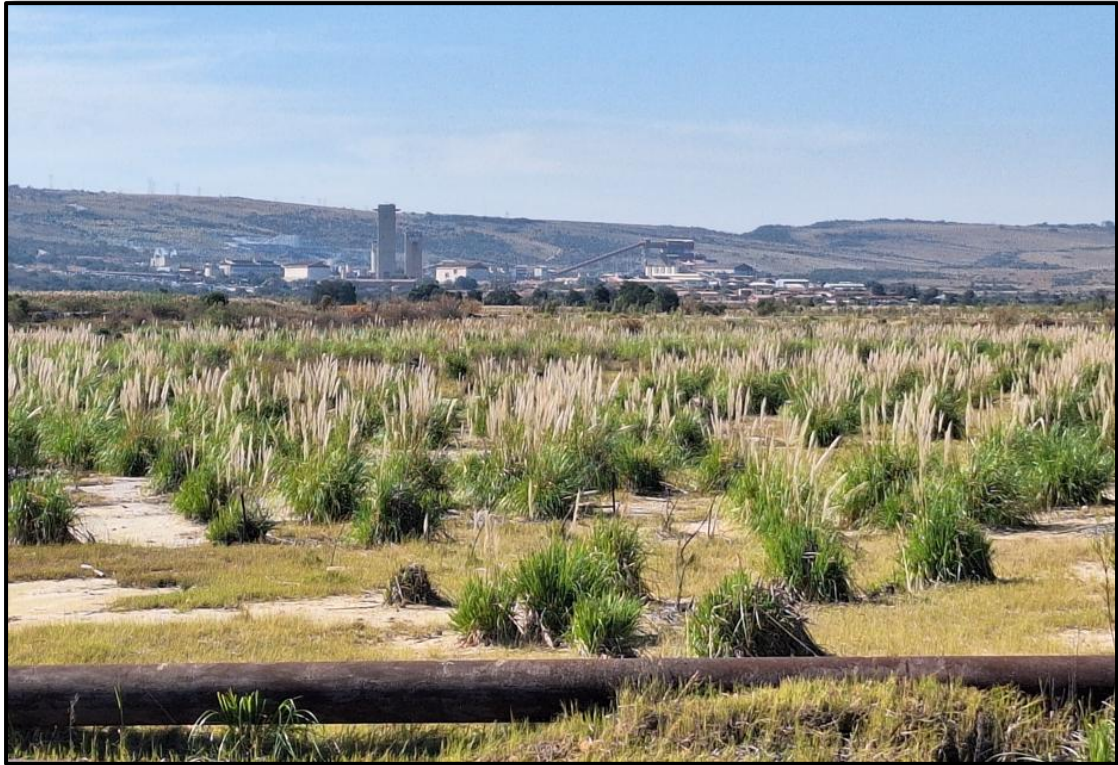


# **MPONENG MINE TAILINGS STORAGE FACILITY LOWER COMPARTMENT GEOTECHNICAL INVESTIGATION**



Prepared for:



Address:  
Block@Nature, Block 5  
472 Botterklapper Street  
Lynnwood  
Pretoria  
0184

**6 June 2025**

Prepared by:



Registration No.:  
2021/629571/07  
Tel: +27 (0)72 729 4561  
Email: [JvT@kipaji.co.za](mailto:JvT@kipaji.co.za)  
[www.kipaji.co.za](http://www.kipaji.co.za)

Report No. P134-01

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The preparation of this report was made according to the available data obtained during the investigation. We believe that the data was analyzed according to the best practice and methods available, and that the results and recommendations of the investigation are limited to the obtained data. The expected geotechnical conditions noted in this report are a product of extrapolation between the data points to our best ability and therefore the actual geotechnical conditions may vary on site during construction.

We therefore limit our liability and cannot accept any claims for losses or damages during the construction phase for geotechnical conditions that were not identified during the investigation.

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Compiled by :   
JP Heyneke (Pr.Sci.Nat)

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J van Tonder (Pr.Sci.Nat)

## **LIST OF ABBREVIATIONS**

AASHTO	: American Association of State and Highway Transport Officials
BH	: Borehole
CBR	: California Bearing Ratio
CH	: Chainage
COLTO	: Committee of Land Transport Officials
DC	: Dynamic Compaction
DCP	: Dynamic Cone Penetrometer
ESP	: Exchangeable Sodium Percentage
FI	: Foundation Indicator
GM	: Grading Modulus
LL	: Liquid Limit
LO	: Longitude of Origin
LOM	: Life of Mine
LS	: Linear Shrinkage
MASL	: Meters Above Sea Level
MDD	: Maximum Dry Density
OMC	: Optimum Moisture Content
PCD	: Pollution Control Dam
PI	: Plasticity Index
PL	: Plastic Limit
ROM	: Run of Mine
TLB	: Tractor Loaded Backhoe
TP	: Test Pit
UCS	: Uniaxial Compressive Strength
V:H	: Vertical to Horizontal

# MPONENG MINE

## TAILINGS STORAGE FACILITY

### LOWER COMPARTMENT

### GEOTECHNICAL INVESTIGATION

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# **MPONENG MINE**

## **TAILINGS STORAGE FACILITY**

### **LOWER COMPARTMENT**

### **GEOTECHNICAL INVESTIGATION**

#### **1. INTRODUCTION**

Eco Elementum Engineering appointed Kipaji Geotechnical Consulting to conduct a geotechnical investigation at the Mponeng Mine tailings storage facility complex located near Carletonville, Gauteng Province. Mponeng Mine is currently utilising the upper compartment of the TSF for storage of their tailings material. It is assumed that this upper compartment is reaching its maximum height and that the mine requires additional storage for tailings material for the continuous mining operations. As such, the mine is considering to recommission the inactive lower compartment for deposition of the tailings material to the height of the active compartment, or to the maximum allowable height.

The aim of this investigation was to provide the existing geotechnical conditions present at the TSF lower compartment to allow the design team to determine if the lower compartment may be utilised for deposition, and to what extent it may be utilised.

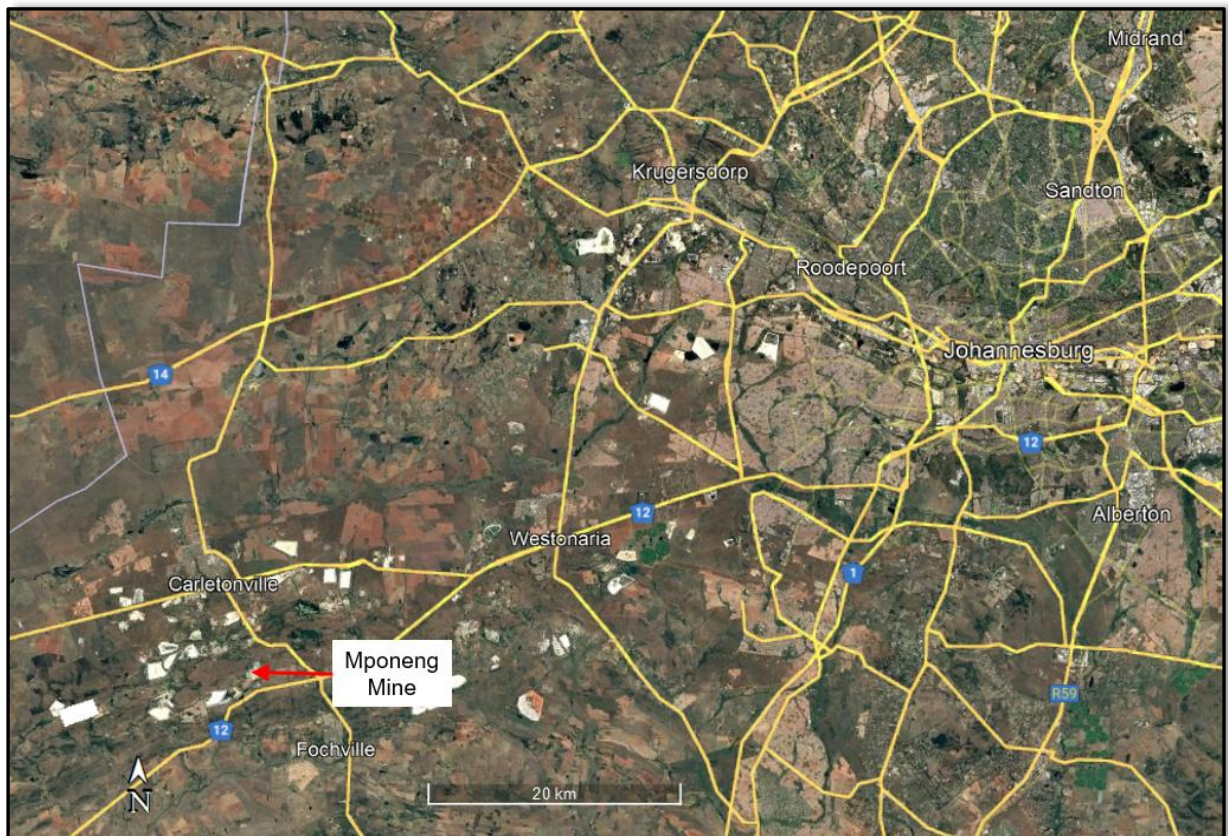
The investigation was conducted to determine the following:

- Review of existing information pertaining the groundwater seepage conditions measured and noted during the recent history of the TSF.
- The nature and distribution of the tailings material and its geotechnical properties to determine any variability across the footprint of the lower compartment.
- The geotechnical conditions at the lower compartment where the original ground surface level are still exposed and to what extent it occurs below the TSF lower compartment.
- The extent of fill and waste deposition occurring within the lower compartment, and
- Relevant geotechnical information regarding the construction of the TSF starter walls along the downstream portion of the lower compartment.

This report describes the results of the investigation and provides recommendations for the evaluation of the geotechnical data.

#### **2. SITE DESCRIPTION**

The Mponeng TSF is located approximately 10 km south of Carletonville and roughly 1.2km north-east of the N12 National Highway in the western portion of Gauteng Province. Refer to **Figure 1** indicating the mine's location, while **Figure 2** provides the position of the TSF relative to the mine.



**Figure 1. Location of the Mponeng Mine**





**Figure 2. Position of TSF relative to Mponeng Mine**

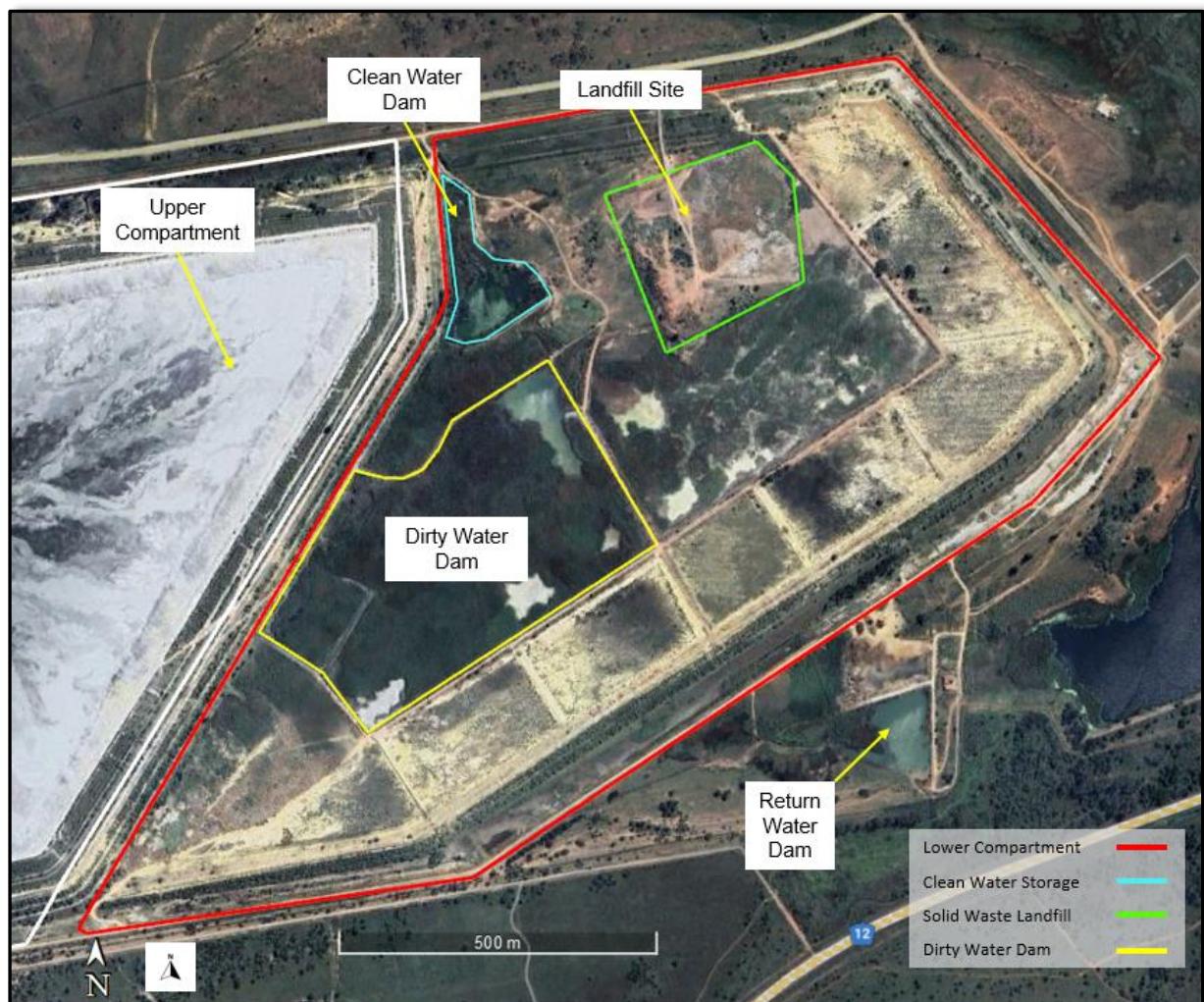
The coordinate of the location of the TSF lower compartment is as follows: (Latitude and Longitude)

- South: 26° 27' 9.03" East: 27° 24' 47.55"

The position of the TSF lower compartment, from hereon referred to as the “site”, occurs directly east of the TSF upper compartment. The site is currently inactive and is being used to store various components, which include:

- A clean water storage area, which is described in more detail at Section 4 from the existing information. This storage area is assumed to inflow from the nearby spring.
- A dirty water dam providing additional storage for excess dirty water from upper compartment.
- An active solid waste landfill site on the northern portion of the site.

The layout of the site is indicated in **Figure 3** below indicating the various components on the lower TSF. Refer to **Appendix A**, plates 1 to 27, for site photographs which indicates the current conditions of the site.



**Figure 3. Site Layout with Positions of various Components.**

Abundant seepage is present at the entrance to both the lower compartment and the landfill site (plates 2 to 4). As discussed in Section 4, the “Mponeng Spring” is located near the entrance to the lower compartment and presumably flows into the clean water storage dam (indicated in Figure 3). Localised seepage, potentially originating from the upper compartment, was encountered along the toe of the embankment (plates 5 & 6), although this may be from seepage along bedrock from the spring.

Several bedrock outcrops (plates 7 & 8) were noted in the northwestern portion of the site, between the landfill site and the area used for clean water storage. The eastern portion of the landfill hosted significantly more waste material (plate 9) as opposed to the western portion (plate 10).

Evaporation paddocks were constructed along the site’s eastern and southern perimeters. Some of the paddocks hosted erosion control measures, which consisted of parallel rows of shade cloth and planted vegetation (plate 11), while most of the paddocks either lacked erosion control measures or have not been maintained (plates 12 & 13). The paddock embankments served as access roads across the TSF.

The area located south of the landfill was dry but hosted dense hydrophilic vegetation (plates 14 & 15), whilst wet and marshy conditions were encountered directly east of the dirty water dam (plate 16 & 17). The dirty water dam was mostly covered with reeds (plate 18), and water was only visible in localised areas (plate 19).

Several pipelines are present and were located both within the evaporation paddocks and along the paddock berms (plates 20 & 21). The far south-western portion of the site hosted some stagnant water (plate 22), and the area was covered with stockpiles of silt material (plate 23) that has been extracted from the return water dam as part of its desilting process.

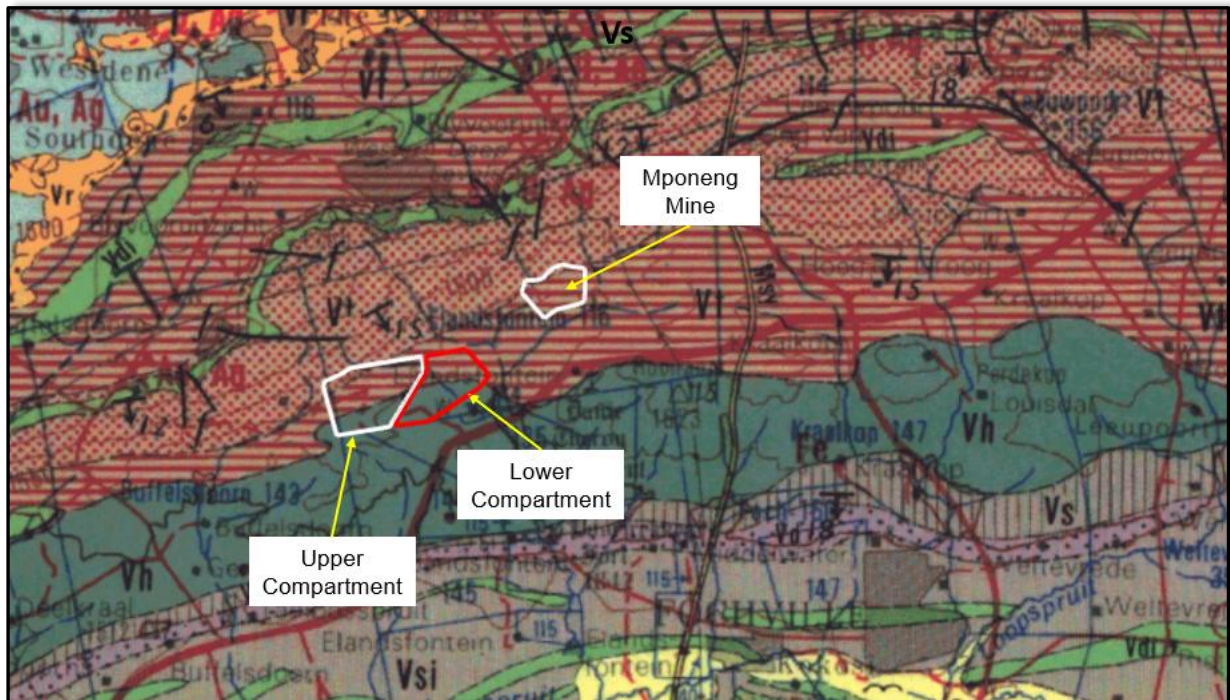
The area between the clean and dirty water dams was also saturated and covered with grass and hydrophilic vegetation (plate 24 & 25). An inspection was conducted along the south-eastern embankment of the lower compartment to determine the extent of the starter wall, viewed in plates 26 to 28. This will be described in detailed in the results. Abundant seepage was noted at the toe of the starter wall at the south-eastern corner (Plate 29).

The regional ground surface outside the TSF area is undulating but slopes in a south-eastern direction at an average angle of 1.5° to 1.7°. The north-western portion of the TSF is still underlain by original ground surface, while the eastern and southern portions of the TSF are underlain by deposited tailings. Therefore, the topography in the north-western portion occurs higher at 1546 masl while the eastern to southern topography on the TSF occurs at 1539 masl, according to Google Earth Imagery. The embankment height varies from 10 m in the north-eastern corner, to approximately 24 m at the maximum height in the south-eastern corner, while the southern embankment reduces gradually to 12 m in height towards the toe of the upper embankment.

The flora covering the site comprises mostly grass and hydrophilic vegetation. The vegetation along the embankments consists of grasses, shrubs and occasional trees (plates 24, 26 & 27).

### 3. GEOLOGY

The site, according to the published geological map (2626 Wes Rand), is located at a contact between the andesites of the Hekpoort Formation and the shales and quartzites of the Timeball Hill Formation of the Pretoria Group, Transvaal Supergroup. **Figure 4** provides the position of the site on an extract of the geological map.



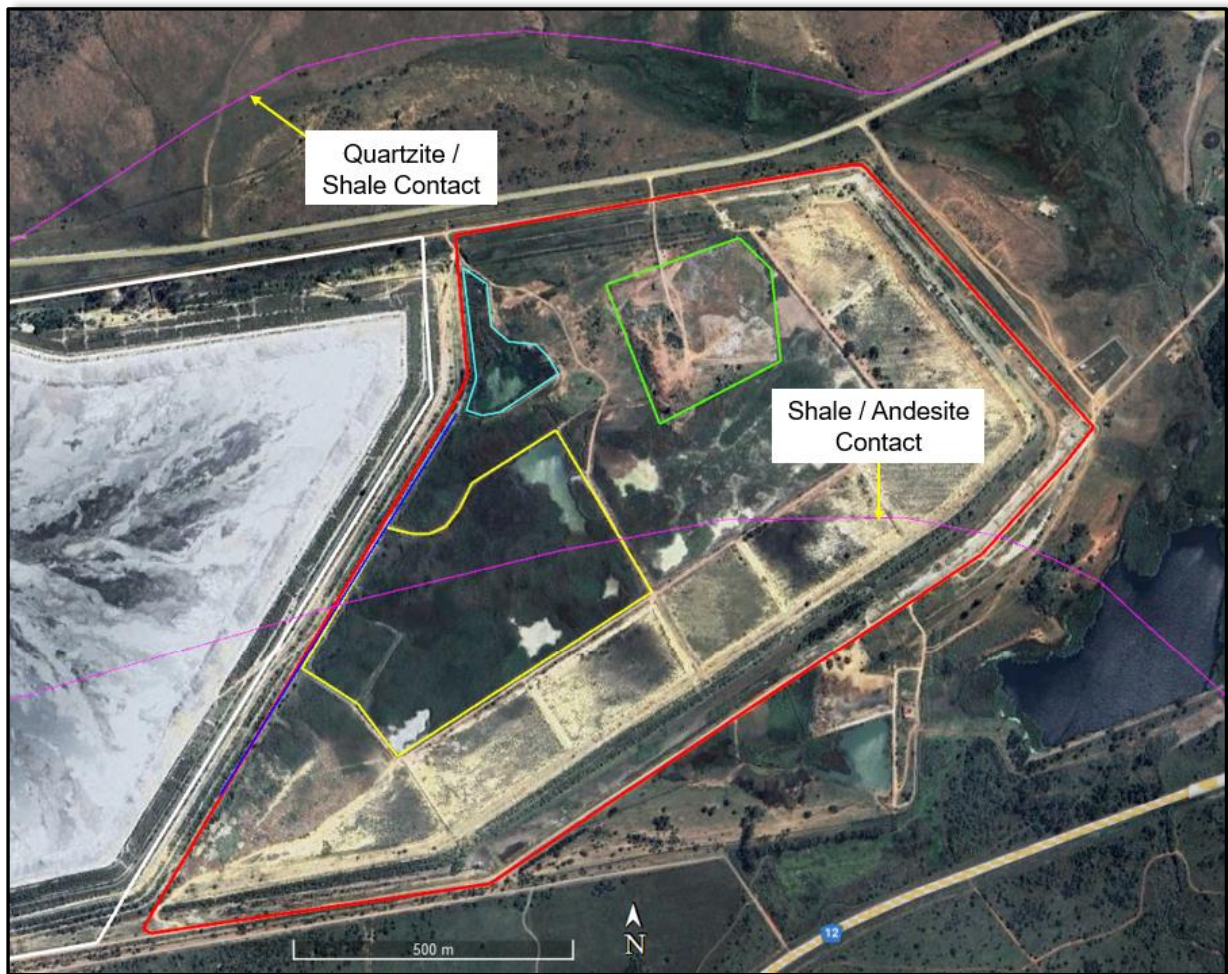
**Figure 4. Position of TSF Mine on Geological Map**

Geological Legend:

Vh – andesite, agglomerate & tuff (Hekpoort Formation)	} Pretoria Group, Transvaal Sequence.
Vt – ferruginous shale & quartzite (Timeball Hill Formation)	

The geological contact, between the quartzite and shale of the Timeball Hill Formation and andesites of the Hekpoort Formation, intersects the rockmass in a general northeast-southwest direction. The shales and quartzites are located across the northern portions of the site whilst the andesites are located along the southern portions. From the existing data described in Section 4, including the evaluation of the electrical resistivity surveys conducted in previous investigations, these contact lines are estimated to occur as per **figure 5**.





**Figure 5 Geological Contacts at TSF Lower Compartment**

According to Weinert's climatic N-value [1], the site falls in an area where the N-value is less than 5, indicating that the area is generally associated with chemical weathering. The weathering of quartzite generally comprises a thinner soil profile, while the weathering of shale produces a thicker fine-grained soil profile [2]. This was however not according to the findings of the geotechnical investigation, which indicated the residual shale soils are generally thin. Weathering of igneous rocks (andesite) generally produces a coarse-grained soil but with extended weathering it transitions to a fine-grained soil, which may occur with depth.

## **4. EXISTING INFORMATION**

### **4.1 GEOTECHNICAL STUDIES**

It is understood that various geotechnical reports are available, which describes the geotechnical conditions at the TSF structure. These include reports that details the foundation conditions, assessments of slope stabilities and the design report. These reports were however not available from the client during the time of this report.

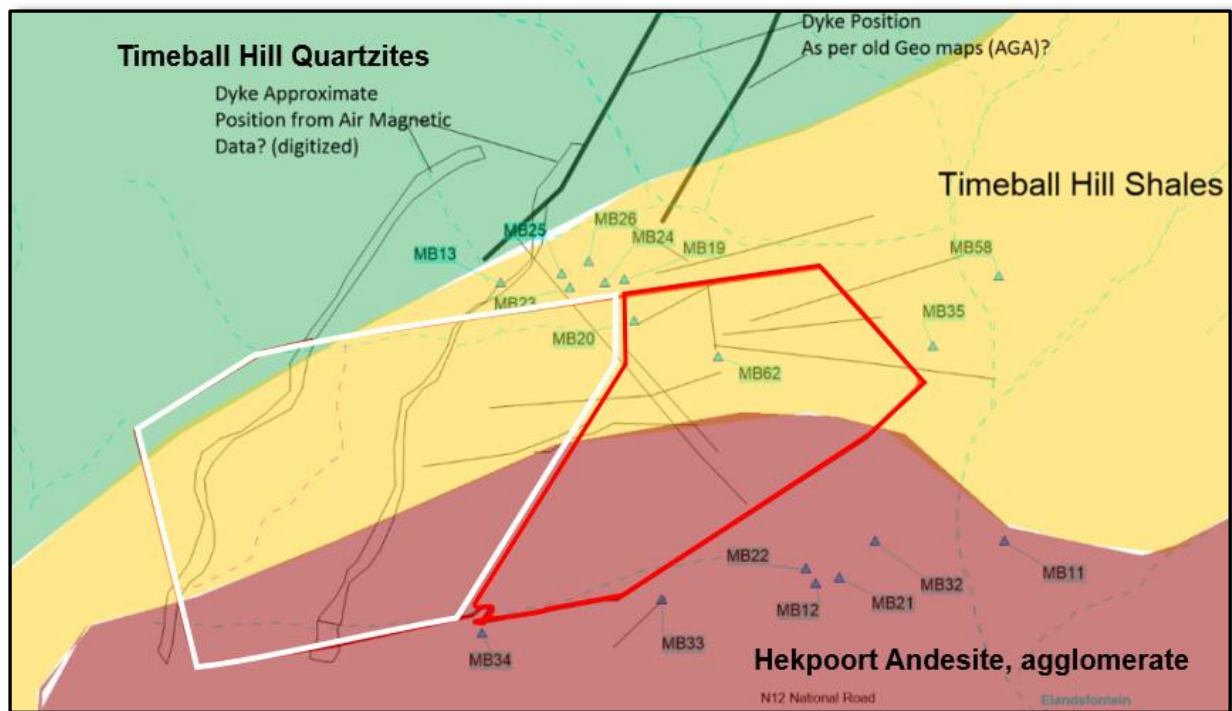


## 4.2 HYDROGEOLOGICAL STUDIES

Several hydrogeological investigations were conducted by GCS Water and Environmental Consultants (GCS) during 2019, 2020, 2024, and 2025. Some of the reports were available for review and the most relevant data from each report is summarised below. Note, the available reports also contain data from previous external reports, hence the information presented below is not solely findings from the investigations conducted by GCS.

Groundwater Assessment for the Mponeng TSF Complex – 1<sup>st</sup> Draft Report. GCS. Report No. 18-0701. 24 January 2019.

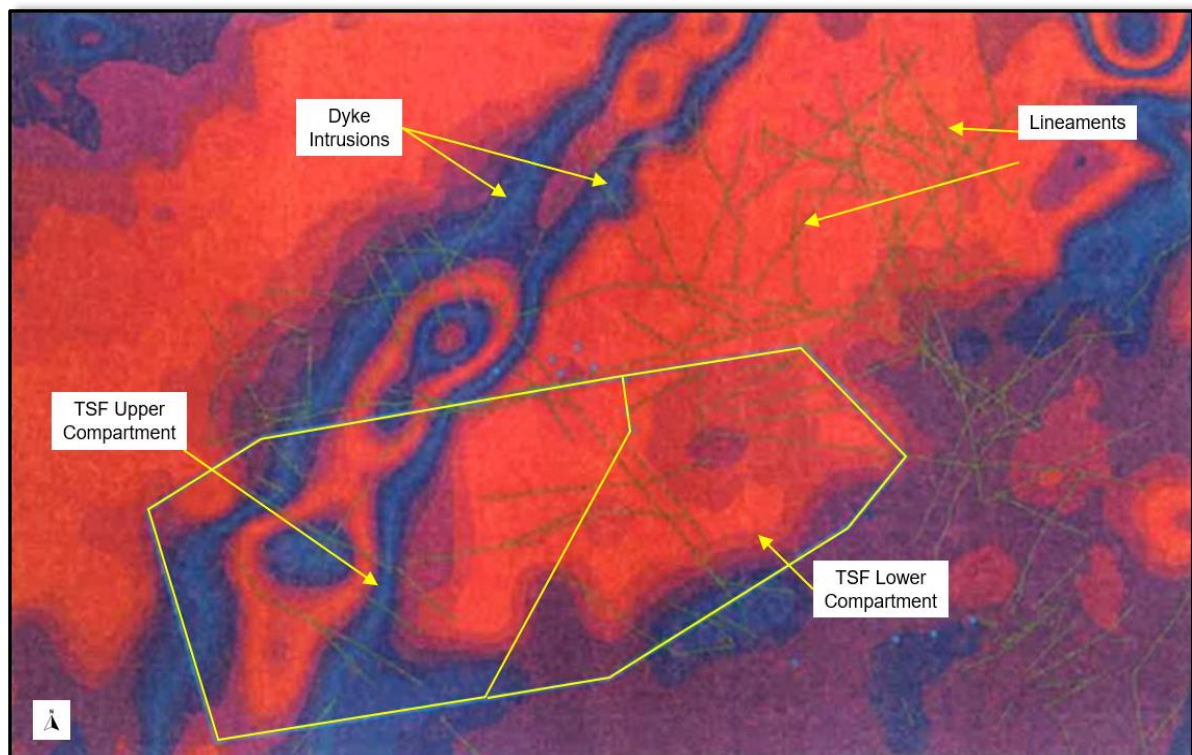
- The regional geological map (2626 Wes Rand) indicates that the underlying rock mass at the investigated site is not intersected by faults or dykes. However, a geological map extract from the report indicates that the lower compartment is underlain by numerous fault related lineaments (exact nature unknown) as well as the presence of two dykes (rock type not specified) intersecting the upper compartment in a general northeast-southwest direction (**Figure 6**).



**Figure 6. Geological Map Extract from 2019 GCS Report**

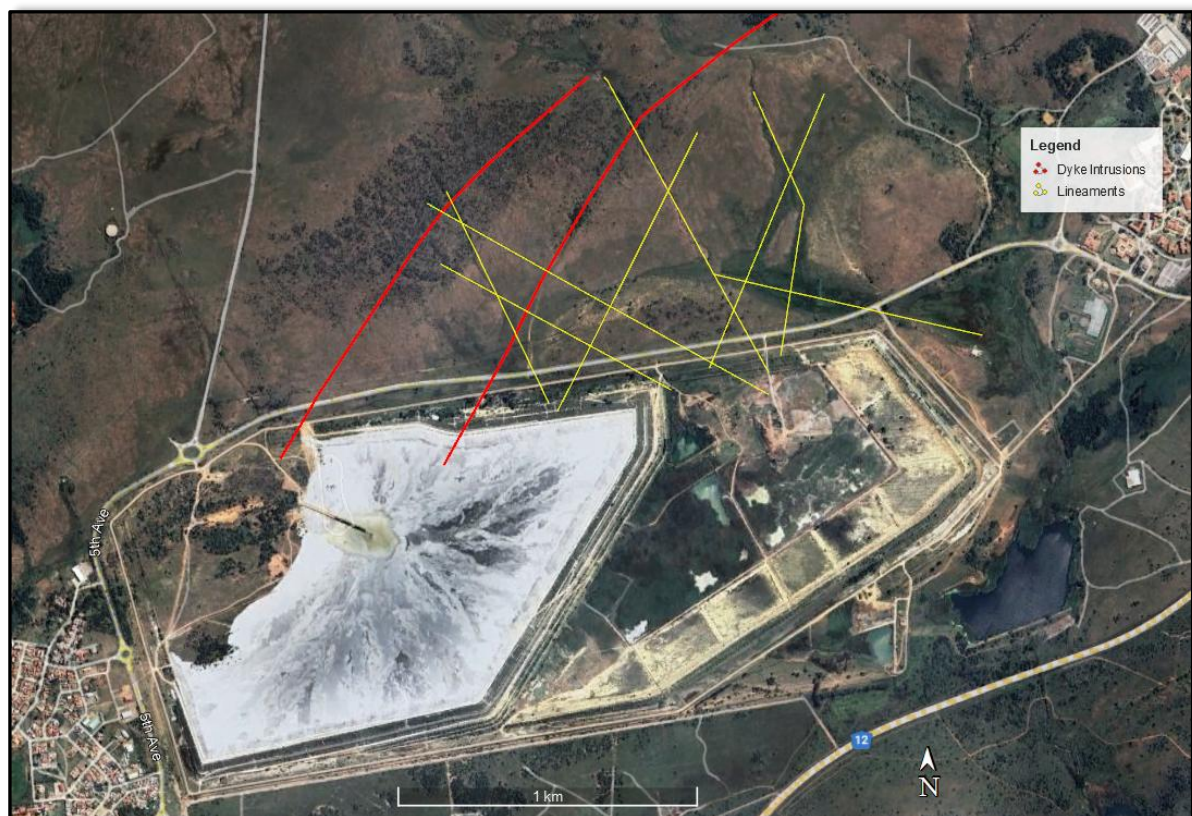
- The previously conducted aeromagnetic survey indicated the presence of two roughly parallel dyke intrusions across the TSF upper compartment, orientated in a northeast-southwest direction. The survey indicated numerous structural lineaments striking across the TSF upper and lower compartments generally in a north-west and south-west to south-west-west directions.

An extract of the aeromagnetic survey completed during this investigation is indicated below in **Figure 7**.



**Figure 7. Aeromagnetic Survey at Mponeng TSF**

The positions of the two parallel dyke intrusions and numerous lineaments mapped from the aeromagnetic survey and Google Earth aerial imagery are indicated below in **Figure 8**.



**Figure 8. View of Mapped Dyke Intrusions and Lineaments**

- The “Mponeng Spring” is situated near the entrance to the TSF lower compartment and is located on an identified or extrapolated structural lineament. These lineaments were interpreted to be fractured zones that allow for efficient groundwater movement. The source of water at the spring is not due to seepage from the TSF but interpreted to be groundwater recharge occurring through the quartzite formations. This spring is indicated next to the freshwater storage area in **Figure 3**.
- The report refers to the groundwater monitoring boreholes and provides a detailed summary of the boreholes, their positions and encountered geology, with depths to the groundwater level. The groundwater level depths vary from 10 m below surface level along the southern embankment of the TSF, at the aquatic dam, while it varies generally between 15 m and 20 m below surface level across the remaining areas. These boreholes, some of which were drilled next to the Mponeng spring, confirmed that the origin of the spring occurs from a deeper aquifer connected via the dyke intrusions and lineaments.

*Harmony West Wits Drilling – Field Report. GCS. Report No.240321 1 July 2024.*

- Five monitoring boreholes (NBH1 to NBH5) were drilled in 2024 within the vicinity of the regional tailings storage facilities, to replace boreholes that became non-operational. The most relevant holes were NBH2 and NBH3 drilled next to Mponeng TSF. Borehole NBH1 was drilled along the RWD.
- NBH2 was drilled at the south-western corner of the TSF lower compartment. The report indicated that hard and competent slate was encountered from a depth of approximately 6 m below ground level to at least 30 m. It is assumed that the percussion chips were logged incorrectly and should rather indicate andesite rock or shale. Two water strikes were encountered at 15 m and 17 m below ground level, and the water from the boreholes were artesian.
- NBH3 was drilled on the southern embankment toe between the upper and the lower compartments. The report states that the borehole encountered shale that is deeply weathered, with saprolitic (completely weathered) material encountered to a depth of roughly 22 m below ground level underlain by competent shale. Two water strikes were encountered at depths of 17 m and 22 m below ground level.

Harmony Mponeng- TSF Spring Hydrogeological Investigation (Phase 1). GCS. Report No.24-0660 dated 14 April 2025.

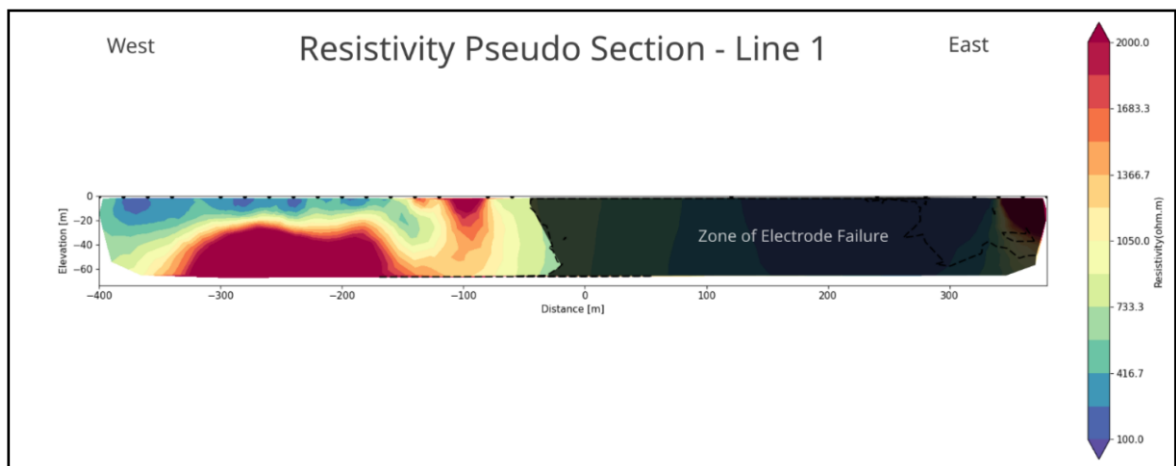
- This investigation was conducted to confirm the presence of the natural spring at the north-east corner of the TSF, identified by ambient groundwater quality and surface discharge. The investigation completed electrical resistivity surveys (three lines) at the north to western perimeter of the TSF.
- The positions of the three electrical resistivity survey lines are provided below in **Figure 9**

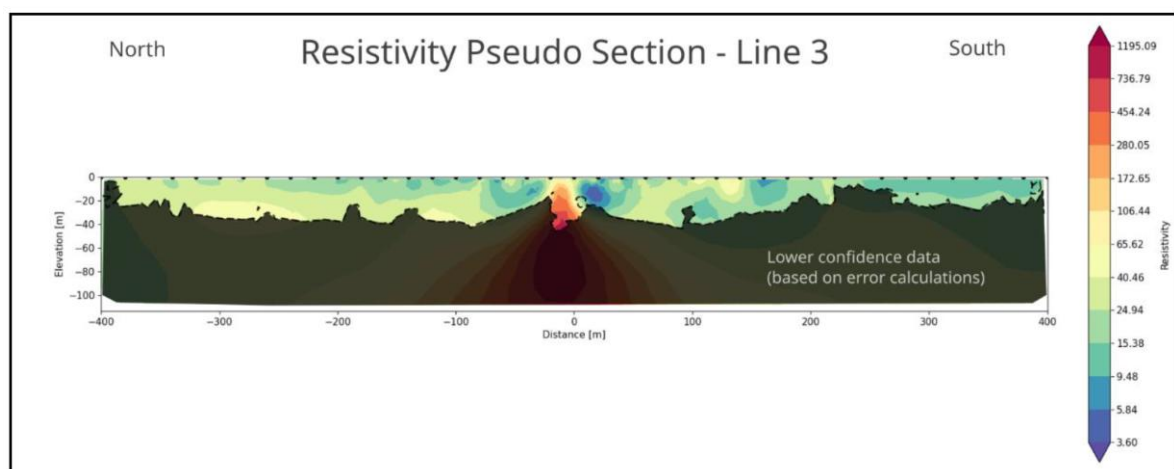
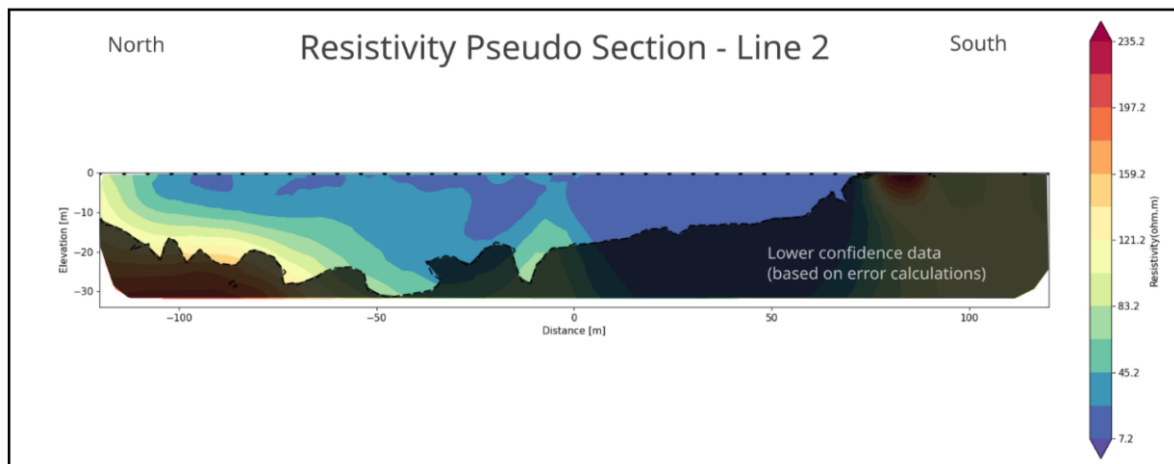




**Figure 9. Positions of Electrical Survey Lines**

The results of the electrical resistivity surveys along each line are provided below.





The results of the electrical resistivity surveys indicate the following:

- Shallow bedrock occurs along Line 1 with high resistivity readings along the toe of the TSF upper compartment. Electrode failure occurred towards the lower compartment. This failure was investigated with a second electrode array which also failed. Due to the failure an inspection on a shallow trench were made which indicated that the mudstone bedrock was dry, with the air pockets between them the cause for failure.
- The results of Line 2 and the northern portion of Line 3 indicated very low resistivity, likely the result of seepage migrating under the TSF. The remainder of Line 3 is underlain by a slightly higher resistive material.
- At the centre of Line 3 a narrow high resistivity was noted, which could be attributed to the contact zone between the two underlying lithologies.

## 5. METHOD OF INVESTIGATION

The investigation was conducted on 14 to 20 May 2025 and included the excavation of 32 test pits (TP1 to TP32) with a 20-ton excavator provided by the client. The test pits were excavated to the maximum reach of the machine or until excavation refusal occurred. It is noted that the excavator was fitted with a smooth blade bucket and that excavation refusal noted on the test

pit logs occurred on a softer material than usually anticipated. The soil profiles were logged by an engineering geologist according to South African standards [3].

Where deep excavations were anticipated, the test pits were dug to a depth of approximately 2,0m and profiled in-situ. The remaining depth of the test pits was logged from surface due to the presence or risk of unstable sidewalls (discussed further in Section 6). The test pits logs are provided in **Appendix B**.

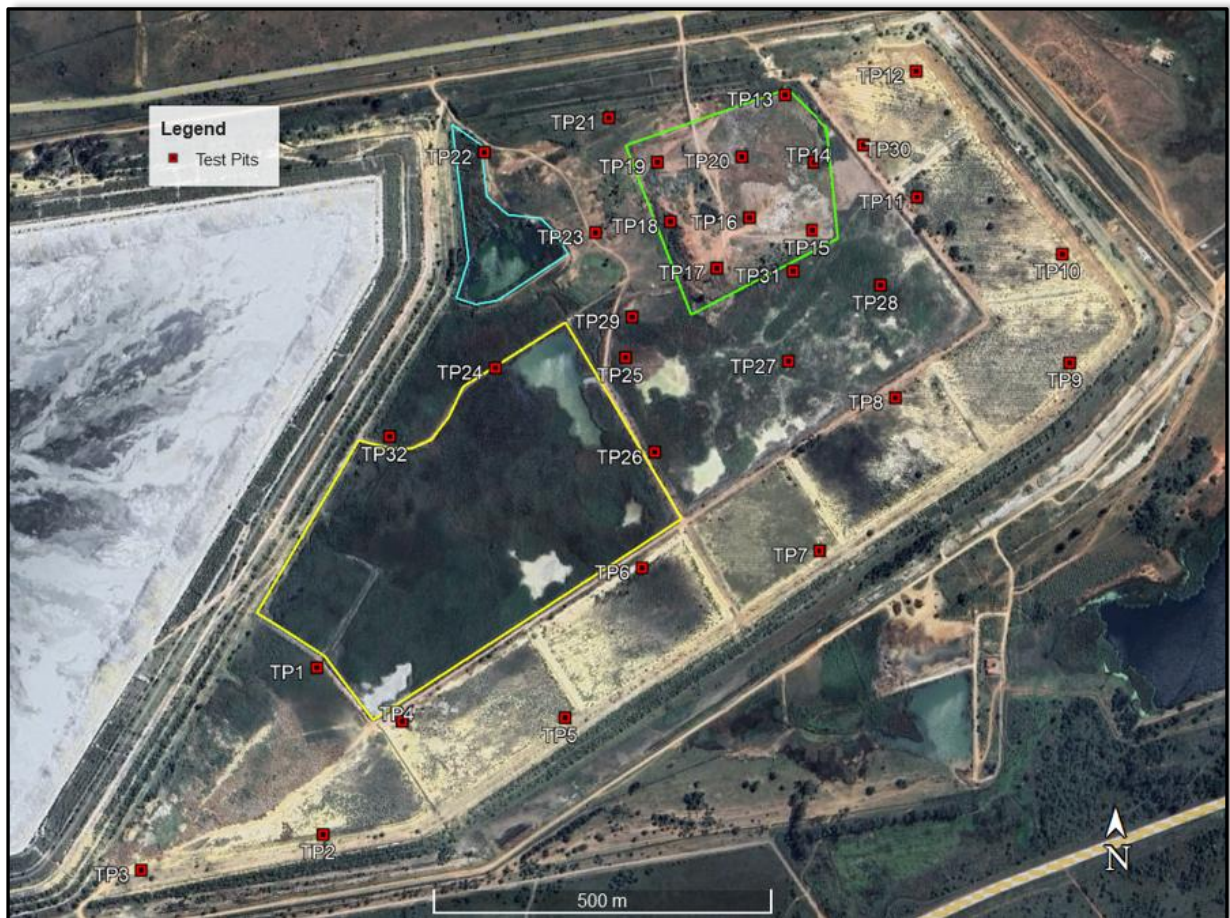
The positions of the test pits were recorded with a hand-held GPS instrument with an accuracy of 3 meters. The coordinates of these are in WGS84 Datum, South African grid (LO27) and are listed in **Table 1** below.

**Table 1. Coordinates of Test Pit Positions**

TP Number	Y-Coord.	X-Coord.	TP Number	Y-Coord.	X-Coord.
TP1	-40569	2927480	TP17	-41157	2926899
TP2	-40577	2927723	TP18	-41089	2926832
TP3	-40310	2927774	TP19	-41070	2926745
TP4	-40693	2927558	TP20	-41194	2926737
TP5	-40932	2927554	TP21	-41000	2926681
TP6	-41046	2927336	TP22	-40817	2926730
TP7	-41307	2927312	TP23	-40979	2926847
TP8	-41419	2927089	TP24	-40832	2927044
TP9	-41675	2927039	TP25	-41023	2927029
TP10	-41664	2926880	TP26	-41065	2927167
TP11	-41451	2926797	TP27	-41262	2927035
TP12	-41450	2926613	TP28	-41397	2926925
TP13	-41258	2926647	TP29	-41032	2926970
TP14	-41300	2926745	TP30	-41374	2926725
TP15	-41297	2926844	TP31	-41269	2926904
TP16	-41205	2926826	TP32	-40677	2927143

The positions of the test pits are indicated in **Figure 10A**, while **Figure 10B** provides an enlarged view of the test pit positions along the eastern portion of the TSF.





**Figure 10A. Site Layout with Test Pit Positions**



**Figure 10B. Enlarged View of Test Pit Positions**



Representative samples were collected from the test pits for laboratory testing and are conducted at Soil Tecnix and STL laboratories, both SANAS accredited. The following laboratory tests are conducted:

- 21 x Foundation indicators (grading, Atterberg limits and clay content).
- 8 x Standard Proctor compaction tests.
- 4 x Oedometer tests on undisturbed samples.
- 3 x Consolidated undrained triaxial tests (at 150kPa, 300kPa and 600kPa increments) on undisturbed samples

The laboratory tests were still in progress during the time of this draft report and will be included into the final report.

## **6. INVESTIGATION RESULTS**

### **6.1 SOIL AND BEDROCK PROFILES**

A summary of the test pit profiles is provided in **Table 2** at the end of the report. The results of the test pit excavations indicated that the descriptions should be separated for four different sites, namely:

- The north-west portion of the TSF underlain mostly by original ground level.
- The TSF lower compartment underlain by tailings material,
- The area used for the dirty water dam, and
- The solid waste landfill site.

Descriptions of the soil profiles for each area are provided below.

#### **6.1.1 TSF Underlain by Original Ground Level**

Refer to **Figure 11**, which indicates the boundary where the TSF is underlain by original ground level.



**Figure 11. TSF Area Underlain by Original Ground Level**

This boundary delineates where no tailings deposition has occurred. The test pits excavated within the area indicates the following:

- At the positions of TP21 to TP23 the area appears to be covered by a thin fill layer, while at the landfill site the waste material is thick, which is described in section 6.1.2 below.
- The residual shale was only encountered at TP21, which occurs as a sandy clay silt to silty clay with a firm becoming gradually stiff and very stiff with depth (to 1.3 m)
- Shale bedrock occurred at shallow depths in the area of TP21 to TP23 and is described as highly weathered soft rock.
- The same conditions were prevalent at TP32, next to the embankment of the upper compartment. It is assumed that shallow bedrock occurs along the toe of the embankment from the north, west of TP22, and continues past TP32 to some extent. It is not clear where the toe of the upper embankment is underlain by tailings material towards the south.
- Shale bedrock was also reached at test pits TP29, TP31, TP30 and TP13 in an eastwards direction. At TP29 the area is covered by a general fill, which appears as excavated residual shale soil, while the remainder of the mentioned test pits are covered by tailings material, or by a mixture of tailings and waste material (TP31). Shale bedrock at these mentioned test pits occurs at various depth of between 0.9 m (TP13) and 3.8 m (TP30).

- Groundwater seepage was encountered at TP32, which appears as drainage along the toe of the upper compartment embankment, while abundant seepage occurred at TP31, which forms part of the landfill seepage and is described below.

#### 6.1.2 Solid Waste Landfill Site

The solid waste landfill site appears to be thicker along the eastern and southern portions and thins out towards the western portion.

- The waste material comprises abundant rubble material and varies in thickness between 2.0 m and more than 4.2 m (at TP20) in the eastern portion, while TP31 south includes abundant waste material with interlayered tailings material to a depth of 2.9 m below the normal TSF surface area (at 1539 masl). This implies that areas at TP20 which occurs at an elevation of approximately 1541 masl may have waste material to extensive depths (approximately 5m thick).
- The waste material at the western portion of the landfill site, at TP18 and TP19, varies from 1.3 m to 0.3 m and is underlain by residual shale at TP18, and directly by bedrock at TP19.
- Shale bedrock was intersected at greater depths along the eastern to southern portions of the landfill site, at between 3.0 m to 4.2 m, and at shallow depths as indicated by the summary table. Bedrock is described similarly as highly weathered soft rock shale.
- Groundwater seepage occurred in most of the test pits on the western and southern portions of the landfill site, generally at depths of between 3.0 m and 4.0 m, which is described as moderate to strong seepage flow. This is also the natural slope direction of the bedrock.

#### 6.1.3 TSF Area used as Dirty Water Dam

The test pits excavated at the dirty water dam includes TP1 and TP24 to TP26.

Test pits TP1 and TP26 were excavated next to a paddock embankments and the excavation could reach depths of between 3.8 m and 4.5 m respectively. Both areas are covered by the oxidised tailings and underlain by fresh tailings with depth. At these two test pits the fresh tailings was very moist to wet and comprised a very soft consistency, where the excavations sidewalls continuously collapsed.

At TP24 and TP25 the areas were saturated, and excavations were difficult due to the strong inflow of dirty water. However, shale bedrock was reached at TP24 at a depth of 3.1 m.

#### 6.1.4 TSF Underlain by Tailings Material

The test pit excavations on this area are represented by test pits TP2 to TP12 and indicated a relatively homogenous profile with depth.

- The TSF is covered by a layer of oxidised tailings material that occurs with a yellow to brown colour. This layer is generally moist and has a grading of slightly sandy and clayey silt. This layer has a thinly bedded soil structure due to the deposition of the thin layers of tailings. The consistency is generally firm but transitions to a soft with depth, while the layer thickness varies between 1.0 m and 2.0 m with an average thickness of 1.7 m.

- The underlying fresh tailings material occurs as thinly bedded grey and dark grey layers. The moisture of the fresh tailings is described as moist to very moist and, in some areas, wet. The soil grading varies from fine sandy silt to slightly clayey sandy silt to slightly clayey silt, which is assumed to be affected by the degree of sorting during the deposition process. The grading did not appear to become more coarser grained towards the embankments, which are due paddock deposition process. The consistency of the fresh tailings was very soft to occasionally soft with very soft pockets.
- Groundwater seepage was only noted at TP6 at a depth of 1.7m between the oxidised and fresh tailings layers. Although the tailings material is often described as wet, the excavations did not indicate a seepage and often the tailings appeared to be liquified during excavations. It is noted that due to the very moist to wet conditions and the poor consistency that numerous test pits collapsed continuously during excavations.

## 7. GEOTECHNICAL EVALUATION

It appears that deposition of the tailings at the TSF lower compartment were halted between 2007 and 2009 according to the history of aerial imagery from Google Earth. This imagery also suggests that the landfill site was prepared by the excavation of all soils to potentially bedrock depth.

The following sections provide observations and geotechnical evaluations of the conditions at the TSF lower compartment.

### 7.1 TSF STARTER WALL

During the site fieldwork an inspection on the downstream starter wall was made. The starter wall appears to be constructed along the south-eastern to southern embankment of the TSF, which is indicated in **Figure 12** below:





**Figure 12. Position of TSF Starter Wall**

The following were noted at the starter wall:

- The elevation of the starter wall, according to Google Earth imagery, varies from 1527 masl to 1520 masl, indicating a maximum height of 7.0 m. This height however appears as a maximum of 5.0 m during the inspection time, and should be verified from the lidar survey.
- The starter wall was construction from material probably excavated within the TSF footprint area, which is described as a mixture of gravel and cobbles in a sandy clayey silt matrix, presumably from the excavation of residual shale and / or residual andesite. A sample of the embankment material was taken for laboratory testing and will be discussed during the final report.

## **7.2 GROUNDWATER SEEPAGE**

The following section provides observations of the groundwater seepage that occurs in and around the TSF.

- The occurrence of seepage at the spring north of the TSF lower compartment appears to runoff into a drainage channel and is transported to the aquatic dam at the south-eastern corner of the TSF. It does not appear to seep directly into the clean water dam, since the higher elevations along this area, underlain by original ground level, channels the seepage into the drainage channel.

- However, from the existing geohydrological reports this seepage may be linked to the clean water dam by means of the lineations striking into the underlying rockmass, as illustrated by **Figure 8**. If this is correct, then further seepage may be expected from the numerous other lineations striking into the rockmass below the TSF lower compartment.
- The test pits on the original ground level area did not indicate any groundwater seepage, except at TP32, which may be seepage that occurs from the toe of the embankment from the upper compartment.
- It was further noted that medium to strong seepage is present at the base of the landfill site, which is expected since the waste material is highly permeable providing access for infiltration. However, the test pits excavated along the downstream area of the landfill site, at TP13, TP30, TP11, TP28 and TP27 did not encounter any seepage, indicating that the seepage at the landfill site is localised.
- Lastly, a large pool of seepage was noted on the downstream corner of the starter wall (south-eastern corner), which indicates that seepage does occur, either from the catchment area of the lower compartment, or along bedrock originating from the intersection of lineations.

### 7.3 TSF FOUNDATION CONDITIONS

The existing geotechnical reports were not available for review during the time of this draft report, and the following observations are made regarding the TSF foundation conditions:

- The test pits along the area where the TSF is underlain by original ground level indicated that the residual shale soil is limited in thickness and occurred at TP21 to a depth of 1.3 m. At test pits TP15 and TP18 at the landfill site it occurs as a thin layer, which may be due to disturbance during the clearing of the landfill site during 2007.
- The test pits, which encountered bedrock in the area underlain by tailings, represented by test pits TP13, TP24 and TP29 to TP31, indicates that the tailings material was placed directly on bedrock. It is thus assumed that these residual soils were excavated during the preparation of the TSF floor to source material for the construction of the TSF starter wall. It may be assumed that the remainder of the TSF floor underwent the same preparation method, but this should be confirmed, either from the existing geotechnical reports, or from additional investigations.
- The expected allowable bearing capacity on the shale bedrock, described as highly weathered soft rock, should be at least 500 kPa, if the shale bedrock is intact with depth.

### 7.4 TAILINGS GEOTECHNICAL EVALUATION

The test pits excavated along the paddocks, which include TP2 to TP12, encountered very similar conditions.

- This area along the paddocks is covered by oxidised tailings with an average thickness of 1.7 m. It occurs as slightly moist, slightly sandy and clayey silt and has a firm to soft consistency with depth. The fresh tailings occurring below is moist to very moist and often wet and has a fine to very fine grading with very soft or soft consistencies.

- The tailings material encountered along the dirty water dam indicated similar conditions, however this area is saturated and is expected to allow for more settlement due to liquefaction during loading.
- Settlement on the area underlain by original ground surface will experience the least settlement, while the landfill site area may exhibit highly differential settlements.
- It is therefore noted that the settlement along the entire surface of the lower compartment may experience differential settlement, which may affect the TSF stability across the footprint.

## **7.5 RECOMMENDATIONS FOR FURTHER INVESTIGATIONS**

It is evident from the geotechnical evaluation that the geotechnical conditions at the TSF lower compartment are not fully comprehended. These factors include the following:

- The non-availability of existing information pertaining the historical geotechnical conditions at the TSF.
- The TSF foundations conditions, whether the tailings material was placed on bedrock across the entire footprint.
- The geotechnical characteristics of the starter wall, viz. the consistency of the compacted embankment, any variations in consistency, the strength parameters of the materials including strength parameters of the in-situ conditions.
- The seepage in and around the TSF, whether seepage occurs from the intersecting lineations, seepage from the spring, and the origin of seepage at the toe of the starter wall. This includes the groundwater level within the TSF storage area.
- And lastly, the in-situ consistency of the tailings material occurring at depths along the eastern and southern portions of the TSF.

It is therefore recommended that additional geotechnical investigations should be conducted, which include the following:

- Test pit excavations along the foundation of the starter wall, to determine whether the structure was placed on bedrock.
- Rotary cored geotechnical boreholes, to determine the foundations conditions across the TSF footprint, especially within the eastern and southern portions of the TSF and to understand the potential seepage source.
- Additional boreholes are required on the starter wall.
- CPTu penetration tests to determine the in-situ strength of the tailings materials with depth, as well as to provide supplementary information regarding the seepage levels and depths within the TSF storage area.



## 8. REFERENCES

- [1] Weinert, H. (1965). A climatic index of weathering. *Geotechniques*. Vol.24, No. 4, pp. 475-488
- [2] Brink, A.B.A. (1979). *Engineering Geology of Southern Africa*, Volume 1. Building Publications, Pretoria.
- [3] The South African Institute of Engineering Geologists (1996). *Guidelines for Soil and Rock Logging*.
- [4] Gerber, F.A, and Harmse, H.J (1987) Proposed procedure for identification of dispersive soils by chemical testing. *The Civil Engineer in South Africa* 29: 397-399.

**TABLE 2. SUMMARY OF TEST PIT PROFILES**

TEST PIT NO.	FINAL DEPTH (m)	LAYER DEPTHS (m) – (m)								DEPTH TO GROUND-WATER SEEPAGE (m)
		WASTE MATERIAL	FILL (Tailings)	FILL (Paddock Embankment)	FILL (Excavated Natural Soils)	OXIDISED TAILINGS	FRESH TAILINGS	RESIDUAL SHALE	VERY SOFT ROCK SHALE	
TP1	3.8			0 – 0.4		0.4 – 1.5	1.5 – 3.8+ <sup>[1]</sup>			
TP2	5.0					0 – 1.9	1.9 – 5.0+			
TP3	4.6					0 – 1.3	1.3 – 4.6+			
TP4	4.7					0 – 1.7	1.7 – 4.7+ <sup>[1]</sup>			
TP5	4.2					0 – 1.7	1.7 – 4.2+			
TP6	4.3					0 – 1.0	1.0 – 4.3+ <sup>[1]</sup>			1.7
TP7	4.0					0 – 1.8	1.8 – 4.0+			
TP8	4.5					0 – 2.0	2.0 – 4.5+			
TP9	4.5					0 – 1.9	1.9 – 4.5+			
TP10	4.4					0 – 1.8	1.8 – 4.4+			
TP11	4.8					0 – 1.6	1.6 – 4.8+			
TP12	4.2					0 – 1.8	1.8 – 4.2+			
TP13	1.3					0 – 0.4	0.4 – 0.9		0.9 – 1.3+ R	
TP14	4.2	0 – 2.2			2.2 – 4.2+					3.3
TP15	4.2	0 – 2.3	2.3 – 3.0		3.0 – 3.5			3.5 – 4.2	4.2+ R	4.0
TP16	4.0	0 – 2.0			2.0 – 3.0				3.0 – 4.0+ R	3.0
TP17	3.2	0 – 0.6			0.6 – 3.2+ <sup>[1]</sup>					
TP18	1.7				0 – 1.3 <sup>[2]</sup>			1.3 – 1.7	1.7+ R	
TP19	1.1				0 – 0.3				0.3 – 1.1+ R	

TEST PIT NO.	FINAL DEPTH (m)	LAYER DEPTHS (m) – (m)								DEPTH TO GROUND-WATER SEEPAGE (m)
		WASTE MATERIAL	FILL (Tailings)	FILL (Paddock Embankment)	FILL (Excavated Natural Soils)	OXIDISED TAILINGS	FRESH TAILINGS	RESIDUAL SHALE	VERY SOFT ROCK SHALE	
TP20	4.2	0 – 4.2+								4.0
TP21	1.7				0 – 0.2			0.2 – 1.3	1.3 – 1.7+	
TP22	0.5				0 – 0.5				0.5+ R	
TP23	0.1				0 – 0.1				0.1+ R	
TP24	3.1						0 – 3.0		3.0 – 3.1+ R <sup>[3]</sup>	0.0
TP25	1.4			0 – 1.4+ <sup>[4]</sup>						0.0
TP26	4.5					0 – 0.8	0.8 – 4.5+			1.2
TP27	4.5					0 – 1.5	1.5 – 4.5+			
TP28	4.0					0 – 1.4	1.4 – 4.0			
TP29	2.1				0 – 1.8		1.8 – 2.0		2.0 – 2.1+ R	
TP30	3.8					0 – 0.8	0.8 – 3.8		3.8+ R	
TP31	2.9				1.9 – 2.9 <sup>[2]</sup>				2.9+ R	2.8
TP32	1.2							0 – 0.3	0.3 – 1.2+ R <sup>[5]</sup>	1.2

*R denotes refusal on soft rock Shale*

*[1] – excavation stopped due to continuous sidewall collapse*

*[2] – hosted abundant waste and rubble*

*[3] – waterlogged conditions: interpreted to be refusal on soft rock shale*

*[4] – excavation stopped due to water ingress from the surface*

*[5] – refusal on medium hard rock shale*

# **APPENDIX A**

## **SITE PHOTOGRAPHS**

Plate 1. View of Positions of Photographs.

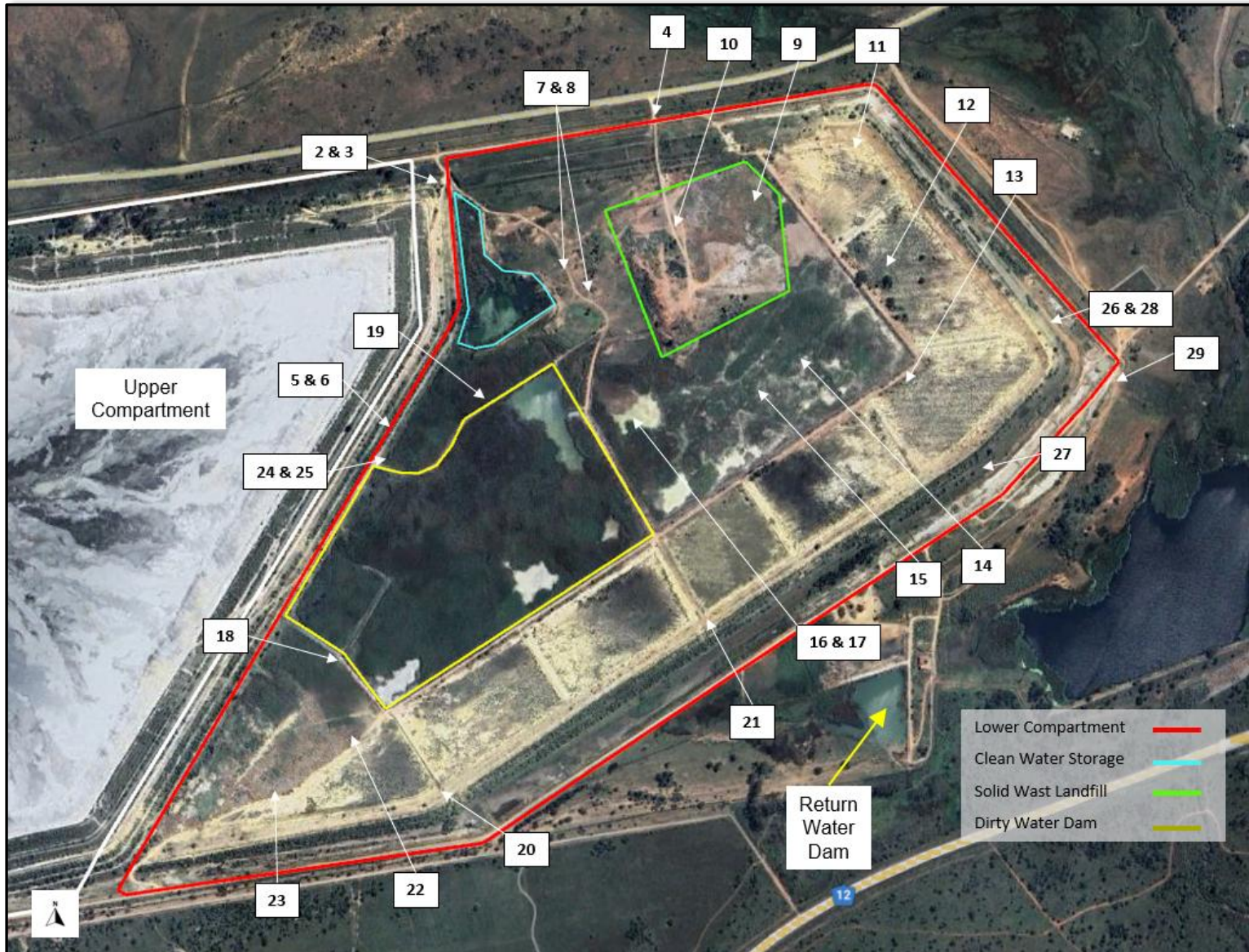






Plate 2. Water seepage at the lower compartment entrance.



Plate 3. Groundwater seepage outside the TSF at the lower compartment entrance.





Plate 4. Water seepage the entrance to the solid waste landfill site, in a western direction.



Plate 5. Seepage along the toe of the upper compartment embankment near test pit TP32.





Plate 6. Seepage along the toe of the upper compartment embankment near test pit TP32.



Plate 7. Shallow bedrock with outcrops at test pit TP23.





Plate 8. Bedrock outcrop located south-east of test pit TP23



Plate 9. Dumping at the Solid Waste Landfill Site.





Plate 10. Portion of the Solid Waste Landfill Site with minimal dumping.



Plate 11. Paddocks at test pit TP12 with erosion control measures.





Plate 12. Paddock at test pit TP11 facing north-east.



Plate 13. Paddocks at test pit TP8 facing south-west.





Plate 14. Hydrophilic vegetation across the central portions of site as viewed from test pit TP27.



Plate 15. View from test pit TP28 facing north-west.





Plate 16. Marsh Conditions east of the dirty water dam as viewed from test pit TP25.



Plate 17. Wet Conditions east of the dirty water dam as viewed from test pit TP25.





Plate 18. View of dirty water dam from test pit TP1 facing north.



Plate 19. View of dirty water dam from test pit TP24 facing east.





Plate 20. Paddock with existing pipe leading from the upper compartment.



Plate 21. Example of berms constructed between the paddocks serving as access roads.





Plate 22. View of the south-western portion of the site near test pit TP4 in a southern direction.



Plate 23. Sampling of soil stockpiled across the south-western portion of the site between TP1 and TP3.





Plate 24. State of upper compartment embankment as viewed from test pit TP32.



Plate 25. Old pipe and saturated conditions adjacent to test pit TP32.





Plate 26. View of the starter wall along the eastern embankment.



Plate 27. View of the starter wall along the southern embankment.





Plate 28. Typical composition of material used to construct the starter wall.



Plate 29. View of abundant seepage below the starter wall at south-eastern embankment.



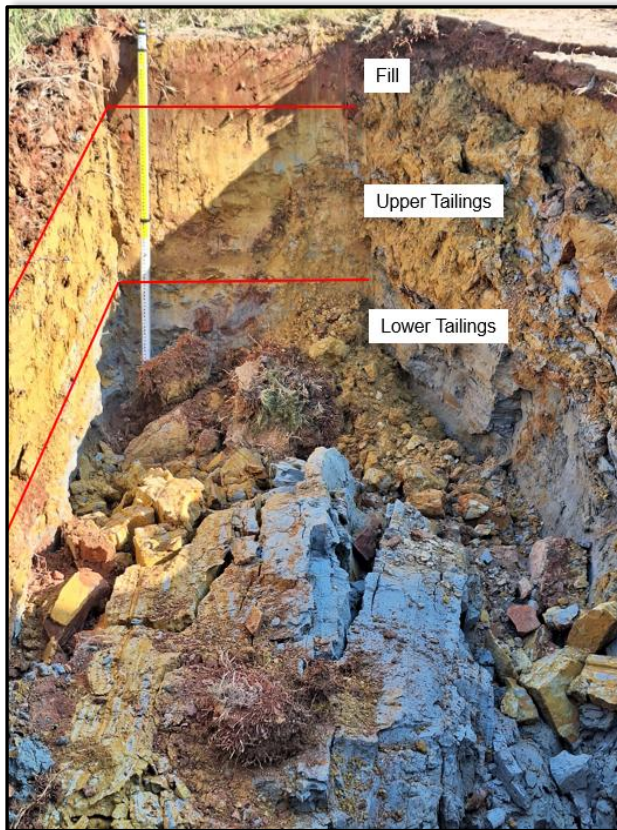


Plate 30. Test pit sidewall at TP1.

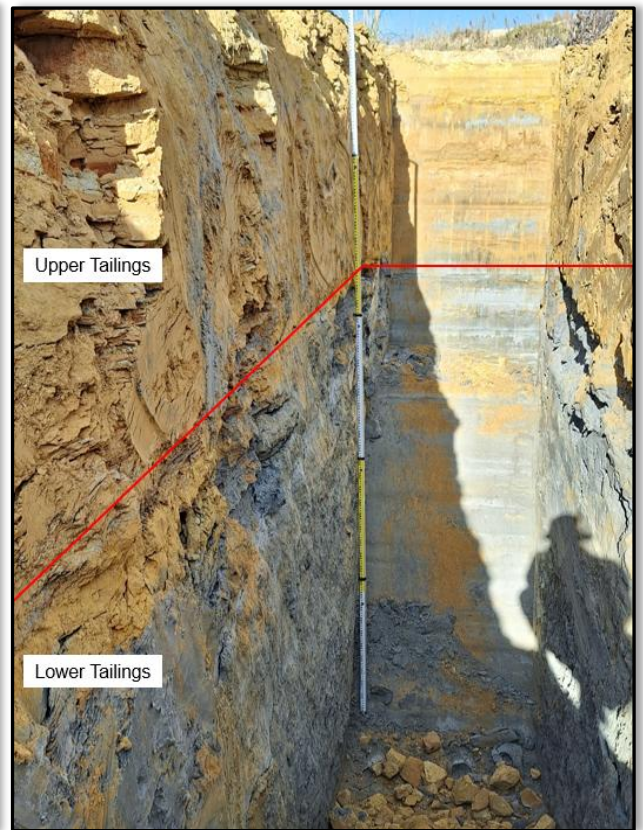


Plate 31. Test pit sidewall at TP2.



Plate 32. Test pit sidewall at TP3.



Plate 33. Test pit sidewall at TP4



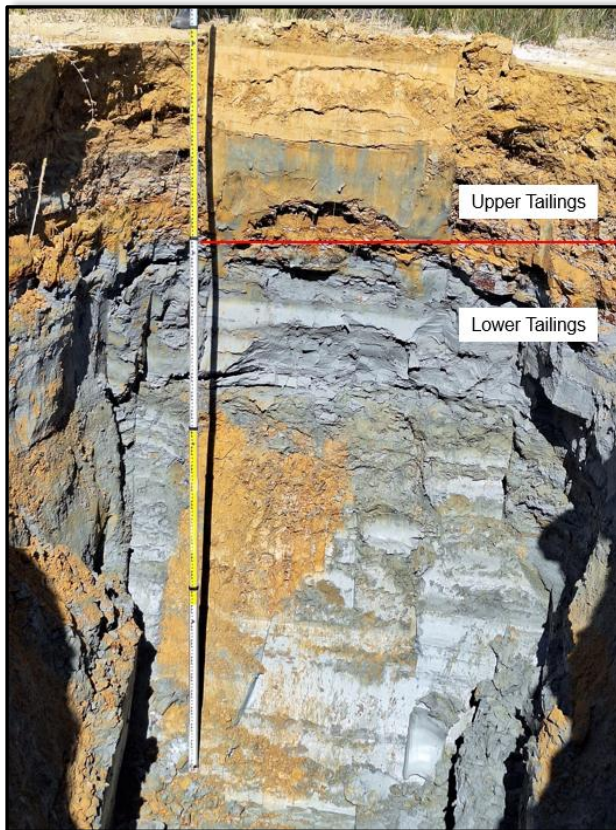


Plate 34. Test pit sidewall at TP6.

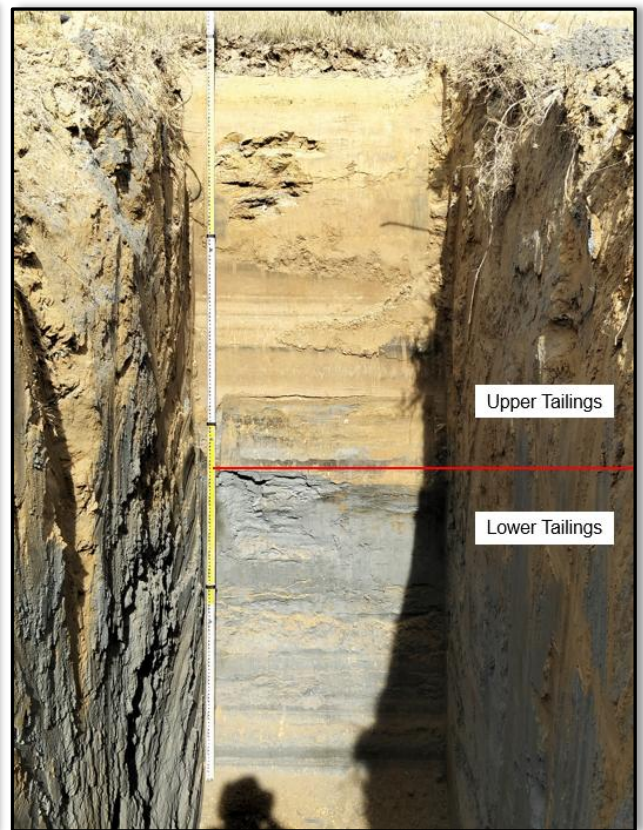


Plate 35. Test pit sidewall at TP7.

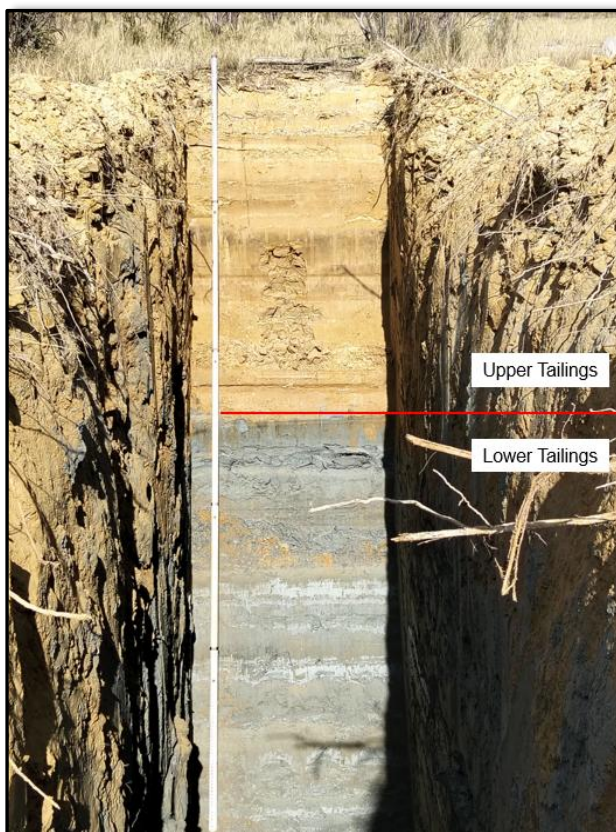


Plate 36. Sandstone at base of TP8.



Plate 37. Test pit sidewall at TP10.





Plate 38. Test pit sidewall at TP11.

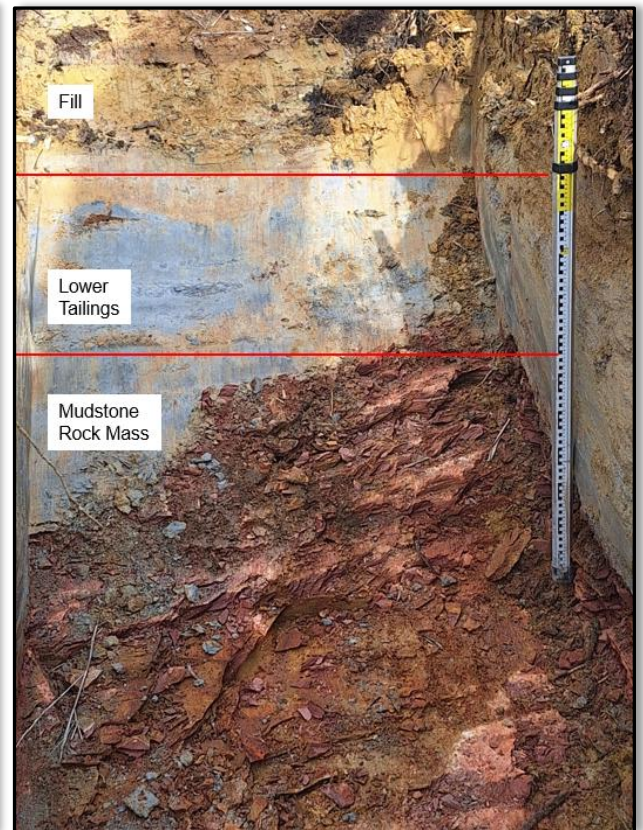


Plate 39. Test pit sidewall at TP13.

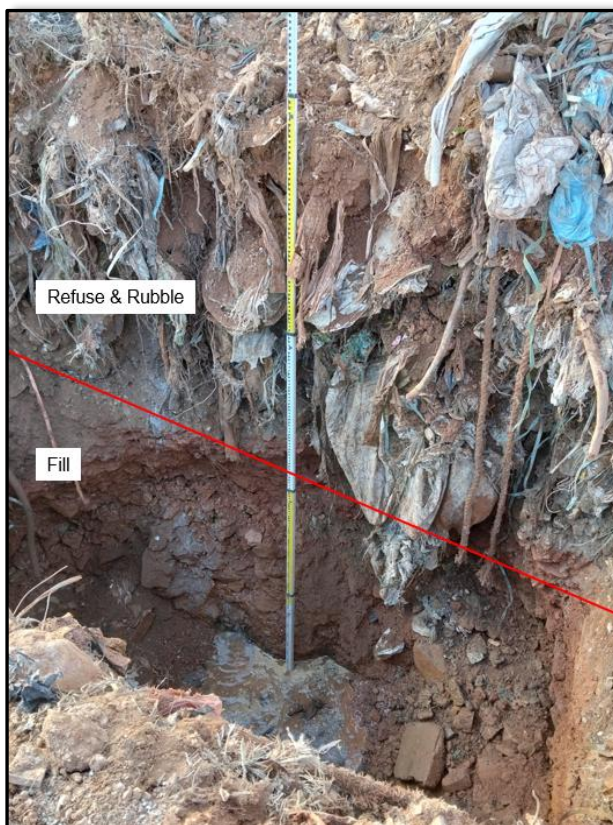


Plate 40. Test pit sidewall at TP14.

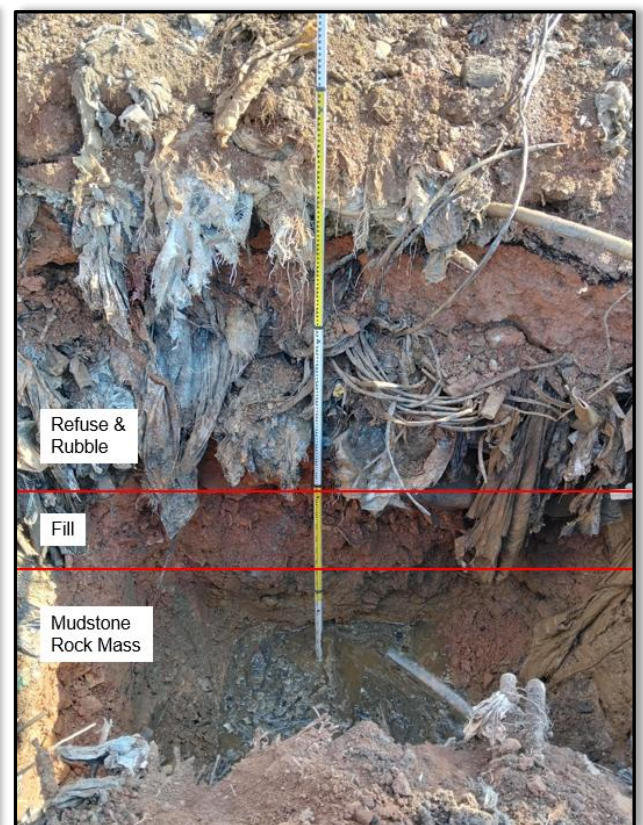


Plate 41. Test pit sidewall at TP16.





Plate 42. Test pit sidewall at TP17.

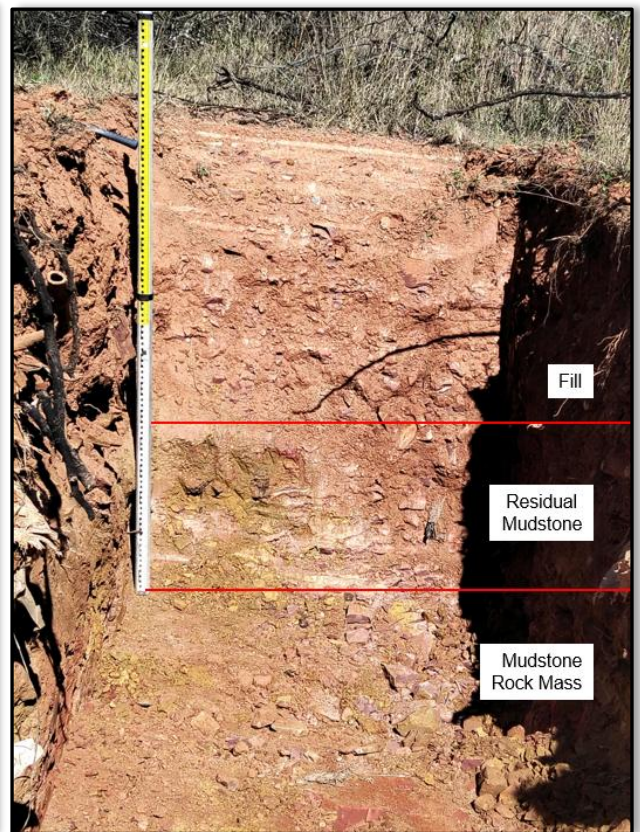


Plate 43. Test pit sidewall at TP18.

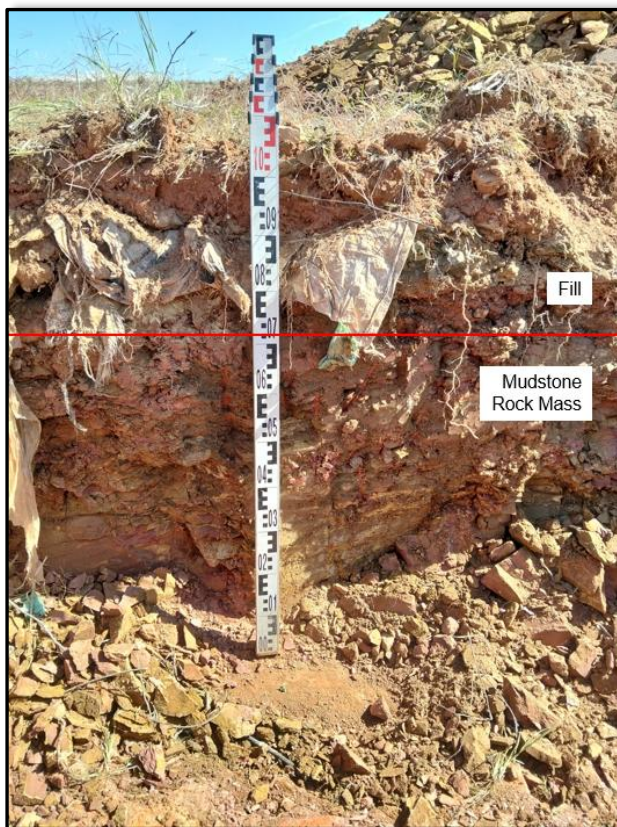


Plate 44. Test pit sidewall at TP19.

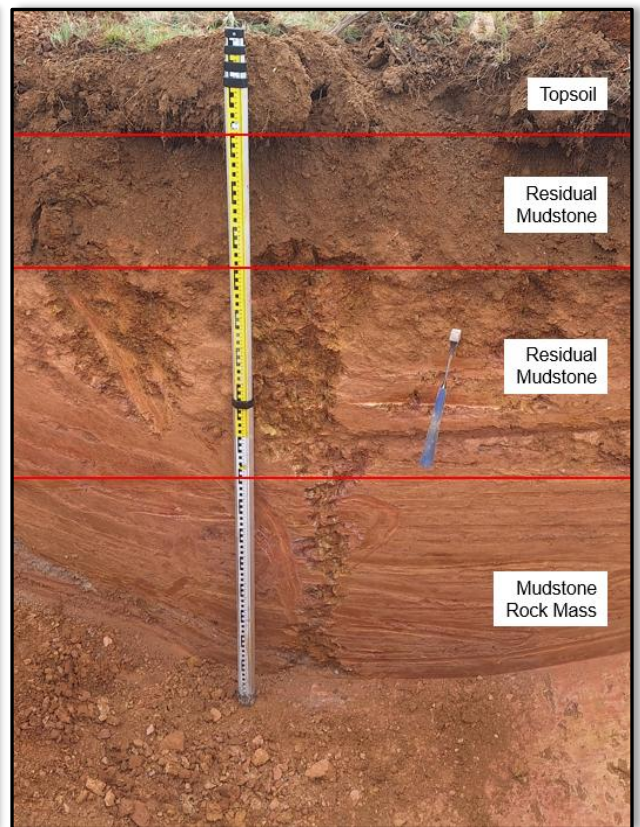


Plate 45. Test pit sidewall at TP21.



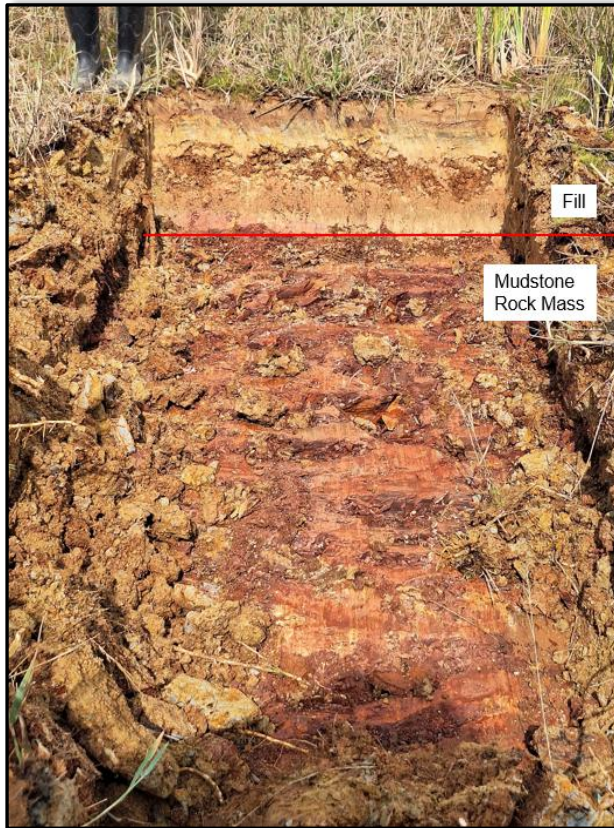


Plate 46. Test pit sidewall at TP22.



Plate 47. Excavation on bedrock at TP23.



Plate 48. Saturated test pit at TP24.



Plate 49. Saturated test pit at TP25.





Plate 50. Test pit sidewall at TP26.

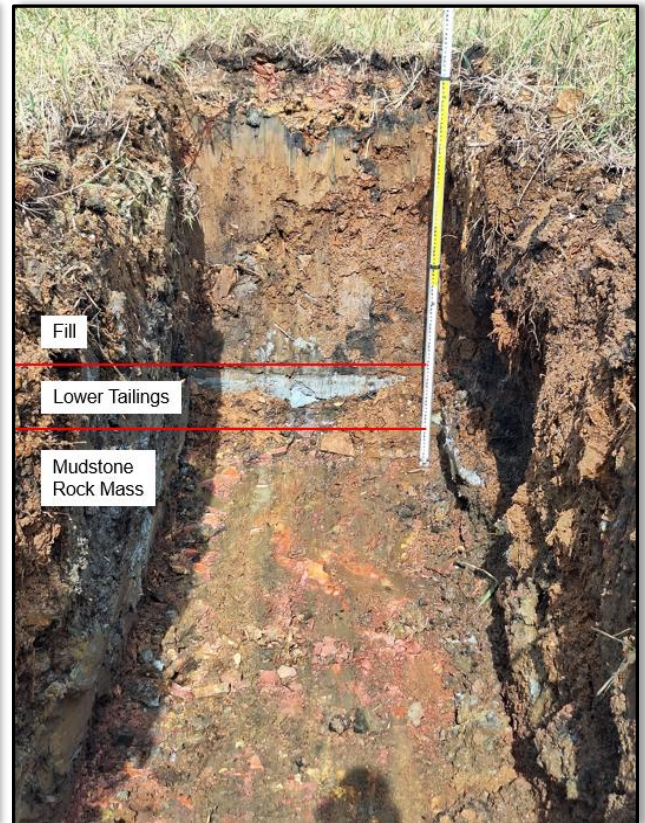


Plate 51. Test pit sidewall at TP29.

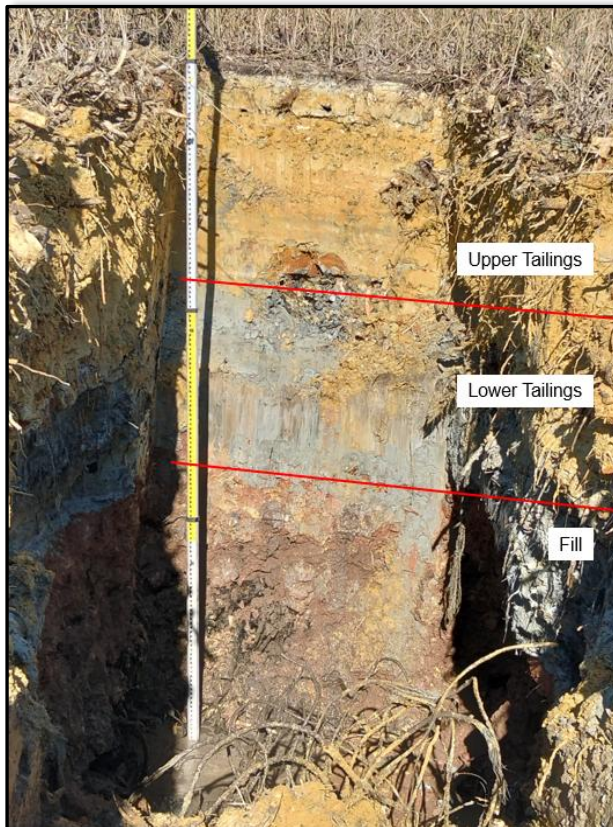


Plate 52. Test pit sidewall at TP31.

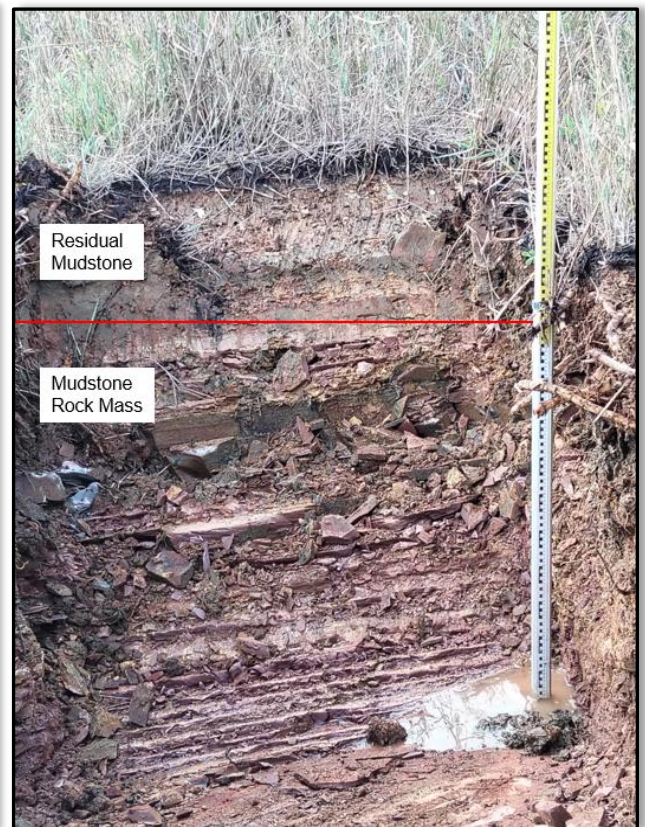


Plate 53. Test pit sidewall at TP32.



**APPENDIX B**

***TEST PIT LOGS***



Scale  
1:30



0.00

Slightly moist, reddish brown spotted grey, stiff to firm with depth, intact, sandy clayey SILT, with abundant gravel of various origin. **FILL.**

**Note:**

TP1 excavated next to paddock embankment, tailings area north and south is saturated.

0.40

Wet, orange stained grey, soft, intact, slightly sandy and clayey SILT. **OXIDISED TAILINGS.**

1.50

Wet, grey, soft to very soft, intact and layered, slightly clayey SILT. **FRESH TAILINGS.**

3.80

EOH: Excavator stopped in very soft TAILINGS due to continuous collapse of sidewalls.

**NOTES**

- 1) No groundwater seepage encountered.
- 2) TP3?? Excavated next to road embankment, tailings area north and south is saturated.
- 3) Test pit logged in-situ to only 1.5m depth due to unstable sidewalls.
- 4) Pipeline at surface next to road connecting from TSF upper compartment.

CONTRACTOR :  
MACHINE : 20-ton Excavator Smooth Blade  
DRILLED BY :  
PROFIED BY : J Heyneke

TYPE SET BY : ET  
SETUP FILE : JVTLO.SET

INCLINATION : Vertical  
DIAM :  
DATE : 14 May 2025  
DATE : 14 May 2025

DATE : 04/06/2025 20:33  
TEXT : C:\WP51\PROFILES\P134TP.TXT

COORDINATE SYSTEM : WGS84 (Lo27)  
X-COORD : 2927480  
Y-COORD : -40569

**HOLE No: TP1**



MPONENG MINE  
TAILINGS STORAGE FACILITY  
LOWER COMPARTMENT

GEOTECHNICAL INVESTIGATION

HOLE No: TP2  
Sheet 1 of 1

JOB: P134

Scale  
1:30

0.00

Slightly moist to moist, yellow brown, firm tending to soft with depth, layered, slightly sandy and clayey SILT. **OXIDISED TAILINGS.**

1.90

Moist, grey banded dark grey, very soft, intact and bedded, slightly clayey sandy SILT. **FRESH TAILINGS.**

5.00

EOH: Excavator stopped on end of reach in soft TAILINGS.

NOTES

- 1) No groundwater seepage encountered.
- 2) Test pit sidewalls partially stable, logged in-situ only to 2.5m depth.

CONTRACTOR :  
MACHINE : 20-ton Excavator Smooth Blade  
DRILLED BY :  
PROFILED BY : J Heyneke

TYPE SET BY : ET  
SETUP FILE : JVTLO.SET

INCLINATION : Vertical

DIAM :  
DATE : 14 May 2025  
DATE : 14 May 2025

DATE : 04/06/2025 20:33  
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X-COORD : 2927723  
Y-COORD : -40577

HOLE No: TP2



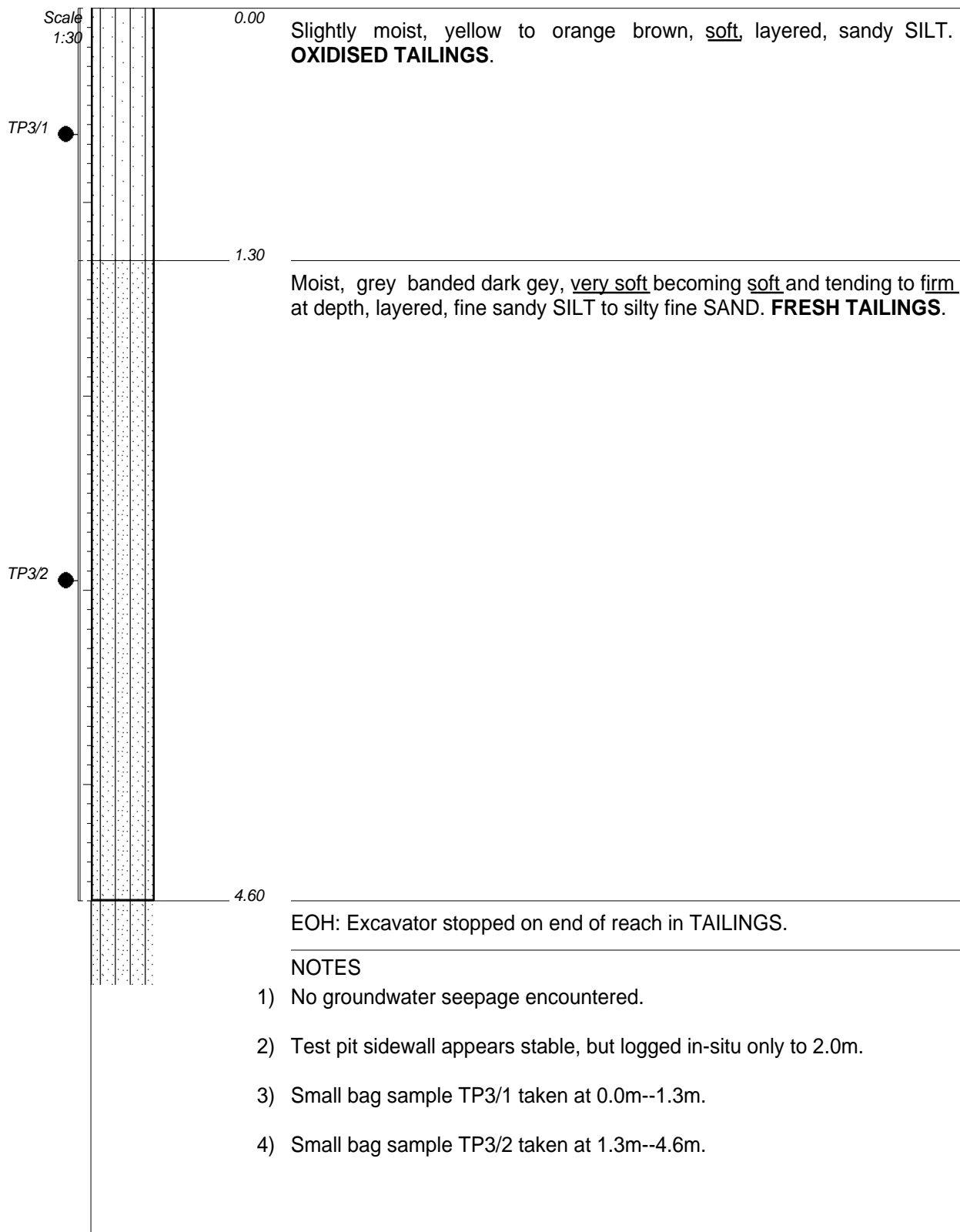


MPONENG MINE  
TAILINGS STORAGE FACILITY  
LOWER COMPARTMENT

GEOTECHNICAL INVESTIGATION

HOLE No: TP3  
Sheet 1 of 1

JOB: P134

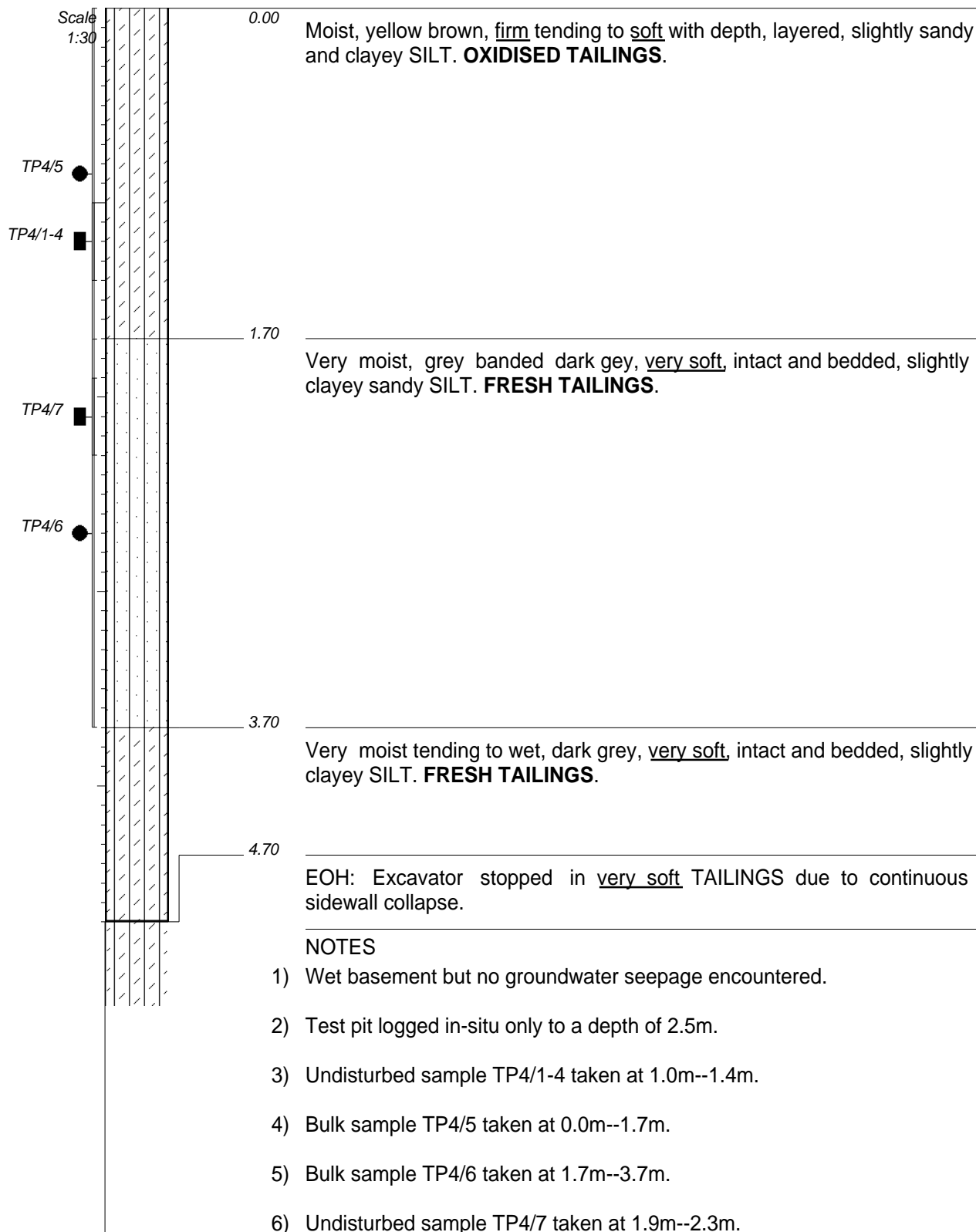


CONTRACTOR :  
MACHINE : 20-ton Excavator Smooth Blade  
DRILLED BY :  
PROFILED BY : J Heyneke  
TYPE SET BY : ET  
SETUP FILE : JVTLO.SET

INCLINATION : Vertical  
DIAM :  
DATE : 14 May 2025  
DATE : 14 May 2025  
DATE : 04/06/2025 20:33  
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COORDINATE SYSTEM : WGS84 (Lo27)  
X-COORD : 2927774  
Y-COORD : -40310

HOLE No: TP3



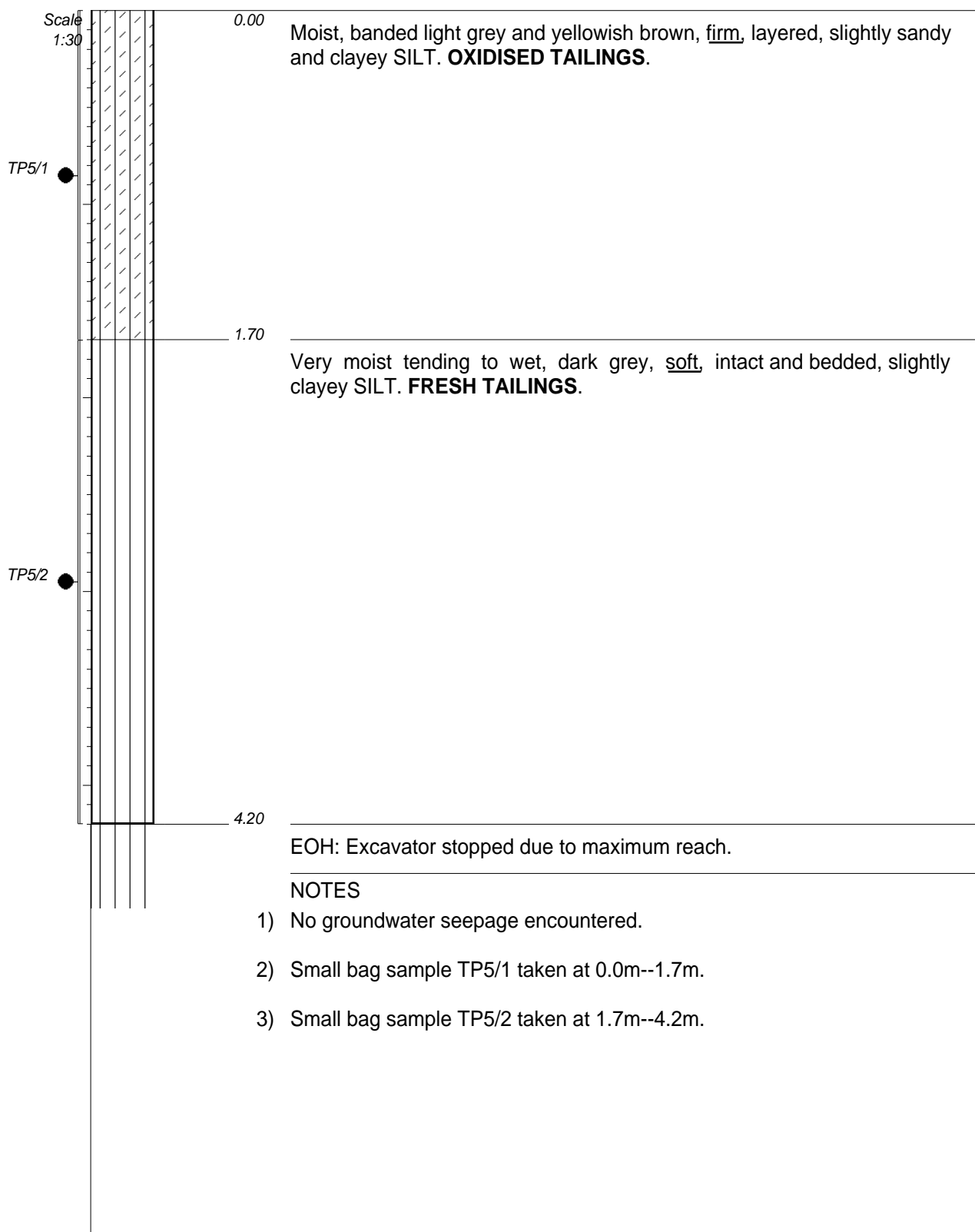
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MACHINE : 20-ton Excavator Smooth Blade  
DRILLED BY :  
PROFIED BY : J Heyneke  
TYPE SET BY : ET  
SETUP FILE : JVTLO.SET

INCLINATION : Vertical  
DIAM :  
DATE : 14 May 2025  
DATE : 14 May 2025  
DATE : 04/06/2025 20:33  
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Y-COORD : -40693

**HOLE No: TP4**



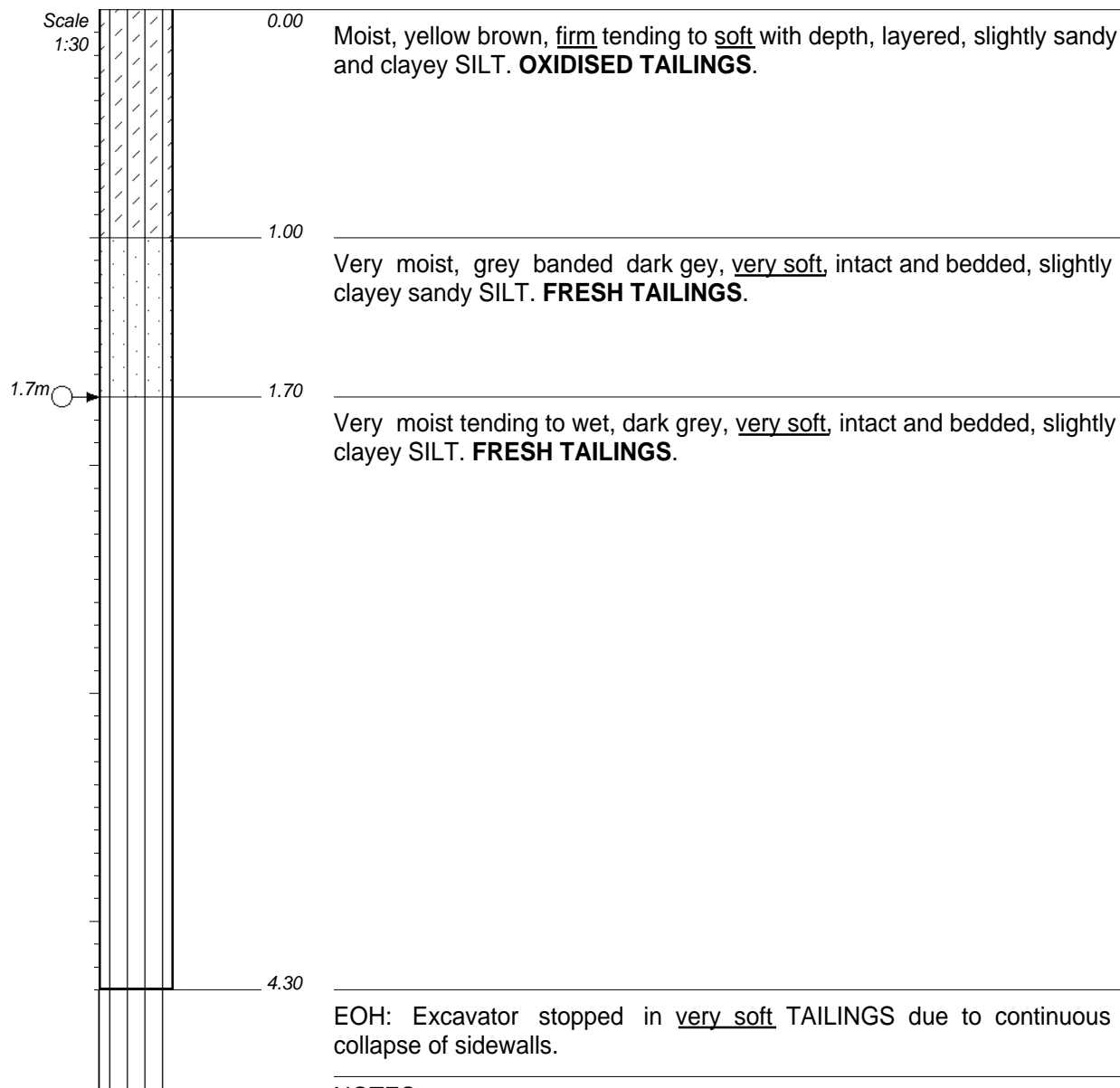


CONTRACTOR :  
MACHINE : 20-ton Excavator Smooth Blade  
DRILLED BY :  
PROFIED BY : J Heyneke  
TYPE SET BY : ET  
SETUP FILE : JVTLO.SET

INCLINATION : Vertical  
DIAM :  
DATE : 14 May 2025  
DATE : 14 May 2025  
DATE : 04/06/2025 20:33  
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COORDINATE SYSTEM : WGS84 (Lo27)  
X-COORD : 2927554  
Y-COORD : -40932

**HOLE No: TP5**



**NOTES**

- 1) Very slight groundwater seepage encountered at 1.7m.
- 2) Test pit logged in-situ to a depth of 1.5m.

CONTRACTOR :  
MACHINE : 20-ton Excavator Smooth Blade  
DRILLED BY :  
PROFIED BY : J Heyneke  
TYPE SET BY : ET  
SETUP FILE : JVTLO.SET

INCLINATION : Vertical  
DIAM :  
DATE : 14 May 2025  
DATE : 14 May 2025  
DATE : 04/06/2025 20:33  
TEXT : C:\WP51\PROFILES\134TP.TXT

COORDINATE SYSTEM : WGS84 (Lo27)  
X-COORD : 2927336  
Y-COORD : -41046

**HOLE No: TP6**





MPONENG MINE  
TAILINGS STORAGE FACILITY  
LOWER COMPARTMENT

GEOTECHNICAL INVESTIGATION

HOLE No: TP7  
Sheet 1 of 1

JOB: P134

Scale  
1:30

0.00

Moist, yellow brown, firm, layered, slightly sandy and clayey SILT.  
**OXIDISED TAILINGS.**

1.80

Very moist, grey banded dark grey, soft, intact and bedded, slightly clayey  
sandy SILT. **FRESH TAILINGS.**

4.00

EOH: Excavator stopped due to maximum reach.

NOTES

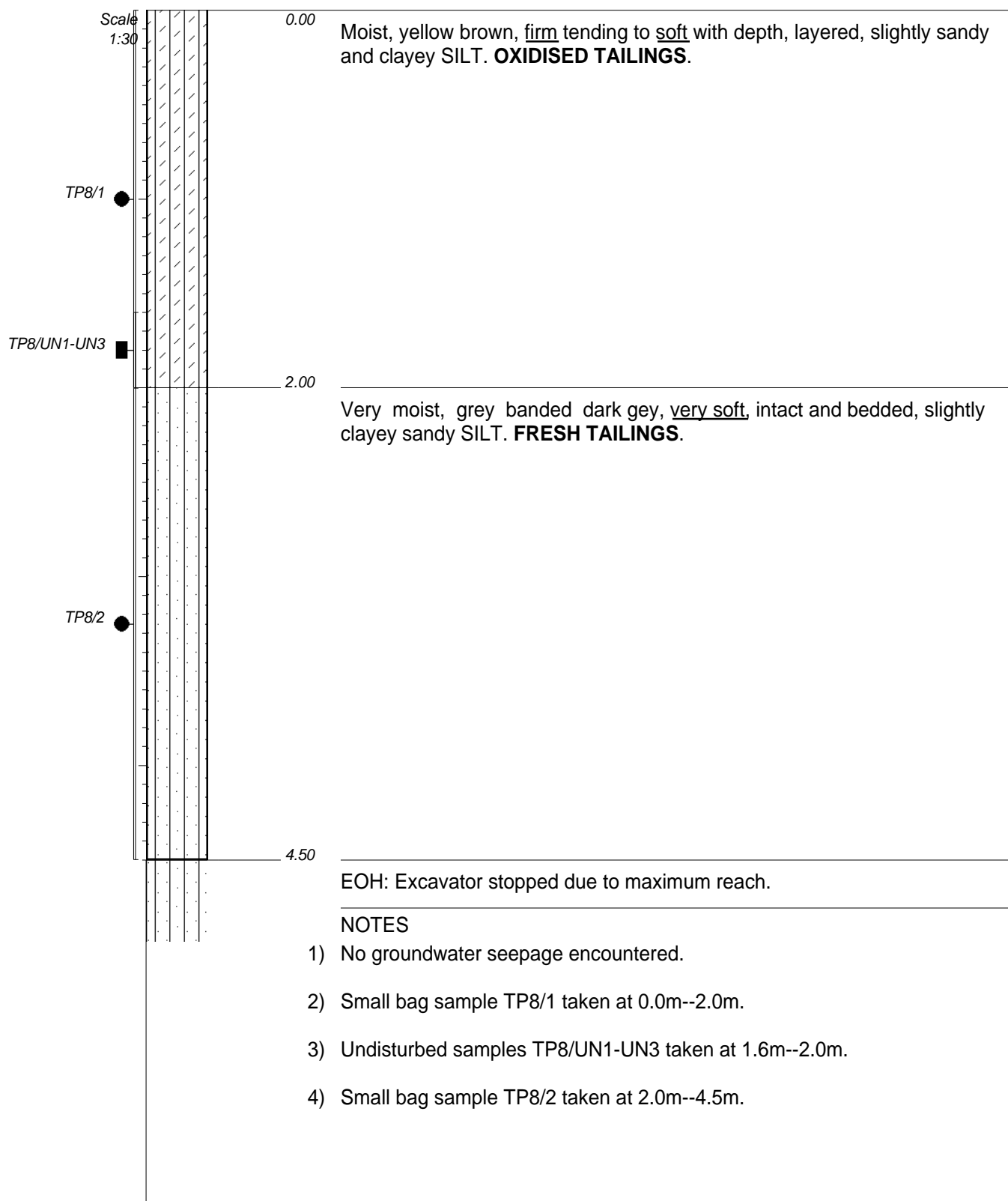
- 1) No groundwater seepage encountered.

CONTRACTOR :  
MACHINE : 20-ton Excavator Smooth Blade  
DRILLED BY :  
PROFILED BY : J Heyneke  
TYPE SET BY : ET  
SETUP FILE : JVTLO.SET

INCLINATION : Vertical  
DIAM :  
DATE : 14 May 2025  
DATE : 14 May 2025  
DATE : 04/06/2025 20:33  
TEXT : C:\WP51\PROFILES\P134TP.TXT

COORDINATE SYSTEM : WGS84 (Lo27)  
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Y-COORD : -41307

HOLE No: TP7



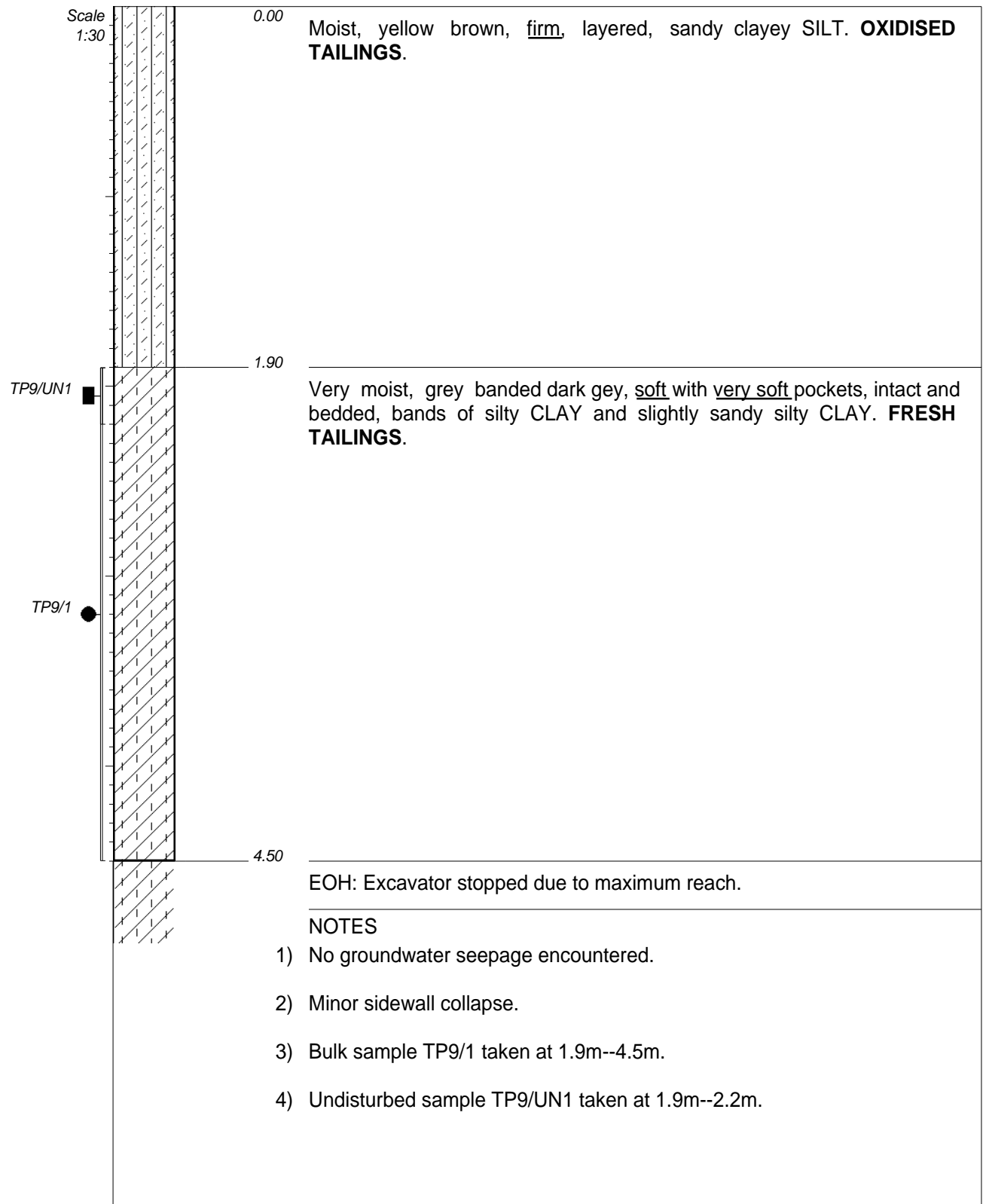
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DRILLED BY :  
PROFILED BY : J Heyneke  
TYPE SET BY : ET  
SETUP FILE : JVTLO.SET

INCLINATION : Vertical  
DIAM :  
DATE : 14 May 2025  
DATE : 14 May 2025  
DATE : 04/06/2025 20:33  
TEXT : C:\WP51\PROFILES\P134TP.TXT

COORDINATE SYSTEM : WGS84 (Lo27)  
X-COORD : 2927089  
Y-COORD : -41419

**HOLE No: TP8**



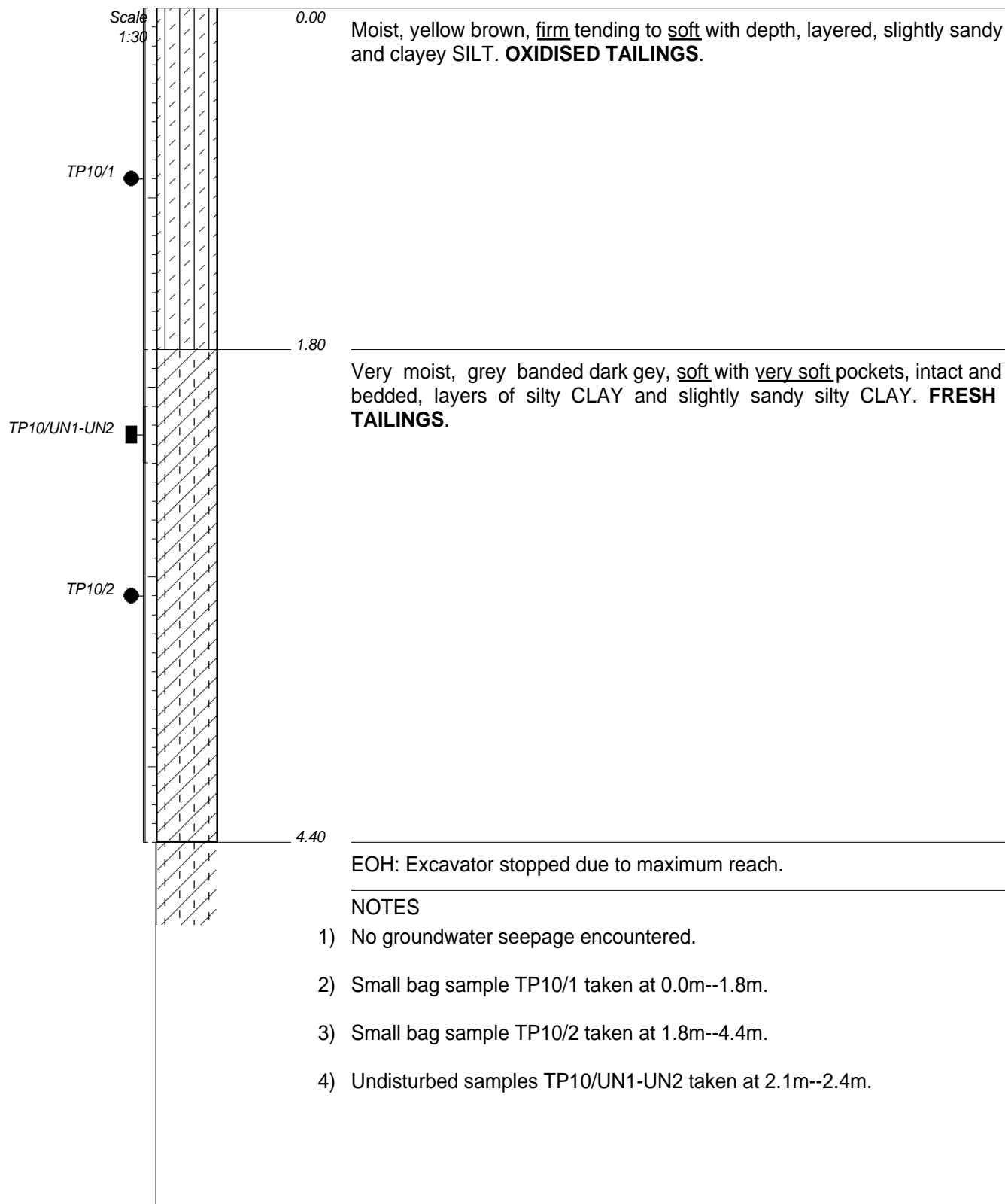


CONTRACTOR :  
MACHINE : 20-ton Excavator Smooth Blade  
DRILLED BY :  
PROFILED BY : J Heyneke  
TYPE SET BY : ET  
SETUP FILE : JVTLO.SET

INCLINATION : Vertical  
DIAM :  
DATE : 14 May 2025  
DATE : 14 May 2025  
DATE : 04/06/2025 20:33  
TEXT : C:\WP51\PROFILES\134TP.TXT

COORDINATE SYSTEM : WGS84 (Lo27)  
X-COORD : 2927039  
Y-COORD : -41675

**HOLE No: TP9**



CONTRACTOR :  
MACHINE : 20-ton Excavator Smooth Blade  
DRILLED BY :  
PROFILED BY : J Heyneke  
TYPE SET BY : ET  
SETUP FILE : JVTLO.SET

INCLINATION : Vertical  
DIAM :  
DATE : 14 May 2025  
DATE : 14 May 2025  
DATE : 04/06/2025 20:33  
TEXT : C:\WP51\PROFILES\P134TP.TXT

COORDINATE SYSTEM : WGS84 (Lo27)  
X-COORD : 2926880  
Y-COORD : -41664

**HOLE No: TP10**





MPONENG MINE  
TAILINGS STORAGE FACILITY  
LOWER COMPARTMENT

GEOTECHNICAL INVESTIGATION

HOLE No: TP11  
Sheet 1 of 1

JOB: P134

Scale  
1:30

0.00

Moist, yellow brown, firm tending to soft with depth, layered, slightly sandy and clayey SILT. **OXIDISED TAILINGS.**

1.60

Very moist tending to wet, dark grey, very soft, intact and bedded, slightly clayey SILT. **FRESH TAILINGS.**

4.80

EOH: Excavator stopped in very soft TAILINGS.

NOTES

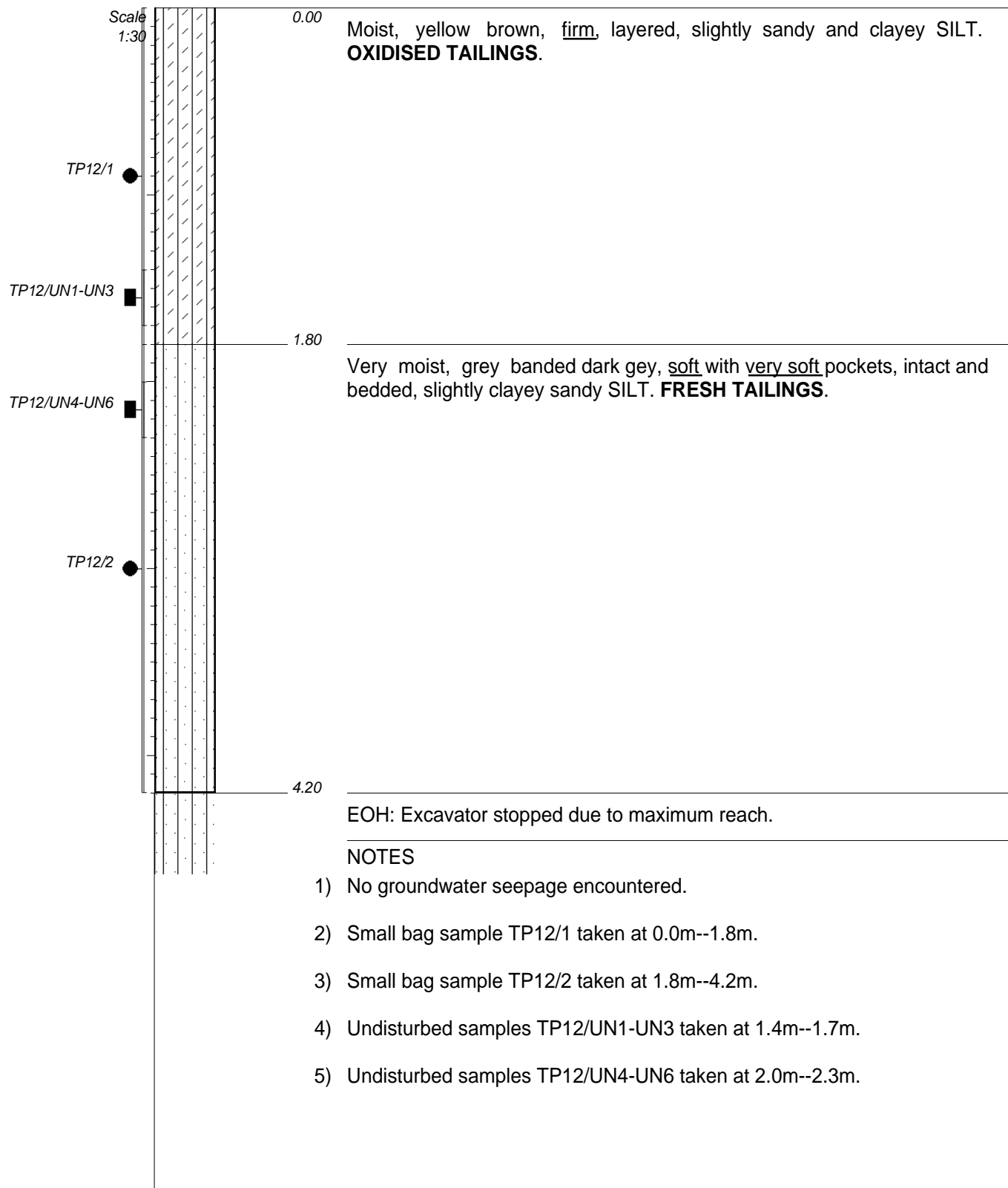
- 1) No groundwater seepage encountered.

CONTRACTOR :  
MACHINE : 20-ton Excavator Smooth Blade  
DRILLED BY :  
PROFILED BY : J Heyneke  
TYPE SET BY : ET  
SETUP FILE : JVTLO.SET

INCLINATION : Vertical  
DIAM :  
DATE : 14 May 2025  
DATE : 14 May 2025  
DATE : 04/06/2025 20:33  
TEXT : C:\WP51\PROFILES\P134TP.TXT

COORDINATE SYSTEM : WGS84 (Lo27)  
X-COORD : 2926797  
Y-COORD : -41451

HOLE No: TP11



CONTRACTOR :  
MACHINE : 20-ton Excavator Smooth Blade  
DRILLED BY :  
PROFILED BY : J Heyneke  
TYPE SET BY : ET  
SETUP FILE : JVTLO.SET

INCLINATION : Vertical  
DIAM :  
DATE : 14 May 2025  
DATE : 14 May 2025  
DATE : 04/06/2025 20:33  
TEXT : C:\WP51\PROFILES\134TP.TXT

COORDINATE SYSTEM : WGS84 (Lo27)  
X-COORD : 2926613  
Y-COORD : -41450

**HOLE No: TP12**





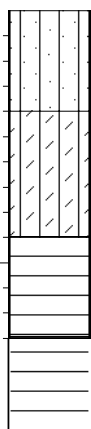
MPONENG MINE  
TAILINGS STORAGE FACILITY  
LOWER COMPARTMENT

GEOTECHNICAL INVESTIGATION

HOLE No: TP13  
Sheet 1 of 1

JOB: P134

Scale  
1:30



0.00

Moist, yellow brown to orange, soft to firm, intact, sandy SILT, with minor gravel. **OXIDISED TAILINGS.**

0.40

Slightly moist, grey, stiff, layered, slightly fine sandy and clayey SILT. **FRESH TAILINGS.**

0.90

Highly weathered, brownish red, bedded, very soft to soft rock SHALE.

1.30

EOH: Excavator stopped in soft rock SHALE.

NOTES

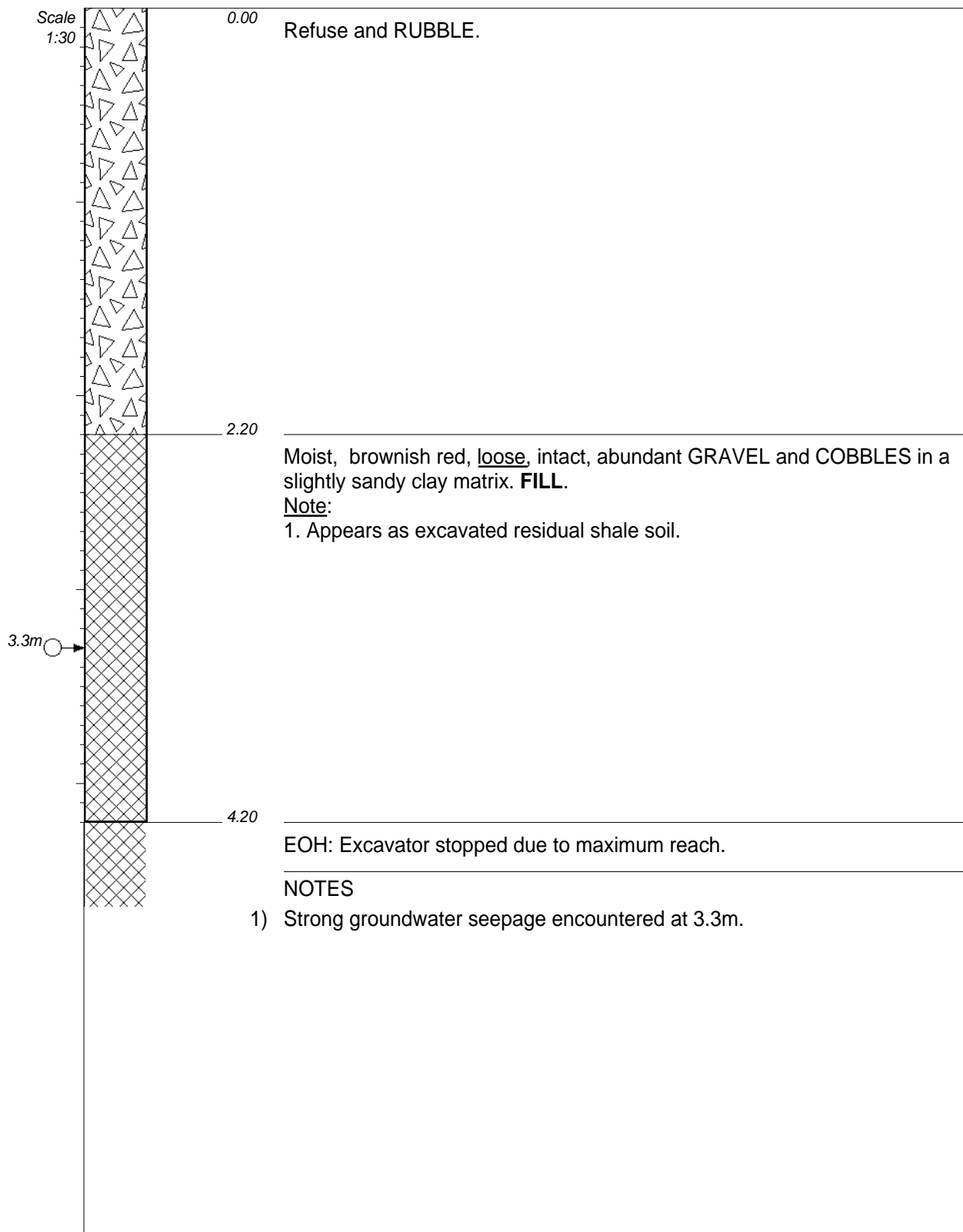
- 1) No groundwater seepage encountered.

CONTRACTOR :  
MACHINE : 20-ton Excavator Smooth Blade  
DRILLED BY :  
PROFILED BY : J Heyneke  
TYPE SET BY : ET  
SETUP FILE : JVTLO.SET

INCLINATION : Vertical  
DIAM :  
DATE : 14 May 2025  
DATE : 14 May 2025  
DATE : 04/06/2025 20:33  
TEXT : C:\WP51\PROFILES\TP134TP.TXT

COORDINATE SYSTEM : WGS84 (Lo27)  
X-COORD : 2926647  
Y-COORD : -41258

HOLE No: TP13



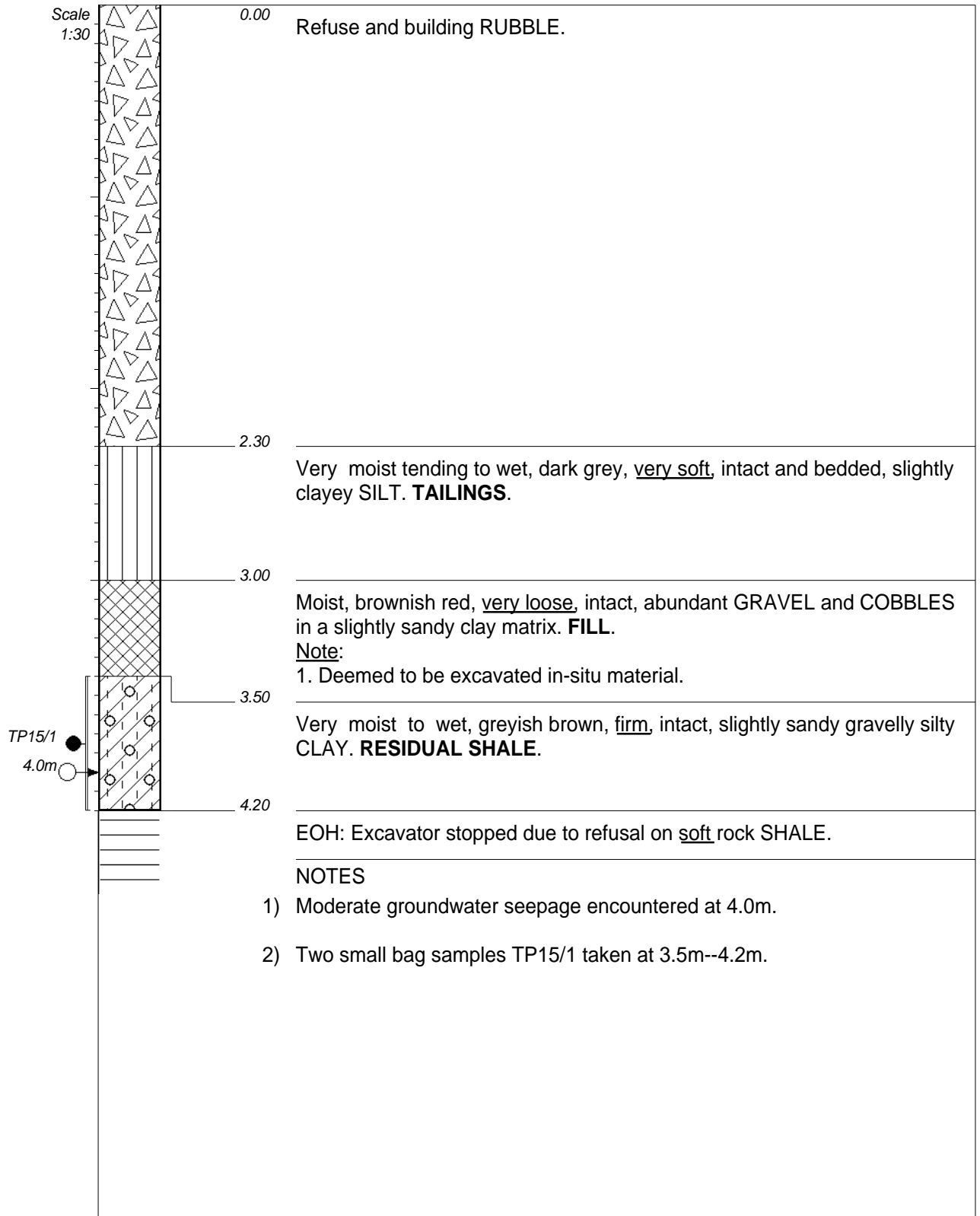
CONTRACTOR :  
MACHINE : 20-ton Excavator Smooth Blade  
DRILLED BY :  
PROFILED BY : J Heyneke  
TYPE SET BY : ET  
SETUP FILE : JVTLO.SET

INCLINATION : Vertical  
DIAM :  
DATE : 14 May 2025  
DATE : 14 May 2025  
DATE : 04/06/2025 20:33  
TEXT : C:\WP51\PROFILES\TP134TP.TXT

COORDINATE SYSTEM : WGS84 (Lo27)  
X-COORD : 2926745  
Y-COORD : -41300

**HOLE No: TP14**





CONTRACTOR :  
MACHINE : 20-ton Excavator Smooth Blade  
DRILLED BY :  
PROFILED BY : J Heyneke

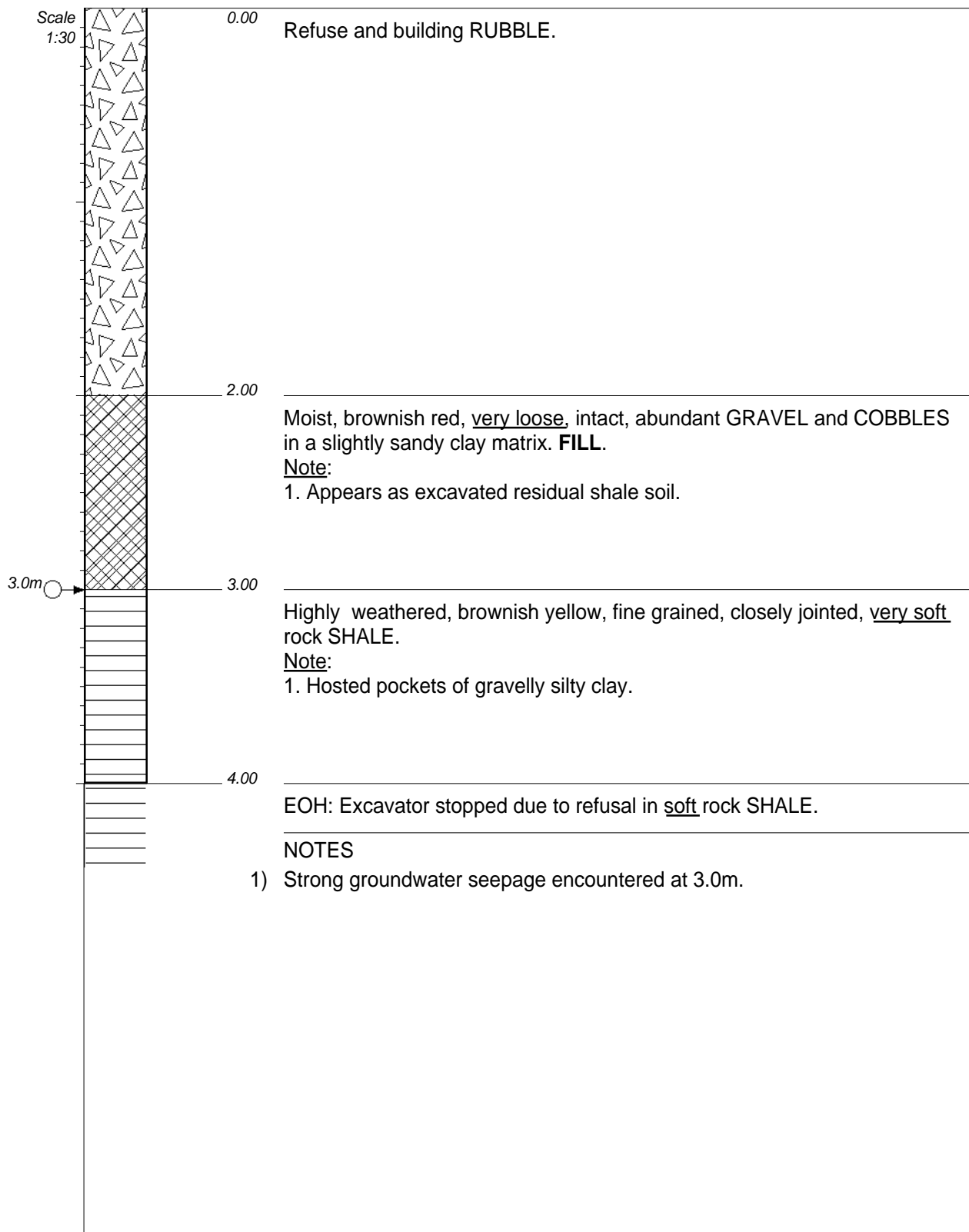
TYPE SET BY : ET  
SETUP FILE : JVTLO.SET

INCLINATION : Vertical  
DIAM :  
DATE : 14 May 2025  
DATE : 14 May 2025

DATE : 04/06/2025 20:33  
TEXT : C:\WP51\PROFILES\P134TP.TXT

COORDINATE SYSTEM : WGS84 (Lo27)  
X-COORD : 2926844  
Y-COORD : -41297

**HOLE No: TP15**



CONTRACTOR :  
MACHINE : 20-ton Excavator Smooth Blade  
DRILLED BY :  
PROFIED BY : J Heyneke  
TYPE SET BY : ET  
SETUP FILE : JVTLO.SET

INCLINATION : Vertical  
DIAM :  
DATE : 14 May 2025  
DATE : 14 May 2025  
DATE : 04/06/2025 20:33  
TEXT : C:\WP51\PROFILES\P134TP.TXT

COORDINATE SYSTEM : WGS84 (Lo27)  
X-COORD : 2926826  
Y-COORD : -41205

**HOLE No: TP16**





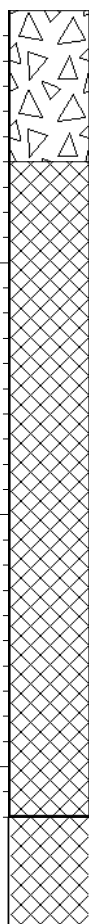
MPONENG MINE  
TAILINGS STORAGE FACILITY  
LOWER COMPARTMENT

GEOTECHNICAL INVESTIGATION

HOLE No: TP17  
Sheet 1 of 1

JOB: P134

Scale  
1:30



0.00

Refuse and building RUBBLE.

0.60

Moist, brownish red, very loose, intact, abundant GRAVEL and COBBLES in a slightly sandy clay matrix. **FILL**.

3.20

EOH: Excavator stopped due to continuous sidewall collapse.

NOTES

- 1) No groundwater seepage encountered.
- 2) Abundant refuse and building rubble at base of excavation. Likely next layer of dumped material.

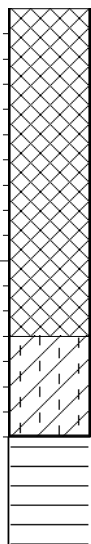
CONTRACTOR :  
MACHINE : 20-ton Excavator Smooth Blade  
DRILLED BY :  
PROFILED BY : J Heyneke  
TYPE SET BY : ET  
SETUP FILE : JVTLO.SET

INCLINATION : Vertical  
DIAM :  
DATE : 14 May 2025  
DATE : 14 May 2025  
DATE : 04/06/2025 20:33  
TEXT : C:\WP51\PROFILES\TP134TP.TXT

COORDINATE SYSTEM : WGS84 (Lo27)  
X-COORD : 2926899  
Y-COORD : -41157

HOLE No: TP17

Scale  
1:30



0.00

Moist, red, medium dense, intact, abundant GRAVEL and COBBLES, in a slightly sandy silty CLAY matrix. **FILL**, with abundant refuse near backside of excavation.

1.30

Moist, brownish yellow mottled red, firm, relict bedding, slightly sandy silty CLAY, with minor soft gravel. **RESIDUAL SHALE**.

Note:

Small rock pockets.

1.70

EOH: Excavator stopped due to refusal on highly weathered, purple, soft rock SHALE.

#### NOTES

- 1) No groundwater seepage encountered.

CONTRACTOR :  
MACHINE : 20-ton Excavator Smooth Blade  
DRILLED BY :  
PROFILED BY : J Heyneke

TYPE SET BY : ET  
SETUP FILE : JVTLO.SET

INCLINATION : Vertical

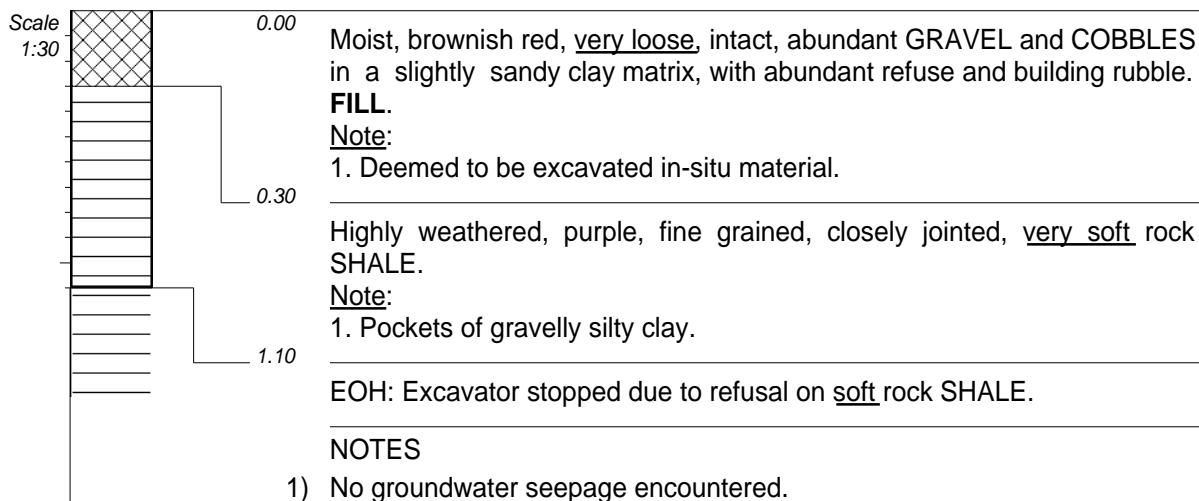
DIAM :  
DATE : 14 May 2025  
DATE : 14 May 2025

DATE : 04/06/2025 20:33  
TEXT : C:\WP51\PROFILES\P134TP.TXT

COORDINATE SYSTEM : WGS84 (Lo27)  
X-COORD : 2926832  
Y-COORD : -41089

**HOLE No: TP18**



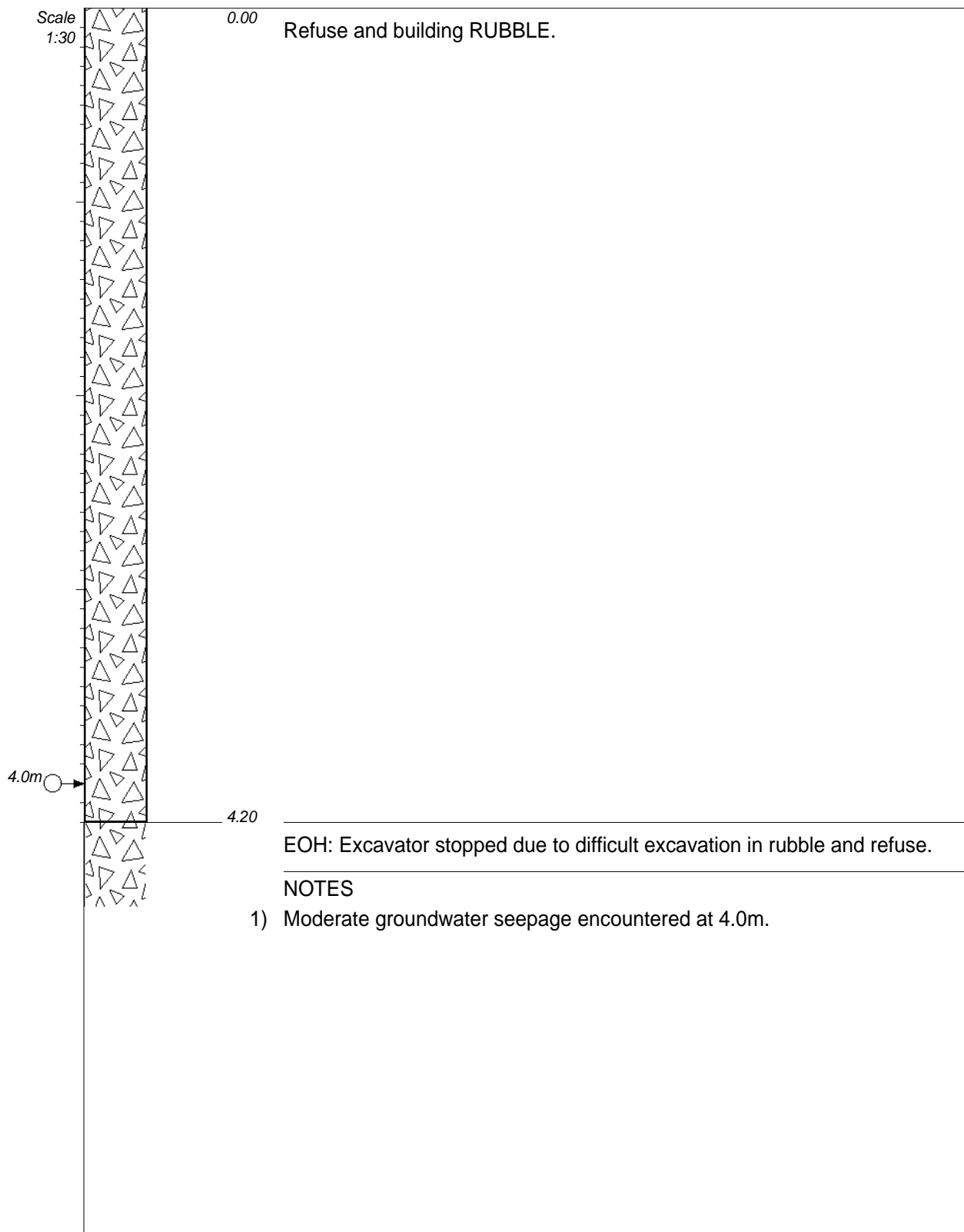


CONTRACTOR :  
MACHINE : 20-ton Excavator Smooth Blade  
DRILLED BY :  
PROFILED BY : J Heyneke  
TYPE SET BY : ET  
SETUP FILE : JVTLO.SET

INCLINATION : Vertical  
DIAM :  
DATE : 14 May 2025  
DATE : 14 May 2025  
DATE : 04/06/2025 20:33  
TEXT : C:\WP51\PROFILES\P134TP.TXT

COORDINATE SYSTEM : WGS84 (Lo27)  
X-COORD : 2926745  
Y-COORD : -41070

**HOLE No: TP19**



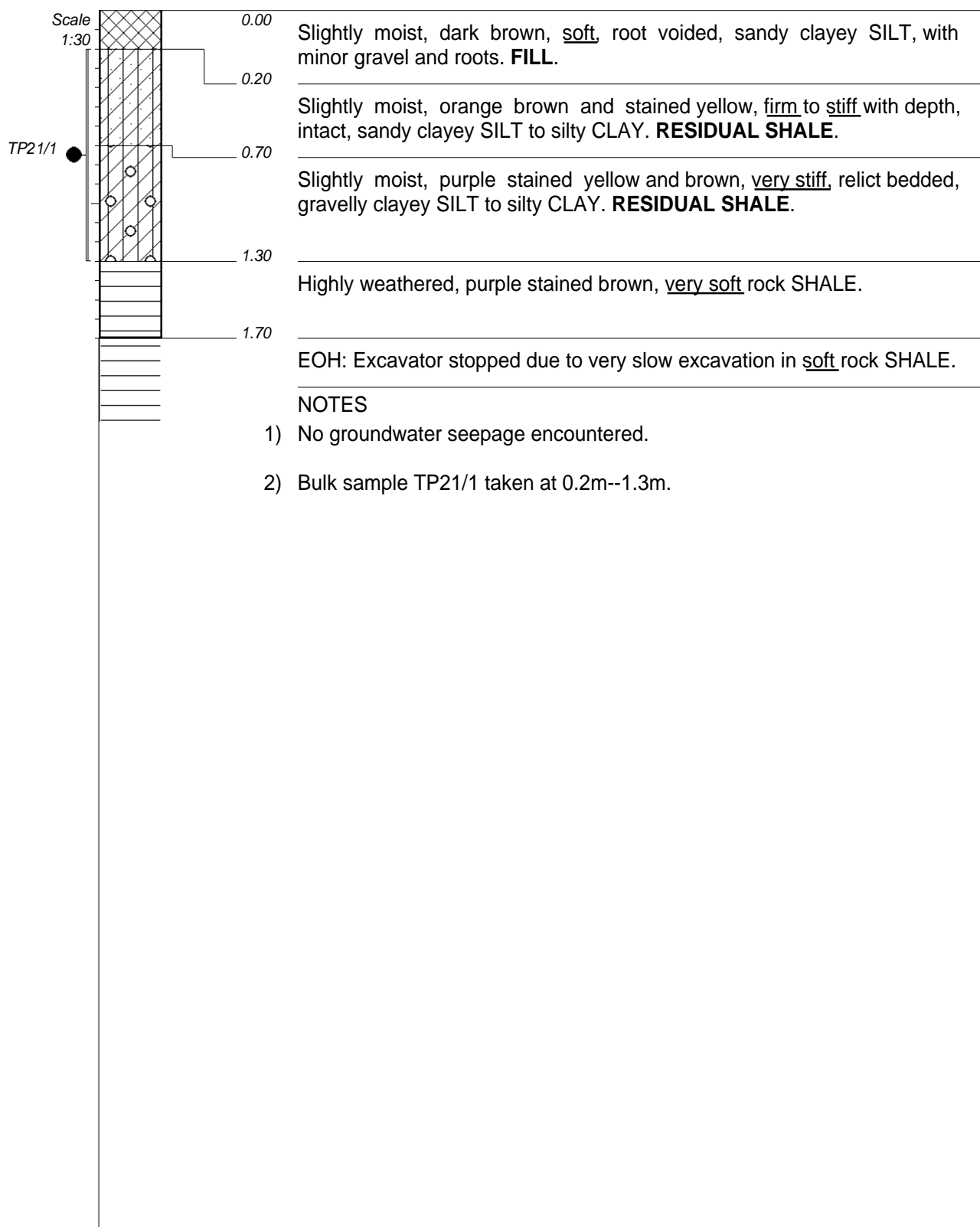
CONTRACTOR :  
MACHINE : 20-ton Excavator Smooth Blade  
DRILLED BY :  
PROFILED BY : J Heyneke  
TYPE SET BY : ET  
SETUP FILE : JVTLO.SET

INCLINATION : Vertical  
DIAM :  
DATE : 14 May 2025  
DATE : 14 May 2025  
DATE : 04/06/2025 20:33  
TEXT : C:\WP51\PROFILES\P134TP.TXT

COORDINATE SYSTEM : WGS84 (Lo27)  
X-COORD : 2926737  
Y-COORD : -41194

**HOLE No: TP20**





CONTRACTOR :  
MACHINE : 20-ton Excavator Smooth Blade  
DRILLED BY :  
PROFILED BY : J Heyneke  
TYPE SET BY : ET  
SETUP FILE : JVTLO.SET

INCLINATION : Vertical  
DIAM :  
DATE : 14 May 2025  
DATE : 14 May 2025  
DATE : 04/06/2025 20:33  
TEXT : C:\WP51\PROFILES\P134TP.TXT

COORDINATE SYSTEM : WGS84 (Lo27)  
X-COORD : 2926681  
Y-COORD : -41000

**HOLE No: TP21**



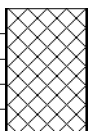
MPONENG MINE  
TAILINGS STORAGE FACILITY  
LOWER COMPARTMENT

GEOTECHNICAL INVESTIGATION

HOLE No: TP22  
Sheet 1 of 1

JOB: P134

Scale  
1:30



0.00

Moist to very moist, orange spotted brown to yellow, soft, intact, sandy clayey SILT, with abundant gravel. **FILL**.

0.50

EOH: Excavator refusal on soft rock SHALE.

NOTES

- 1) No groundwater seepage encountered.

CONTRACTOR :  
MACHINE : 20-ton Excavator Smooth Blade  
DRILLED BY :  
PROFILED BY : J Heyneke  
TYPE SET BY : ET  
SETUP FILE : JVTLO.SET

INCLINATION : Vertical  
DIAM :  
DATE : 14 May 2025  
DATE : 14 May 2025  
DATE : 04/06/2025 20:33  
TEXT : C:\WP51\PROFILES\P134TP.TXT

COORDINATE SYSTEM : WGS84 (Lo27)  
X-COORD : 2926730  
Y-COORD : -40817

HOLE No: TP22





MPONENG MINE  
TAILINGS STORAGE FACILITY  
LOWER COMPARTMENT

GEOTECHNICAL INVESTIGATION

HOLE No: TP23  
Sheet 1 of 1

JOB: P134

Scale  
1:30



0.00

0.10

Dry, brown, soft, root voided, gravelly SILT, with fine roots. **FILL**.

EOH: Excavator refusal on soft rock SHALE.

NOTES

- 1) No groundwater seepage encountered.
- 2) Abundant SHALE outcrop next to test pit.

CONTRACTOR :  
MACHINE : 20-ton Excavator Smooth Blade  
DRILLED BY :  
PROFILED BY : J Heyneke  
TYPE SET BY : ET  
SETUP FILE : JVTLO.SET

INCLINATION : Vertical  
DIAM :  
DATE : 14 May 2025  
DATE : 14 May 2025  
DATE : 04/06/2025 20:33  
TEXT : C:\WP51\PROFILES\P134TP.TXT

COORDINATE SYSTEM : WGS84 (Lo27)  
X-COORD : 2926847  
Y-COORD : -40979

HOLE No: TP23



MPONENG MINE  
TAILINGS STORAGE FACILITY  
LOWER COMPARTMENT

GEOTECHNICAL INVESTIGATION

HOLE No: TP24  
Sheet 1 of 1

JOB: P134

Scale  
1:30

0.00

Wet, grey banded dark grey, very soft, intact and bedded, slightly clayey sandy SILT. **TAILINGS**.

3.00

Potentially bedrock, but cannot confirm.

3.10

EOH: Excavator stopped due to difficult excavation.

NOTES

- 1) Nature of potential bedrock unknown.
- 2) Water logged.

CONTRACTOR :  
MACHINE : 20-ton Excavator Smooth Blade  
DRILLED BY :  
PROFIED BY : J Heyneke  
TYPE SET BY : ET  
SETUP FILE : JVTLO.SET

INCLINATION : Vertical  
DIAM :  
DATE : 14 May 2025  
DATE : 14 May 2025  
DATE : 04/06/2025 20:33  
TEXT : C:\WP51\PROFILES\P134TP.TXT

COORDINATE SYSTEM : WGS84 (Lo27)  
X-COORD : 2927044  
Y-COORD : -40832

HOLE No: TP24





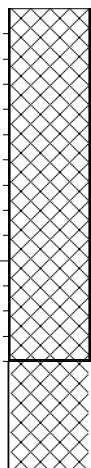
**MPONENG MINE  
TAILINGS STORAGE FACILITY  
LOWER COMPARTMENT**

**GEOTECHNICAL INVESTIGATION**

**HOLE No: TP25**  
**Sheet 1 of 1**

**JOB: P134**

Scale  
1:30



0.00

Paddock embankment FILL, comprising abundant rockfill in a sandy silty matrix.

1.40

EOH: Excavator stopped due to water ingress at surface level.

**NOTES**

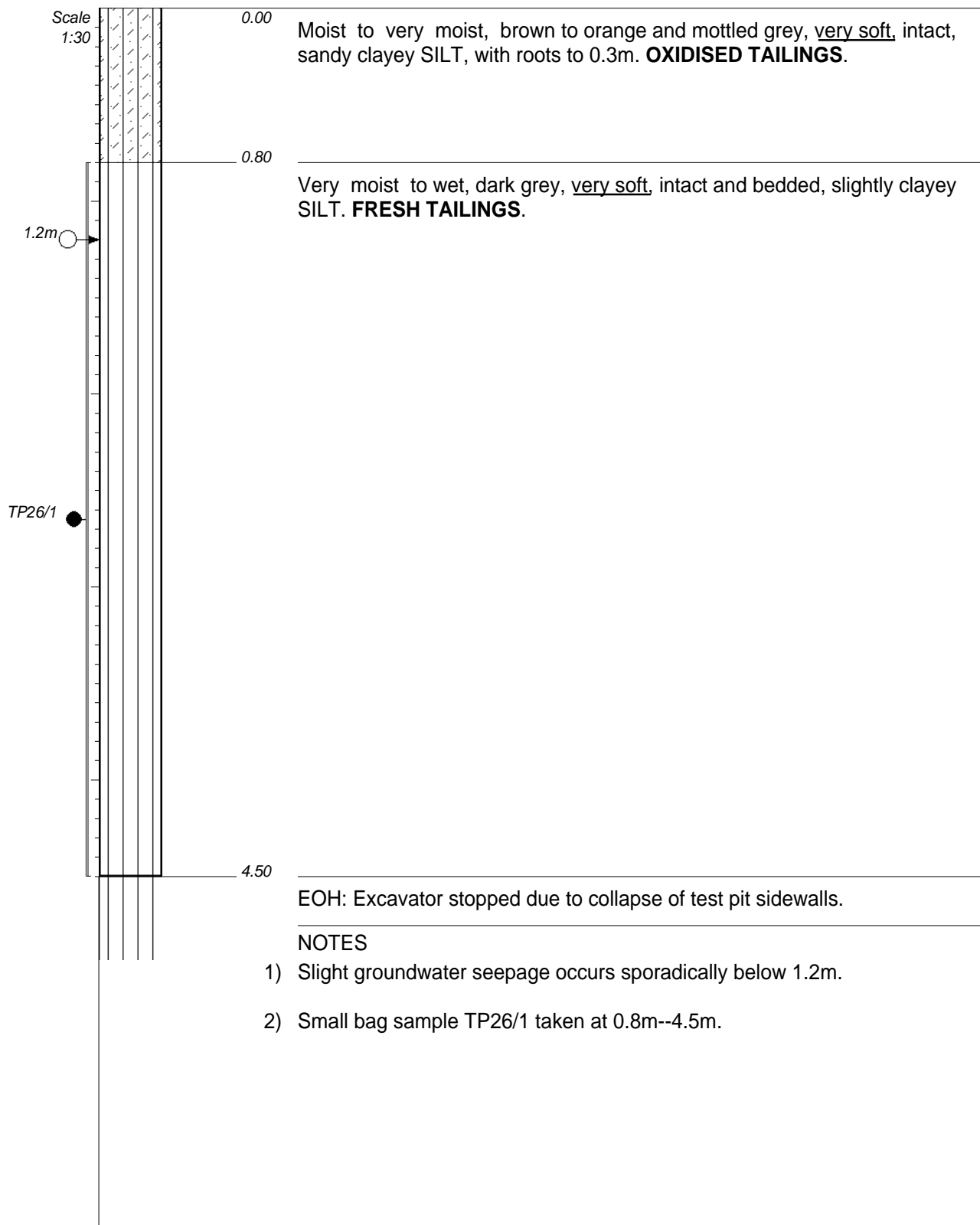
- 1) Surface water present at both sides of paddock embankment.

CONTRACTOR :  
MACHINE : 20-ton Excavator Smooth Blade  
DRILLED BY :  
PROFILED BY : J Heyneke  
TYPE SET BY : ET  
SETUP FILE : JVTLO.SET

INCLINATION : Vertical  
DIAM :  
DATE : 14 May 2025  
DATE : 14 May 2025  
DATE : 04/06/2025 20:33  
TEXT : C:\WP51\PROFILES\P134TP.TXT

COORDINATE SYSTEM : WGS84 (Lo27)  
X-COORD : 2927029  
Y-COORD : -41023

**HOLE No: TP25**



CONTRACTOR :  
MACHINE : 20-ton Excavator Smooth Blade  
DRILLED BY :  
PROFILED BY : J Heyneke  
TYPE SET BY : ET  
SETUP FILE : JVTLO.SET

INCLINATION : Vertical  
DIAM :  
DATE : 14 May 2025  
DATE : 14 May 2025  
DATE : 04/06/2025 20:33  
TEXT : C:\WP51\PROFILES\P134TP.TXT

COORDINATE SYSTEM : WGS84 (Lo27)  
X-COORD : 2927167  
Y-COORD : -41065

**HOLE No: TP26**



Scale  
1:30

0.00

Moist, yellow brown, firm tending to soft with depth, layered, slightly sandy and clayey SILT. **OXIDISED TAILINGS.**

1.50

Moist to very moist, dark grey, very soft, intact and bedded, layers of slightly clayey sandy SILT and slightly clayey SILT. **FRESH TAILINGS.**

4.50

EOH: Excavator stopped due to maximum reach.

**NOTES**

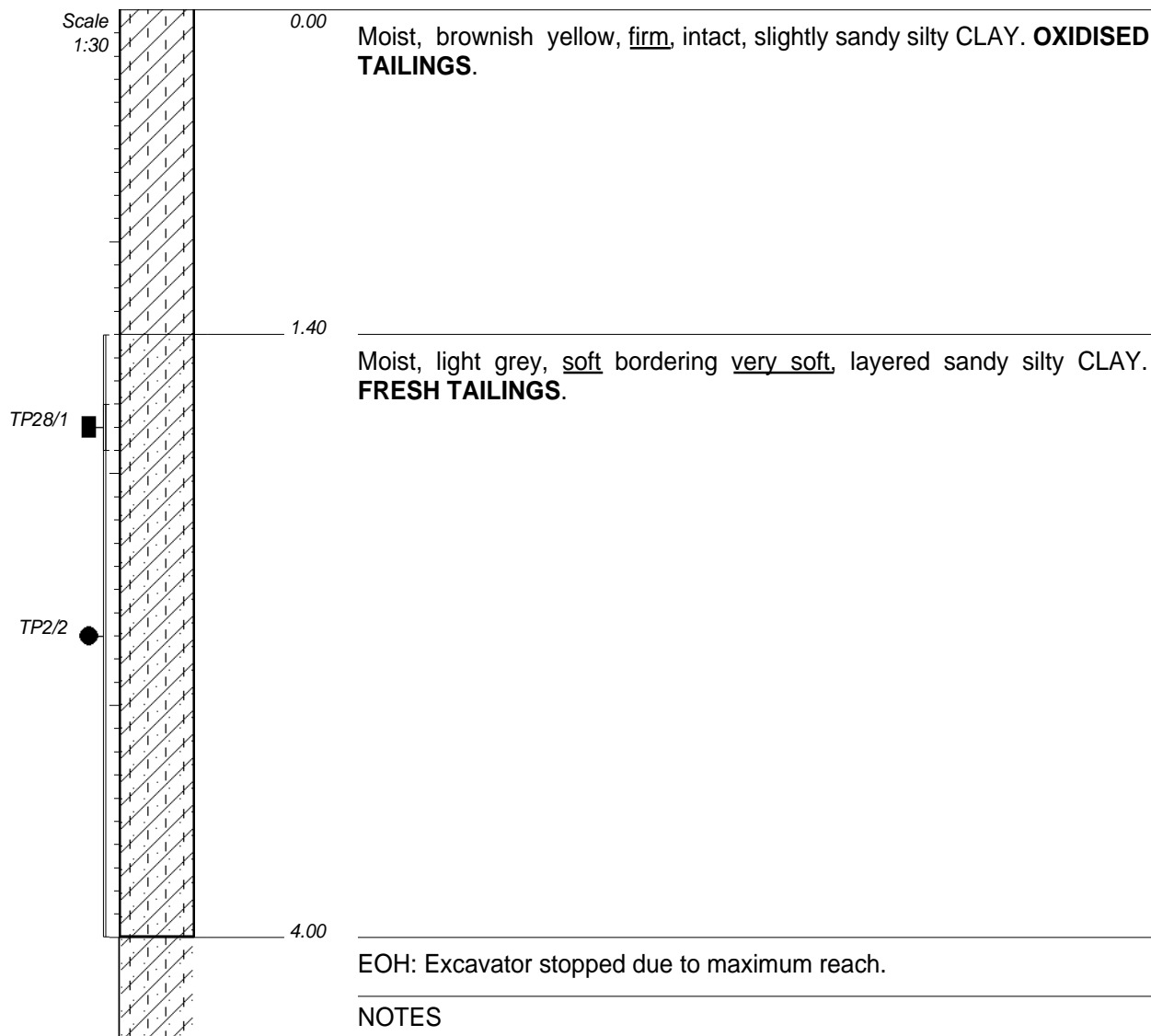
- 1) No groundwater seepage encountered.

CONTRACTOR :  
MACHINE : 20-ton Excavator Smooth Blade  
DRILLED BY :  
PROFILED BY : J Heyneke  
TYPE SET BY : ET  
SETUP FILE : JVTLO.SET

INCLINATION : Vertical  
DIAM :  
DATE : 14 May 2025  
DATE : 14 May 2025  
DATE : 04/06/2025 20:33  
TEXT : C:\WP51\PROFILES\P134TP.TXT

COORDINATE SYSTEM : WGS84 (Lo27)  
X-COORD : 2927035  
Y-COORD : -41262

**HOLE No: TP27**



EOH: Excavator stopped due to maximum reach.

**NOTES**

- 1) No groundwater seepage encountered.
- 2) Undisturbed sample TP28/1 taken at 1.7m--1.9m.
- 3) Bulk sample TP2/2 taken at 1.4m--4.0m.

CONTRACTOR :  
MACHINE : 20-ton Excavator Smooth Blade  
DRILLED BY :  
PROFILED BY : J Heyneke  
TYPE SET BY : ET  
SETUP FILE : JVTLO.SET

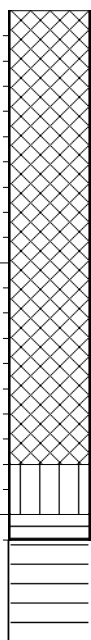
INCLINATION : Vertical  
DIAM :  
DATE : 14 May 2025  
DATE : 14 May 2025  
DATE : 04/06/2025 20:33  
TEXT : C:\WP51\PROFILES\P134TP.TXT

COORDINATE SYSTEM : WGS84 (Lo27)  
X-COORD :  
Y-COORD :

**HOLE No: TP28**



Scale  
1:30



0.00

Moist to wet, brown blotched black and orange, soft, intact to voided, sandy clayey SILT, with abundant gravel and cobbles of various origin. **FILL.**

1.80

Wet, grey, soft, intact, slightly sandy and clayey SILT. **TAILINGS.**

2.00

Highly weathered, brownish purple, soft rock SHALE.

2.10

EOH: Excavator refusal on soft rock SHALE.

**NOTES**

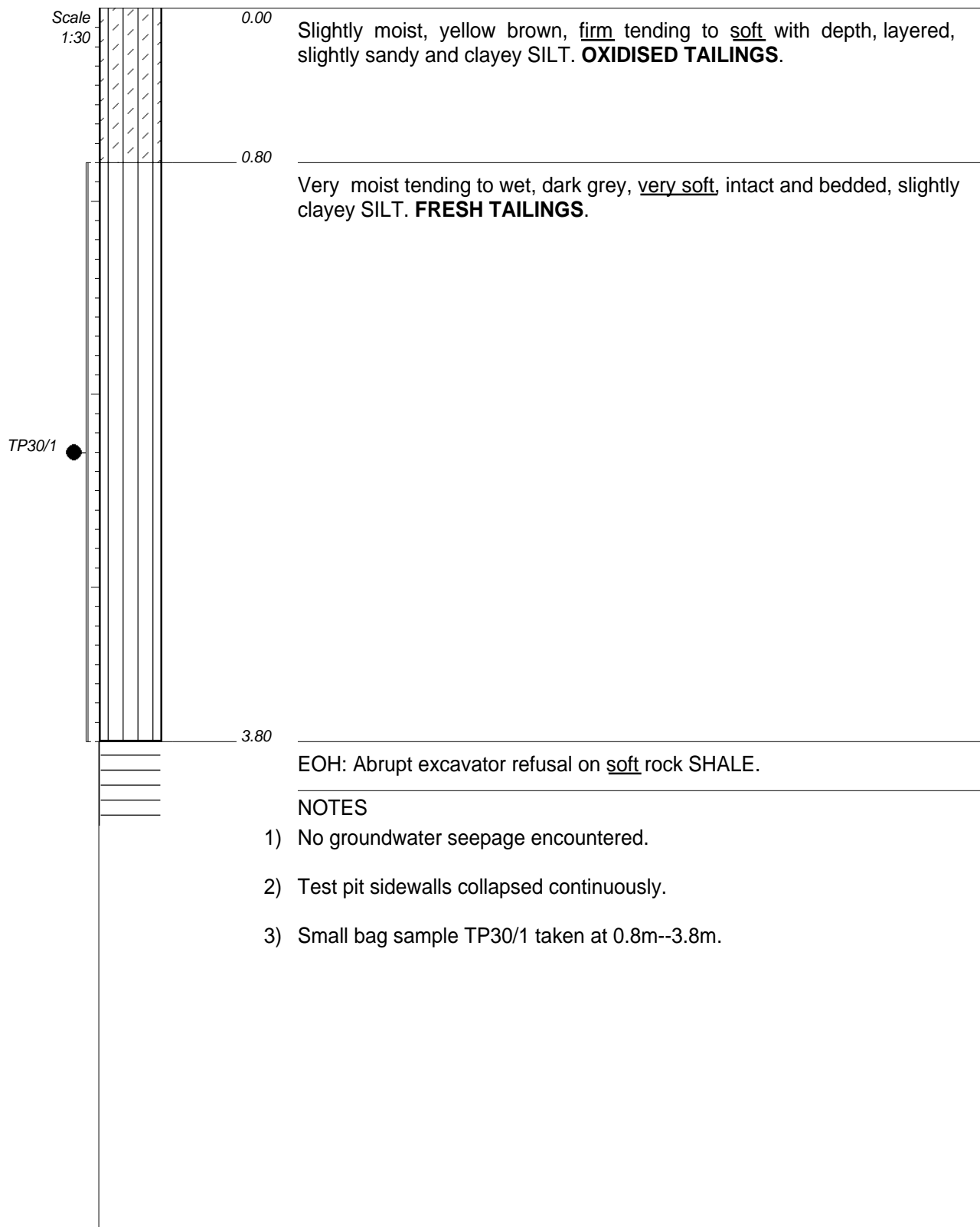
- 1) No groundwater seepage encountered.

CONTRACTOR :  
MACHINE : 20-ton Excavator Smooth Blade  
DRILLED BY :  
PROFILED BY : J Heyneke  
TYPE SET BY : ET  
SETUP FILE : JVTLO.SET

INCLINATION : Vertical  
DIAM :  
DATE : 14 May 2025  
DATE : 14 May 2025  
DATE : 04/06/2025 20:33  
TEXT : C:\WP51\PROFILES\P134TP.TXT

COORDINATE SYSTEM : WGS84 (Lo27)  
X-COORD : 2926970  
Y-COORD : -41032

**HOLE No: TP29**



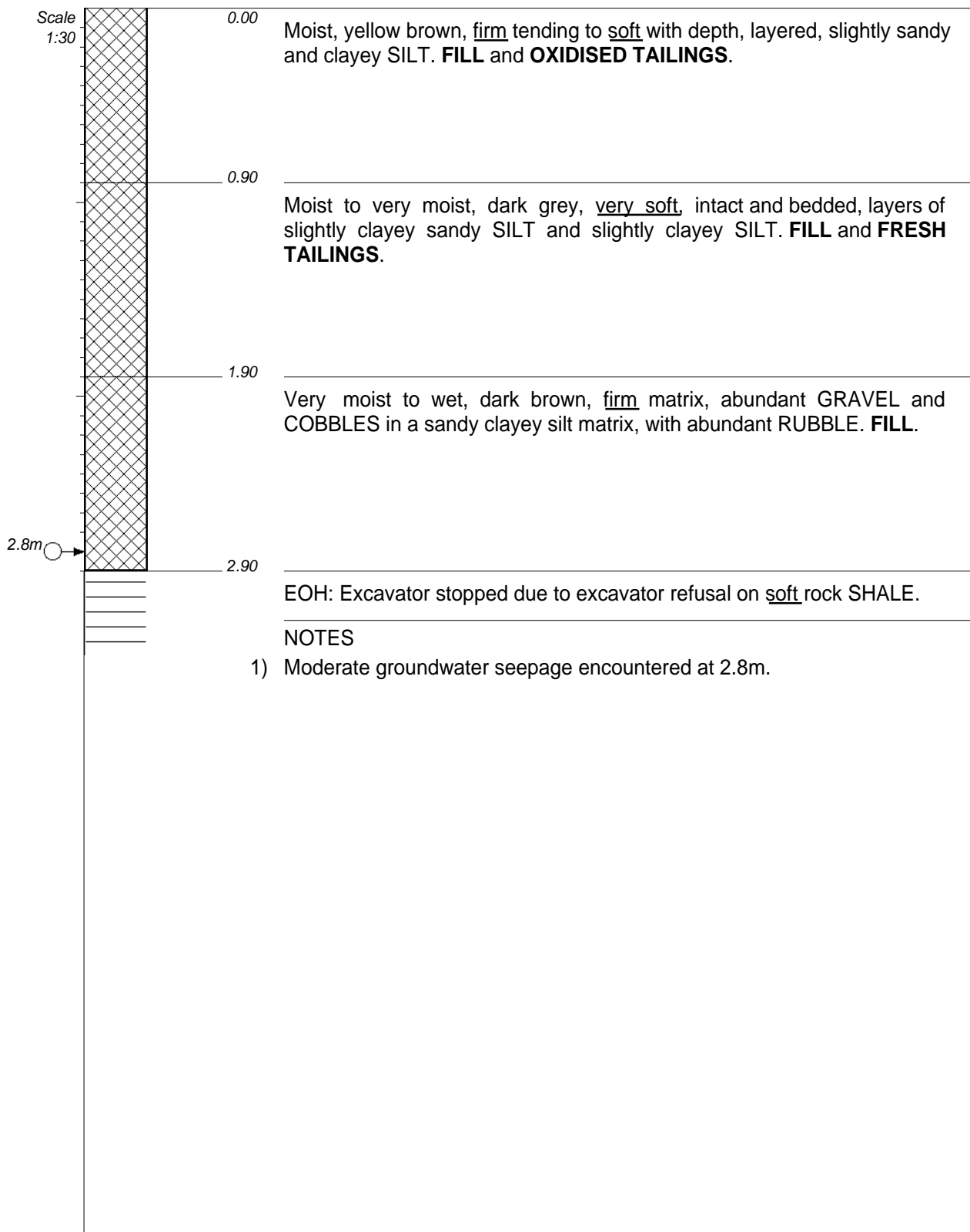
CONTRACTOR :  
MACHINE : 20-ton Excavator Smooth Blade  
DRILLED BY :  
PROFILED BY : J Heyneke  
TYPE SET BY : ET  
SETUP FILE : JVTLO.SET

INCLINATION : Vertical  
DIAM :  
DATE : 14 May 2025  
DATE : 14 May 2025  
DATE : 04/06/2025 20:33  
TEXT : C:\WP51\PROFILES\P134TP.TXT

COORDINATE SYSTEM : WGS84 (Lo27)  
X-COORD : 2926725  
Y-COORD : -41374

**HOLE No: TP30**



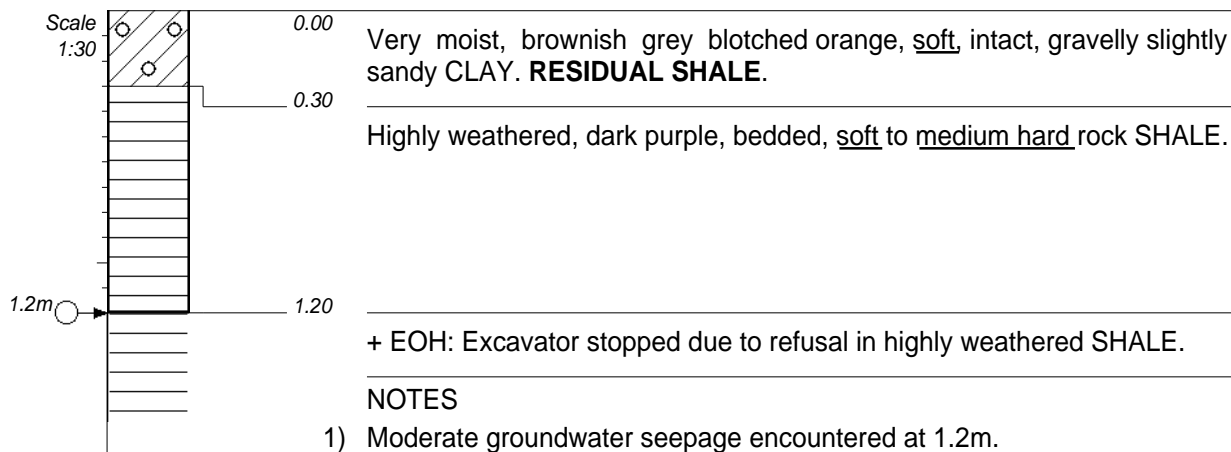


CONTRACTOR :  
MACHINE : 20-ton Excavator Smooth Blade  
DRILLED BY :  
PROFILED BY : J Heyneke  
TYPE SET BY : ET  
SETUP FILE : JVTLO.SET

INCLINATION : Vertical  
DIAM :  
DATE : 14 May 2025  
DATE : 14 May 2025  
DATE : 04/06/2025 20:33  
TEXT : C:\WP51\PROFILES\P134TP.TXT

COORDINATE SYSTEM : WGS84 (Lo27)  
X-COORD : 2926904  
Y-COORD : -41269

**HOLE No: TP31**



CONTRACTOR :  
MACHINE : 20-ton Excavator Smooth Blade  
DRILLED BY :  
PROFILED BY : J Heyneke  
TYPE SET BY : ET  
SETUP FILE : JVTLO.SET

INCLINATION : Vertical  
DIAM :  
DATE : 14 May 2025  
DATE : 14 May 2025  
DATE : 04/06/2025 20:33  
TEXT : C:\WP51\PROFILES\P134TP.TXT

COORDINATE SYSTEM : WGS84 (Lo27)  
X-COORD : 2927143  
Y-COORD : -40677

**HOLE No: TP32**