DRAFT IMPACT ASSESSMENT REPORT FOR THE PROPOSED EXPANSION OF THE CAPE WINELANDS AIRPORT
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APPENDIX 46

STORMWATER MANAGEMENT PLAN

NOVEMBER 2024

Concept Stormwater Management Plan

Cape Winelands Airport

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1 Introduction

Zutari has been tasked with the development of a Concept Stormwater Management Plan advising the Cape Winelands Airport company (CWA) on the management of stormwater for the proposed development and to engage the City of Cape Town's Catchment, Stormwater & River Management (CSRM) officials regarding the various submission requirements associated with stormwater management on the site.

This Concept Stormwater Management Plan discusses the proposed stormwater management systems for the Cape Winelands Airport development and details the stormwater infrastructure and interventions proposed to achieve the requirements stipulated in the applicable policies and guidelines.

Accordingly, this development is subject to the City of Cape Town's Stormwater Policy (Management of Urban Stormwater Impacts Policy – C58/05/09) which states criteria for compliance when considering the quality and quantity of stormwater run-off from the post-developed site.

Considerations for the implementation of stormwater management measures for the proposed development will occur in the following manner:

1. Assess status quo and existing stormwater infrastructure.
2. Assess policy requirements and engage in high-level discussion with City of Cape Town officials.
3. Prepare a Concept Stormwater Management Plan for recommending high-level interventions to be implemented to ensure compliance to the Policy.
4. Prepare at a later stage a detailed Stormwater Management Plan to recommend measures to mitigate the hydrology-, hydraulic-, and pollution-related effects of surface water released into the municipal stormwater network, and to illustrate how the proposed Cape Winelands Airport development will comply with the relevant policies.

The submission of this Concept Stormwater Management Plan for the proposed Cape Winelands Airport development will address points 1) to 3) listed above with any comments received from CoCT being incorporated into the submission of the detailed Stormwater Management Plan to follow.

Zutari will also develop and submit a detailed Stormwater Management Plan for the development (which will address point 4) at a later stage as described later in this report.

1.1 Location and Nature of the Development

The proposed Cape Winelands Airport development is located within the jurisdictional area of the City of Cape Town, Northern Region, Kraaifontein District and is located at the following coordinates: 33°46'13.84"S, 18°44'24.20"E. The proposed Cape Winelands Airport site is to be located on portions of Erven: PA724-0, PA724-10, PA474-4, PA474-23,PA474-4, PA474-0 and MA942-7, while the general location in relation to the surrounding areas can be seen below in Figure 1.

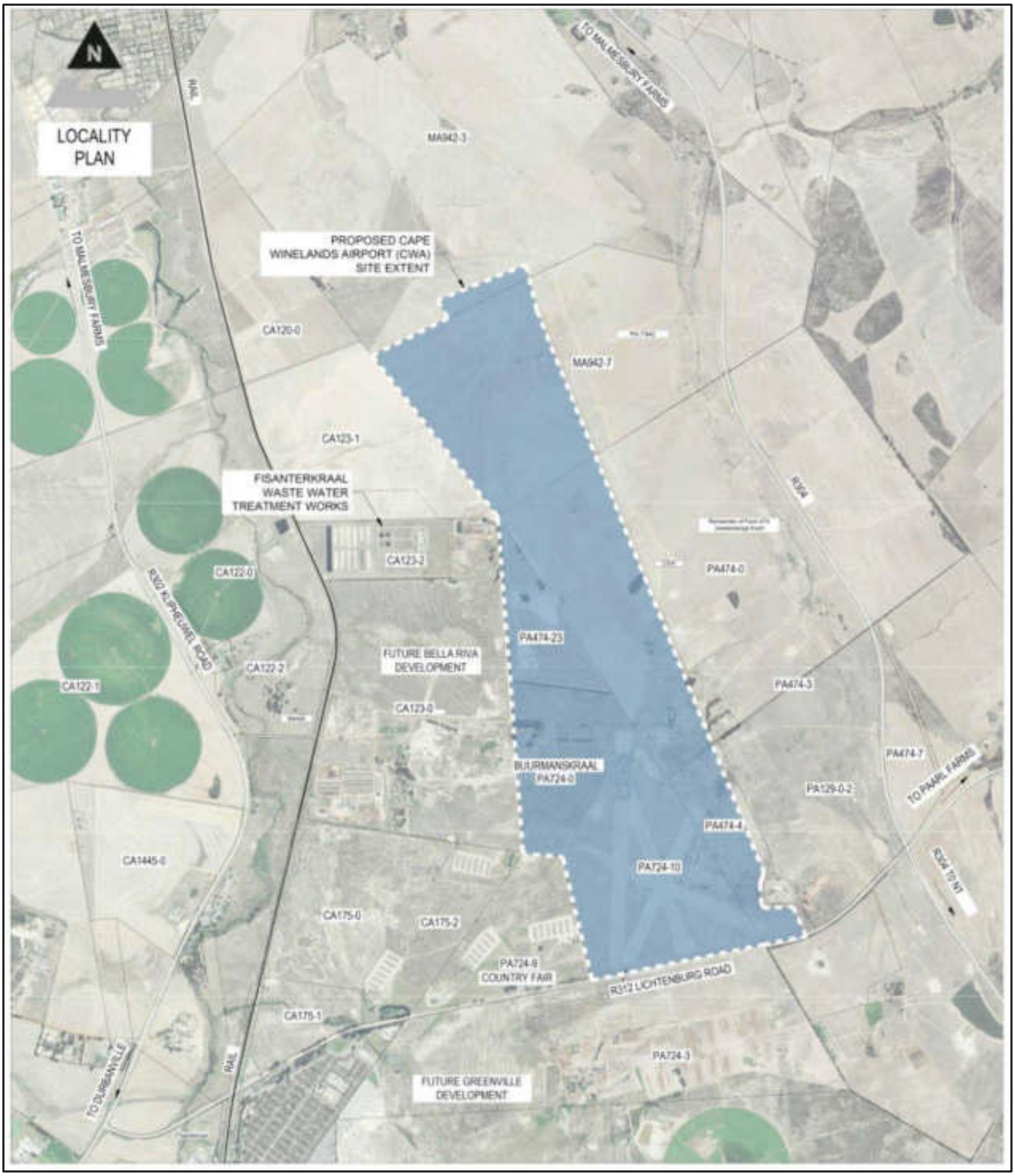


Figure 1: Site Locality Map

The current Site Development Plan and stormwater drawings used to compile this Concept Stormwater Management Plan may be referenced in Appendix A – Drawings.

1.2 Objectives of the report

This Concept Stormwater Management Plan for the Cape Winelands Airport has the following objectives:

- To identify measures to comply with the Council's Management of Urban Stormwater Impacts Policy (C58/05/09) (City of Cape Town (CCT), 2009).
- To identify measures to comply with Council's Floodplain and River Corridor Management Policy (C58/05/09) (City of Cape Town (CCT), 2009).
- To propose methods (structural controls) for removing, reducing, or retarding runoff flows, and preventing targeted stormwater runoff constituents, pollutants, and contaminants from reaching receiving water bodies.

The purpose of this Concept Stormwater Management Plan is to stipulate a framework consisting of minimum Best Management Practices (BMP's) required for implementation. The current proposal is that Cape Winelands Airport is constructed in two (2) phases and the intention of this report is to specify minimum requirements which need to be adhered to for the ultimate scheme to satisfy various statutory requirements. When detailed design commences, the developer will be required to submit a detailed Stormwater Management Plan for each phase which satisfies the requirements stated in this overarching Concept Stormwater Management Plan. If there is any deviation from this Concept Stormwater Management Plan, the developer must first submit an amended Concept Stormwater Management Plan for approval.

2 Status Quo and Existing Infrastructure

2.1 Existing Site Conditions and Topography

The existing property is currently mainly used for agricultural purposes with approximately 90% of the surface areas being green permeable spaces and the remainder consisting of the existing Cape Winelands Airport (previously known as the Fisantekraal Aerodrome), basic farm roads and small holdings. The existing site topography can be summarised as follows:

- The proposed Cape Winelands Airport site is approximately 430 hectares in size.
- Site slopes:
    - A ridge is formed along the centre of the site splitting the flows in easterly and westerly directions. The stormwater then drains towards the Klapmuts River and the Mosselbank River respectively.
    - In addition, there are low points situated along the site boundary resulting in numerous outfalls discharging from the Cape Winelands Airport development site boundary.
- The vegetation is generally defined by agricultural farmlands.
- The existing site topography consists of varying slopes that range between 0.25% and 6%
- The stormwater from the existing site quarry daylights into the adjacent property, the proposed Bella Riva development, and flows overland towards the Mosselbank River.
- Clearly defined watercourses are noted along the eastern and western boundaries of the site.

The pre-development scenario has been modelled in PCSWMM and the actual Topographical LIDAR Survey (DTM at 5m Grid Interval), received from Geospatial Project Services in January 2021, was used to create the topographic height illustration seen below in Figure 2: General Topography and Natural Overland Flow Direction.

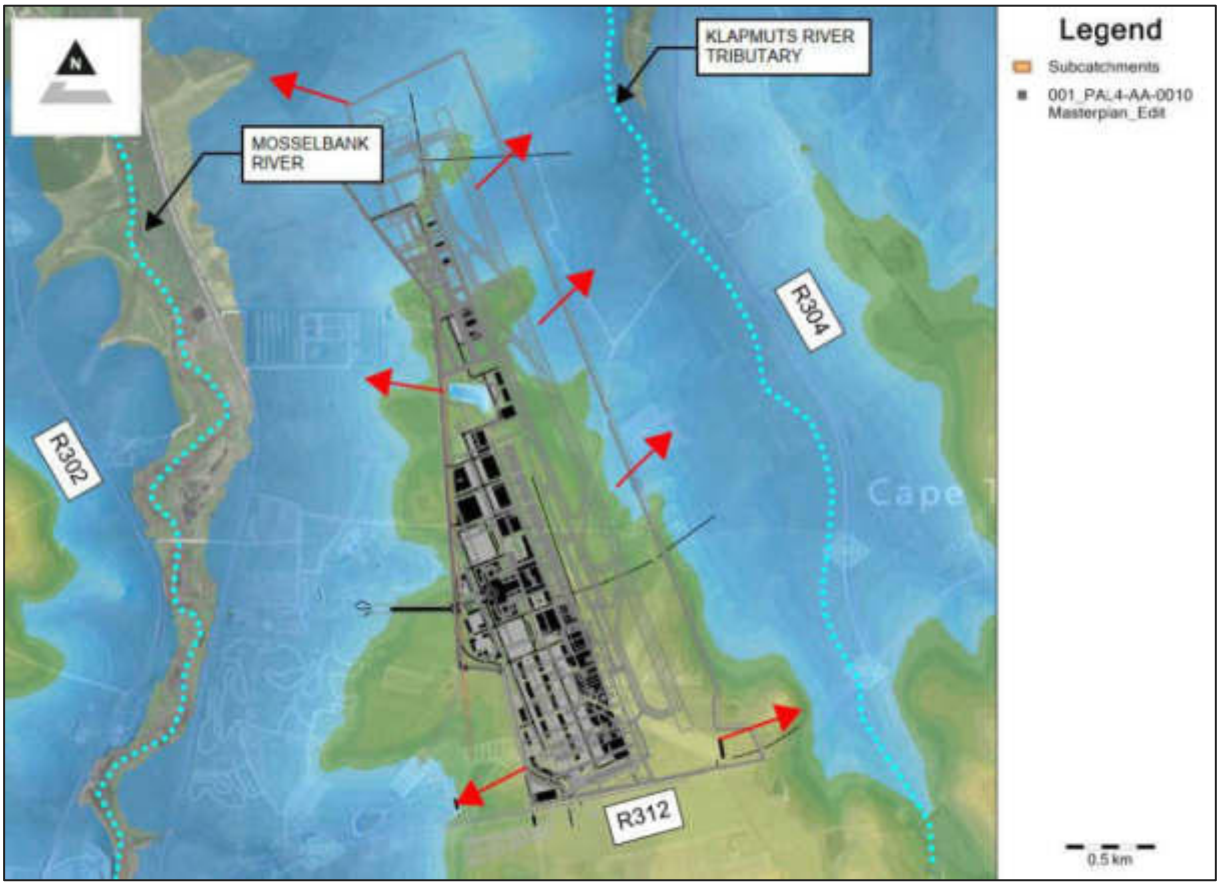


Figure 2: General Topography and Natural Overland Flow Direction

The general topography and overland flow direction of the site can be clearly seen. The spine of the development is the highest point positioned along the centre of the site in a south to north direction, with a portion of the overland runoff flowing towards the western boundary and into the Mosselbank River and the remaining portion of the runoff towards the eastern boundary and into the Klapmuts River.

2.2 Geotechnical Investigation

A detailed geotechnical investigation was carried out by GEOSS South Africa (Pty) Ltd. This investigation found that the materials on site are generally classified as "soft" to "intermediate" excavation in accordance with SANS 1200D. The soil type used for characterising soil infiltration in the hydrological model is that of Sand.

The proposed Cape Winelands Airport site is approximately 430 hectares and therefore the site was divided into five (5) main geotechnical zones which exhibit similar soil profile characteristics based on the descriptions of the material encountered in the trail pits, considering the several methods of investigation carried out. The general ground profiles are defined in five (5) geotechnical zones on site and can be seen in Figure 3 below:

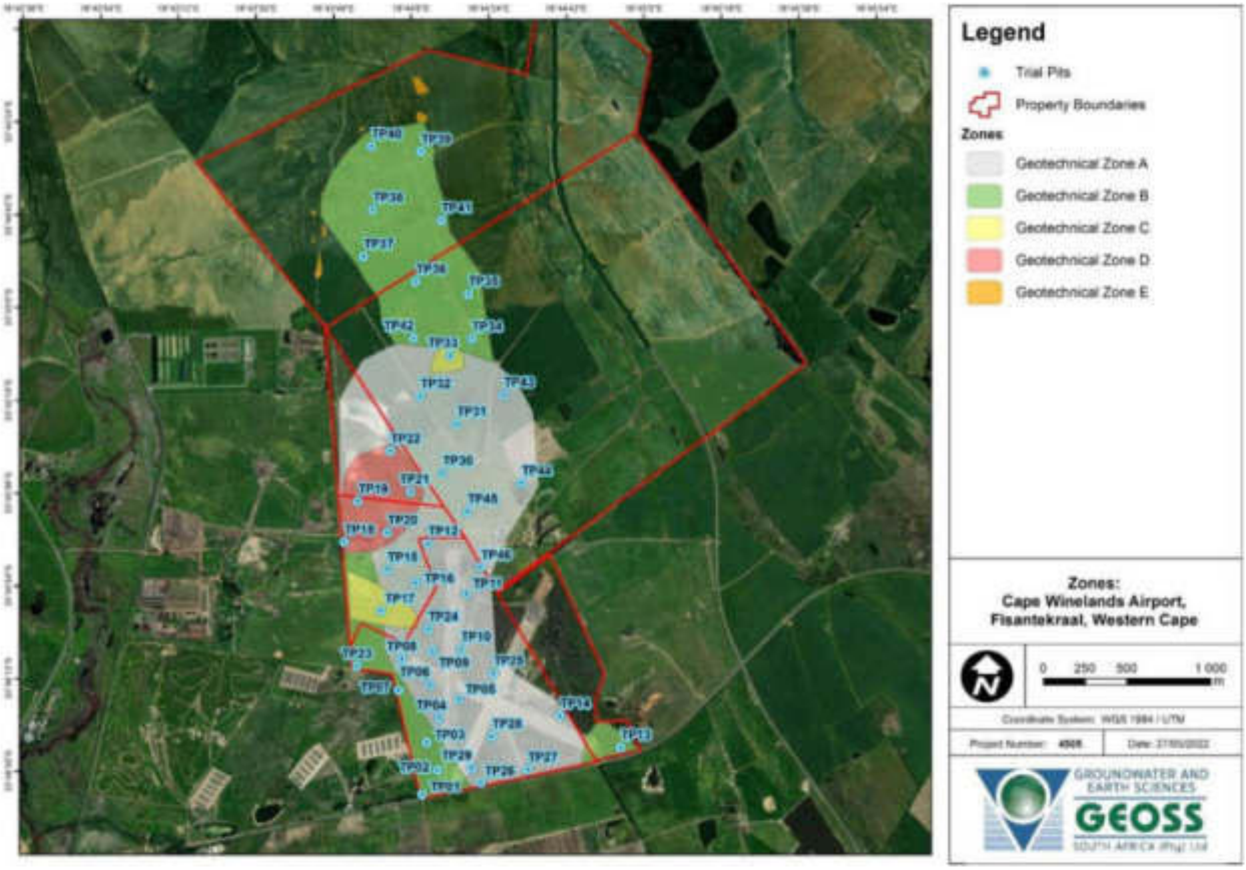


Figure 3: Geotechnical Investigation Zones

The predominant ground profiles present on site are summarized as:

- The upper layer of soils generally consists of a between 500mm and 900mm of slightly voided very loose to medium dense sand to gravelly sand (Transported/hillwash).
- The pedogenic materials encountered are described as medium dense to very dense partially cemented nodular to hardpan ferricrete in a sandy matrix.
- The sandy fine gravel materials encountered are described as a very loose to medium dense sandy fine gravel.
- The residual material encountered is generally described as a silty clay, medium dense to very dense silty sand or gravelly silty sand.
- A relatively shallow water table is expected, and it is likely that water seepage may be encountered during the wet season.

The Geotechnical Investigation can be found attached hereto as Appendix B – Geotechnical Investigation Report (GEOSS). The detailed stormwater management plan for each phase of the development should consider the specific geotechnical properties of each of the identified zones.

2.3 Existing Stormwater Infrastructure

There are no formal existing municipal stormwater infrastructure connections along the immediate boundaries of the site. The Cape Winelands Airport development is situated on a high point and a ridge is formed along the centre of the site splitting the flows in easterly and westerly directions resulting in various low points situated along the site boundary. Due to the natural low points situated across the site, it was necessary to maintain the eight natural outfall locations which discharge stormwater from the Cape Winelands Airport site.

The clearly defined watercourses noted along the eastern and western boundaries of the site were assessed as part of the Flood Risk Assessment which is attached hereto as Appendix C – Flood Risk Assessment Report.

The proposed future Bella Riva development is situated to the west of the proposed Cape Winelands Airport. After assessing the SWMP prepared for the Bella Riva development we can confirm that the Bella Riva development will account for a portion of the Cape Winelands pre-development flows – for further detail pertaining to the Bella Riva Stormwater Management Plan reference can be made to Appendix D. It is proposed that the Cape Winelands Airport development discharges stormwater from the detention pond (Pond 2 / Outfall 2) into the future proposed Bella Riva stormwater infrastructure as can be seen on Figure 4 below. Furthermore, reference can be made to Figure 7 below for an overview of the Pond / Outfall numbers.

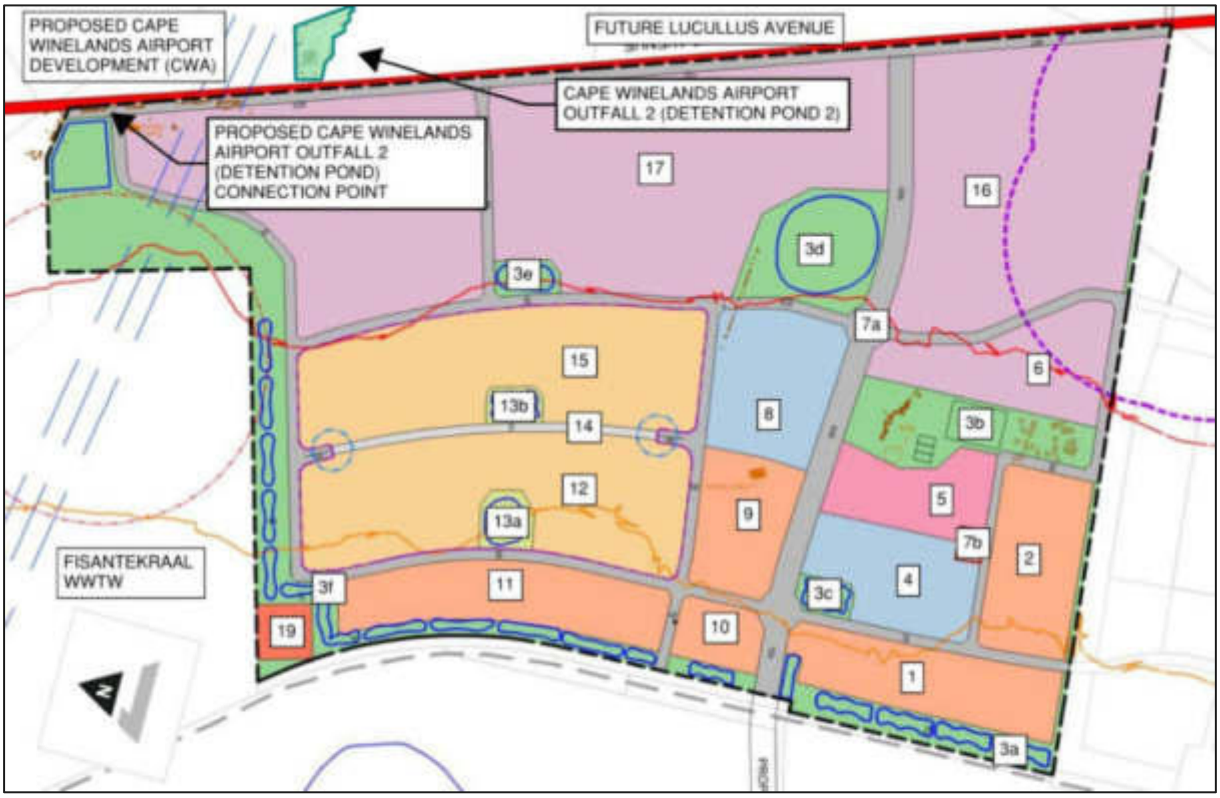


Figure 4: Bella Riva Future Development Layout

The detailed Cape Winelands Airport Stormwater Management Plan will include further detail pertaining to the measures and mitigations required to ensure the protection of the existing environment and avoid erosion.

2.4 Environmental Authorisations

The Cape Winelands Airport company has appointed independent environmental consultants to undertake an environmental process and the associated public participation requirements, as stipulated in the Environmental Conservation Act, 1989 (Act No. 73 of 1989) (ECA) and the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) for the authorisation of the Cape Winelands Airport (CWA) development.

The Environmental Impact Assessment (EIA) for the proposed Cape Winelands Airport development is currently in the Pre-application Scoping Phase and the initial 30 day public participation period has closed. The required public meeting was concluded. Upon completion of the Concept Stormwater Management Plan, a formal application will be lodged, and the statutory in-process Scoping Phase will commence.

A Water Use Licence Application (WULA) is also required in terms of the Water Act of 1998, for the storage of water, construction of infrastructure within wetlands and rivers, storage of stormwater and discharge of stormwater from the Cape Winelands Airport development.

2.5 Interaction with Freshwater Ecologist

A Freshwater Ecology Impact Assessment Report was compiled by FEN Consulting (Pty) Ltd as part of the Environmental Impact Assessment (EIA) and Water Use Authorisation (WUA) processes for the proposed Cape Winelands Airport development.

This assessment identified numerous freshwater ecosystems within the proposed Cape Winelands Airport's development extent as well as the investigation area (defined as a 500m radius around the proposed Cape Winelands Airport development). These freshwater ecosystems include a combination of seep wetlands; and channelled valley bottom (CVB) wetlands as can be seen below on Figure 5.

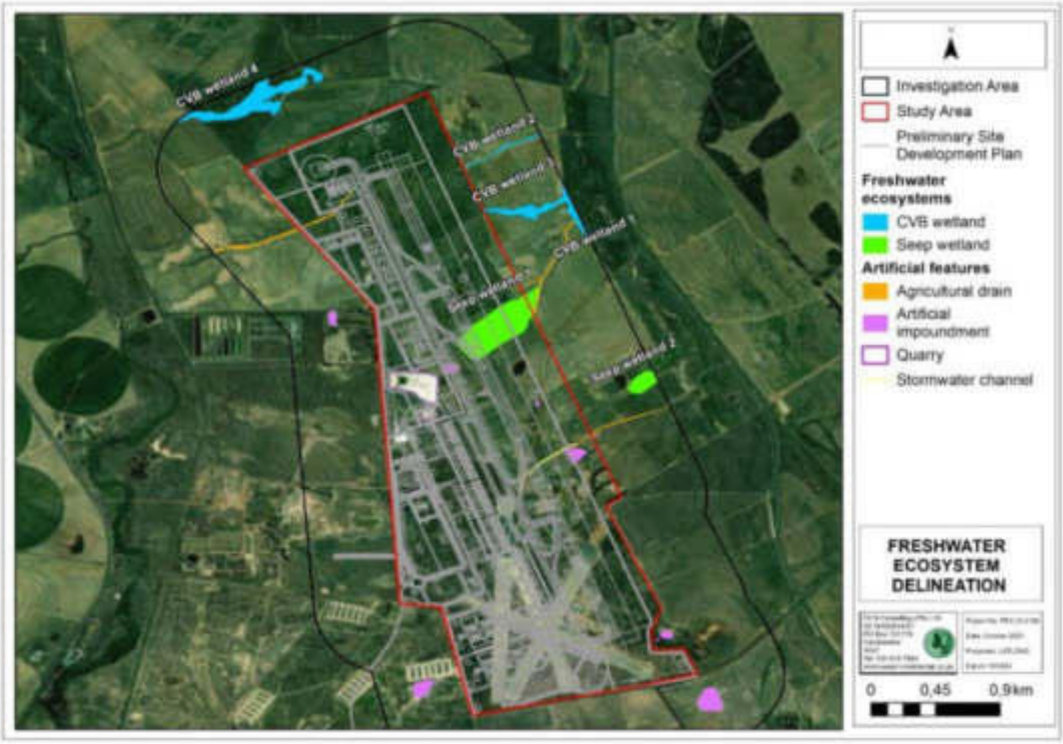


Figure 5: Aquatic Ecosystem Layout

Further to the above, the Freshwater Ecologist's Impact Assessment Report details the potential design, construction and operational impacts of the development and corresponding recommended monitoring and mitigation measures required to limit the impact of the development on the aquatic ecosystem.

The recommendations and rehabilitation measures summarised below are contained in the Freshwater Ecologists Impact Assessment report in order to reduce the risks of the development to a low negative significance:

- Construction work, particularly within the 15 m construction conservation buffer of the wetlands, must as far as possible be restricted to the dry, summer season. Channelled valley bottom Wetlands 2 and 3 and the remainder of Seep Wetland 1 where development will not occur, as well as the wetlands' 15 m construction phase conservation buffers must be marked as a no-go areas during the construction phase of the proposed development.
- Sediment trapping devices must be utilised downstream of where works are to be undertaken within seep wetland 1.
- Under no circumstances must linear infrastructure be trenched within the channelled valley bottom Wetlands 2 and 3 or their conservation buffers. Design plans must reconsider the layout of the water pipelines and fences to avoid these wetlands.
- Any fences which are to traverse the channelled valley bottom Wetlands 2 and 3 must be installed in such a way that hydro pedological processes are not impeded within these systems. It is recommended that the erection of fence posts within the channelled valley bottom Wetlands 2 and 3 are avoided.
- Stormwater attenuation ponds must be designed and landscaped in accordance with a Stormwater Management Plan with input from a Landscape and Open Space Planning consultant as well as a Freshwater Ecologist. All stormwater infrastructure must be incorporated into the Stormwater Management Plan.
- For the construction of the maintenance road along the eastern boundary of the study area, it is recommended that culverts be installed to allow the passage of water from the upstream portions of the channelled valley bottom Wetlands 2 and 3 to the downgradient portions. Any disturbed areas within these wetlands must be rehabilitated on completion of construction of the road. Cobbles are to be placed downstream of the maintenance road to trap sediment and reduce flow velocity of surface water entering the wetlands. The maintenance road should ideally avoid seep wetland 1 and circumvent it to avoid further fragmentation of the wetland. Should this not be possible, the road must be designed in such a manner as to allow hydraulic and hydro pedological process connectivity in the landscape while also allowing fauna to traverse the roadway.
- Disturbed areas related to the maintenance road and fences which will traverse the channelled valley bottom Wetlands 2 and 3 must be rehabilitated once construction activities have ceased.
- Control measures related to trenching and stockpiling activities must be strictly implemented.
- A monitoring programme must be implemented to detect and prevent the pollution of soils, surface water and groundwater.
- Wetlands that will be impacted by the proposed Cape Winelands Airport development must be monitored and where possible improved. An offset plan is being compiled by FEN Consulting which will outline an appropriate monitoring approach.
- A Service Infrastructure Management Plan is to be compiled which details the frequency in which service infrastructure, particularly the sewer and water treatment plants and sewer conveyance infrastructure must be serviced. This will assist in the prevention of leakages and bursting of the sewer infrastructure.
- An emergency plan must be compiled to ensure a quick response and attendance to the matter in case of a leakage or bursting of a pipeline or overtopping of sewage at the treatment plant.

This Concept Stormwater Management Plan therefore incorporates the recommendations pertaining to stormwater from both the freshwater ecologist and the environmental representatives and were used as such to shape the design of the stormwater system and control measures. For further context and detail to the above listed measures the Freshwater Ecologists Impact Assessment Report should be read in conjunction with this Concept Stormwater Management Plan. Due to the length of the Freshwater EIA Report, a draft version can be made available upon request.

2.6 Site Development Plan

The Cape Winelands Airport development is a commercial airport which entails the redevelopment of the existing Fisantekraal Aerodrome. The proposed Site Development Plan that informs this Concept Stormwater Management Plan is shown below in Figure 6. The proposed development consists of combination of interconnecting roads leading to the runways, taxiways, terminal building, hangers, workshops, hotels, administration buildings and commercial buildings.

The latest Site Development Plan is attached hereto as part of Appendix A – Drawings.

Figure 6: Site Development Plan (PAL 4 Ultimate Scheme)

2.7 Proposed Phasing

The proposed Cape Winelands Airport development is envisaged to be constructed in two phases based on conceptual information available at this stage. When the detailed design commences, the developer will be required to submit a detailed Stormwater Management Plan for each phase demonstrating compliance with the Concept Stormwater Masterplan and the CoCT policy requirements are achieved and satisfied.

The detailed Cape Winelands Airport Stormwater Management Plan will include further detail pertaining to the development phasing plan once layouts are made available.

3 Policy Requirements and City of Cape Town Engagement

3.1 Background

This concept Stormwater Management Plan describes the approach used for the design of the stormwater infrastructure for the Cape Winelands Airport development. The purpose is to describe how the proposed stormwater management infrastructure will achieve the requirements stipulated in the applicable policies. Urbanisation typically impacts on natural waterway health in two key areas:

- The quantity of stormwater runoff is increased as the proportion of impervious area within a catchment is increased, leading to larger peak flows and more frequent runoff which may have detrimental effects on river health and can cause flooding in downstream areas.
- The quality of runoff is also negatively impacted with additional pollutant loads in the form of gross pollutants, suspended sediments, and various other pollutants such as nitrogen, phosphorus, and heavy metals.

The Management of Urban Stormwater Impacts Policy has been prepared by the CCT CSRM Branch to address these stormwater impacts and ensures that new developments incorporate Water Sensitive Urban Design elements.

3.2 Policy Requirements

The Cape Winelands Airport site is categorised as a Brownfields Development. To achieve the stormwater management objectives mentioned above, the CCT recommends the following criteria for a Brownfields Development Site (> 50 000m^2) by means of on-site facilities:

A. Improve quality of runoff
   - Design storm event: 0.5-year Recurrence Interval (RI), 24-hour storm.
   - Pollutants removal target: SS – 80%, TP – 45%.

B. Control quantity and rate of runoff
   - 24 hour extended detention of 1-year Recurrence Interval (RI), 24-hour storm.
   - Up to 10-year RI storm peak flow reduced to pre-development level.
   - Up to 50-year RI storm peak flow reduced to existing development level.
   - Evaluate the effects of the 100-year RI storm event.

C. Encourage natural groundwater recharge
   - As and where possible and appropriate on the development site.

3.3 Interaction with City of Cape Town officials and departures from Policy

A number of interactions have taken place between Zutari and the CCT officials since commencement of the development of this Concept Stormwater Management Plan. These include:

- 9th April 2024 – An introductory meeting between Zutari's Carshif Talip, Ashley van der Nest, Marno Pretorius and the CCT's Johann Terblanche, Willem Burger, Motlatsi Nkhoesa, Kloey Bam, Willie Liebenberg, and Stefan De Villiers.
  - This meeting was arranged to provide an introductory overview of the project, objectives, concept, and proposed timelines of the project to Mr Johann Terblanche. This platform was also used to discuss various pertinent items regarding stormwater management within the catchment as well as other project related matters.

4 Proposed Stormwater Management Measures

4.1 Design Overview

The proposed stormwater drainage network is based on a dual stormwater system, consisting of a major and a minor network, conveying stormwater generated on site via pipes and overland flow routes into seven (7) dry attenuation ponds with engineered layerworks and one (1) wet detention pond, positioned at strategic locations along the proposed Cape Winelands Airport development site boundary.

The basic stormwater design principles used to inform the concept design of stormwater infrastructure for the Cape Winelands Airport site can be best described as follows:

- The natural drainage direction of stormwater of the site will remain unchanged as the site generally falls in a south to north direction with outfalls positioned strategically along the eastern and western boundaries.
- The minor system will comprise of open drains, an underground piped network complete with channels, inlet catchpits, oil separators, manholes and outlet structures sized to accommodate stormwater runoff from the roads, buildings, and other hard surfaced area for at least minor storm events up to the 1:5-year RI storm.
- The major system will comprise of roads and on-site overland flow paths which will operate in conjunction with the minor system to accommodate stormwater runoff from roofs and other hard surfaced areas for major storm events up to and including the 1:50-year RI storm.
    - The design levels allow for on-site overland flow routes in the event of a blockage or failure of the minor system.
- Where no on-site overland flow paths exist to accommodate run-off from major storm events, the underground piped network will be sized to accommodate run-off for major storm events (up to the 1:50 year).
- The overland flow routes on the Cape Winelands Airport site are designed to safely convey the 1:100-year storm event towards the ponds situated along the boundary of the site. From there formal overland escape routes, in the form of pond overflows, will be designed to convey peak runoff from the 1:100-year storm which cannot be handled by the above proposed stormwater system before discharging into the adjacent infrastructure.

4.2 Required Site Area

The adopted rainfall depths used were extrapolated from the CCT rainfall grids. The 24-hour 0.5-year RI storm rainfall is 20.1mm with the area of the Cape Winelands Airport site equating to ±430 ha for the calculation. The calculated Water Quality Volume (WQv) is calculated to be approximately 37.82ML. See 4.5.2 below for the detailed calculations.

To accommodate the required treatment of this volume, the following Low Impact Developments (LID's) will be implemented as detailed in Table 1 below:

BMP's	BMP	Approximate Surface Area (m^2)	Depth (m)	Recurrence Interval (Years)	Attenuation Volume (m^3)
Pond 1	Dry Attenuation Pond	7,000	2.0	1:50 Year RI	10,800
Pond 2	Wet Detention Pond	28,000	5.0	1:50 Year RI	95,000
Pond 3	Dry Attenuation Pond	5,700	2.0	1:50 Year RI	9,600
Pond 4	Dry Attenuation Pond	1,800	1.5	1:50 Year RI	2,100

Pond 5	Dry Attenuation Pond	6,300	2.0	1:50 Year RI	10,800
Pond 6	Dry Attenuation Pond	500	1.0	1:50 Year RI	350
Pond 7	Dry Attenuation Pond	1,150	1.5	1:50 Year RI	1,550
Pond 8	Dry Attenuation Pond	2,700	2.0	1:50 Year RI	4,200
Swale 9	Dry Swales	15,000	1.0	1:50 Year RI	9,000

Table 1: Proposed Low Impact Developments (LID)

The proposed areas identified for the low impact developments (LID's) can be seen in Figure 7 below.

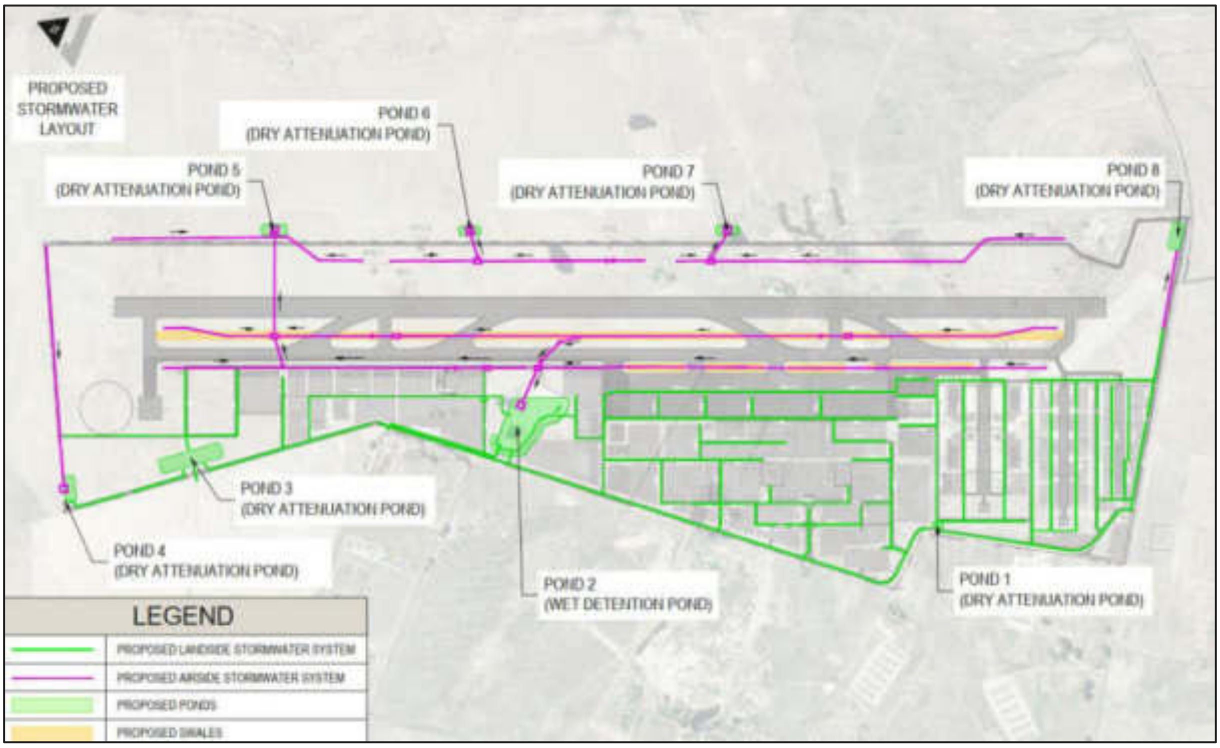


Figure 7: Proposed Areas Identified for LIDs

4.3 Best Management Practices (BMP's)

4.3.1 Dry Attenuation Pond with Engineered Layerworks

As previously mentioned, it is proposed that all stormwater generated on the Cape Winelands Airport site be conveyed into seven (7) dry attenuation ponds and one (1) wet detention pond strategically positioned around the development. These ponds will be designed to attenuate up to the 1:50-year post development flows. Treatment of stormwater run-off conveyed to the ponds will mainly be achieved through the dry pond infiltration layerworks relying on filtration to reduce waterborne pollutant concentration through sedimentation, filtration, and plant uptake of nutrients.

According to Armitage *et.al.* (2013), the potential pollutant removal rate for a dry attenuation pond with engineered layerworks is:

- Nutrient Removal Rate (TP): 40% - 50%
- Sediment Removal Rate (TSS): 50% - 80%

The proposed dry attenuation pond with engineered layerworks consists of the following:

- **Filter Media:** A mix of sand and loam which removes the runoff pollutants and supports the vegetation on the surface. This layer will be 100mm deep.
- **Transition Layer:** Located under the filter media, contains coarse sand which prevents the movement of finer particles from the top layer to pass through to the drainage layer. This layer also aids in preventing clogging of the drainage layer. This may be replaced with a Geotextile wrapping as approved by the Engineer. This layer will have a depth of 300mm.
- **Drainage Layer:** This layer is in fact a system which consists of a 19mm stone layer and a 110mm perforated sub-soil pipe that collects and conveys water into the proposed stormwater variable outlet structure. This layer will have a depth of 200mm.

Typical details of the dry attenuation pond engineered layerworks can be seen below in Figure 8: Typical Dry Attenuation Pond Engineered Layerworks.

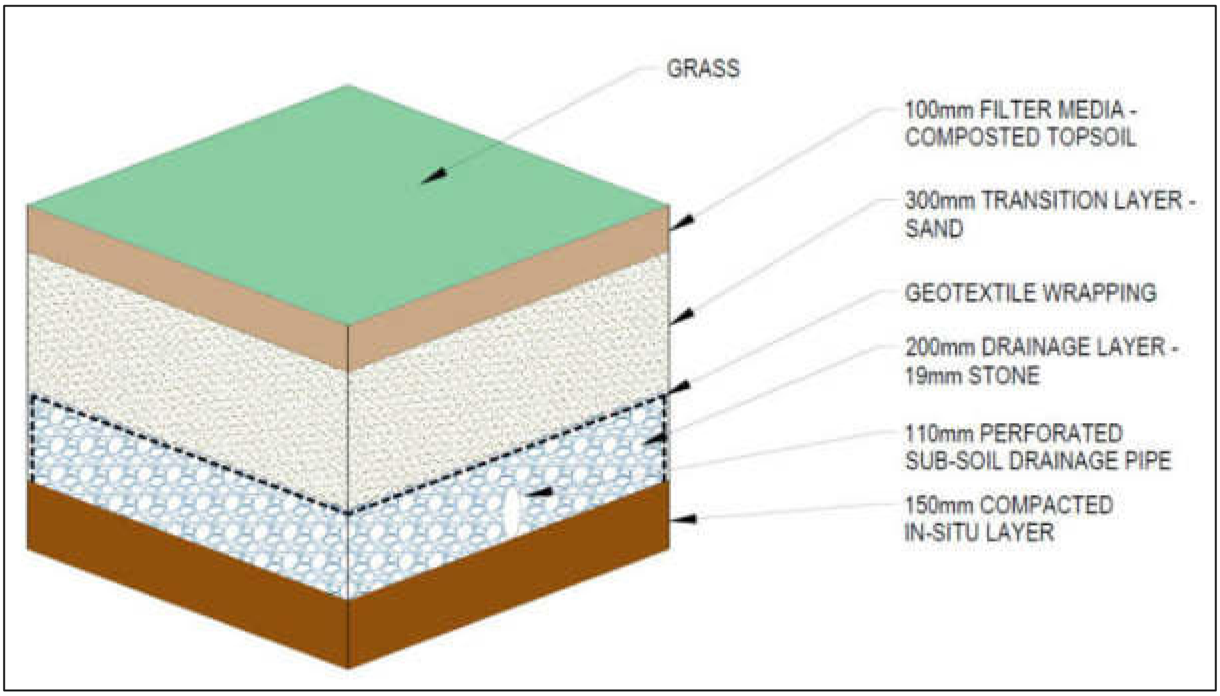


Figure 8: Typical Dry Attenuation Pond Engineered Layerworks

4.3.2 Dry Swale with Engineered Layerworks

Runoff from the Cape Winelands Airport runway and taxiways will be directed overland to landscaped areas. As can be seen on Figure 7 above, selected landscaped areas will consist of landscaped swales which then drain towards localised detention ponds and wetland areas.

The swales provide both stormwater treatment and conveyance functions, combining a bioretention system installed in the base of the swale which is designed to convey stormwater. The swale component provides pre-treatment of stormwater to remove coarse to medium sediments while the bioretention system removes finer particulates and associated contaminants.

The swales also provide a form of flow retardation for frequent storm events and are particularly efficient at removing nutrients. The swale treatment process operates by filtering stormwater runoff through surface of the swale and then percolating the runoff through a prescribed filter media, forming the bioretention component which provides treatment through fine filtration, extended detention treatment and some biological uptake.

Typically, the swale is underlain by a formalised piped drainage network which usually conveys stormwater from within the development to a swale outfall, as shown in Figure 9 below.

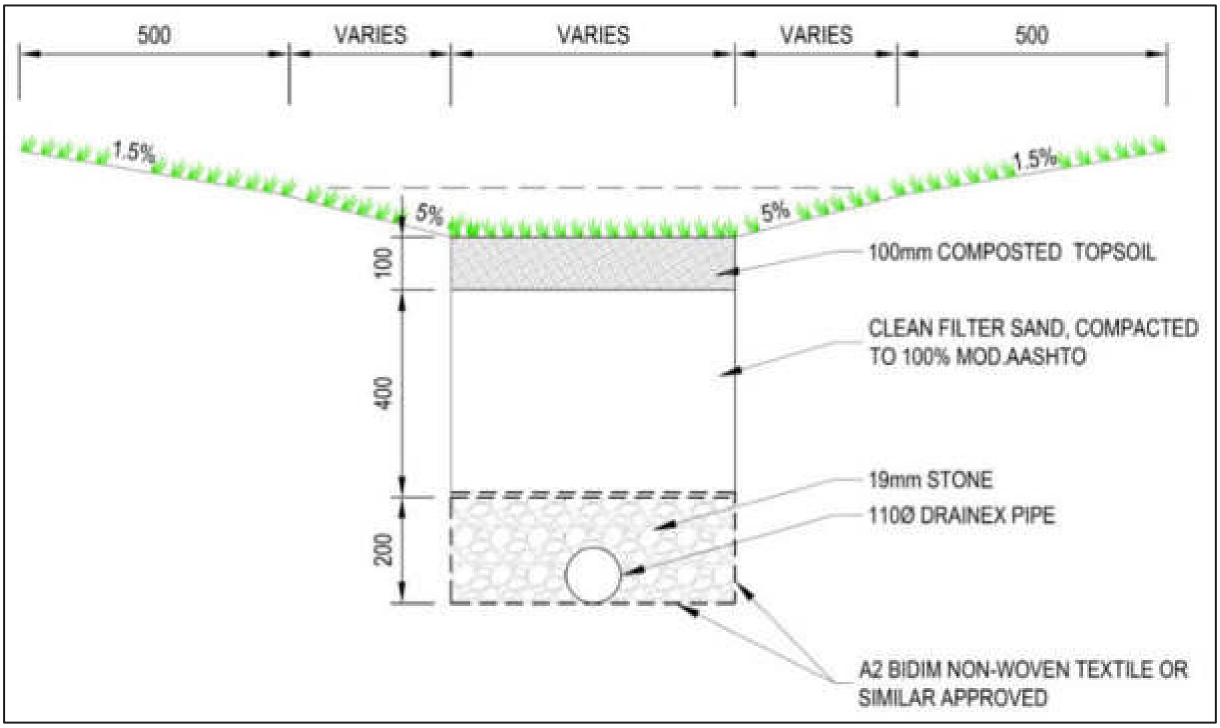


Figure 9: Typical Cross-Section of Dry Swale

4.3.3 Wet Detention Pond

Stormwater runoff generated by the catchment areas situated to the West of the site, which is not infiltrated into the dry swales, will be conveyed to the wet detention pond (Pond 2 / Outfall 2). The wet detention pond will operate in a similar manner to the dry swales when it comes to treatment of runoff, however besides treatment, the wet detention pond will serve a key function for attenuation on the site. Pond 2 / Outfall 2 has been designed with a formalised variable outlet structure which will release peak flows from the various Recurrence Interval storms.

The design of the wet detention pond is based on the following:

- The bottom of the existing Quarry is to be filled up to an invert level of 105.00masl
- The permanent water level is assumed to be at 107.5masl (Which equates to an initial depth of 2.5m from the new invert of the pond)
- Inlet headwall is at 108.25masl
- Variable outlet structure
    - Orifice 1 = 108.00masl
    - Orifice 2 = 108.25masl
    - Orifice 3 = 108.75masl
    - Orifice 4 = 109.50masl
- Overflow level into the proposed Lucullus Road extension is at 110.30masl

The conceptual design of the proposed wet detention pond at Outfall 2 can be seen shown in Figure 10 below:

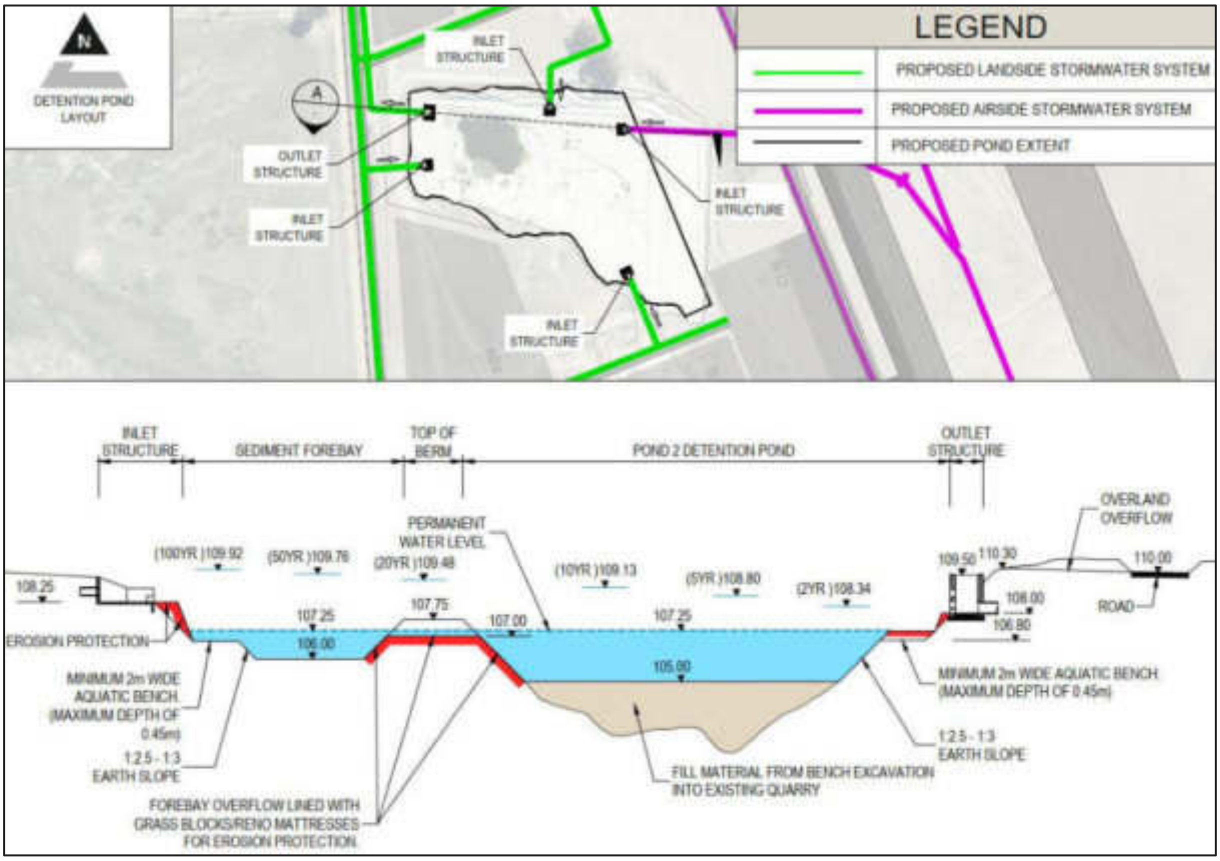


Figure 10: Typical Cross section of the Wet Detention Pond

Figure 11 below depicts a typical inlet structure for the Cape Winelands Airport and Figure 12 shows a typical variable outlet structure discharging flow from the pond.

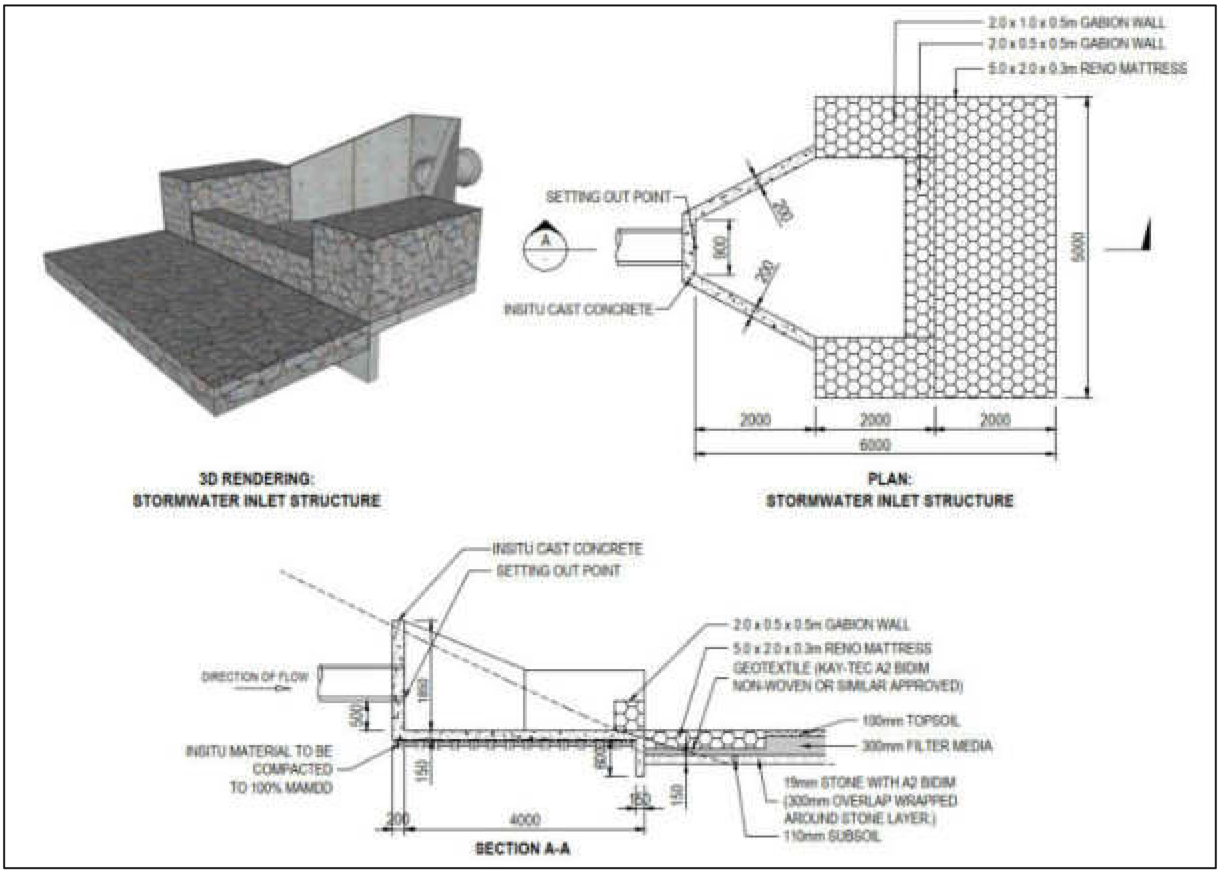


Figure 11: Wet Detention Pond – Typical Pond Inlet Structure

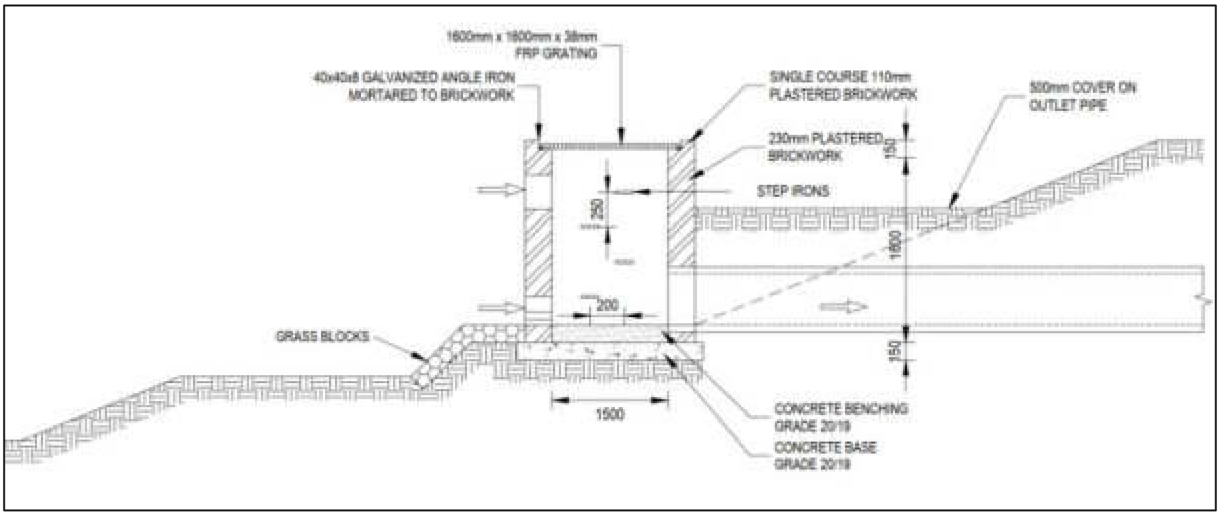


Figure 12: Wet Detention Pond – Typical Variable Outlet Structure

4.4 Calculation of Stormwater Runoff

The stormwater management concepts were investigated using the Personal Computer Stormwater Management Model (PCSWMM) software. The modelling was used to develop pre-development and post-development models to compare the status quo with the proposed Cape Winelands Airport site's ultimate state, and to interpret and analyse the stormwater management interventions considered.

The overall site is categorized as a Brownfields Development. Although the generation of additional hard surfaces is expected due to the development, a combination of stormwater management control systems will ensure that the peak runoff volumes discharged from the Cape Winelands Airport is below pre-development levels to mitigate any negative impacts on adjacent properties.

Three scenarios were modelled:

- 0.5-year storm event – to address treatment requirements.
- 1-year extended detention – to address attenuation requirements.
- Larger storm events – to address attenuation requirements.

Stormwater runoff was calculated using the "PCSWMM 2017 2D Professional" software package.

An extract of the relevant PCSWMM model simulation output data is attached hereto as Appendix E – PCSWMM Model Simulation Output Results. Additional data is available on request.

4.4.1 Rainfall Data and Simulation of Storm Events

Various design storms (South Africa, 24h SCS Type 2) were created and simulated based on the rainfall data and storm distributions as shown in Table 2: City of Cape Town Rainfall Depths from CCT Climate Grid below. Rainfall data from the City of Cape Town's Rainfall Grid RP2 200 Climate Change is used to create storm events for return intervals from 2 year to 100 year storms, while rainfall data for the 0.5 year and 1-year storms were extrapolated from the Rainfall Grid.

Source of Rainfall Information	**Recurrence Interval (years) / Storm Rainfall (mm)**							
	0.5yr	**1yr**	**2yr**	**5yr**	**10yr**	**20yr**	**50yr**	**100yr**
CCT Rainfall Grid RP2 200 **(15% Added for Climate Change)**	20.1	32.9	44.9	60.3	71.4	83.0	99.4	112.7

Table 2: City of Cape Town Rainfall Depths from CCT Climate Grid

4.4.2 Pre-Development Runoff

To simulate the stormwater runoff for the various storm-events, sub-catchment parameters were determined for pre-development simulations as can be seen below in Figure 13. The sub-catchment parameters are summarised below in Table 3:

Sub-Catchment Parameters	**Cape Winelands Airport (Pre-Development)**
Area (ha)	430
Width (m)	Varies
Length (m)	Varies
% Impervious Area	Varies per catchment
"n" Impervious Area	0.02
"n" Pervious Area	0.05
Depression Storage Impervious Area (mm)	2
Depression Storage Pervious Area (mm)	5
Modified Green and Ampt Soil Parameters for Texture Class Sand (Rawls *et al.*, 1983)	
Suction Head (mm)	49.02
Conductivity (mm/hr)	120.34
Initial Deficit (frac.)	0.413

Table 3: Typical PCSWMM Pre-development Model Sub-Catchment Parameters

The pre-development peak runoff volumes are summarised in Table 4 below:

Pre-Development (Brownfields) Peak Volumes (m^3/s) - Recurrence Interval (Years)					
Outfall	**2yr**	**5yr**	**10yr**	**20yr**	**50yr**
Pond 1	0.350	0.492	0.596	0.706	0.873
Pond 2	1.085	1.520	1.838	2.174	2.654
Pond 3	0.243	0.334	0.400	0.469	0.567
Pond 4	0.238	0.330	0.396	0.466	0.565
Pond 5	0.470	0.642	0.767	0.897	1.082
Pond 6	0.289	0.396	0.473	0.553	0.668
Pond 7	1.691	2.392	2.909	3.457	4.245
Pond 8	0.189	0.256	0.304	0.356	0.428
Cape Winelands Airport Site Overall Total	**4.555**	**6.362**	**7.683**	**9.078**	**11.082**

Table 4: Pre-development Peak Runoff Volumes

The Pre-Development Scenario and subdivision of the various sub-catchments can be seen in Figure 13 below:

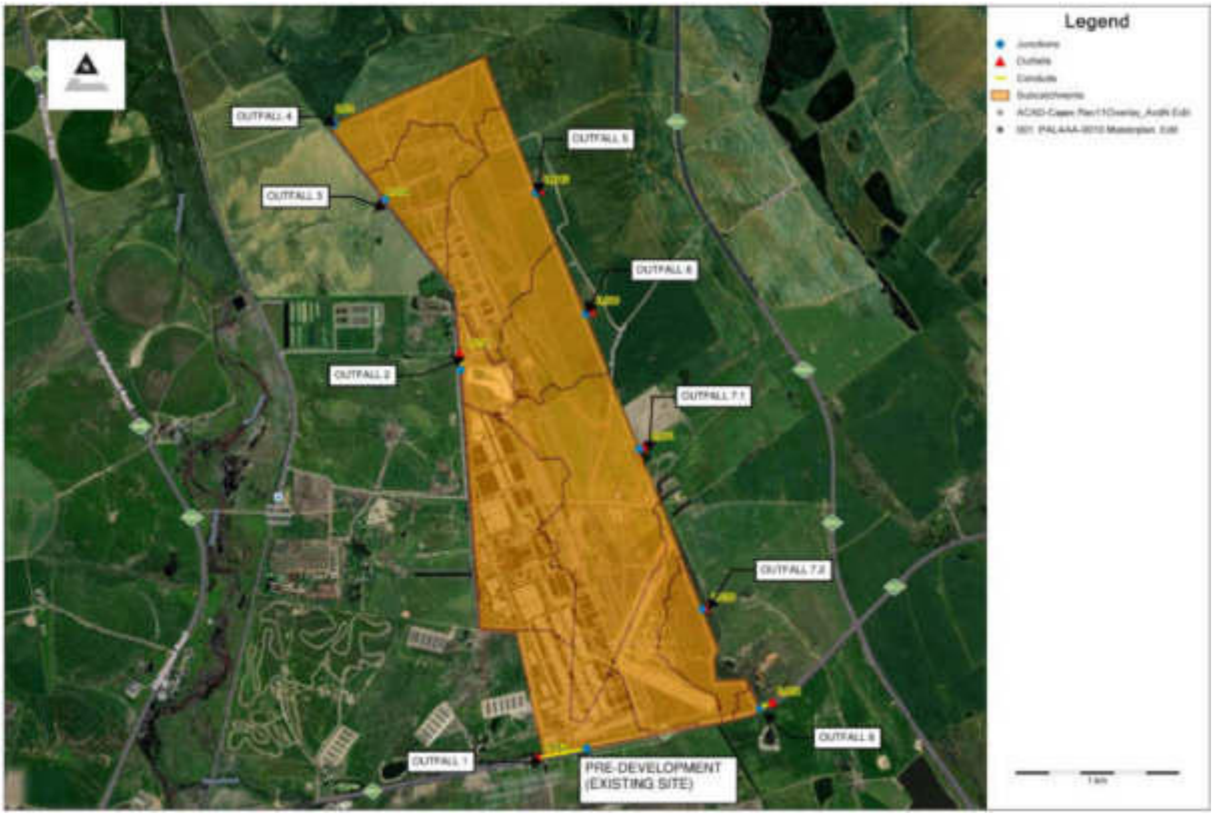
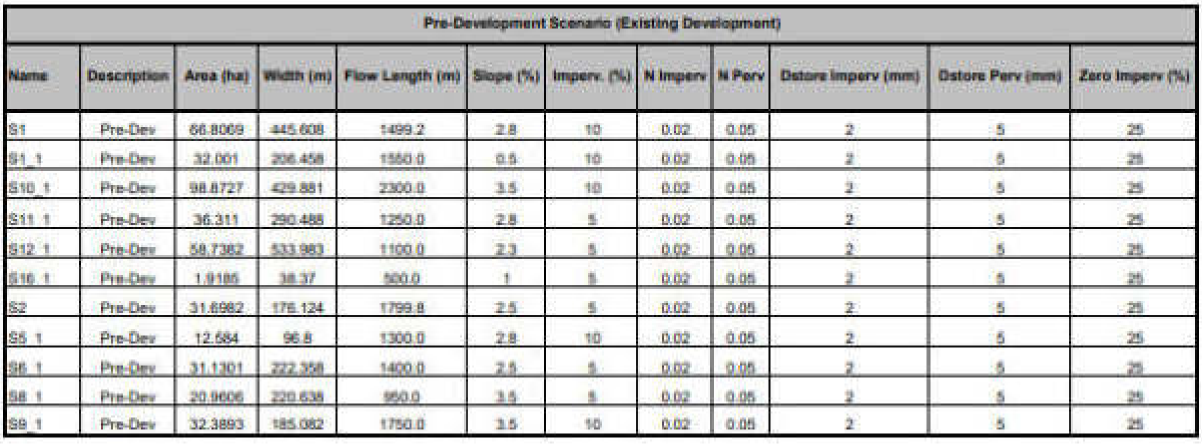


Figure 13: Pre-Development Scenario

The Pre-Development scenario and sub-catchments parameters can be seen in Table 5 below.



Pre-Development Scenario (Existing Development)											
Name	Description	Area (ha)	Width (m)	Flow Length (m)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)
S1	Pre-Dev	66.8069	445.608	1499.2	2.8	10	0.02	0.05	2	5	25
S1_1	Pre-Dev	32.001	206.458	1550.0	0.5	10	0.02	0.05	2	5	25
S10_1	Pre-Dev	98.8727	429.881	2300.0	3.5	10	0.02	0.05	2	5	25
S11_1	Pre-Dev	36.311	290.488	1250.0	2.8	5	0.02	0.05	2	5	25
S12_1	Pre-Dev	58.7382	533.983	1100.0	2.3	5	0.02	0.05	2	5	25
S16_1	Pre-Dev	1.9185	38.37	500.0	1	5	0.02	0.05	2	5	25
S2	Pre-Dev	31.6982	176.124	1799.8	2.5	5	0.02	0.05	2	5	25
S5_1	Pre-Dev	12.584	96.8	1300.0	2.8	10	0.02	0.05	2	5	25
S6_1	Pre-Dev	31.1301	222.358	1400.0	2.5	5	0.02	0.05	2	5	25
S8_1	Pre-Dev	20.9606	220.638	950.0	3.5	5	0.02	0.05	2	5	25
S9_1	Pre-Dev	32.3893	185.082	1750.0	3.5	10	0.02	0.05	2	5	25

Table 5: PCSWMM Pre-Development Model Catchment Parameter Summary

4.4.3 Post-Development Runoff

To accurately model run-off from various areas on site for the Post-Development Scenario, the site was subdivided into various sub-catchments. This sub-division was based on surface type and various other geometric constraints. The post development sub-catchment parameters are summarised below in Table 6:

Sub-Catchment Parameters	Cape Winelands Airport (Post-Development)
Area (ha)	430
Width (m)	Varies
Length (m)	Varies
"n" Impervious Area	0.014 (roof) 0.014 (asphalt) 0.014 (Other – Paved / Concrete Hardstand)
"n" Pervious Area	0.05
Slope (%)	Varies
Depression Storage Impervious Area (mm)	2
Depression Storage Pervious Area (mm)	5
Modified Green and Ampt Soil Parameters for Texture Sand (Rawls *et al.*, 1983)	
Suction Head (mm)	49.02
Conductivity (mm/hr)	120.34
Initial Deficit (frac.)	0.413

Table 6: Typical PCSWMM Post-development Model Sub-Catchment Parameters

The post-development peak un-attenuated runoff volumes for the development are summarised in Table 7 below.

Post-Development Peak Un-Attenuated Volumes (m^3/s) - Recurrence Interval (Years)					
Outfall	**2yr**	**5yr**	**10yr**	**20yr**	**50yr**
Pond 1	2.419	3.379	4.059	4.748	5.570
Pond 2	8.289	11.713	14.334	17.135	21.416
Pond 3	2.116	2.959	3.582	4.235	5.212
Pond 4	0.106	0.148	0.179	0.212	0.259
Pond 5	1.763	2.553	3.099	3.563	3.850
Pond 6	0.099	0.144	0.177	0.213	0.265
Pond 7	0.322	0.465	0.571	0.683	0.844
Pond 8	0.639	0.933	1.155	1.395	1.738
Cape Winelands Airport Site Overall Total	**15.753**	**22.294**	**27.156**	**32.184**	**39.154**

Table 7: Post-development Peak Un-Attenuated Runoff Volumes

The Post-Development Scenario and subdivision of the various sub-catchments can be seen in Figure 14 below:

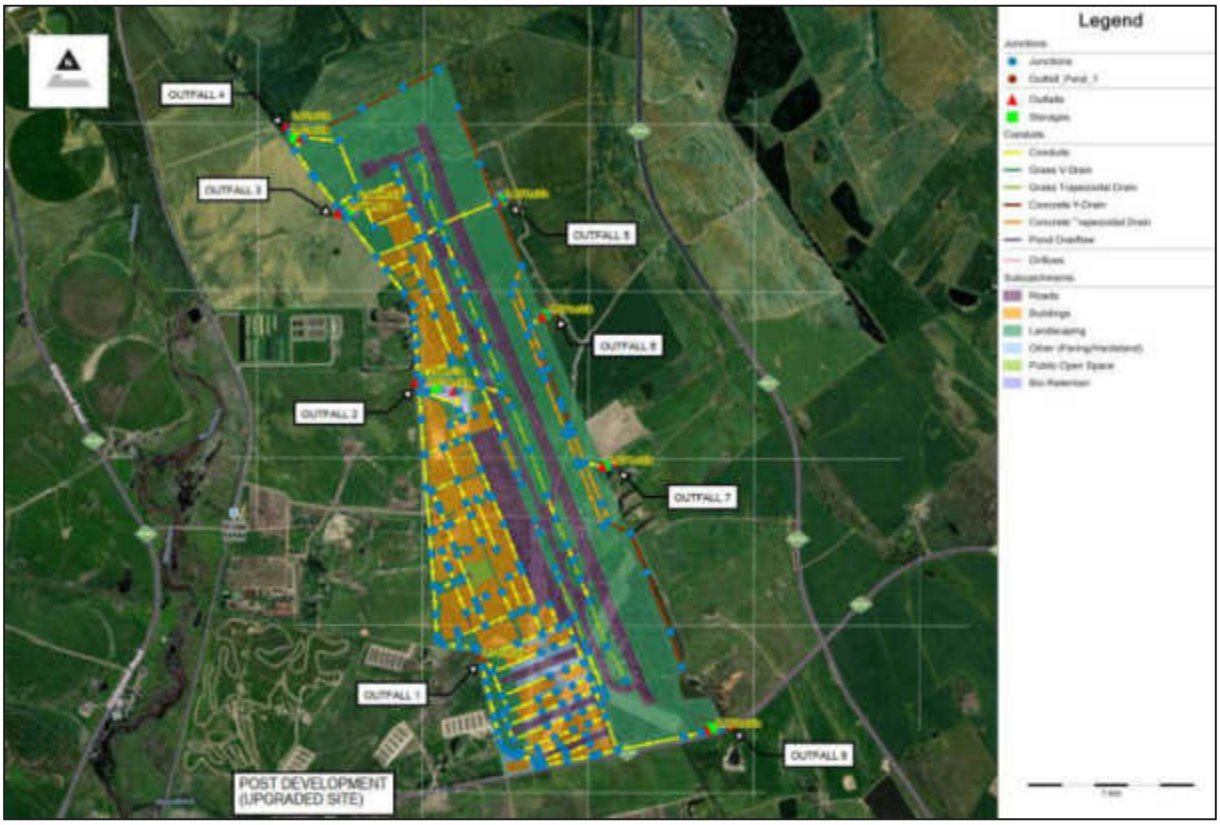
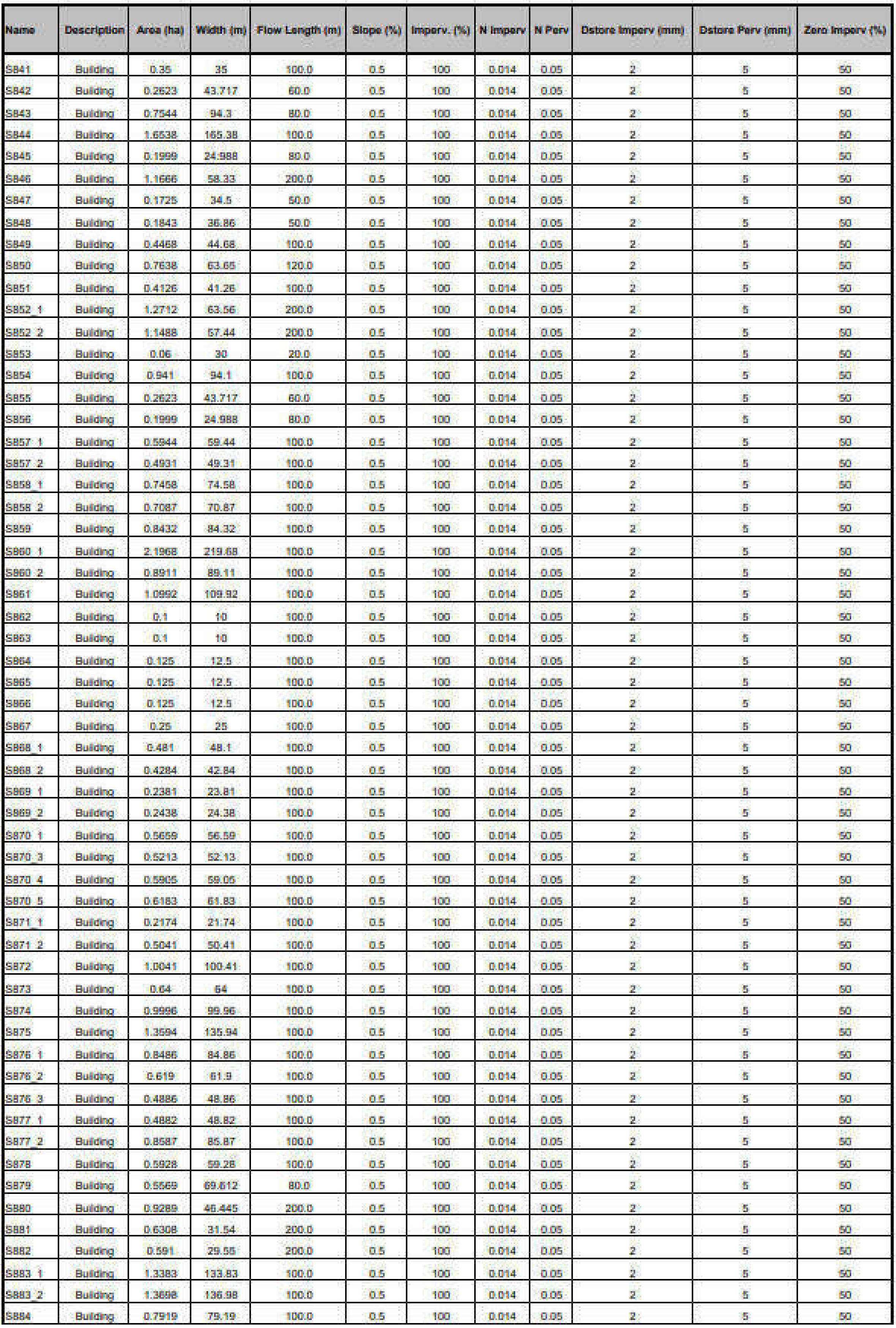


Figure 14: Post-Development Scenario

The Post-Development scenario and sub-catchments parameters can be seen in Table 8 below:

Name	Description	Area (ha)	Width (m)	Flow Length (m)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)
S136_1	Building	0.8716	87.16	100.0	0.5	100	0.014	0.05	2	5	50
S136_3	Building	0.5861	58.61	100.0	0.5	100	0.014	0.05	2	5	50
S136_4	Building	1.1421	114.21	100.0	0.5	100	0.014	0.05	2	5	50
S136_5	Building	1.7665	176.65	100.0	0.5	100	0.014	0.05	2	5	50
S824_1	Building	0.5428	54.28	100.0	0.5	100	0.014	0.05	2	5	50
S824_2	Building	1.3202	132.02	100.0	0.5	100	0.014	0.05	2	5	50
S825	Building	1.2328	123.28	100.0	0.5	100	0.014	0.05	2	5	50
S826	Building	1.959	122.438	160.0	0.5	100	0.014	0.05	2	5	50
S827	Building	0.044	4.4	100.0	0.5	100	0.014	0.05	2	5	50
S828	Building	1.8348	131.057	140.0	0.5	100	0.014	0.05	2	5	50
S829	Building	0.1827	30.45	60.0	0.5	100	0.014	0.05	2	5	50
S830	Building	0.325	46.429	70.0	0.5	100	0.014	0.05	2	5	50
S831_1	Building	0.967	96.7	100.0	0.5	100	0.014	0.05	2	5	50
S831_2	Building	0.9844	98.44	100.0	0.5	100	0.014	0.05	2	5	50
S832_1	Building	0.7294	72.94	100.0	0.5	100	0.014	0.05	2	5	50
S832_2	Building	1.525	152.5	100.0	0.5	100	0.014	0.05	2	5	50
S833	Building	3.3216	332.16	100.0	0.5	100	0.014	0.05	2	5	50
S834	Building	0.046	4.6	100.0	0.5	100	0.014	0.05	2	5	50
S835_1	Building	0.2346	23.46	100.0	0.5	100	0.014	0.05	2	5	50
S835_2	Building	0.5313	53.13	100.0	0.5	100	0.014	0.05	2	5	50
S836_1	Building	0.5395	53.95	100.0	0.5	100	0.014	0.05	2	5	50
S836_2	Building	0.5775	57.75	100.0	0.5	100	0.014	0.05	2	5	50
S837_1	Building	0.4918	49.18	100.0	0.5	100	0.014	0.05	2	5	50
S837_2	Building	0.4226	42.26	100.0	0.5	100	0.014	0.05	2	5	50
S838_1	Building	0.4154	41.54	100.0	0.5	100	0.014	0.05	2	5	50
S838_2	Building	0.4921	49.21	100.0	0.5	100	0.014	0.05	2	5	50
S839	Building	1.7435	174.35	100.0	0.5	100	0.014	0.05	2	5	50
S840	Building	1.4043	140.43	100.0	0.5	100	0.014	0.05	2	5	50



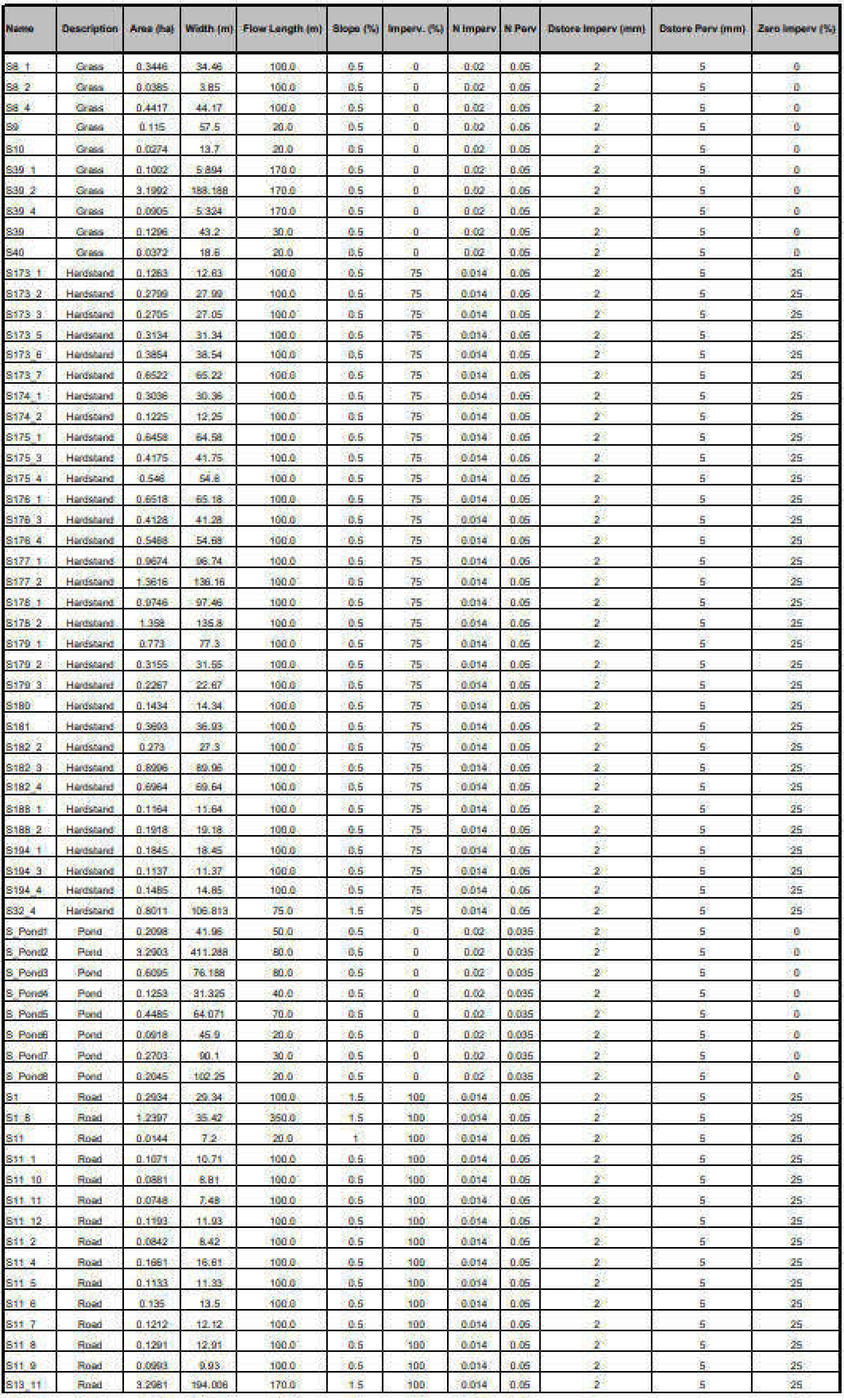
Name	Description	Area (ha)	Width (m)	Flow Length (m)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)
S841	Building	0.35	35	100.0	0.5	100	0.014	0.05	2	5	50
S842	Building	0.2623	43.717	60.0	0.5	100	0.014	0.05	2	5	50
S843	Building	0.7544	94.3	80.0	0.5	100	0.014	0.05	2	5	50
S844	Building	1.6538	165.38	100.0	0.5	100	0.014	0.05	2	5	50
S845	Building	0.1999	24.988	80.0	0.5	100	0.014	0.05	2	5	50
S846	Building	1.1666	58.33	200.0	0.5	100	0.014	0.05	2	5	50
S847	Building	0.1725	34.5	50.0	0.5	100	0.014	0.05	2	5	50
S848	Building	0.1843	36.86	50.0	0.5	100	0.014	0.05	2	5	50
S849	Building	0.4468	44.68	100.0	0.5	100	0.014	0.05	2	5	50
S850	Building	0.7638	63.65	120.0	0.5	100	0.014	0.05	2	5	50
S851	Building	0.4126	41.26	100.0	0.5	100	0.014	0.05	2	5	50
S852_1	Building	1.2712	63.56	200.0	0.5	100	0.014	0.05	2	5	50
S852_2	Building	1.1488	57.44	200.0	0.5	100	0.014	0.05	2	5	50
S853	Building	0.06	30	20.0	0.5	100	0.014	0.05	2	5	50
S854	Building	0.941	94.1	100.0	0.5	100	0.014	0.05	2	5	50
S855	Building	0.2623	43.717	60.0	0.5	100	0.014	0.05	2	5	50
S856	Building	0.1999	24.988	80.0	0.5	100	0.014	0.05	2	5	50
S857_1	Building	0.5944	59.44	100.0	0.5	100	0.014	0.05	2	5	50
S857_2	Building	0.4931	49.31	100.0	0.5	100	0.014	0.05	2	5	50
S858_1	Building	0.7458	74.58	100.0	0.5	100	0.014	0.05	2	5	50
S858_2	Building	0.7087	70.87	100.0	0.5	100	0.014	0.05	2	5	50
S859	Building	0.8432	84.32	100.0	0.5	100	0.014	0.05	2	5	50
S860_1	Building	2.1968	219.68	100.0	0.5	100	0.014	0.05	2	5	50
S860_2	Building	0.8911	89.11	100.0	0.5	100	0.014	0.05	2	5	50
S861	Building	1.0992	109.92	100.0	0.5	100	0.014	0.05	2	5	50
S862	Building	0.1	10	100.0	0.5	100	0.014	0.05	2	5	50
S863	Building	0.1	10	100.0	0.5	100	0.014	0.05	2	5	50
S864	Building	0.125	12.5	100.0	0.5	100	0.014	0.05	2	5	50
S865	Building	0.125	12.5	100.0	0.5	100	0.014	0.05	2	5	50
S866	Building	0.125	12.5	100.0	0.5	100	0.014	0.05	2	5	50
S867	Building	0.25	25	100.0	0.5	100	0.014	0.05	2	5	50
S868_1	Building	0.481	48.1	100.0	0.5	100	0.014	0.05	2	5	50
S868_2	Building	0.4284	42.84	100.0	0.5	100	0.014	0.05	2	5	50
S869_1	Building	0.2381	23.81	100.0	0.5	100	0.014	0.05	2	5	50
S869_2	Building	0.2438	24.38	100.0	0.5	100	0.014	0.05	2	5	50
S870_1	Building	0.5659	56.59	100.0	0.5	100	0.014	0.05	2	5	50
S870_3	Building	0.5213	52.13	100.0	0.5	100	0.014	0.05	2	5	50
S870_4	Building	0.5905	59.05	100.0	0.5	100	0.014	0.05	2	5	50
S870_5	Building	0.6183	61.83	100.0	0.5	100	0.014	0.05	2	5	50
S871_1	Building	0.2174	21.74	100.0	0.5	100	0.014	0.05	2	5	50
S871_2	Building	0.5041	50.41	100.0	0.5	100	0.014	0.05	2	5	50
S872	Building	1.0041	100.41	100.0	0.5	100	0.014	0.05	2	5	50
S873	Building	0.64	64	100.0	0.5	100	0.014	0.05	2	5	50
S874	Building	0.9996	99.96	100.0	0.5	100	0.014	0.05	2	5	50
S875	Building	1.3594	135.94	100.0	0.5	100	0.014	0.05	2	5	50
S876_1	Building	0.8486	84.86	100.0	0.5	100	0.014	0.05	2	5	50
S876_2	Building	0.619	61.9	100.0	0.5	100	0.014	0.05	2	5	50
S876_3	Building	0.4886	48.86	100.0	0.5	100	0.014	0.05	2	5	50
S877_1	Building	0.4882	48.82	100.0	0.5	100	0.014	0.05	2	5	50
S877_2	Building	0.8587	85.87	100.0	0.5	100	0.014	0.05	2	5	50
S878	Building	0.5928	59.28	100.0	0.5	100	0.014	0.05	2	5	50
S879	Building	0.5569	69.612	80.0	0.5	100	0.014	0.05	2	5	50
S880	Building	0.9289	46.445	200.0	0.5	100	0.014	0.05	2	5	50
S881	Building	0.6308	31.54	200.0	0.5	100	0.014	0.05	2	5	50
S882	Building	0.591	29.55	200.0	0.5	100	0.014	0.05	2	5	50
S883_1	Building	1.3383	133.83	100.0	0.5	100	0.014	0.05	2	5	50
S883_2	Building	1.3698	136.98	100.0	0.5	100	0.014	0.05	2	5	50
S884	Building	0.7919	79.19	100.0	0.5	100	0.014	0.05	2	5	50

Name	Description	Area (ha)	Width (m)	Flow Length (m)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)
S885	Building	0.622	62.2	100.0	0.5	100	0.014	0.05	2	5	50
S886	Building	0.7017	70.17	100.0	0.5	100	0.014	0.05	2	5	50
S887	Building	0.7017	70.17	100.0	0.5	100	0.014	0.05	2	5	50
S888	Building	0.622	62.2	100.0	0.5	100	0.014	0.05	2	5	50
S889	Building	0.7017	70.17	100.0	0.5	100	0.014	0.05	2	5	50
S890	Building	0.7017	70.17	100.0	0.5	100	0.014	0.05	2	5	50
S891_1	Building	1.1307	113.07	100.0	0.5	100	0.014	0.05	2	5	50
S891_3	Building	0.705	70.5	100.0	0.5	100	0.014	0.05	2	5	50
S891_4	Building	0.9408	94.08	100.0	0.5	100	0.014	0.05	2	5	50
S892_1	Building	1.1103	111.03	100.0	0.5	100	0.014	0.05	2	5	50
S892_3	Building	0.7257	72.57	100.0	0.5	100	0.014	0.05	2	5	50
S892_4	Building	0.9389	93.89	100.0	0.5	100	0.014	0.05	2	5	50
S893	Building	0.6315	50.52	125.0	0.5	100	0.014	0.05	2	5	50
S894_1	Building	0.7528	75.28	100.0	0.5	100	0.014	0.05	2	5	50
S894_2	Building	1.1102	111.02	100.0	0.5	100	0.014	0.05	2	5	50
S895	Building	0.4636	46.36	100.0	0.5	100	0.014	0.05	2	5	50
S896	Building	0.8512	85.12	100.0	0.5	100	0.014	0.05	2	5	50
S897	Building	0.5204	52.04	100.0	0.5	100	0.014	0.05	2	5	50
S898	Building	0.2987	24.892	120.0	0.5	100	0.014	0.05	2	5	50
S1_4	Grass	0.3307	66.14	50.0	0.5	0	0.02	0.05	2	5	0
S12_1	Grass	0.4631	30.873	150.0	0.5	0	0.02	0.05	2	5	0
S12_2	Grass	0.3307	33.07	100.0	0.5	0	0.02	0.05	2	5	0
S12_3	Grass	0.8082	36.736	220.0	0.5	0	0.02	0.05	2	5	0
S12_5	Grass	0.4882	32.547	150.0	0.5	0	0.02	0.05	2	5	0
S12_6	Grass	0.4429	31.636	140.0	0.5	0	0.02	0.05	2	5	0
S12_7	Grass	0.64	32	200.0	0.5	0	0.02	0.05	2	5	0
S12_8	Grass	0.3765	34.227	110.0	0.5	0	0.02	0.05	2	5	0
S13	Grass	4.4598	222.99	200.0	0.5	0	0.02	0.05	2	5	0
S15_3	Grass	0.6131	30.655	200.0	0.5	0	0.02	0.05	2	5	0
S15_4	Grass	0.6073	30.365	200.0	0.5	0	0.02	0.05	2	5	0
S18	Grass	2.1429	107.145	200.0	0.5	0	0.02	0.05	2	5	0
S18_6	Grass	3.2386	323.86	100.0	0.5	0	0.02	0.05	2	5	0
S183	Grass	0.5514	55.14	100.0	0.5	0	0.02	0.05	2	5	0
S184_1	Grass	0.0808	8.08	100.0	0.5	0	0.02	0.05	2	5	0
S184_3	Grass	0.0804	8.04	100.0	0.5	0	0.02	0.05	2	5	0
S184_4	Grass	0.6383	63.83	100.0	0.5	0	0.02	0.05	2	5	0
S185	Grass	0.1687	16.87	100.0	0.5	0	0.02	0.05	2	5	0
S186	Grass	0.2872	28.72	100.0	0.5	0	0.02	0.05	2	5	0
S187	Grass	0.3972	39.72	100.0	0.5	0	0.02	0.05	2	5	0
S189	Grass	0.0903	9.03	100.0	0.5	0	0.02	0.05	2	5	0
S19	Grass	0.0543	5.43	100.0	0.5	0	0.02	0.05	2	5	0
S190	Grass	0.7908	79.08	100.0	0.5	0	0.02	0.05	2	5	0
S191	Grass	0.3845	38.45	100.0	0.5	0	0.02	0.05	2	5	0
S193_2	Grass	0.423	70.5	60.0	0.5	0	0.02	0.05	2	5	0
S193_3	Grass	0.7555	75.55	100.0	0.5	0	0.02	0.05	2	5	0
S193_4	Grass	0.6987	87.338	80.0	0.5	0	0.02	0.05	2	5	0
S193_5	Grass	0.2076	34.6	60.0	0.5	0	0.02	0.05	2	5	0
S193_6	Grass	0.5185	74.071	70.0	0.5	0	0.02	0.05	2	5	0
S193_7	Grass	0.7365	92.062	80.0	0.5	0	0.02	0.05	2	5	0
S195_1	Grass	0.5457	54.57	100.0	0.75	0	0.02	0.05	2	5	0
S195_2	Grass	0.9104	91.04	100.0	0.75	0	0.02	0.05	2	5	0
S197_1	Grass	0.5532	55.32	100.0	0.5	0	0.02	0.05	2	5	0
S197_3	Grass	0.3629	36.29	100.0	0.5	0	0.02	0.05	2	5	0
S197_4	Grass	0.2028	20.28	100.0	0.5	0	0.02	0.05	2	5	0
S197_5	Grass	0.116	11.6	100.0	0.5	0	0.02	0.05	2	5	0
S197_6	Grass	0.3071	30.71	100.0	0.5	0	0.02	0.05	2	5	0
S198_1	Grass	0.338	33.8	100.0	0.5	0	0.02	0.05	2	5	0
S198_10	Grass	0.0743	7.43	100.0	0.5	0	0.02	0.05	2	5	0
S198_2	Grass	0.3601	36.01	100.0	0.5	0	0.02	0.05	2	5	0
S198_3	Grass	0.3197	31.97	100.0	0.5	0	0.02	0.05	2	5	0

Name	Description	Area (ha)	Width (m)	Flow Length (m)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)
S198_4	Grass	0.1222	12.22	100.0	0.5	0	0.02	0.05	2	5	0
S198_5	Grass	0.1467	14.67	100.0	0.5	0	0.02	0.05	2	5	0
S198_6	Grass	0.3309	33.09	100.0	0.5	0	0.02	0.05	2	5	0
S198_7	Grass	0.1941	19.41	100.0	0.5	0	0.02	0.05	2	5	0
S198_8	Grass	0.1324	13.24	100.0	0.5	0	0.02	0.05	2	5	0
S199	Grass	0.309	30.9	100.0	0.5	0	0.02	0.05	2	5	0
S200_1	Grass	0.3474	34.74	100.0	0.5	0	0.02	0.05	2	5	0
S200_2	Grass	0.4685	46.85	100.0	0.5	0	0.02	0.05	2	5	0
S201	Grass	0.27	24.545	110.0	0.5	0	0.02	0.05	2	5	0
S202	Grass	0.5447	54.47	100.0	0.5	0	0.02	0.05	2	5	0
S203	Grass	0.1518	15.18	100.0	0.5	0	0.02	0.05	2	5	0
S204	Grass	0.1672	15.2	110.0	0.5	0	0.02	0.05	2	5	0
S205	Grass	0.162	16.2	100.0	0.5	0	0.02	0.05	2	5	0
S206_1	Grass	0.2851	23.758	120.0	0.5	0	0.02	0.05	2	5	0
S206_2	Grass	0.414	34.5	120.0	0.5	0	0.02	0.05	2	5	0
S206_3	Grass	0.2117	21.17	100.0	0.5	0	0.02	0.05	2	5	0
S207	Grass	0.453	45.3	100.0	0.5	0	0.02	0.05	2	5	0
S208_1	Grass	0.5643	70.538	80.0	0.5	0	0.02	0.05	2	5	0
S208_2	Grass	0.1272	12.72	100.0	0.5	0	0.02	0.05	2	5	0
S208_3	Grass	0.312	31.2	100.0	0.5	0	0.02	0.05	2	5	0
S208_4	Grass	0.2359	23.59	100.0	0.5	0	0.02	0.05	2	5	0
S209	Grass	0.6781	67.81	100.0	0.5	0	0.02	0.05	2	5	0
S21	Grass	3.4882	348.82	100.0	0.5	0	0.02	0.05	2	5	0
S210_1	Grass	0.2153	21.53	100.0	0.5	0	0.02	0.05	2	5	0
S210_3	Grass	0.2828	28.28	100.0	0.5	0	0.02	0.05	2	5	0
S210_4	Grass	0.1065	10.65	100.0	0.5	0	0.02	0.05	2	5	0
S210_5	Grass	0.2299	22.99	100.0	0.5	0	0.02	0.05	2	5	0
S211_1	Grass	0.9571	95.71	100.0	0.5	0	0.02	0.05	2	5	0
S211_2	Grass	2.1091	210.91	100.0	0.5	0	0.02	0.05	2	5	0
S212_1	Grass	0.2361	23.61	100.0	0.5	0	0.02	0.05	2	5	0
S212_2	Grass	1.5663	156.63	100.0	0.5	0	0.02	0.05	2	5	0
S213_1	Grass	0.4712	47.12	100.0	0.5	0	0.02	0.05	2	5	0
S213_2	Grass	0.1444	14.44	100.0	0.5	0	0.02	0.05	2	5	0
S213_3	Grass	1.4522	90.762	160.0	0.5	0	0.02	0.05	2	5	0
S214	Grass	0.1355	13.55	100.0	0.5	0	0.02	0.05	2	5	0
S215	Grass	0.3375	33.75	100.0	0.5	0	0.02	0.05	2	5	0
S216	Grass	1.1982	66.567	180.0	0.5	0	0.02	0.05	2	5	0
S217_1	Grass	0.39	39	100.0	0.5	0	0.02	0.05	2	5	0
S217_2	Grass	0.5325	44.375	120.0	0.5	0	0.02	0.05	2	5	0
S217_3	Grass	0.885	88.5	100.0	0.5	0	0.02	0.05	2	5	0
S218	Grass	0.2	20	100.0	0.5	0	0.02	0.05	2	5	0
S219	Grass	0.1902	19.02	100.0	0.5	0	0.02	0.05	2	5	0
S22	Grass	4.487	448.7	100.0	0.5	0	0.02	0.05	2	5	0
S220	Grass	0.0274	2.74	100.0	0.5	0	0.02	0.05	2	5	0
S221	Grass	0.3031	30.31	100.0	0.5	0	0.02	0.05	2	5	0
S222	Grass	0.1232	12.32	100.0	0.5	0	0.02	0.05	2	5	0
S223_1	Grass	0.1515	18.938	80.0	0.5	0	0.02	0.05	2	5	0
S223_2	Grass	1.2694	79.338	160.0	0.5	0	0.02	0.05	2	5	0
S224	Grass	0.0499	4.99	100.0	0.5	0	0.02	0.05	2	5	0
S225	Grass	0.0297	2.97	100.0	0.5	0	0.02	0.05	2	5	0
S226	Grass	0.3987	39.87	100.0	0.5	0	0.02	0.05	2	5	0
S227	Grass	0.4756	47.56	100.0	0.5	0	0.02	0.05	2	5	0
S228	Grass	0.0537	5.37	100.0	0.5	0	0.02	0.05	2	5	0
S229_1	Grass	0.1344	13.44	100.0	0.5	0	0.02	0.05	2	5	0
S229_2	Grass	0.1093	10.93	100.0	0.5	0	0.02	0.05	2	5	0
S229_3	Grass	0.2684	26.84	100.0	0.5	0	0.02	0.05	2	5	0
S229_4	Grass	0.069	6.9	100.0	0.5	0	0.02	0.05	2	5	0
S230_1	Grass	0.336	33.6	100.0	0.5	0	0.02	0.05	2	5	0
S230_2	Grass	0.2926	29.26	100.0	0.5	0	0.02	0.05	2	5	0

Name	Description	Area (ha)	Width (m)	Flow Length (m)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)
S231	Grass	0.1566	15.66	100.0	0.5	0	0.02	0.05	2	5	0
S232	Grass	0.0252	2.52	100.0	0.5	0	0.02	0.05	2	5	0
S233	Grass	0.0476	4.76	100.0	0.5	0	0.02	0.05	2	5	0
S234	Grass	0.0572	5.72	100.0	0.5	0	0.02	0.05	2	5	0
S235	Grass	0.302	30.2	100.0	0.5	0	0.02	0.05	2	5	0
S236	Grass	0.0157	1.57	100.0	0.5	0	0.02	0.05	2	5	0
S237	Grass	0.1674	16.74	100.0	0.5	0	0.02	0.05	2	5	0
S238	Grass	0.0874	8.74	100.0	0.5	0	0.02	0.05	2	5	0
S239	Grass	0.4724	47.24	100.0	0.5	0	0.02	0.05	2	5	0
S240_1	Grass	0.2282	25.356	90.0	0.5	0	0.02	0.05	2	5	0
S240_2	Grass	0.3818	42.422	90.0	0.5	0	0.02	0.05	2	5	0
S241	Grass	0.2344	29.3	80.0	0.5	0	0.02	0.05	2	5	0
S242	Grass	0.8934	52.553	170.0	0.5	0	0.02	0.05	2	5	0
S28	Grass	0.6137	61.37	100.0	0.5	0	0.02	0.05	2	5	0
S29	Grass	2.3307	116.535	200.0	0.5	0	0.02	0.05	2	5	0
S3	Grass	4.463	446.3	100.0	0.5	0	0.02	0.05	2	5	0
S3_119	Grass	1.5332	85.178	180.0	0.5	0	0.02	0.05	2	5	0
S3_122	Grass	1.921	80.042	240.0	0.5	0	0.02	0.05	2	5	0
S3_124	Grass	3.594	94.579	380.0	0.5	0	0.02	0.05	2	5	0
S3_126	Grass	2.9847	149.235	200.0	0.5	0	0.02	0.05	2	5	0
S3_127	Grass	3.0986	154.93	200.0	0.5	0	0.02	0.05	2	5	0
S3_17	Grass	2.9314	101.083	290.0	0.5	0	0.02	0.05	2	5	0
S3_18	Grass	1.1744	65.244	180.0	0.5	0	0.02	0.05	2	5	0
S3_19	Grass	0.9188	45.94	200.0	0.5	0	0.02	0.05	2	5	0
S3_20	Grass	2.9278	146.39	200.0	0.5	0	0.02	0.05	2	5	0
S3_21	Grass	1.662	83.1	200.0	0.5	0	0.02	0.05	2	5	0
S3_23	Grass	1.6534	91.856	180.0	0.5	0	0.02	0.05	2	5	0
S3_24	Grass	1.2164	121.64	100.0	0.5	0	0.02	0.05	2	5	0
S3_27	Grass	2.9873	90.524	330.0	0.5	0	0.02	0.05	2	5	0
S3_32	Grass	1.3324	74.022	180.0	0.5	0	0.02	0.05	2	5	0
S3_42	Grass	0.4377	43.77	100.0	0.5	0	0.02	0.05	2	5	0
S3_69	Grass	1.38	138	100.0	0.5	0	0.02	0.05	2	5	0
S3_7	Grass	0.2614	26.14	100.0	0.5	0	0.02	0.05	2	5	0
S3_8	Grass	1.6619	83.095	200.0	0.5	0	0.02	0.05	2	5	0
S32	Grass	0.1018	10.18	100.0	0.5	0	0.02	0.05	2	5	0
S32_1	Grass	0.2138	21.38	100.0	0.5	0	0.02	0.05	2	5	0
S32_10	Grass	1.0169	40.676	250.0	0.5	0	0.02	0.05	2	5	0
S32_11	Grass	0.6588	32.94	200.0	0.5	0	0.02	0.05	2	5	0
S32_12	Grass	0.548	39.143	140.0	0.5	0	0.02	0.05	2	5	0
S32_13	Grass	0.0756	7.56	100.0	0.5	0	0.02	0.05	2	5	0
S32_3	Grass	0.5271	29.283	180.0	0.5	0	0.02	0.05	2	5	0
S32_6	Grass	0.5857	32.539	180.0	0.5	0	0.02	0.05	2	5	0
S32_8	Grass	0.6524	32.62	200.0	0.5	0	0.02	0.05	2	5	0
S36	Grass	3.2245	161.225	200.0	0.5	0	0.02	0.05	2	5	0
S37	Grass	0.7418	30.908	240.0	0.5	0	0.02	0.05	2	5	0
S38	Grass	6.0018	300.09	200.0	0.5	0	0.02	0.05	2	5	0
S4	Grass	1.1763	65.35	180.0	0.5	0	0.02	0.05	2	5	0
S45_11	Grass	0.166	16.6	100.0	1.5	0	0.02	0.05	2	5	0
S45_12	Grass	0.1515	15.15	100.0	1.5	0	0.02	0.05	2	5	0
S45_14	Grass	0.1155	9.625	120.0	1.5	0	0.02	0.05	2	5	0
S45_16	Grass	0.1027	5.706	180.0	1.5	0	0.02	0.05	2	5	0
S45_17	Grass	0.1004	5.578	180.0	1.5	0	0.02	0.05	2	5	0
S45_19	Grass	0.0996	9.96	100.0	1.5	0	0.02	0.05	2	5	0
S45_2	Grass	0.0706	8.825	80.0	1.5	0	0.02	0.05	2	5	0
S45_20	Grass	0.0968	9.68	100.0	1.5	0	0.02	0.05	2	5	0
S45_22	Grass	0.1331	7.829	170.0	1.5	0	0.02	0.05	2	5	0
S45_23	Grass	0.056	11.2	50.0	1.5	0	0.02	0.05	2	5	0
S45_25	Grass	0.1246	7.788	160.0	1.5	0	0.02	0.05	2	5	0
S45_26	Grass	0.1226	7.662	160.0	1.5	0	0.02	0.05	2	5	0

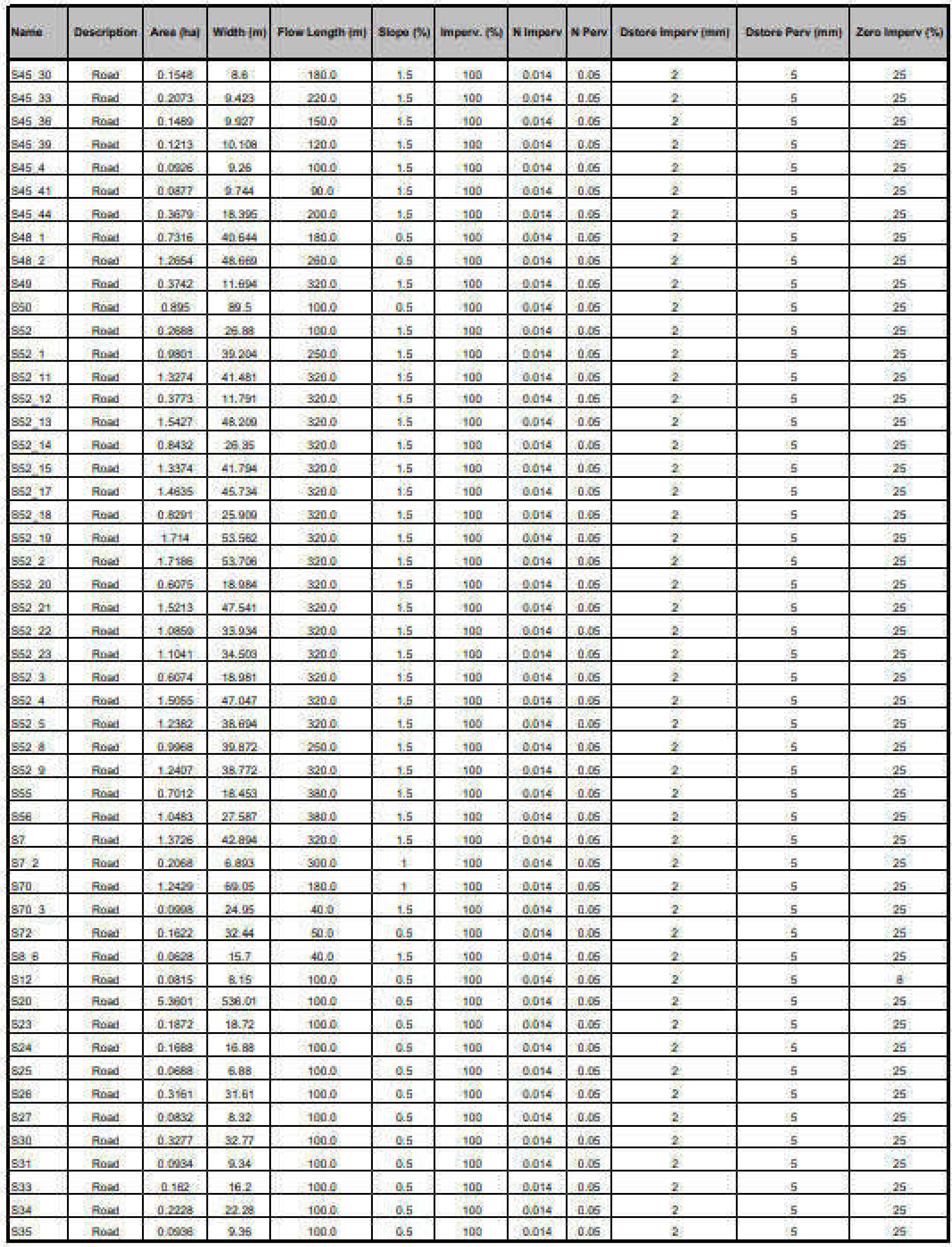
Name	Description	Area (ha)	Width (m)	Flow Length (m)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)
S45_28	Grass	0.1202	8.013	150.0	1.5	0	0.02	0.05	2	5	0
S45_29	Grass	0.1104	7.36	150.0	1.5	0	0.02	0.05	2	5	0
S45_3	Grass	0.0707	10.1	70.0	1.5	0	0.02	0.05	2	5	0
S45_31	Grass	0.1584	9.9	160.0	1.5	0	0.02	0.05	2	5	0
S45_32	Grass	0.0259	6.475	40.0	1.5	0	0.02	0.05	2	5	0
S45_34	Grass	0.1121	8.623	130.0	1.5	0	0.02	0.05	2	5	0
S45_37	Grass	0.0951	10.567	90.0	1.5	0	0.02	0.05	2	5	0
S45_38	Grass	0.0742	8.244	90.0	1.5	0	0.02	0.05	2	5	0
S45_40	Grass	0.0654	8.175	80.0	1.5	0	0.02	0.05	2	5	0
S45_42	Grass	0.2917	16.206	180.0	1.5	0	0.02	0.05	2	5	0
S45_43	Grass	0.0268	6.7	40.0	1.5	0	0.02	0.05	2	5	0
S45_45	Grass	0.077	9.625	80.0	1.5	0	0.02	0.05	2	5	0
S45_46	Grass	0.0261	6.525	40.0	1.5	0	0.02	0.05	2	5	0
S45_47	Grass	0.0863	9.589	90.0	1.5	0	0.02	0.05	2	5	0
S45_48	Grass	0.0478	9.56	50.0	1.5	0	0.02	0.05	2	5	0
S45_49	Grass	0.092	4.6	200.0	1.5	0	0.02	0.05	2	5	0
S45_5	Grass	0.1644	10.96	150.0	1.5	0	0.02	0.05	2	5	0
S45_6	Grass	0.1202	8.586	140.0	1.5	0	0.02	0.05	2	5	0
S45_7	Grass	0.0692	8.65	80.0	1.5	0	0.02	0.05	2	5	0
S45_8	Grass	0.1316	10.967	120.0	1.5	0	0.02	0.05	2	5	0
S5	Grass	1.679	167.9	100.0	0.5	0	0.02	0.05	2	5	0
S51_1	Grass	0.3084	20.56	150.0	0.868	0	0.02	0.05	2	5	0
S51_2	Grass	0.2899	19.327	150.0	0.868	0	0.02	0.05	2	5	0
S54	Grass	7.3951	369.755	200.0	0.5	0	0.02	0.05	2	5	0
S6	Grass	3.8232	212.4	180.0	0.5	0	0.02	0.05	2	5	0
S66_3	Grass	7.9683	796.83	100.0	0.5	0	0.02	0.05	2	5	0
S66_4	Grass	5.6638	566.38	100.0	0.5	0	0.02	0.05	2	5	0
S66_5	Grass	2.4406	244.06	100.0	0.5	0	0.02	0.05	2	5	0
S67	Grass	6.2018	310.09	200.0	0.5	0	0.02	0.05	2	5	0
S7_1	Grass	0.5354	66.925	80.0	0.5	0	0.02	0.05	2	5	0
S7_11	Grass	1.6543	82.715	200.0	0.5	0	0.02	0.05	2	5	0
S7_12	Grass	0.4761	23.805	200.0	0.5	0	0.02	0.05	2	5	0
S7_3	Grass	3.8494	192.47	200.0	0.5	0	0.02	0.05	2	5	0
S7_39	Grass	0.4525	22.625	200.0	0.5	0	0.02	0.05	2	5	0
S7_4	Grass	1.2187	121.87	100.0	0.5	0	0.02	0.05	2	5	0
S7_41	Grass	4.353	217.65	200.0	0.5	0	0.02	0.05	2	5	0
S7_44	Grass	3.2677	163.385	200.0	0.5	0	0.02	0.05	2	5	0
S7_45	Grass	8.0963	404.815	200.0	0.5	0	0.02	0.05	2	5	0
S7_46	Grass	6.3093	315.465	200.0	0.5	0	0.02	0.05	2	5	0
S7_49	Grass	5.241	262.05	200.0	0.5	0	0.02	0.05	2	5	0
S7_5	Grass	1.3015	130.15	100.0	0.5	0	0.02	0.05	2	5	0
S7_50	Grass	6.9122	345.61	200.0	0.5	0	0.02	0.05	2	5	0
S7_51	Grass	2.0226	101.13	200.0	0.5	0	0.02	0.05	2	5	0
S7_53	Grass	7.9924	399.62	200.0	0.5	0	0.02	0.05	2	5	0
S7_6	Grass	0.3656	45.7	80.0	0.5	0	0.02	0.05	2	5	0
S7_7	Grass	0.5805	72.562	80.0	0.5	0	0.02	0.05	2	5	0
S7_8	Grass	8.4494	422.47	200.0	0.5	0	0.02	0.05	2	5	0
S70_1	Grass	0.0629	6.29	100.0	0.5	0	0.02	0.05	2	5	0
S70_4	Grass	2.1595	179.958	120.0	0.5	0	0.02	0.05	2	5	0
S71_1	Grass	0.1697	16.97	100.0	0.5	0	0.02	0.05	2	5	0
S71_10	Grass	0.2056	20.56	100.0	0.5	0	0.02	0.05	2	5	0
S71_11	Grass	0.5037	50.37	100.0	0.5	0	0.02	0.05	2	5	0
S71_3	Grass	0.2287	22.87	100.0	0.5	0	0.02	0.05	2	5	0
S71_5	Grass	0.5007	50.07	100.0	0.5	0	0.02	0.05	2	5	0
S71_6	Grass	0.9087	90.87	100.0	0.5	0	0.02	0.05	2	5	0
S71_7	Grass	0.4584	45.84	100.0	0.5	0	0.02	0.05	2	5	0
S71_8	Grass	2.0617	206.17	100.0	0.5	0	0.02	0.05	2	5	0
S71_9	Grass	1.2004	120.04	100.0	0.5	0	0.02	0.05	2	5	0
S8	Grass	2.4899	177.85	140.0	0.5	0	0.02	0.05	2	5	0



Name	Description	Area (ha)	Width (m)	Flow Length (m)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)
S8_1	Grass	0.3446	34.46	100.0	0.5	0	0.02	0.05	2	5	0
S8_2	Grass	0.0385	3.85	100.0	0.5	0	0.02	0.05	2	5	0
S8_4	Grass	0.4417	44.17	100.0	0.5	0	0.02	0.05	2	5	0
S9	Grass	0.115	57.5	20.0	0.5	0	0.02	0.05	2	5	0
S10	Grass	0.0274	13.7	20.0	0.5	0	0.02	0.05	2	5	0
S39_1	Grass	0.1002	5.894	170.0	0.5	0	0.02	0.05	2	5	0
S39_2	Grass	3.1992	188.188	170.0	0.5	0	0.02	0.05	2	5	0
S39_4	Grass	0.0905	5.324	170.0	0.5	0	0.02	0.05	2	5	0
S39	Grass	0.1296	43.2	30.0	0.5	0	0.02	0.05	2	5	0
S40	Grass	0.0372	18.6	20.0	0.5	0	0.02	0.05	2	5	0
S173_1	Hardstand	0.1263	12.63	100.0	0.5	75	0.014	0.05	2	5	25
S173_2	Hardstand	0.2799	27.99	100.0	0.5	75	0.014	0.05	2	5	25
S173_3	Hardstand	0.2705	27.05	100.0	0.5	75	0.014	0.05	2	5	25
S173_5	Hardstand	0.3134	31.34	100.0	0.5	75	0.014	0.05	2	5	25
S173_6	Hardstand	0.3854	38.54	100.0	0.5	75	0.014	0.05	2	5	25
S173_7	Hardstand	0.6522	65.22	100.0	0.5	75	0.014	0.05	2	5	25
S174_1	Hardstand	0.3036	30.36	100.0	0.5	75	0.014	0.05	2	5	25
S174_2	Hardstand	0.1225	12.25	100.0	0.5	75	0.014	0.05	2	5	25
S175_1	Hardstand	0.6458	64.58	100.0	0.5	75	0.014	0.05	2	5	25
S175_3	Hardstand	0.4175	41.75	100.0	0.5	75	0.014	0.05	2	5	25
S175_4	Hardstand	0.548	54.8	100.0	0.5	75	0.014	0.05	2	5	25
S176_1	Hardstand	0.6518	65.18	100.0	0.5	75	0.014	0.05	2	5	25
S176_3	Hardstand	0.4128	41.28	100.0	0.5	75	0.014	0.05	2	5	25
S176_4	Hardstand	0.5468	54.68	100.0	0.5	75	0.014	0.05	2	5	25
S177_1	Hardstand	0.9674	96.74	100.0	0.5	75	0.014	0.05	2	5	25
S177_2	Hardstand	1.3616	136.16	100.0	0.5	75	0.014	0.05	2	5	25
S178_1	Hardstand	0.9746	97.46	100.0	0.5	75	0.014	0.05	2	5	25
S178_2	Hardstand	1.358	135.8	100.0	0.5	75	0.014	0.05	2	5	25
S179_1	Hardstand	0.773	77.3	100.0	0.5	75	0.014	0.05	2	5	25
S179_2	Hardstand	0.3155	31.55	100.0	0.5	75	0.014	0.05	2	5	25
S179_3	Hardstand	0.2267	22.67	100.0	0.5	75	0.014	0.05	2	5	25
S180	Hardstand	0.1434	14.34	100.0	0.5	75	0.014	0.05	2	5	25
S181	Hardstand	0.3693	36.93	100.0	0.5	75	0.014	0.05	2	5	25
S182_2	Hardstand	0.273	27.3	100.0	0.5	75	0.014	0.05	2	5	25
S182_3	Hardstand	0.8996	89.96	100.0	0.5	75	0.014	0.05	2	5	25
S182_4	Hardstand	0.6964	69.64	100.0	0.5	75	0.014	0.05	2	5	25
S188_1	Hardstand	0.1164	11.64	100.0	0.5	75	0.014	0.05	2	5	25
S188_2	Hardstand	0.1918	19.18	100.0	0.5	75	0.014	0.05	2	5	25
S194_1	Hardstand	0.1845	18.45	100.0	0.5	75	0.014	0.05	2	5	25
S194_3	Hardstand	0.1137	11.37	100.0	0.5	75	0.014	0.05	2	5	25
S194_4	Hardstand	0.1485	14.85	100.0	0.5	75	0.014	0.05	2	5	25
S32_4	Hardstand	0.8011	106.813	75.0	1.5	75	0.014	0.05	2	5	25
S_Pond1	Pond	0.2098	41.96	50.0	0.5	0	0.02	0.035	2	5	0
S_Pond2	Pond	3.2903	411.288	80.0	0.5	0	0.02	0.035	2	5	0
S_Pond3	Pond	0.6095	76.188	80.0	0.5	0	0.02	0.035	2	5	0
S_Pond4	Pond	0.1253	31.325	40.0	0.5	0	0.02	0.035	2	5	0
S_Pond5	Pond	0.4485	64.071	70.0	0.5	0	0.02	0.035	2	5	0
S_Pond6	Pond	0.0918	45.9	20.0	0.5	0	0.02	0.035	2	5	0
S_Pond7	Pond	0.2703	90.1	30.0	0.5	0	0.02	0.035	2	5	0
S_Pond8	Pond	0.2045	102.25	20.0	0.5	0	0.02	0.035	2	5	0
S1	Road	0.2934	29.34	100.0	1.5	100	0.014	0.05	2	5	25
S1_8	Road	1.2397	35.42	350.0	1.5	100	0.014	0.05	2	5	25
S11	Road	0.0144	7.2	20.0	1	100	0.014	0.05	2	5	25
S11_1	Road	0.1071	10.71	100.0	0.5	100	0.014	0.05	2	5	25
S11_10	Road	0.0881	8.81	100.0	0.5	100	0.014	0.05	2	5	25
S11_11	Road	0.0748	7.48	100.0	0.5	100	0.014	0.05	2	5	25
S11_12	Road	0.1193	11.93	100.0	0.5	100	0.014	0.05	2	5	25
S11_2	Road	0.0842	8.42	100.0	0.5	100	0.014	0.05	2	5	25
S11_4	Road	0.1661	16.61	100.0	0.5	100	0.014	0.05	2	5	25
S11_5	Road	0.1133	11.33	100.0	0.5	100	0.014	0.05	2	5	25
S11_6	Road	0.135	13.5	100.0	0.5	100	0.014	0.05	2	5	25
S11_7	Road	0.1212	12.12	100.0	0.5	100	0.014	0.05	2	5	25
S11_8	Road	0.1291	12.91	100.0	0.5	100	0.014	0.05	2	5	25
S11_9	Road	0.0993	9.93	100.0	0.5	100	0.014	0.05	2	5	25
S13_11	Road	3.2981	194.006	170.0	1.5	100	0.014	0.05	2	5	25

Name	Description	Area (ha)	Width (m)	Flow Length (m)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)
S13_12	Road	2.8633	143.165	200.0	1.5	100	0.014	0.05	2	5	25
S13_14	Road	2.183	128.412	170.0	1.5	100	0.014	0.05	2	5	25
S13_2	Road	3.7056	217.976	170.0	1.5	100	0.014	0.05	2	5	25
S13_8	Road	2.2906	134.741	170.0	1.5	100	0.014	0.05	2	5	25
S139_1	Road	0.19	19	100.0	0.5	100	0.014	0.05	2	5	25
S139_2	Road	0.2501	17.864	140.0	0.5	100	0.014	0.05	2	5	25
S14	Road	0.4324	43.24	100.0	1.5	100	0.014	0.05	2	5	25
S140_1	Road	0.2455	20.458	120.0	0.5	100	0.014	0.05	2	5	25
S140_2	Road	0.1968	15.138	130.0	0.5	100	0.014	0.05	2	5	25
S141_1	Road	0.1978	19.78	100.0	0.5	100	0.014	0.05	2	5	25
S141_2	Road	0.1638	16.38	100.0	0.5	100	0.014	0.05	2	5	25
S141_4	Road	0.2705	27.05	100.0	0.5	100	0.014	0.05	2	5	25
S141_5	Road	0.1037	10.37	100.0	0.5	100	0.014	0.05	2	5	25
S143_1	Road	0.1235	12.35	100.0	0.5	100	0.014	0.05	2	5	25
S143_2	Road	0.1954	15.031	130.0	0.5	100	0.014	0.05	2	5	25
S143_3	Road	0.1526	15.26	100.0	0.5	100	0.014	0.05	2	5	25
S144_1	Road	0.1849	23.112	80.0	0.5	100	0.014	0.05	2	5	25
S144_3	Road	0.3115	14.159	220.0	0.5	100	0.014	0.05	2	5	25
S144_4	Road	0.1335	13.35	100.0	0.5	100	0.014	0.05	2	5	25
S144_5	Road	0.152	10.133	150.0	0.5	100	0.014	0.05	2	5	25
S145_2	Road	0.1074	10.74	100.0	0.5	100	0.014	0.05	2	5	25
S147	Road	0.4239	28.26	150.0	0.5	100	0.014	0.05	2	5	25
S148_1	Road	0.1977	10.983	180.0	0.5	100	0.014	0.05	2	5	25
S15	Road	0.2072	10.36	200.0	0.521	100	0.014	0.05	2	5	25
S150	Road	0.357	12.75	280.0	0.5	100	0.014	0.05	2	5	25
S152	Road	0.0198	9.9	20.0	0.5	100	0.014	0.05	2	5	25
S153	Road	1.2938	129.38	100.0	0.5	100	0.014	0.05	2	5	25
S155	Road	0.1133	11.33	100.0	0.5	100	0.014	0.05	2	5	25
S156_1	Road	0.1718	17.18	100.0	0.5	100	0.014	0.05	2	5	25
S157	Road	0.0807	8.07	100.0	0.5	100	0.014	0.05	2	5	25
S158_1	Road	0.0881	8.81	100.0	0.5	100	0.014	0.05	2	5	25
S158_2	Road	0.1513	10.087	150.0	0.5	100	0.014	0.05	2	5	25
S16	Road	0.228	27.874	81.8	0.519	100	0.014	0.05	2	5	25
S160_2	Road	0.1475	10.536	140.0	0.5	100	0.014	0.05	2	5	25
S161_1	Road	0.0418	4.18	100.0	0.5	100	0.014	0.05	2	5	25
S161_2	Road	0.1013	10.13	100.0	0.5	100	0.014	0.05	2	5	25
S161_3	Road	0.141	9.4	150.0	0.5	100	0.014	0.05	2	5	25
S161_5	Road	0.094	9.4	100.0	0.5	100	0.014	0.05	2	5	25
S161_6	Road	0.1572	10.48	150.0	0.5	100	0.014	0.05	2	5	25
S163	Road	0.172	13.231	130.0	0.5	100	0.014	0.05	2	5	25
S164_1	Road	0.1539	9.619	160.0	0.5	100	0.014	0.05	2	5	25
S164_3	Road	0.1075	8.958	120.0	0.5	100	0.014	0.05	2	5	25
S164_4	Road	0.1032	9.382	110.0	0.5	100	0.014	0.05	2	5	25
S164_5	Road	0.0476	7.933	60.0	0.5	100	0.014	0.05	2	5	25
S165	Road	0.1017	10.17	100.0	0.5	100	0.014	0.05	2	5	25
S166_1	Road	0.109	9.909	110.0	0.5	100	0.014	0.05	2	5	25
S166_3	Road	0.1154	9.617	120.0	0.5	100	0.014	0.05	2	5	25
S166_4	Road	0.1912	9.56	200.0	0.5	100	0.014	0.05	2	5	25
S167_1	Road	0.1259	9.685	130.0	0.5	100	0.014	0.05	2	5	25
S167_2	Road	0.2613	10.887	240.0	0.5	100	0.014	0.05	2	5	25
S168_1	Road	0.0794	8.822	90.0	0.5	100	0.014	0.05	2	5	25
S168_2	Road	0.116	9.667	120.0	0.5	100	0.014	0.05	2	5	25
S168_3	Road	0.0784	8.711	90.0	0.5	100	0.014	0.05	2	5	25
S168_4	Road	0.1217	9.362	130.0	0.5	100	0.014	0.05	2	5	25
S17	Road	0.1038	9.962	104.2	0.542	100	0.014	0.05	2	5	25
S170_1	Road	0.2726	27.26	100.0	0.5	100	0.014	0.05	2	5	25
S170_2	Road	0.092	9.2	100.0	0.5	100	0.014	0.05	2	5	25
S170_3	Road	0.2666	13.28	200.0	0.5	100	0.014	0.05	2	5	25

Name	Description	Area (ha)	Width (m)	Flow Length (m)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)
S170_4	Road	0.5958	29.79	200.0	0.5	100	0.014	0.05	2	5	25
S170_5	Road	0.0917	9.17	100.0	0.5	100	0.014	0.05	2	5	25
S170_7	Road	0.173	9.105	190.0	0.5	100	0.014	0.05	2	5	25
S170_8	Road	0.2387	23.87	100.0	0.5	100	0.014	0.05	2	5	25
S171_1	Road	0.1244	12.44	100.0	0.5	100	0.014	0.05	2	5	25
S171_10	Road	0.1248	12.48	100.0	0.5	100	0.014	0.05	2	5	25
S171_13	Road	0.1741	17.41	100.0	0.5	100	0.014	0.05	2	5	25
S171_14	Road	0.137	13.7	100.0	0.5	100	0.014	0.05	2	5	25
S171_16	Road	0.1952	19.52	100.0	0.5	100	0.014	0.05	2	5	25
S171_17	Road	0.1292	12.92	100.0	0.5	100	0.014	0.05	2	5	25
S171_18	Road	0.1467	14.67	100.0	0.5	100	0.014	0.05	2	5	25
S171_19	Road	0.129	12.9	100.0	0.5	100	0.014	0.05	2	5	25
S171_2	Road	0.2101	21.01	100.0	0.5	100	0.014	0.05	2	5	25
S171_3	Road	0.1036	10.36	100.0	0.5	100	0.014	0.05	2	5	25
S171_4	Road	0.1119	11.19	100.0	0.5	100	0.014	0.05	2	5	25
S171_5	Road	0.1779	17.79	100.0	0.5	100	0.014	0.05	2	5	25
S171_7	Road	0.0981	9.81	100.0	0.5	100	0.014	0.05	2	5	25
S171_8	Road	0.1416	14.16	100.0	0.5	100	0.014	0.05	2	5	25
S18_3	Road	0.1855	6.182	300.1	1	100	0.014	0.05	2	5	25
S192	Road	0.0078	0.78	100.0	0.5	100	0.014	0.05	2	5	25
S196_1	Road	0.1117	9.308	120.0	0.5	100	0.014	0.05	2	5	25
S196_2	Road	0.0731	8.6	85.0	0.5	100	0.014	0.05	2	5	25
S196_3	Road	0.0649	8.113	80.0	0.5	100	0.014	0.05	2	5	25
S2	Road	1.2727	36.363	350.0	1.5	100	0.014	0.05	2	5	25
S2_1	Road	1.0831	28.503	380.0	1.5	100	0.014	0.05	2	5	25
S2_11	Road	2.2623	59.534	380.0	1.5	100	0.014	0.05	2	5	25
S2_12	Road	0.5442	14.321	380.0	1.5	100	0.014	0.05	2	5	25
S2_2	Road	0.3157	8.308	380.0	1.5	100	0.014	0.05	2	5	25
S2_21	Road	0.8985	23.645	380.0	1.5	100	0.014	0.05	2	5	25
S2_22	Road	1.0928	28.758	380.0	1.5	100	0.014	0.05	2	5	25
S2_23	Road	0.3759	9.892	380.0	1.5	100	0.014	0.05	2	5	25
S2_24	Road	0.9336	24.568	380.0	1.5	100	0.014	0.05	2	5	25
S2_25	Road	0.5713	15.034	380.0	1.5	100	0.014	0.05	2	5	25
S2_26	Road	1.4833	39.034	380.0	1.5	100	0.014	0.05	2	5	25
S2_27	Road	0.8646	22.753	380.0	1.5	100	0.014	0.05	2	5	25
S2_28	Road	0.2321	6.108	380.0	1.5	100	0.014	0.05	2	5	25
S2_3	Road	2.6638	70.1	380.0	1.5	100	0.014	0.05	2	5	25
S2_4	Road	0.5751	15.134	380.0	1.5	100	0.014	0.05	2	5	25
S2_5	Road	1.477	38.868	380.0	1.5	100	0.014	0.05	2	5	25
S2_6	Road	2.6067	68.597	380.0	1.5	100	0.014	0.05	2	5	25
S2_7	Road	0.7242	19.058	380.0	1.5	100	0.014	0.05	2	5	25
S2_8	Road	0.7619	20.05	380.0	1.5	100	0.014	0.05	2	5	25
S23_2	Road	1.8656	58.3	320.0	1.5	100	0.014	0.05	2	5	25
S23_3	Road	0.3537	11.053	320.0	1.5	100	0.014	0.05	2	5	25
S23_4	Road	0.089	2.781	320.0	1.5	100	0.014	0.05	2	5	25
S24_2	Road	0.391	32.583	120.0	0.5	100	0.014	0.05	2	5	25
S24_3	Road	0.5227	34.847	150.0	0.5	100	0.014	0.05	2	5	25
S24_4	Road	0.4546	34.969	130.0	0.5	100	0.014	0.05	2	5	25
S3_1	Road	0.6254	41.693	150.0	0.5	100	0.014	0.05	2	5	25
S3_11	Road	0.1077	10.77	100.0	1.5	100	0.014	0.05	2	5	25
S3_3	Road	0.1839	18.39	100.0	1.5	100	0.014	0.05	2	5	25
S3_4	Road	0.3978	39.78	100.0	0.5	100	0.014	0.05	2	5	25
S3_5	Road	0.6568	43.787	150.0	0.5	100	0.014	0.05	2	5	25
S43	Road	0.2585	25.85	100.0	0.5	100	0.014	0.05	2	5	25
S45_1	Road	0.2575	8.583	300.0	1.5	100	0.014	0.05	2	5	25
S45_10	Road	0.2034	9.245	220.0	1.5	100	0.014	0.05	2	5	25
S45_13	Road	0.2098	11.656	180.0	1.5	100	0.014	0.05	2	5	25
S45_15	Road	0.1595	8.861	180.0	1.5	100	0.014	0.05	2	5	25
S45_18	Road	0.1365	7.583	180.0	1.5	100	0.014	0.05	2	5	25
S45_21	Road	0.1326	7.367	180.0	1.5	100	0.014	0.05	2	5	25
S45_24	Road	0.1626	8.558	190.0	1.5	100	0.014	0.05	2	5	25
S45_27	Road	0.1501	7.9	190.0	1.5	100	0.014	0.05	2	5	25



Name	Description	Area (ha)	Width (m)	Flow Length (m)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)
S45_30	Road	0.1548	8.6	180.0	1.5	100	0.014	0.05	2	5	25
S45_33	Road	0.2073	9.423	220.0	1.5	100	0.014	0.05	2	5	25
S45_36	Road	0.1489	9.927	150.0	1.5	100	0.014	0.05	2	5	25
S45_39	Road	0.1213	10.108	120.0	1.5	100	0.014	0.05	2	5	25
S45_4	Road	0.0926	9.26	100.0	1.5	100	0.014	0.05	2	5	25
S45_41	Road	0.0877	9.744	90.0	1.5	100	0.014	0.05	2	5	25
S45_44	Road	0.3679	18.395	200.0	1.5	100	0.014	0.05	2	5	25
S48_1	Road	0.7316	40.644	180.0	0.5	100	0.014	0.05	2	5	25
S48_2	Road	1.2654	48.669	260.0	0.5	100	0.014	0.05	2	5	25
S49	Road	0.3742	11.694	320.0	1.5	100	0.014	0.05	2	5	25
S50	Road	0.895	89.5	100.0	0.5	100	0.014	0.05	2	5	25
S52	Road	0.2688	26.88	100.0	1.5	100	0.014	0.05	2	5	25
S52_1	Road	0.9801	39.204	250.0	1.5	100	0.014	0.05	2	5	25
S52_11	Road	1.3274	41.481	320.0	1.5	100	0.014	0.05	2	5	25
S52_12	Road	0.3773	11.791	320.0	1.5	100	0.014	0.05	2	5	25
S52_13	Road	1.5427	48.209	320.0	1.5	100	0.014	0.05	2	5	25
S52_14	Road	0.8432	26.35	320.0	1.5	100	0.014	0.05	2	5	25
S52_15	Road	1.3374	41.794	320.0	1.5	100	0.014	0.05	2	5	25
S52_17	Road	1.4635	45.734	320.0	1.5	100	0.014	0.05	2	5	25
S52_18	Road	0.8291	25.909	320.0	1.5	100	0.014	0.05	2	5	25
S52_19	Road	1.714	53.562	320.0	1.5	100	0.014	0.05	2	5	25
S52_2	Road	1.7186	53.706	320.0	1.5	100	0.014	0.05	2	5	25
S52_20	Road	0.6075	18.984	320.0	1.5	100	0.014	0.05	2	5	25
S52_21	Road	1.5213	47.541	320.0	1.5	100	0.014	0.05	2	5	25
S52_22	Road	1.0859	33.934	320.0	1.5	100	0.014	0.05	2	5	25
S52_23	Road	1.1041	34.503	320.0	1.5	100	0.014	0.05	2	5	25
S52_3	Road	0.6074	18.981	320.0	1.5	100	0.014	0.05	2	5	25
S52_4	Road	1.5055	47.047	320.0	1.5	100	0.014	0.05	2	5	25
S52_5	Road	1.2382	38.694	320.0	1.5	100	0.014	0.05	2	5	25
S52_8	Road	0.9968	39.872	250.0	1.5	100	0.014	0.05	2	5	25
S52_9	Road	1.2407	38.772	320.0	1.5	100	0.014	0.05	2	5	25
S55	Road	0.7012	18.453	380.0	1.5	100	0.014	0.05	2	5	25
S56	Road	1.0483	27.587	380.0	1.5	100	0.014	0.05	2	5	25
S7	Road	1.3726	42.894	320.0	1.5	100	0.014	0.05	2	5	25
S7_2	Road	0.2068	6.893	300.0	1	100	0.014	0.05	2	5	25
S70	Road	1.2429	69.05	180.0	1	100	0.014	0.05	2	5	25
S70_3	Road	0.0998	24.95	40.0	1.5	100	0.014	0.05	2	5	25
S72	Road	0.1622	32.44	50.0	0.5	100	0.014	0.05	2	5	25
S8_6	Road	0.0628	15.7	40.0	1.5	100	0.014	0.05	2	5	25
S12	Road	0.0815	8.15	100.0	0.5	100	0.014	0.05	2	5	8
S20	Road	5.3601	536.01	100.0	0.5	100	0.014	0.05	2	5	25
S23	Road	0.1872	18.72	100.0	0.5	100	0.014	0.05	2	5	25
S24	Road	0.1688	16.88	100.0	0.5	100	0.014	0.05	2	5	25
S25	Road	0.0688	6.88	100.0	0.5	100	0.014	0.05	2	5	25
S26	Road	0.3161	31.61	100.0	0.5	100	0.014	0.05	2	5	25
S27	Road	0.0832	8.32	100.0	0.5	100	0.014	0.05	2	5	25
S30	Road	0.3277	32.77	100.0	0.5	100	0.014	0.05	2	5	25
S31	Road	0.0934	9.34	100.0	0.5	100	0.014	0.05	2	5	25
S33	Road	0.162	16.2	100.0	0.5	100	0.014	0.05	2	5	25
S34	Road	0.2228	22.28	100.0	0.5	100	0.014	0.05	2	5	25
S35	Road	0.0936	9.36	100.0	0.5	100	0.014	0.05	2	5	25

Table 8: PCSWMM Post-Development Model Catchment Parameter Summary

4.4.4 Extended Detention of the 1-year 24hr Event

When considering the 1-year 24-hour storm event to establish the extent of extended detention achieved by the proposed stormwater control measures, it is important to take note of the following:

- The run-off generated during the 1-year storm event is relatively low and can easily be discharged via the proposed underground stormwater pipe system
- It is not practical for outlet pipes to be sized smaller than 110mm Ø as the probability of blockage is high

It is proposed that variable outlet structures are designed specifically for each of the ponds based on the peak volume inflows. A typical variable outlet structure detail can be seen in Figure 15 below.

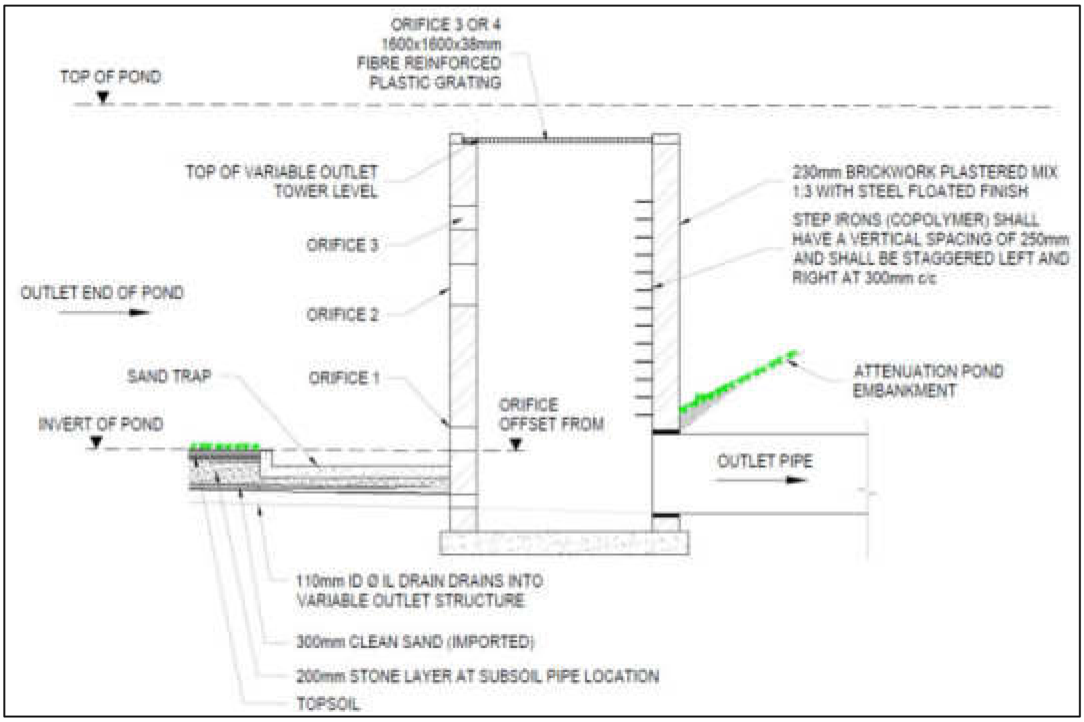


Figure 15: Typical Variable Outlet Structure

The typical variable outlet structure detail depicted above should be read with Table 9 below, where the pond structure and various orifice sizes and numbers indicated with their desired offset from the respective pond invert levels.

Pond No.	Orifice 1		Orifice 2		Orifice 3		Orifice 4	
	Outlet (mm)	Offset (m)	Outlet (mm)	Offset (m)	Outlet (mm)	Offset (m)	Outlet (m)	Offset (m)
1	200	0	250	0.5	300	1	Grid 1600x1600	1.85
2	200	3	300	3.25	300	3.75	Grid 1600x1600	4.5
3	160	0	200	0.25	200	0.6	Grid 1600x1600	1.35
4	160	0	200	0.3	Grid 1600x1600	0.85		
5	200	0	300	0.5	Grid 1600x1600	1.95		
6	110	0	Grid 1600x1600	0.5				
7	160	0	200	0.3	Grid 1600x1600	1		
8	160	0	200	0.4	Grid 1600x1600	1.65		

Table 9: Variable Outlet Structure Offsets for each Pond

Extended detention achieved by the overall stormwater systems for the post development scenario is in accordance with the CoCT policy requirements for the 1-year 24-hour storm event. The figures below indicate the various pond inflows over 48 hours at the outfall manhole in the pre-development unattenuated scenario (Grey) and the post-development attenuated scenario (Blue).

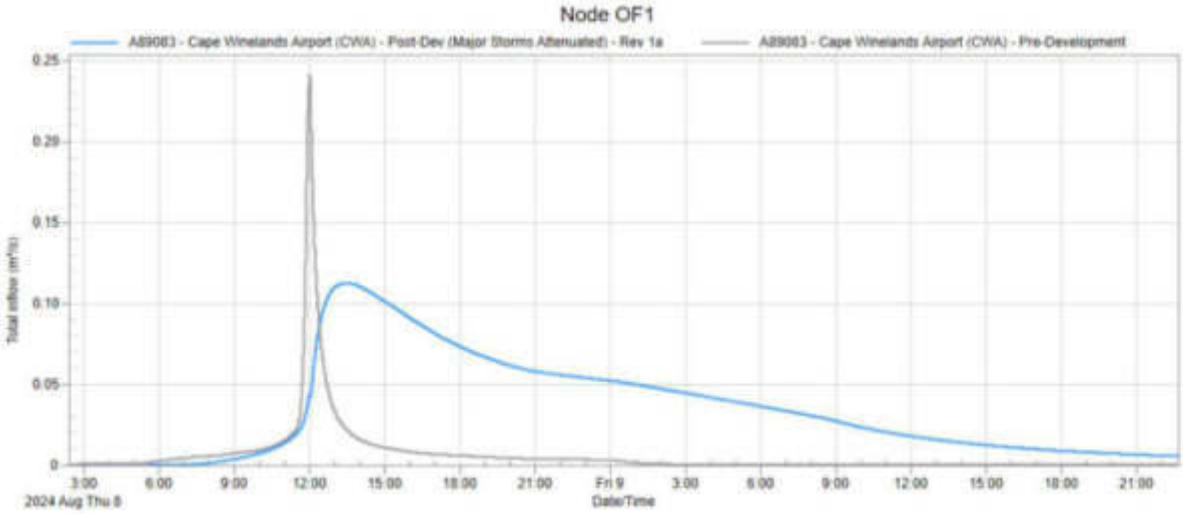


Figure 16: Pond 1 – Outfall Junction showing Extended Detention achieved on Site

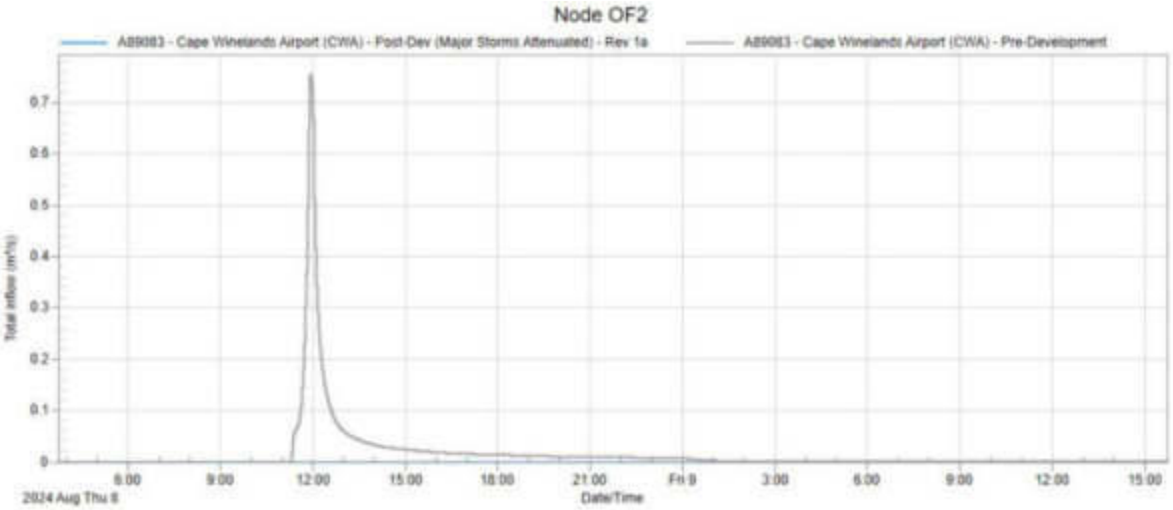


Figure 17: Pond 2 – Outfall Junction showing Extended Detention achieved on Site

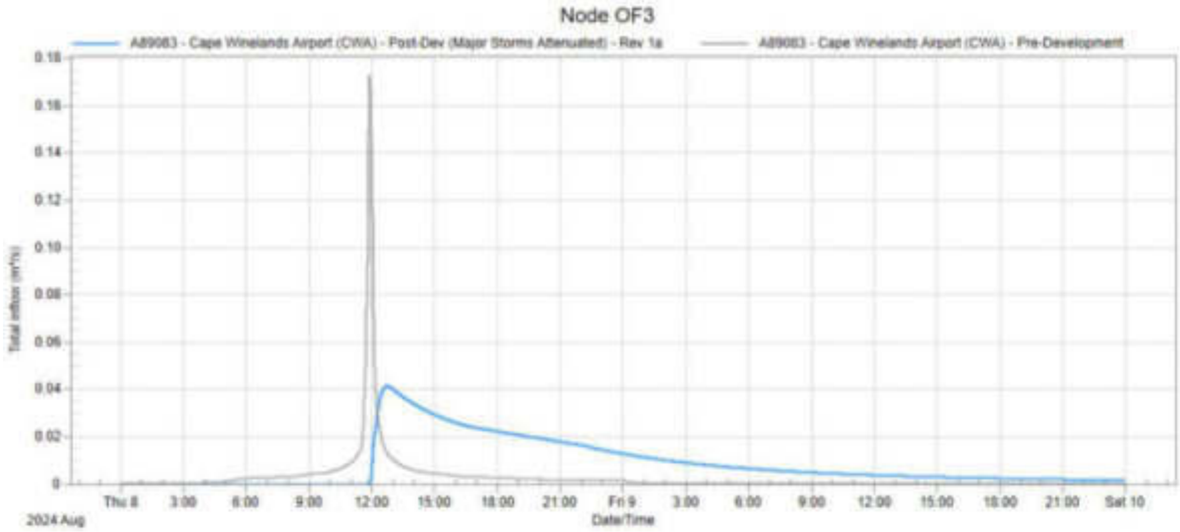


Figure 18: Pond 3 – Outfall Junction showing Extended Detention achieved on Site

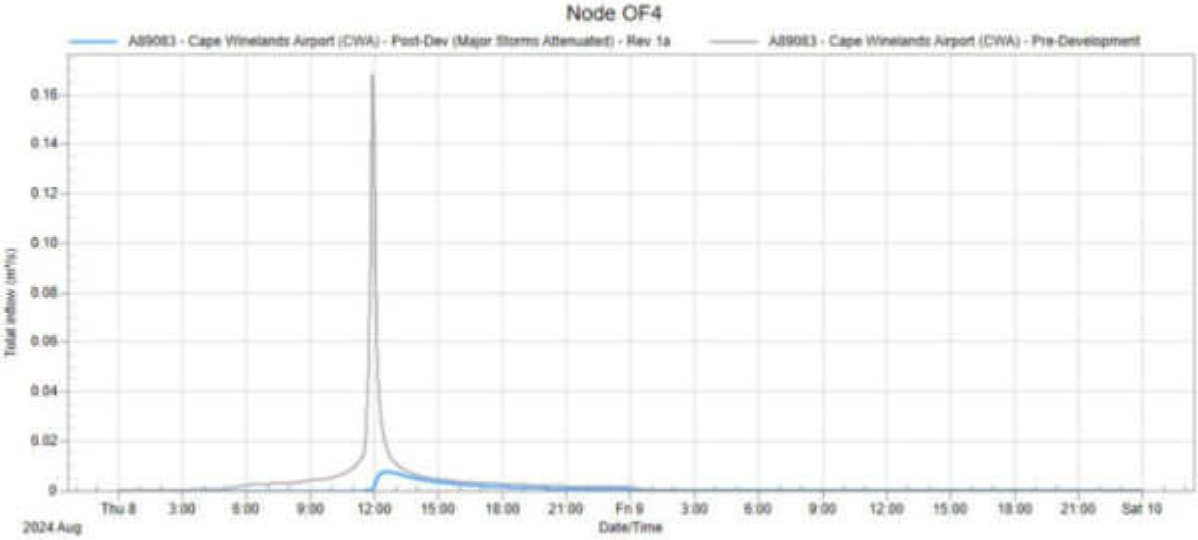


Figure 19: Pond 4 – Outfall Junction showing Extended Detention achieved on Site

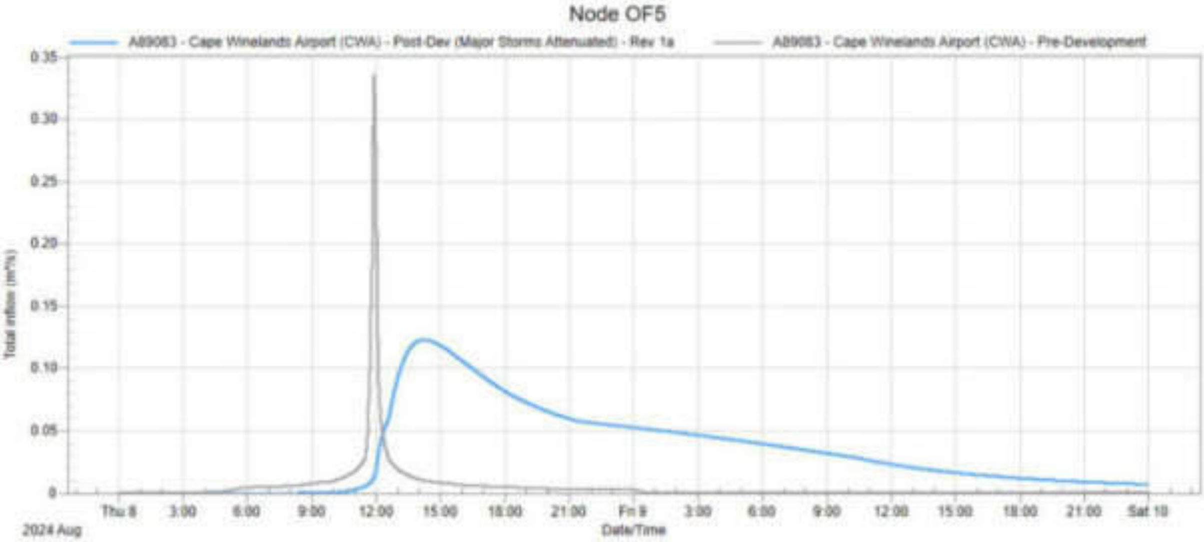


Figure 20: Pond 5 – Outfall Junction showing Extended Detention achieved on Site

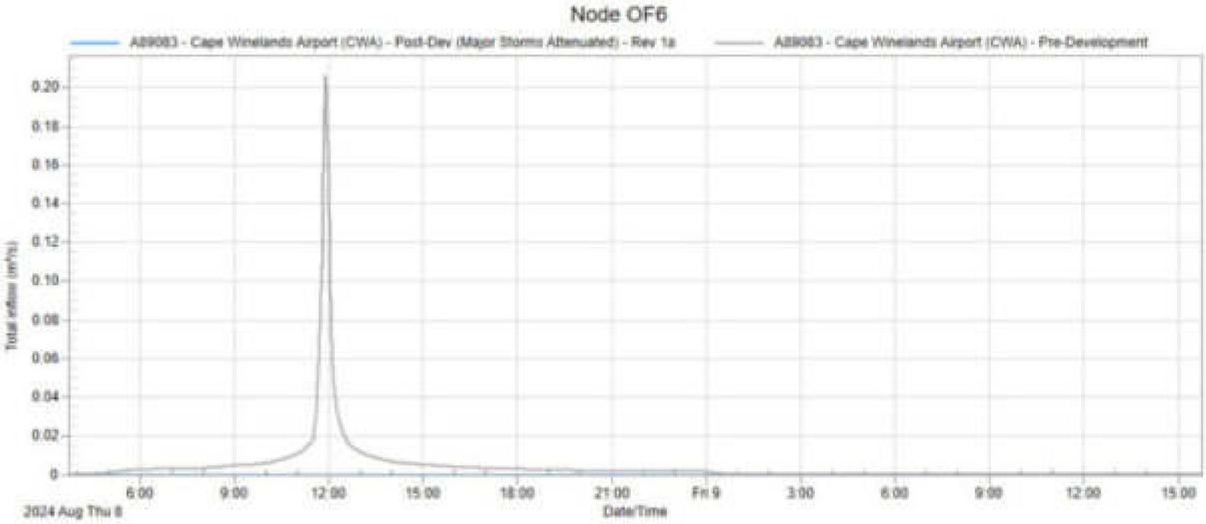


Figure 21: Pond 6 – Outfall Junction showing Extended Detention achieved on Site

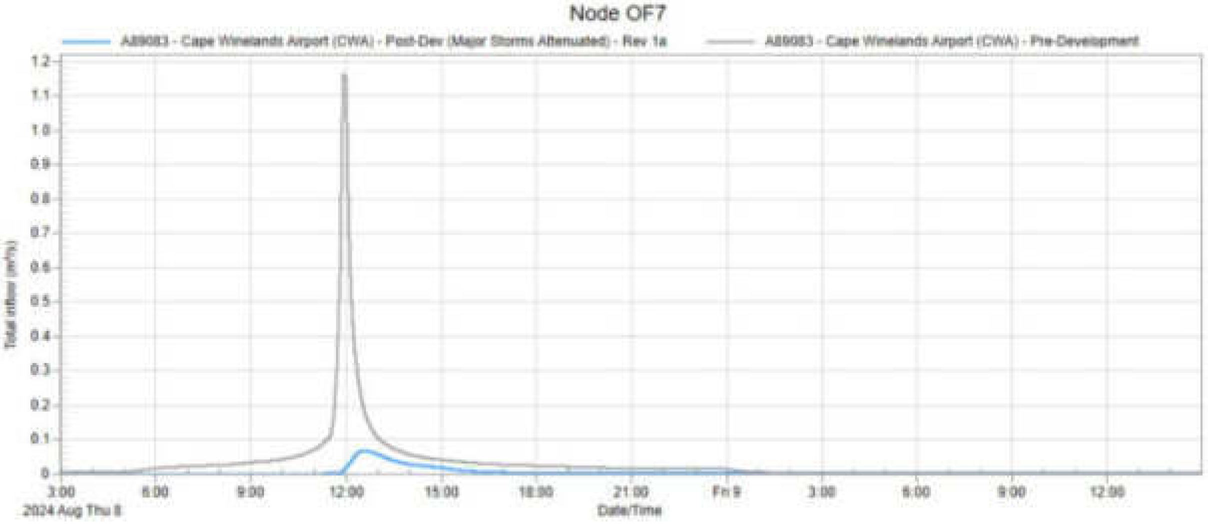


Figure 22: Pond 7 – Outfall Junction showing Extended Detention achieved on Site

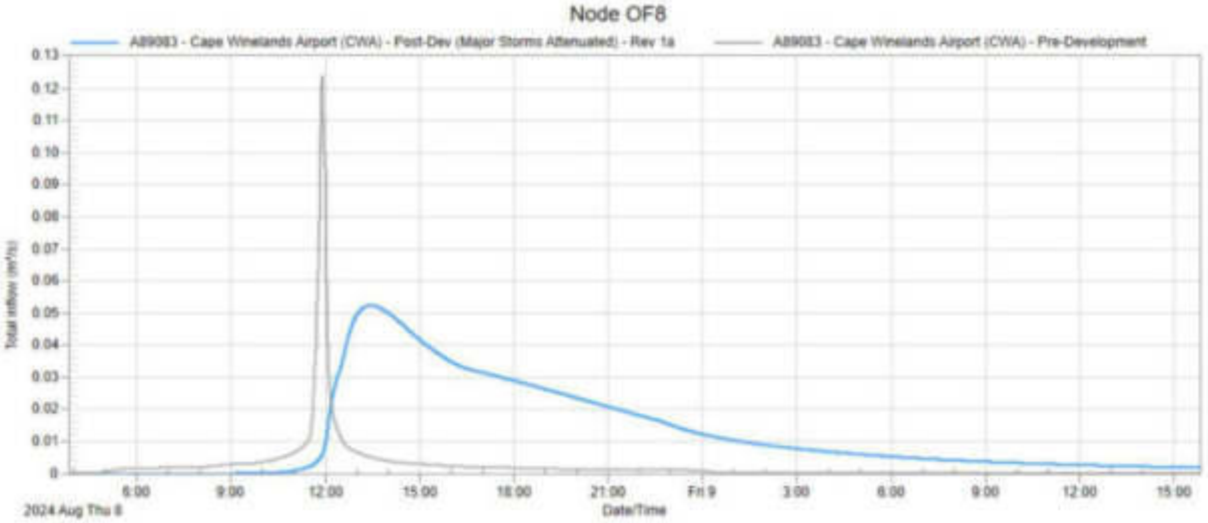


Figure 23: Pond 8 – Outfall Junction showing Extended Detention achieved on Site

4.5 Storm Event Management

4.5.1 Stormwater Attenuation

The implementation of treatment measures will inherently reduce peak flows as it will include storage capacity while facilitating infiltration, slow down velocities and provide extra storage in the underlying layers. Pre-Development run-offs were modelled to compare the different scenarios with the post-development model. Peak run-off outputs for pre-development and post-development are summarised in the tables below for each of the proposed ponds.

The peak run-off values for stormwater Pond 1 can be seen summarised in Table 10 below.

Storm Event (24h duration)	**Peak Runoff values for the Stormwater Pond 1 at Cape Winelands Airport**		
	Pre-Development	**Post-Development (Unattenuated)**	**Post-Development (Attenuated)**
2yr	0.350	2.419	0.168
5yr	0.492	3.379	0.278
10yr	0.596	4.059	0.353
20yr	0.706	4.748	0.411
50yr	0.873	5.57	0.808

Table 10: Pond 1 – Peak Run-off Values for Various Design Storm Events

The peak flows detailed in Table 10 above are presented graphically in Figure 24 below:

Figure 24: Pond 1 – Peak Run-off Values for Various Storm Events

The peak run-off values for stormwater Pond 2 can be seen summarised in Table 11 below.

Storm Event (24h duration)	Peak Runoff values for the Stormwater Pond 2 at Cape Winelands Airport		
	Pre-Development	Post-Development (Unattenuated)	Post-Development (Attenuated)
2yr	1.085	8.289	0.057
5yr	1.520	11.713	0.212
10yr	1.838	14.334	0.365
20yr	2.174	17.135	0.474
50yr	2.654	21.416	2.105

Table 11: Pond 2 – Peak Run-off Values for Various Design Storm Events

The peak flows detailed in Table 11 above are presented graphically in Figure 25 below:

Figure 25: Pond 2 – Peak Run-off Values for Various Storm Events

The peak run-off values for stormwater Pond 3 can be seen summarised in Table 12 below.

Storm Event (24h duration)	Peak Runoff values for the Stormwater Pond 3 at Cape Winelands Airport		
	Pre-Development	Post-Development (Unattenuated)	Post-Development (Attenuated)
2yr	0.243	2.116	0.082
5yr	0.334	2.959	0.141
10yr	0.400	3.582	0.177
20yr	0.469	4.235	0.206
50yr	0.567	5.212	0.438

Table 12: Pond 3 – Peak Run-off Values for Various Design Storm Events

The peak flows detailed in Table 12 above are presented graphically in Figure 26 below:

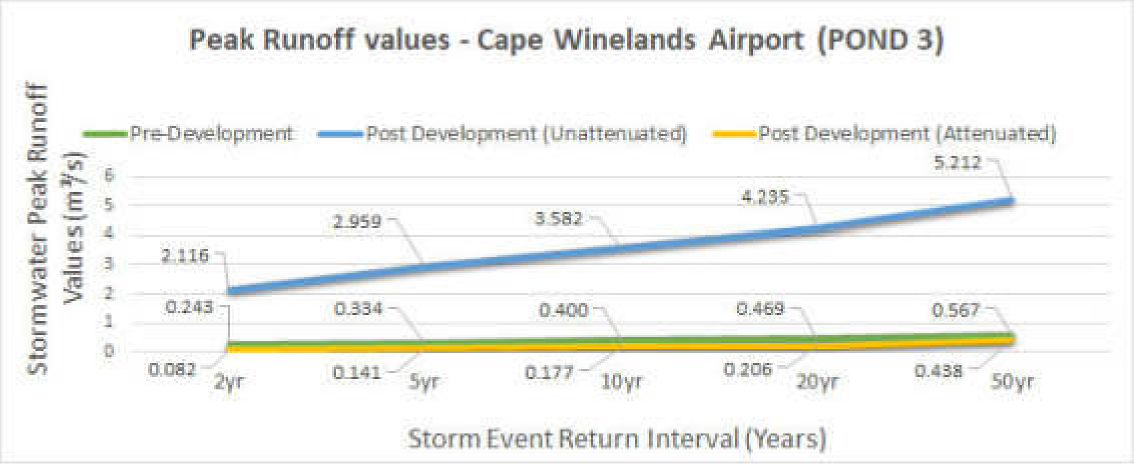


Figure 26: Pond 3 – Peak Run-off Values for Various Storm Events

The peak run-off values for stormwater Pond 4 can be seen summarised in Table 13 below.

Storm Event (24h duration)	Peak Runoff values for the Stormwater Pond 4 at Cape Winelands Airport		
	Pre-Development	Post-Development (Unattenuated)	Post-Development (Attenuated)
2yr	0.238	0.106	0.014
5yr	0.330	0.148	0.020
10yr	0.396	0.179	0.024
20yr	0.466	0.212	0.027
50yr	0.565	0.259	0.036

Table 13: Pond 4 – Peak Run-off Values for Various Design Storm Events

The peak flows detailed in Table 13 above are presented graphically in Figure 27 below:

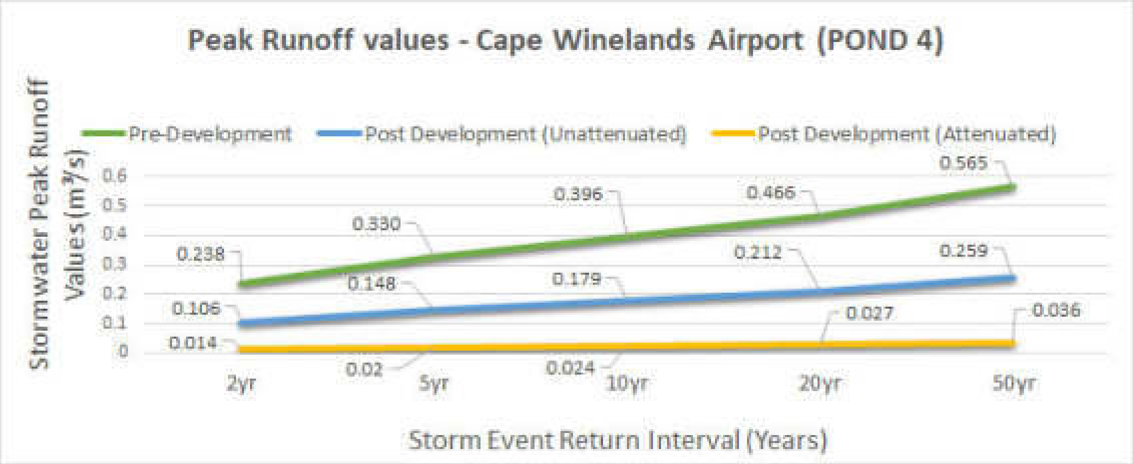


Figure 27: Pond 4 – Peak Run-off Values for Various Storm Events

The peak run-off values for stormwater Pond 5 can be seen summarised in Table 14 below.

Storm Event (24h duration)	Peak Runoff values for the Stormwater Pond 5 at Cape Winelands Airport		
	Pre-Development	Post-Development (Unattenuated)	Post-Development (Attenuated)
2yr	0.470	1.763	0.205
5yr	0.642	2.553	0.272
10yr	0.767	3.099	0.311
20yr	0.897	3.563	0.346
50yr	1.082	3.85	0.95

Table 14: Pond 5 – Peak Run-off Values for Various Design Storm Events

The peak flows detailed in Table 14 above are presented graphically in Figure 28 below:

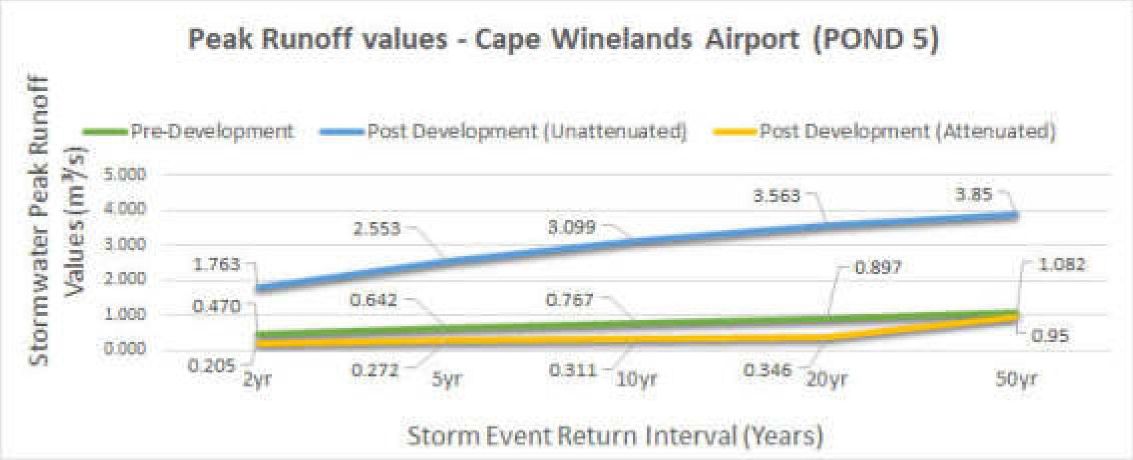


Figure 28: Pond 5 – Peak Run-off Values for Various Storm Events

The peak run-off values for stormwater Pond 6 can be seen summarised in Table 15 below:

Storm Event (24h duration)	Peak Runoff values for the Stormwater Pond 6 at Cape Winelands Airport		
	Pre-Development	Post-Development (Unattenuated)	Post-Development (Attenuated)
2yr	0.289	0.099	0.000
5yr	0.396	0.144	0.001
10yr	0.473	0.177	0.001
20yr	0.553	0.213	0.002
50yr	0.668	0.265	0.004

Table 15: Pond 6 – Peak Run-off Values for Various Design Storm Events

The peak flows detailed in Table 15 above are presented graphically in Figure 29 below:

Figure 29: Pond 6 – Peak Run-off Values for Various Storm Events

The peak run-off values for stormwater Pond 7 can be seen summarised in Table 16 below:

Storm Event (24h duration)	Peak Runoff values for the Stormwater Pond 7 at Cape Winelands Airport		
	Pre-Development	Post-Development (Unattenuated)	Post-Development (Attenuated)
2yr	1.691	0.322	0.094
5yr	2.392	0.465	0.120
10yr	2.909	0.571	0.237
20yr	3.457	0.683	0.412
50yr	4.245	0.844	0.649

Table 16: Pond 7 – Peak Run-off Values for Various Design Storm Events

The peak flows detailed in Table 16 above are presented graphically in Figure 30 below:

Figure 30: Pond 7 – Peak Run-off Values for Various Storm Events

The peak run-off values for stormwater Pond 8 can be seen summarised in Table 17 below:

Storm Event (24h duration)	Peak Runoff values for the Stormwater Pond 8 at Cape Winelands Airport		
	Pre-Development	Post-Development (Unattenuated)	Post-Development (Attenuated)
2yr	0.189	0.639	0.088
5yr	0.256	0.933	0.116
10yr	0.304	1.155	0.131
20yr	0.356	1.395	0.146
50yr	0.428	1.738	0.163

Table 17: Pond 8 – Peak Run-off Values for Various Design Storm Events

The peak flows detailed in Table 17 above are presented graphically in Figure 31 below:

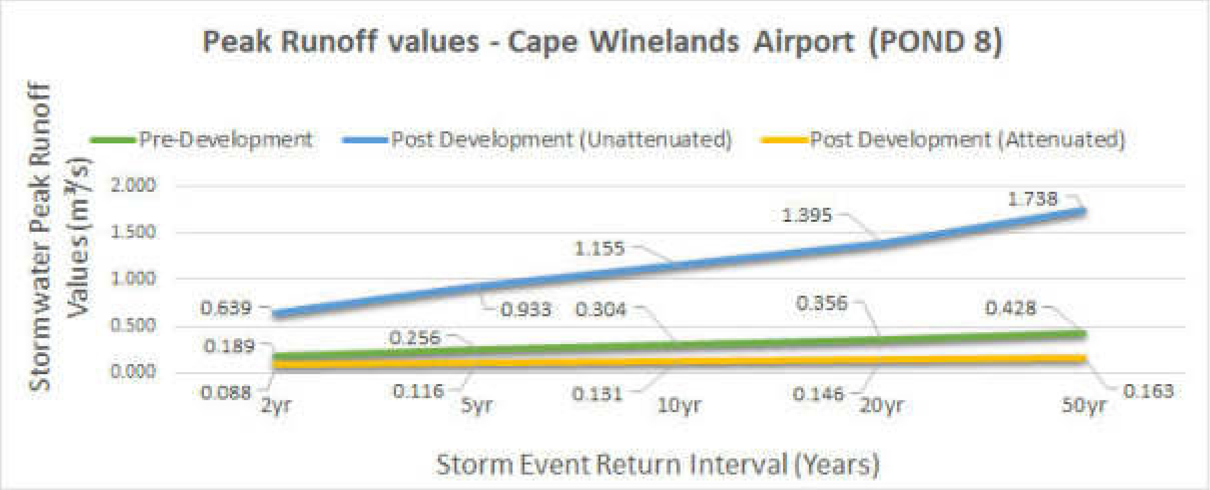


Figure 31: Pond 8 – Peak Run-off Values for Various Storm Events

When comparing the pre-development and post-development peak flow rates for Cape Winelands Airport as demonstrated in the figures above, it can be seen that the post development attenuated peak flows are reduced to below pre-development levels.

The focus of the proposed concept design was to ensure that peak run-offs for the post-development scenario are sufficiently reduced to mitigate damage to existing stormwater infrastructure, downstream properties and receiving water bodies from the post development flows.

4.5.2 Water Quality Targets

The CoCT policy requires treatment of the runoff from the 0.5-year, 24-hour storm (design storm), which is the Water Quality Volume (WQv). In terms of the CCT's "Management of Urban Stormwater Impacts Policy", acceptable improvement in the quality of stormwater runoff may be achieved through the removal of pollutants by a combination of reducing and / or disconnecting impervious areas from the drainage system and the use of LIDS (Low impact drainage systems) that infiltrate and / or capture and treat stormwater runoff. Sub-catchment types and impervious areas used in the calculations are summarised in Table 18 below.

Sub-Catchment Type	Total Area (ha)	Impervious (%)	Impervious Area (ha)	Pervious Area (ha)
Pond/Bioretention Area	5.25	0%	0.00	5.25
Roads	97.59	100%	97.59	0.00
Buildings	75.97	100%	75.97	0.00
Other (Development)	15.59	75%	11.69	3.90
Grassed/Public Open Spaces	235.19	0%	0.00	235.19
Total	**429.59**		**185.26**	**244.34**
Resultant Impervious Percentage (%)		**43.1%**		

Table 18: Water Quality Volume Calculations

The Calculation of the WQv is calculated from the following formula (Atlanta Regional Commission, 2016)

$$\mathrm{WQv} = \frac{P.R_v.\mathrm{A}}{1000}$$

Where:

WQv = Water Quality Volume (Ml)
P = ½ year, 24-hour storm, precipitation (mm)
Rv =Volumetric runoff coefficient
A = Site area (m^2)

The Volumetric runoff coefficient is calculated as follows:

$$R_v = 0.05 + 0.009(I)$$

Where:

I = Site impervious percentage

Therefore, the Volumetric runoff coefficient R_v can be calculated as: Rv=0.05+0.009(43.1) =0.438

The Water Quality Volume calculation is therefore as follows:

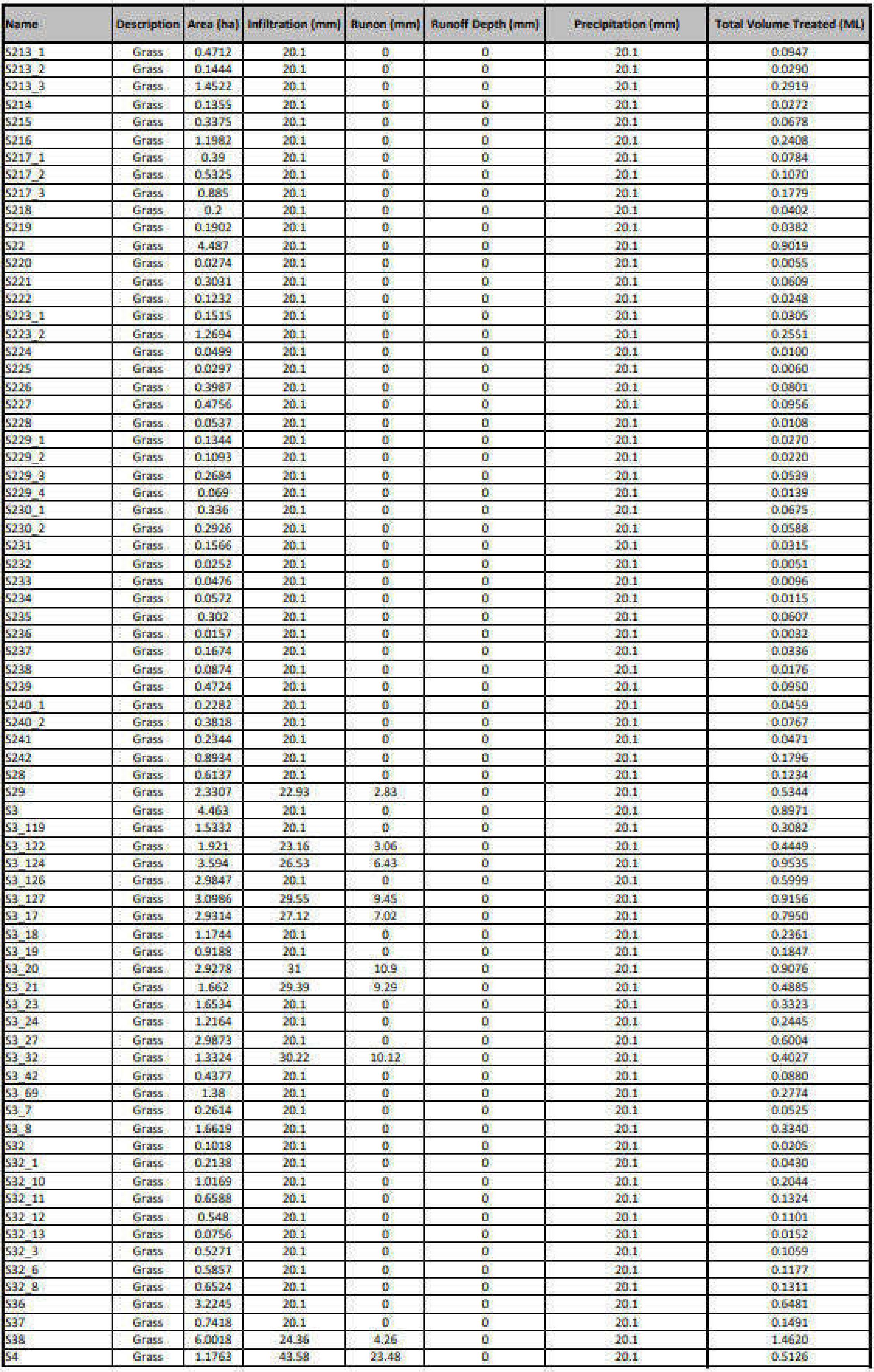
$$\mathrm{WQv} = \frac{(20.1).(0.438).(4295930)}{(1000)}$$

$$\mathrm{WQv} = 37820.5m^3$$

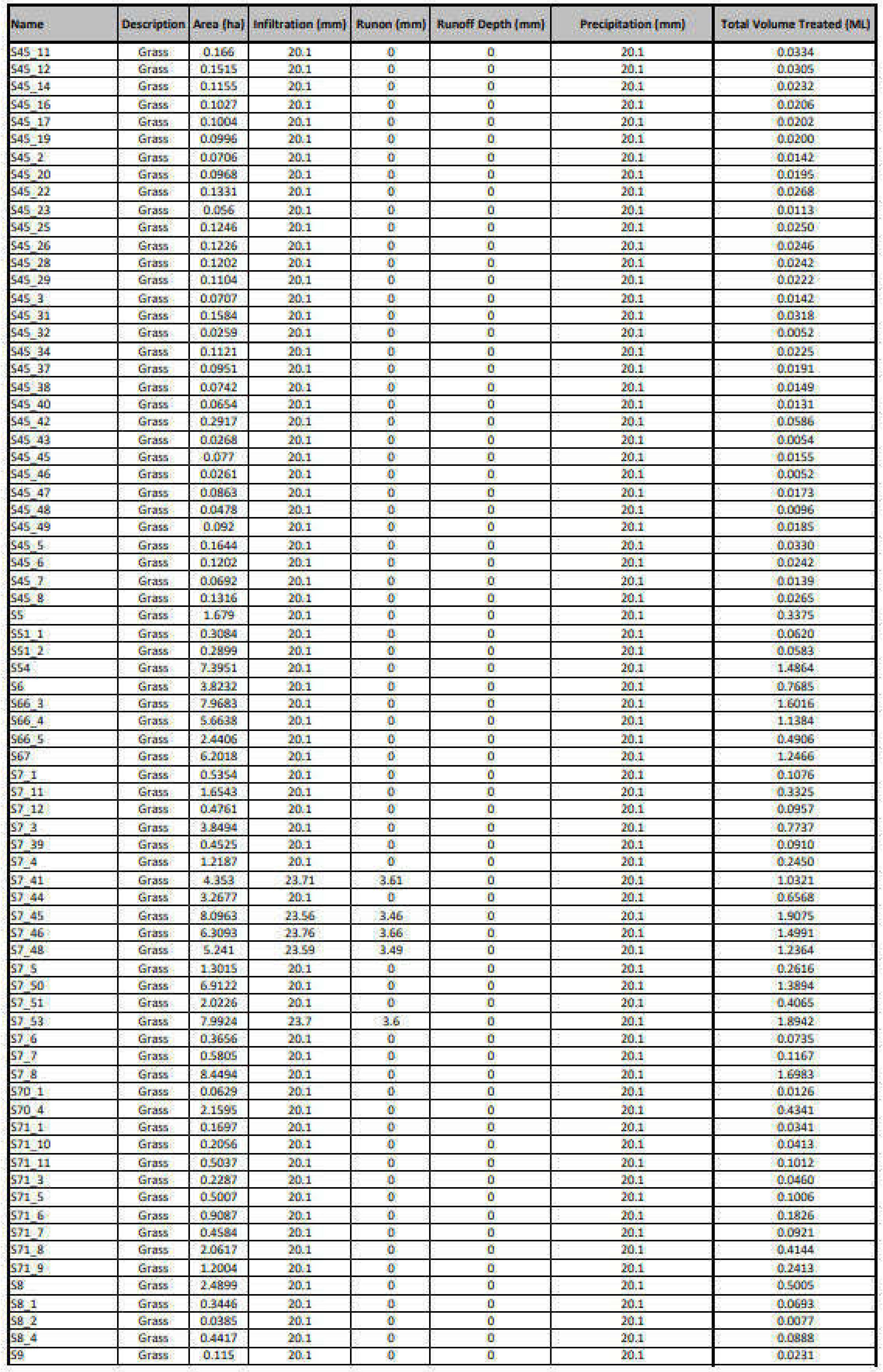
The WQv calculated above was used to size the bottom of pond area.

The total treated volume which entered the LID's for the 0.5-year RI 24-hour storm event is 73.79ML as can be seen in Table 19 below. This total run-off volume infiltrated the engineered layerworks before discharging into the downstream system through the sub-surface drains.

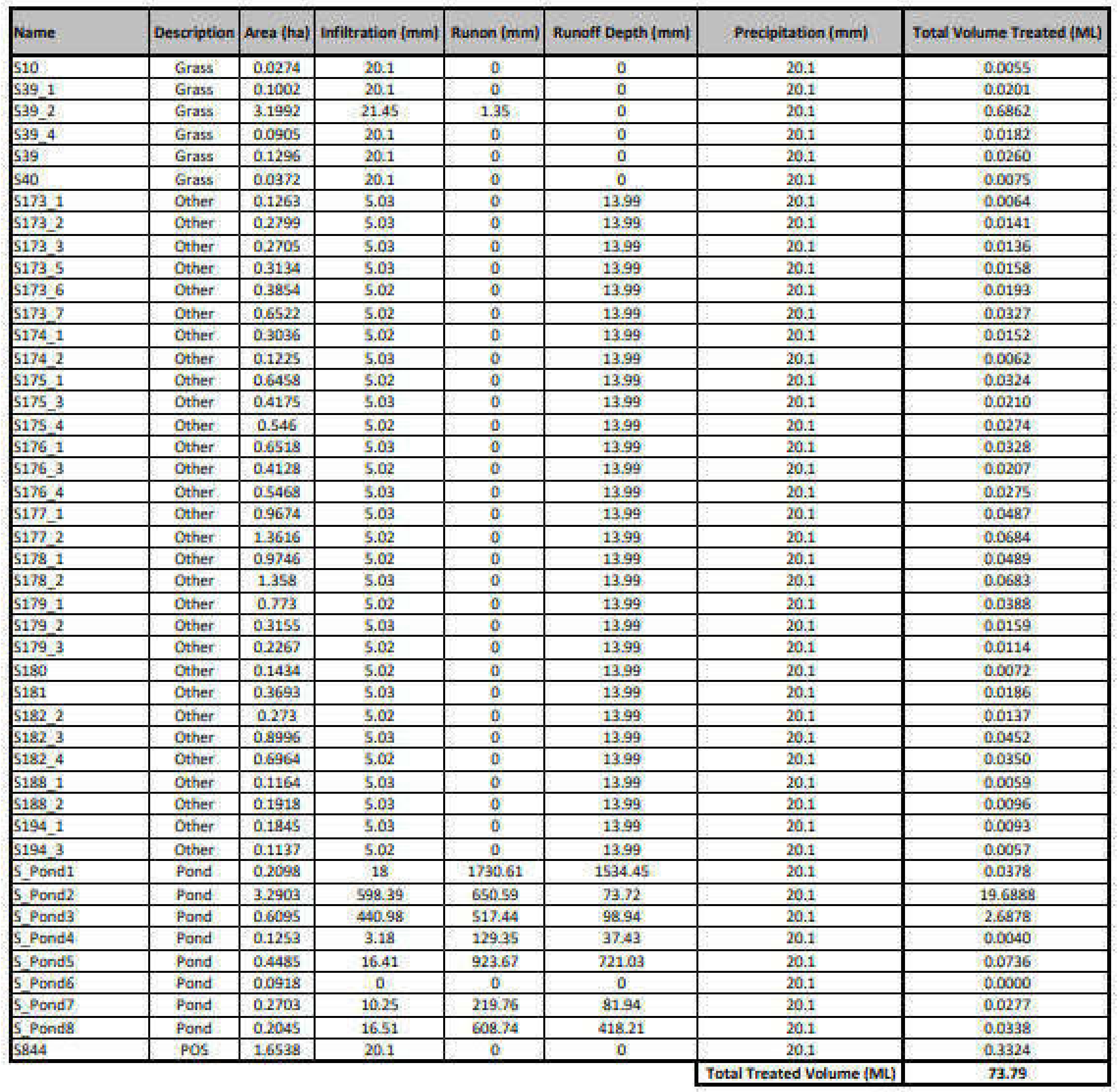
Name	Description	Area (ha)	Infiltration (mm)	Runon (mm)	Runoff Depth (mm)	Precipitation (mm)	Total Volume Treated (ML)
S1_4	Grass	0.3307	20.1	0	0	20.1	0.0665
S12_1	Grass	0.4631	20.1	0	0	20.1	0.0931
S12_2	Grass	0.3307	20.1	0	0	20.1	0.0665
S12_3	Grass	0.8082	20.1	0	0	20.1	0.1624
S12_5	Grass	0.4882	20.1	0	0	20.1	0.0981
S12_6	Grass	0.4429	20.1	0	0	20.1	0.0890
S12_7	Grass	0.64	20.1	0	0	20.1	0.1286
S12_8	Grass	0.3765	20.1	0	0	20.1	0.0757
S13	Grass	4.4598	20.1	0	0	20.1	0.8964
S15_3	Grass	0.6131	20.1	0	0	20.1	0.1232
S15_4	Grass	0.6073	20.1	0	0	20.1	0.1221
S18	Grass	2.1429	22.44	2.34	0	20.1	0.4809
S18_6	Grass	3.2386	20.1	0	0	20.1	0.6510
S183	Grass	0.5514	20.1	0	0	20.1	0.1108
S184_1	Grass	0.0808	20.1	0	0	20.1	0.0162
S184_3	Grass	0.0804	20.1	0	0	20.1	0.0162
S184_4	Grass	0.6383	20.1	0	0	20.1	0.1283
S185	Grass	0.1687	20.1	0	0	20.1	0.0339
S186	Grass	0.2872	20.1	0	0	20.1	0.0577
S187	Grass	0.3972	20.1	0	0	20.1	0.0798
S189	Grass	0.0903	20.1	0	0	20.1	0.0182
S19	Grass	0.0543	20.1	0	0	20.1	0.0109
S190	Grass	0.7908	20.1	0	0	20.1	0.1590
S191	Grass	0.3845	20.1	0	0	20.1	0.0773
S193_2	Grass	0.423	20.1	0	0	20.1	0.0850
S193_3	Grass	0.7555	20.1	0	0	20.1	0.1519
S193_4	Grass	0.6987	20.1	0	0	20.1	0.1404
S193_5	Grass	0.2076	20.1	0	0	20.1	0.0417
S193_6	Grass	0.5185	20.1	0	0	20.1	0.1042
S193_7	Grass	0.7365	20.1	0	0	20.1	0.1480
S195_1	Grass	0.5457	20.1	0	0	20.1	0.1097
S195_2	Grass	0.9104	20.1	0	0	20.1	0.1830
S197_1	Grass	0.5532	20.1	0	0	20.1	0.1112
S197_3	Grass	0.3629	20.1	0	0	20.1	0.0729
S197_4	Grass	0.2028	20.1	0	0	20.1	0.0408
S197_5	Grass	0.116	20.1	0	0	20.1	0.0233
S197_6	Grass	0.3071	20.1	0	0	20.1	0.0617
S198_1	Grass	0.338	20.1	0	0	20.1	0.0679
S198_10	Grass	0.0743	20.1	0	0	20.1	0.0149
S198_2	Grass	0.3601	20.1	0	0	20.1	0.0724
S198_3	Grass	0.3197	20.1	0	0	20.1	0.0643
S198_4	Grass	0.1222	20.1	0	0	20.1	0.0246
S198_5	Grass	0.1467	20.1	0	0	20.1	0.0295
S198_6	Grass	0.3309	20.1	0	0	20.1	0.0665
S198_7	Grass	0.1941	20.1	0	0	20.1	0.0390
S198_8	Grass	0.1324	20.1	0	0	20.1	0.0266
S199	Grass	0.309	20.1	0	0	20.1	0.0621
S200_1	Grass	0.3474	20.1	0	0	20.1	0.0698
S200_2	Grass	0.4685	20.1	0	0	20.1	0.0942
S201	Grass	0.27	20.1	0	0	20.1	0.0543
S202	Grass	0.5447	20.1	0	0	20.1	0.1095
S203	Grass	0.1518	20.1	0	0	20.1	0.0305
S204	Grass	0.1672	20.1	0	0	20.1	0.0336
S205	Grass	0.162	20.1	0	0	20.1	0.0326
S206_1	Grass	0.2851	20.1	0	0	20.1	0.0573
S206_2	Grass	0.414	20.1	0	0	20.1	0.0832
S206_3	Grass	0.2117	20.1	0	0	20.1	0.0426
S207	Grass	0.453	20.1	0	0	20.1	0.0911
S208_1	Grass	0.5643	20.1	0	0	20.1	0.1134
S208_2	Grass	0.1272	20.1	0	0	20.1	0.0256
S208_3	Grass	0.312	20.1	0	0	20.1	0.0627
S208_4	Grass	0.2359	20.1	0	0	20.1	0.0474
S209	Grass	0.6781	20.1	0	0	20.1	0.1363
S21	Grass	3.4882	20.1	0	0	20.1	0.7011
S210_1	Grass	0.2153	20.1	0	0	20.1	0.0433
S210_3	Grass	0.2828	20.1	0	0	20.1	0.0568
S210_4	Grass	0.1065	20.1	0	0	20.1	0.0214
S210_5	Grass	0.2299	20.1	0	0	20.1	0.0462
S211_1	Grass	0.9571	20.1	0	0	20.1	0.1924
S211_2	Grass	2.1091	20.1	0	0	20.1	0.4239
S212_1	Grass	0.2361	20.1	0	0	20.1	0.0475
S212_2	Grass	1.5663	20.1	0	0	20.1	0.3148



Name	Description	Area (ha)	Infiltration (mm)	Runon (mm)	Runoff Depth (mm)	Precipitation (mm)	Total Volume Treated (ML)
S213_1	Grass	0.4712	20.1	0	0	20.1	0.0947
S213_2	Grass	0.1444	20.1	0	0	20.1	0.0290
S213_3	Grass	1.4522	20.1	0	0	20.1	0.2919
S214	Grass	0.1355	20.1	0	0	20.1	0.0272
S215	Grass	0.3375	20.1	0	0	20.1	0.0678
S216	Grass	1.1982	20.1	0	0	20.1	0.2408
S217_1	Grass	0.39	20.1	0	0	20.1	0.0784
S217_2	Grass	0.5325	20.1	0	0	20.1	0.1070
S217_3	Grass	0.885	20.1	0	0	20.1	0.1779
S218	Grass	0.2	20.1	0	0	20.1	0.0402
S219	Grass	0.1902	20.1	0	0	20.1	0.0382
S22	Grass	4.487	20.1	0	0	20.1	0.9019
S220	Grass	0.0274	20.1	0	0	20.1	0.0055
S221	Grass	0.3031	20.1	0	0	20.1	0.0609
S222	Grass	0.1232	20.1	0	0	20.1	0.0248
S223_1	Grass	0.1515	20.1	0	0	20.1	0.0305
S223_2	Grass	1.2694	20.1	0	0	20.1	0.2551
S224	Grass	0.0499	20.1	0	0	20.1	0.0100
S225	Grass	0.0297	20.1	0	0	20.1	0.0060
S226	Grass	0.3987	20.1	0	0	20.1	0.0801
S227	Grass	0.4756	20.1	0	0	20.1	0.0956
S228	Grass	0.0537	20.1	0	0	20.1	0.0108
S229_1	Grass	0.1344	20.1	0	0	20.1	0.0270
S229_2	Grass	0.1093	20.1	0	0	20.1	0.0220
S229_3	Grass	0.2684	20.1	0	0	20.1	0.0539
S229_4	Grass	0.069	20.1	0	0	20.1	0.0139
S230_1	Grass	0.336	20.1	0	0	20.1	0.0675
S230_2	Grass	0.2926	20.1	0	0	20.1	0.0588
S231	Grass	0.1566	20.1	0	0	20.1	0.0315
S232	Grass	0.0252	20.1	0	0	20.1	0.0051
S233	Grass	0.0476	20.1	0	0	20.1	0.0096
S234	Grass	0.0572	20.1	0	0	20.1	0.0115
S235	Grass	0.302	20.1	0	0	20.1	0.0607
S236	Grass	0.0157	20.1	0	0	20.1	0.0032
S237	Grass	0.1674	20.1	0	0	20.1	0.0336
S238	Grass	0.0874	20.1	0	0	20.1	0.0176
S239	Grass	0.4724	20.1	0	0	20.1	0.0950
S240_1	Grass	0.2282	20.1	0	0	20.1	0.0459
S240_2	Grass	0.3818	20.1	0	0	20.1	0.0767
S241	Grass	0.2344	20.1	0	0	20.1	0.0471
S242	Grass	0.8934	20.1	0	0	20.1	0.1796
S28	Grass	0.6137	20.1	0	0	20.1	0.1234
S29	Grass	2.3307	22.93	2.83	0	20.1	0.5344
S3	Grass	4.463	20.1	0	0	20.1	0.8971
S3_119	Grass	1.5332	20.1	0	0	20.1	0.3082
S3_122	Grass	1.921	23.16	3.06	0	20.1	0.4449
S3_124	Grass	3.594	26.53	6.43	0	20.1	0.9535
S3_126	Grass	2.9847	20.1	0	0	20.1	0.5999
S3_127	Grass	3.0986	29.55	9.45	0	20.1	0.9156
S3_17	Grass	2.9314	27.12	7.02	0	20.1	0.7950
S3_18	Grass	1.1744	20.1	0	0	20.1	0.2361
S3_19	Grass	0.9188	20.1	0	0	20.1	0.1847
S3_20	Grass	2.9278	31	10.9	0	20.1	0.9076
S3_21	Grass	1.662	29.39	9.29	0	20.1	0.4885
S3_23	Grass	1.6534	20.1	0	0	20.1	0.3323
S3_24	Grass	1.2164	20.1	0	0	20.1	0.2445
S3_27	Grass	2.9873	20.1	0	0	20.1	0.6004
S3_32	Grass	1.3324	30.22	10.12	0	20.1	0.4027
S3_42	Grass	0.4377	20.1	0	0	20.1	0.0880
S3_69	Grass	1.38	20.1	0	0	20.1	0.2774
S3_7	Grass	0.2614	20.1	0	0	20.1	0.0525
S3_8	Grass	1.6619	20.1	0	0	20.1	0.3340
S32	Grass	0.1018	20.1	0	0	20.1	0.0205
S32_1	Grass	0.2138	20.1	0	0	20.1	0.0430
S32_10	Grass	1.0169	20.1	0	0	20.1	0.2044
S32_11	Grass	0.6588	20.1	0	0	20.1	0.1324
S32_12	Grass	0.548	20.1	0	0	20.1	0.1101
S32_13	Grass	0.0756	20.1	0	0	20.1	0.0152
S32_3	Grass	0.5271	20.1	0	0	20.1	0.1059
S32_6	Grass	0.5857	20.1	0	0	20.1	0.1177
S32_8	Grass	0.6524	20.1	0	0	20.1	0.1311
S36	Grass	3.2245	20.1	0	0	20.1	0.6481
S37	Grass	0.7418	20.1	0	0	20.1	0.1491
S38	Grass	6.0018	24.36	4.26	0	20.1	1.4620
S4	Grass	1.1763	43.58	23.48	0	20.1	0.5126



Name	Description	Area (ha)	Infiltration (mm)	Runon (mm)	Runoff Depth (mm)	Precipitation (mm)	Total Volume Treated (ML)
S45_11	Grass	0.166	20.1	0	0	20.1	0.0334
S45_12	Grass	0.1515	20.1	0	0	20.1	0.0305
S45_14	Grass	0.1155	20.1	0	0	20.1	0.0232
S45_16	Grass	0.1027	20.1	0	0	20.1	0.0206
S45_17	Grass	0.1004	20.1	0	0	20.1	0.0202
S45_19	Grass	0.0996	20.1	0	0	20.1	0.0200
S45_2	Grass	0.0706	20.1	0	0	20.1	0.0142
S45_20	Grass	0.0968	20.1	0	0	20.1	0.0195
S45_22	Grass	0.1331	20.1	0	0	20.1	0.0268
S45_23	Grass	0.056	20.1	0	0	20.1	0.0113
S45_25	Grass	0.1246	20.1	0	0	20.1	0.0250
S45_26	Grass	0.1226	20.1	0	0	20.1	0.0246
S45_28	Grass	0.1202	20.1	0	0	20.1	0.0242
S45_29	Grass	0.1104	20.1	0	0	20.1	0.0222
S45_3	Grass	0.0707	20.1	0	0	20.1	0.0142
S45_31	Grass	0.1584	20.1	0	0	20.1	0.0318
S45_32	Grass	0.0259	20.1	0	0	20.1	0.0052
S45_34	Grass	0.1121	20.1	0	0	20.1	0.0225
S45_37	Grass	0.0951	20.1	0	0	20.1	0.0191
S45_38	Grass	0.0742	20.1	0	0	20.1	0.0149
S45_40	Grass	0.0654	20.1	0	0	20.1	0.0131
S45_42	Grass	0.2917	20.1	0	0	20.1	0.0586
S45_43	Grass	0.0268	20.1	0	0	20.1	0.0054
S45_45	Grass	0.077	20.1	0	0	20.1	0.0155
S45_46	Grass	0.0261	20.1	0	0	20.1	0.0052
S45_47	Grass	0.0863	20.1	0	0	20.1	0.0173
S45_48	Grass	0.0478	20.1	0	0	20.1	0.0096
S45_49	Grass	0.092	20.1	0	0	20.1	0.0185
S45_5	Grass	0.1644	20.1	0	0	20.1	0.0330
S45_6	Grass	0.1202	20.1	0	0	20.1	0.0242
S45_7	Grass	0.0692	20.1	0	0	20.1	0.0139
S45_8	Grass	0.1316	20.1	0	0	20.1	0.0265
S5	Grass	1.679	20.1	0	0	20.1	0.3375
S51_1	Grass	0.3084	20.1	0	0	20.1	0.0620
S51_2	Grass	0.2899	20.1	0	0	20.1	0.0583
S54	Grass	7.3951	20.1	0	0	20.1	1.4864
S6	Grass	3.8232	20.1	0	0	20.1	0.7685
S66_3	Grass	7.9683	20.1	0	0	20.1	1.6016
S66_4	Grass	5.6638	20.1	0	0	20.1	1.1384
S66_5	Grass	2.4406	20.1	0	0	20.1	0.4906
S67	Grass	6.2018	20.1	0	0	20.1	1.2466
S7_1	Grass	0.5354	20.1	0	0	20.1	0.1076
S7_11	Grass	1.6543	20.1	0	0	20.1	0.3325
S7_12	Grass	0.4761	20.1	0	0	20.1	0.0957
S7_3	Grass	3.8494	20.1	0	0	20.1	0.7737
S7_39	Grass	0.4525	20.1	0	0	20.1	0.0910
S7_4	Grass	1.2187	20.1	0	0	20.1	0.2450
S7_41	Grass	4.353	23.71	3.61	0	20.1	1.0321
S7_44	Grass	3.2677	20.1	0	0	20.1	0.6568
S7_45	Grass	8.0963	23.56	3.46	0	20.1	1.9075
S7_46	Grass	6.3093	23.76	3.66	0	20.1	1.4991
S7_48	Grass	5.241	23.59	3.49	0	20.1	1.2364
S7_5	Grass	1.3015	20.1	0	0	20.1	0.2616
S7_50	Grass	6.9122	20.1	0	0	20.1	1.3894
S7_51	Grass	2.0226	20.1	0	0	20.1	0.4065
S7_53	Grass	7.9924	23.7	3.6	0	20.1	1.8942
S7_6	Grass	0.3656	20.1	0	0	20.1	0.0735
S7_7	Grass	0.5805	20.1	0	0	20.1	0.1167
S7_8	Grass	8.4494	20.1	0	0	20.1	1.6983
S70_1	Grass	0.0629	20.1	0	0	20.1	0.0126
S70_4	Grass	2.1595	20.1	0	0	20.1	0.4341
S71_1	Grass	0.1697	20.1	0	0	20.1	0.0341
S71_10	Grass	0.2056	20.1	0	0	20.1	0.0413
S71_11	Grass	0.5037	20.1	0	0	20.1	0.1012
S71_3	Grass	0.2287	20.1	0	0	20.1	0.0460
S71_5	Grass	0.5007	20.1	0	0	20.1	0.1006
S71_6	Grass	0.9087	20.1	0	0	20.1	0.1826
S71_7	Grass	0.4584	20.1	0	0	20.1	0.0921
S71_8	Grass	2.0617	20.1	0	0	20.1	0.4144
S71_9	Grass	1.2004	20.1	0	0	20.1	0.2413
S8	Grass	2.4899	20.1	0	0	20.1	0.5005
S8_1	Grass	0.3446	20.1	0	0	20.1	0.0693
S8_2	Grass	0.0385	20.1	0	0	20.1	0.0077
S8_4	Grass	0.4417	20.1	0	0	20.1	0.0888
S9	Grass	0.115	20.1	0	0	20.1	0.0231



Name	Description	Area (ha)	Infiltration (mm)	Runon (mm)	Runoff Depth (mm)	Precipitation (mm)	Total Volume Treated (ML)
S10	Grass	0.0274	20.1	0	0	20.1	0.0055
S39_1	Grass	0.1002	20.1	0	0	20.1	0.0201
S39_2	Grass	3.1992	21.45	1.35	0	20.1	0.6862
S39_4	Grass	0.0905	20.1	0	0	20.1	0.0182
S39	Grass	0.1296	20.1	0	0	20.1	0.0260
S40	Grass	0.0372	20.1	0	0	20.1	0.0075
S173_1	Other	0.1263	5.03	0	13.99	20.1	0.0064
S173_2	Other	0.2799	5.03	0	13.99	20.1	0.0141
S173_3	Other	0.2705	5.03	0	13.99	20.1	0.0136
S173_5	Other	0.3134	5.03	0	13.99	20.1	0.0158
S173_6	Other	0.3854	5.02	0	13.99	20.1	0.0193
S173_7	Other	0.6522	5.02	0	13.99	20.1	0.0327
S174_1	Other	0.3036	5.02	0	13.99	20.1	0.0152
S174_2	Other	0.1225	5.03	0	13.99	20.1	0.0062
S175_1	Other	0.6458	5.02	0	13.99	20.1	0.0324
S175_3	Other	0.4175	5.03	0	13.99	20.1	0.0210
S175_4	Other	0.546	5.02	0	13.99	20.1	0.0274
S176_1	Other	0.6518	5.03	0	13.99	20.1	0.0328
S176_3	Other	0.4128	5.02	0	13.99	20.1	0.0207
S176_4	Other	0.5468	5.03	0	13.99	20.1	0.0275
S177_1	Other	0.9674	5.03	0	13.99	20.1	0.0487
S177_2	Other	1.3616	5.02	0	13.99	20.1	0.0684
S178_1	Other	0.9746	5.02	0	13.99	20.1	0.0489
S178_2	Other	1.358	5.03	0	13.99	20.1	0.0683
S179_1	Other	0.773	5.02	0	13.99	20.1	0.0388
S179_2	Other	0.3155	5.03	0	13.99	20.1	0.0159
S179_3	Other	0.2267	5.02	0	13.99	20.1	0.0114
S180	Other	0.1434	5.02	0	13.99	20.1	0.0072
S181	Other	0.3693	5.03	0	13.99	20.1	0.0186
S182_2	Other	0.273	5.02	0	13.99	20.1	0.0137
S182_3	Other	0.8996	5.03	0	13.99	20.1	0.0452
S182_4	Other	0.6964	5.02	0	13.99	20.1	0.0350
S188_1	Other	0.1164	5.03	0	13.99	20.1	0.0059
S188_2	Other	0.1918	5.03	0	13.99	20.1	0.0096
S194_1	Other	0.1845	5.03	0	13.99	20.1	0.0093
S194_3	Other	0.1137	5.02	0	13.99	20.1	0.0057
S_Pond1	Pond	0.2098	18	1730.61	1534.45	20.1	0.0378
S_Pond2	Pond	3.2903	598.39	650.59	73.72	20.1	19.6888
S_Pond3	Pond	0.6095	440.98	517.44	98.94	20.1	2.6878
S_Pond4	Pond	0.1253	3.18	129.35	37.43	20.1	0.0040
S_Pond5	Pond	0.4485	16.41	923.67	721.03	20.1	0.0736
S_Pond6	Pond	0.0918	0	0	0	20.1	0.0000
S_Pond7	Pond	0.2703	10.25	219.76	81.94	20.1	0.0277
S_Pond8	Pond	0.2045	16.51	608.74	418.21	20.1	0.0338
S844	POS	1.6538	20.1	0	0	20.1	0.3324
						Total Treated Volume (ML)	**73.79**

Table 19: LID Control Treatment Achieved during the ½ year 24-hour Storm

Comparing the Water Quality Volume calculated (37.82ML) with the total volume of treated runoff (73.79ML), we see that the 0.5-year RI storm is infiltrated and that the Water Quality Volume is sufficiently treated by the proposed LID's at the Cape Winelands Airport development – There is a total surplus treated volume of 35.97ML.

4.6 Effects of the 1:100-Year Storm Event

The combined systems on site have been designed to attenuate up to and including the 1:50-year flood. The stormwater attenuation ponds, positioned strategically across the site, will each have dedicated variable outlet structures as well as overflows sized accordingly to convey the run-off from larger storms in excess of the 1:50 year event towards the overland escape routes as can be seen on Figure 32 below:

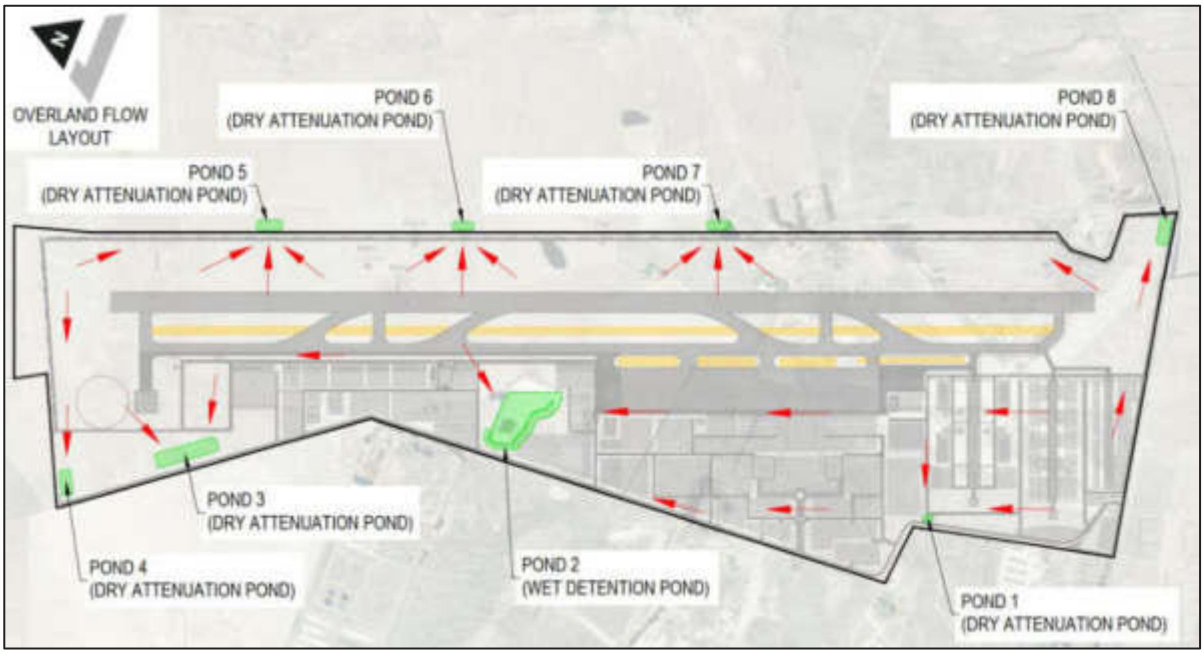


Figure 32: Overland Escape Routes

PCSWMM Simulations of the 1:100-year RI storm event have been modelled to ensure that no flooding occurs across the site and that the overland escape routes can convey the excess runoff away from critical infrastructure on the site towards the adjacent aquatic ecosystems namely the Mosselbank River and the Klapmuts River tributaries.

In the event that there is a blockage or failure within the system, the overland escape routes provided on the site will provide relief and can be seen detailed in Table 20 below.

Outfall	Description
Outfall 1	Discharges into the future Lucullus Road extension proposed stormwater infrastructure and drains towards Pond 2 / Outfall 2 after which it will be routed into the proposed future Bella Riva development stormwater BMP's.
Outfall 2	Discharges from the detention pond and will be routed into the proposed future Bella Riva development stormwater BMP's.
Outfall 3	Discharges into the delineated catchment situated to the West of the Cape Winelands Airport development ultimately leading into the Mosselbank River
Outfall 4	Discharges into the delineated catchment situated to the West of the Cape Winelands Airport development ultimately leading into the Mosselbank River
Outfall 5	Discharges into the delineated catchment situated to the East of the Cape Winelands Airport development ultimately leading into the Klapmuts River
Outfall 6	Discharges into the delineated catchment situated to the East of the Cape Winelands Airport development ultimately leading into the Klapmuts River
Outfall 7	Discharges into the delineated catchment situated to the East of the Cape Winelands Airport development ultimately leading into the Klapmuts River
Outfall 8	Discharges along the R312 (Lichtenburg Road) open earth drain which will act as an overland channel in the event of system failure and from there into the Klapmuts river tributary

Table 20: Summary – Overland Escape Routes

In additional to the above, a further hydraulic analysis was carried out in HEC-RAS to review the impact that the post development 1:100-year flood scenario, discharged from the Cape Winelands Airport site, will have on the downstream environment and has been assessed as part of the Flood Risk Assessment Report attached hereto as Appendix B.

4.7 Landscaping and Security

Landscaping for the proposed dry attenuation ponds will be as per the CoCT prescribed plant list and best practice. More detail pertaining to the landscaping plan, fencing, security, and erection of safety signage will be provided in the detailed Stormwater Management Plan.

Further to the above, appropriate signage as indicated in Figure 33 below is to be displayed at all stormwater drainage elements to mitigate against the following:

- Hardening of surfaces within the stormwater element area. Hardening of surfaces and the placement of obstructions will reduce the infiltration and treatment capacities and alter the intended attenuation and drainage path.
- Health & Safety risks associated with the element. These risks are associated with both the quality and quantity of water which will fill up when a storm event occurs. In terms of quality the water may be polluted, and consumption of the water will pose health risks. The severity of rainfall events and the subsequent quantities of water which enter the element can lead to unsafe conditions within the element due to the potential rapid rise in flow rates and water levels.
- Another security consideration is the attraction of birds to the wet pond. Birds present a risk to aviation safety and thus preventing birds from gathering at standing water bodies will need to be addressed during the detail design. Measures that may be contemplated included netting placed over the water body or bespoke products to cover the water surface.

The signage will serve as a guide and a warning and must be displayed at all entrances/access points to the ponds on site.

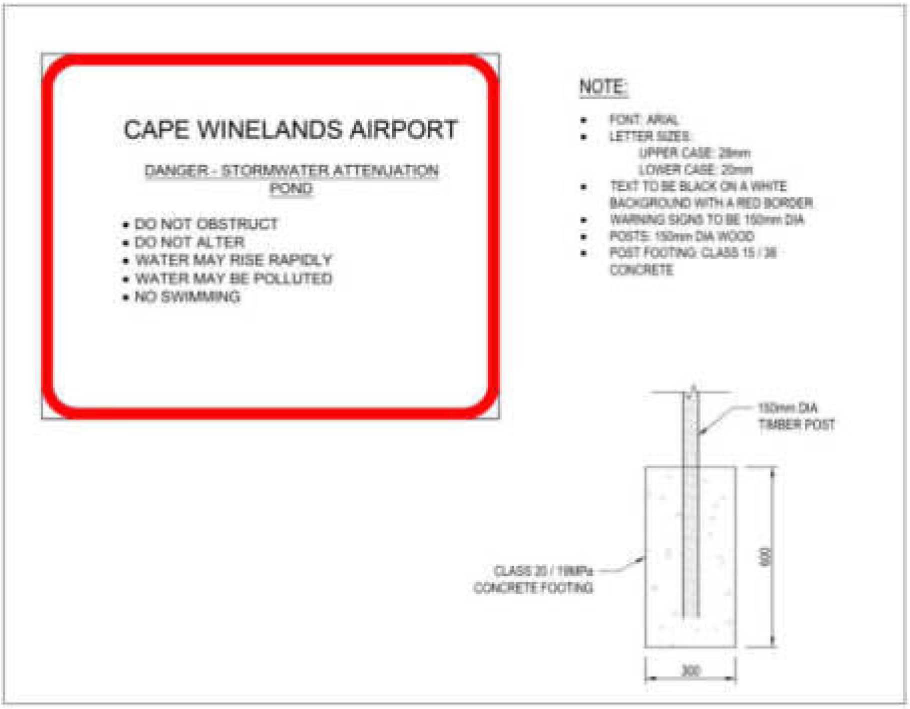


Figure 33: Typical Stormwater Pond Safety Signage

In principle there will be signage erected for safety, warning, and education for each of the dry attenuation ponds and wet detention pond to ensure the safeguarding of all personnel on the property. It is also noted that the site and its stormwater infrastructure is not accessible to the public.

5 Operations and Maintenance

Operation and maintenance procedures will be prepared as part of the closeout procedures for the project. The maintenance agreement will require the Cape Winelands Airport to periodically clean the structures, monitor the vegetation and sediment accumulation, and provide occasional watering to preserve the vegetation during the dry season. Once the stormwater system has been completed, the maintenance and monitoring thereof will remain the sole responsibility of the Cape Winelands Airport, who will take financial responsibility for the operations and necessary maintenance of the system.

5.1 Dry Attenuation Pond Maintenance Requirements

Adequate maintenance is essential to ensure that the dry attenuation pond operates correctly to prevent poor functionality and poor aesthetics. Typical periodic maintenance activities are provided in (Woods Ballard *et al.*, 2015) and the Cape Winelands Airport will implement the most suitable of these activities for the specific site conditions or as required during the lifecycle of the dry attenuation pond:

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly
	Manage vegetation	Monthly
	Inspect inlets, outlets, and overflows for blockages	Monthly
	Inspect inlets and basin for sediment accumulation. Determine appropriate frequencies.	Monthly, then as required
	Tidy dead vegetation before growth season	Annually
	Manage wetland plants in pools – where provided	Annually
Occasional maintenance	Reseed or replant in dilapidated areas	As required
	Prune and trim plants where necessary and remove cuttings	Every 2 years or as required
	Remove sediment from inlets, outlets and forebays	Annually, or as required
Remedial actions	Repair erosion or other damage	As required
	Repair or rehabilitate inlets, outlets, and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Realign riprap, gabions, and/or Reno mattresses	As required

Table 21: Typical Operating and Maintenance activities for Dry Attenuation Ponds

In addition to the items listed above, some comments regarding maintenance procedures are provided below:

- Litter clearing: A litter clean-up is to take place monthly or as required.
- Cleaning of kerbs and channels: Sand, litter and refuse should be removed from kerbs and channels monthly or as required.
- Cleaning of pipes: Refuse should be removed from pipes monthly. Sand and silt should also be removed by using high pressure jetting.
- Cleaning of covers and frames: The covers and frames should be inspected monthly and need to be replaced, repositioned, or repaired where necessary.
- Earth embankment inspection: Embankments should be inspected monthly or after each rain. If the embankment is compromised, it should be reshaped to tie in with the original slope.
- Headwalls inspection: The headwalls should be inspected monthly or after each rain. Any blockage should be removed, and the natural vegetation trimmed to allow free drainage of water.

Many of the specific maintenance activities for dry ponds can be undertaken as part of a general landscape management contract and therefore, if landscape management is already required at site, should have marginal cost implications whilst creating local employment opportunities in the long-term.

5.2 Dry Swale Maintenance Requirements

Adequate maintenance is essential to ensure that the dry swales operate correctly to prevent poor functionality and poor aesthetics. Typical periodic maintenance activities are provided in (Woods Ballard *et al.*, 2015) and the Cape Winelands Airport will implement the most suitable of these activities for the specific site conditions or as required during the lifecycle of the dry swale:

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly
	Manage vegetation, retain vegetation to design levels	Monthly
	Inspect inlets, outlets, and overflows for blockages	Monthly
	Inspect inlets and basin for sediment accumulation. Determine appropriate frequencies.	Monthly, then as required
	Tidy dead vegetation before growth season	Annually
	Manage wetland plants in pools – where provided	Annually
Occasional maintenance	Reseed or replant in dilapidated areas	As required
	Prune and trim plants where necessary and remove cuttings	Every 2 years or as required
	Remove sediment from inlets, outlets and forebays	Annually, or as required
Remedial actions	Repair erosion or other damage	As required
	Repair or rehabilitate inlets, outlets, and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Realign Riprap, gabions, and/or Reno mattresses	As required

Table 22: Typical Operating and Maintenance activities for Dry Swales

In addition to the items listed above, some comments regarding maintenance procedures are provided below:

- Litter clearing: A litter clean-up is to take place monthly or as required.
- Embankment inspection: Embankments should be inspected monthly or after each rain. If the embankment is compromised, it should be reshaped to tie in with the original slope.
- Cleaning of headwalls: Refuse should be removed from headwalls within the dry swale monthly. Sand and silt should also be removed by using high pressure jetting.
- Headwalls inspection: The headwalls should be inspected monthly or after each rain. Any blockage should be removed, and the natural vegetation trimmed to allow free drainage of water.

Many of the specific maintenance activities for dry swales can be undertaken as part of a general landscape management contract and therefore, if landscape management is already required at site, should have marginal cost implications whilst creating local employment opportunities in the long term (Woods Ballard *et al.*, 2015).

5.3 Wet Pond / Detention Basin Maintenance Requirements

Adequate maintenance is essential to ensure that the detention basin operates correctly to prevent poor functionality and poor aesthetics. Typical periodic maintenance activities are provided in (Woods Ballard *et al.*, 2015) and the Cape Winelands Airport will implement the most suitable of these activities for the specific site conditions or as required during the lifecycle of the detention basin:

Activity	**Typical frequency**
Remove litter and debris from Inlet and outlet structures	Monthly
Mow vegetation (Side slopes)	Monthly
Inspect inlets, outlets, and overflows for blockages	Monthly
Inspect inlet and forebay for sediment accumulation	Semi-Annually
Inspect for invasive vegetation	Semi-Annually
Manage wetland plants in pools – where provided	Annually
Check for signs of Hydrocarbon buildup and remove appropriately	Inspection
Prune and trim plants where necessary and remove cuttings	Every 2 years or as required
Remove sediment from inlets, outlets and forebays	Annually, or as required
Inspect for damage paying attention to the variable outlet control structure	Annually
Remove sediment from forebay	5 to 7 years or when 50% of forebay capacity is lost
Repair undercut or eroded areas	As required
Realign riprap, gabions, and/or Reno mattresses	As required

Table 23: Typical Operating and Maintenance activities for Detention Basins

In addition to the items listed above, some comments regarding maintenance procedures are provided below:

- Irrigation system: It will take some time for the vegetation in the pond to be fully established. As such, it is proposed that an irrigation system or procedure be put in place to ensure the vegetation survive the initial dry seasons. Suitable inspections to identify potential faulty elements should be conducted on the irrigation system to ensure its proper functioning.
- Litter clearing: A litter clean-up is to take place monthly or as required.
- Alien and problem vegetation: It is proposed that the pond must be inspected for invasive alien vegetation routinely by the appointed landscaper. As far as possible all alien vegetation should be manually removed. Where manual removal is not possible, alien vegetation should be treated with an appropriate herbicide using the correct application method and to the manufacturer's directions and specifications. Herbicides should not be applied when conditions are windy, so as to avoid spray drift. No herbicides should be applied when rain is forecast within 2 days. Colour dyes should be used with the herbicides to clearly mark areas that have been treated, taking exceptional care when working near water. It must be recognized that under certain conditions some indigenous vegetation may become problematic and may require intervention.
- Cleaning of silt traps: The sedimentation forebay as well as the apron of the outlet headwalls must be inspected every six months, with one of the inspections taking place just before the first seasonal rains. These must be inspected for build-up of silt, dirt, mud, and similar material. All silt and other material must be removed and disposed of at a suitable landfill site. Care must be taken to ensure that no silt enters the stormwater system during the cleaning process.

Should a situation arise where there are persistent or recurring problems with the pond such as poor water quality, problems with vegetation and similar issues, an aquatic specialist should be consulted for input and advice on the matter. If then required or requested by the specialist, water sampling will be undertaken.

6 Conclusion and Recommendations

The proposed stormwater management interventions for the Cape Winelands Airport development align with the City of Cape Town's stormwater management policies. The stormwater management interventions have been designed such that they will manage, control, and treat the stormwater runoff for larger infrequent storm events as well as smaller more frequent storms.

Given the nature of the project and the coordination and integration required across various disciplines, it is noted that there are specialist reports which are on-going, and copies of these reports shall be made available to the City of Cape Town's CSRM branch upon completion to support this Concept Stormwater Management Plan. The ultimate scenario was considered in the current modelling scenarios and the proposed BMP's are capable of addressing the stormwater management for both the medium- and long-term developments. Appropriate energy dissipation structures shall be implemented to ensure that the outflows from the pond across the site have a minimal impact on the surrounding and downstream environments.

The extent to which the Cape Winelands Airport conceptual stormwater interventions complies with the stormwater management policy requirements and targets are summarized in Table 24 below:

SuDS Objectives		**Requirements**	**Achieved**
Improve quality of stormwater runoff	Remove pollutants through a combination of: - Reducing and/or disconnecting impervious areas - Using BMPs/SuDS to infiltrate, capture, and/or treat stormwater runoff	Design storm event for water quality treatment is the 0.5-year or 6-month RI, 24-hour storm event	Yes
		Target pollutant removal aimed at reducing the annual stormwater pollutant load discharged from the developed site by <u>on-site treatment measures</u> to achieve: - A reduction of suspended solids (SS) by 80% - A reduction of total Phosphorus (TP) by 45%	Yes
		All developments must trap litter, oil, and grease at source	Yes
Control quantity and rate of runoff Using on-site measures	Protect the stability of downstream channels	24-hour extended detention of the 1-year RI, 24-hour storm event	Yes
	Protect downstream properties from frequent floods	Up to 10-year RI peak flow reduced to pre-development levels	Yes
	Protect floodplain developments and floodplains from extreme floods	Up to 50-year RI peak flow reduced to existing development levels	Yes
		Evaluate the effects of the 100-year RI storm event on the stormwater system, adjacent property, and downstream facilities and property.	Yes
		Manage the impacts through detention controls and/or floodplain management	Yes
		Developments adjacent to floodplains must adhere to the requirements stipulated in the *Floodplain and River Corridor Management Policy* (CCT, 2009b)	Yes
Encourage natural groundwater recharge		Where appropriate, site-specific requirements to be considered in consultation with Council.	Yes

Table 24: Management of Urban Stormwater Impacts Policy Requirements (Compliance)

It is to be concluded that this report outlines the stormwater management objectives for the proposed development. Through strict adherence to the Concept Stormwater Management Plan, the potential adverse effects the stormwater runoff pose on the development and downstream infrastructure, can be successfully mitigated. Zutari trusts that the stormwater interventions as described in this Concept Stormwater Management Plan are acceptable to City of Cape Town's CSRM branch and sufficient to obtain the required support.

7 References

Armitage, N., Vice, M., Fisher-Jeffes, L., Winter, K., Spiegel, A., & Dunstan, J. (2013). The South African Guidelines for Sustainable Drainage Systems. Alternative Technology for Stormwater Management. WRC Project No. K 5/1826.

Atlanta Regional Commission (2016). Georgia Stormwater Management Manual, Volume 2 – Technical Handbook.

City of Cape Town (CCT) (2009a). Management of Stormwater Impacts Policy. Catchment, Stormwater, and River Management Branch, Roads, and Stormwater Department. C . Available:

http://resource.capetown.gov.za/documentcentre/Documents/Bylawsandpolicies/ManagementofUrbanStormwaterImpactsPolicy-approvedon-27May2009.pdf

CCT (2009b). Floodplain and River Corridor Management Policy, Balancing flood risk, ecological and socio-economic considerations in developments near watercourses and wetlands, Version 2.1. Catchment, Stormwater, and River Management Branch, Roads, and Stormwater Department.

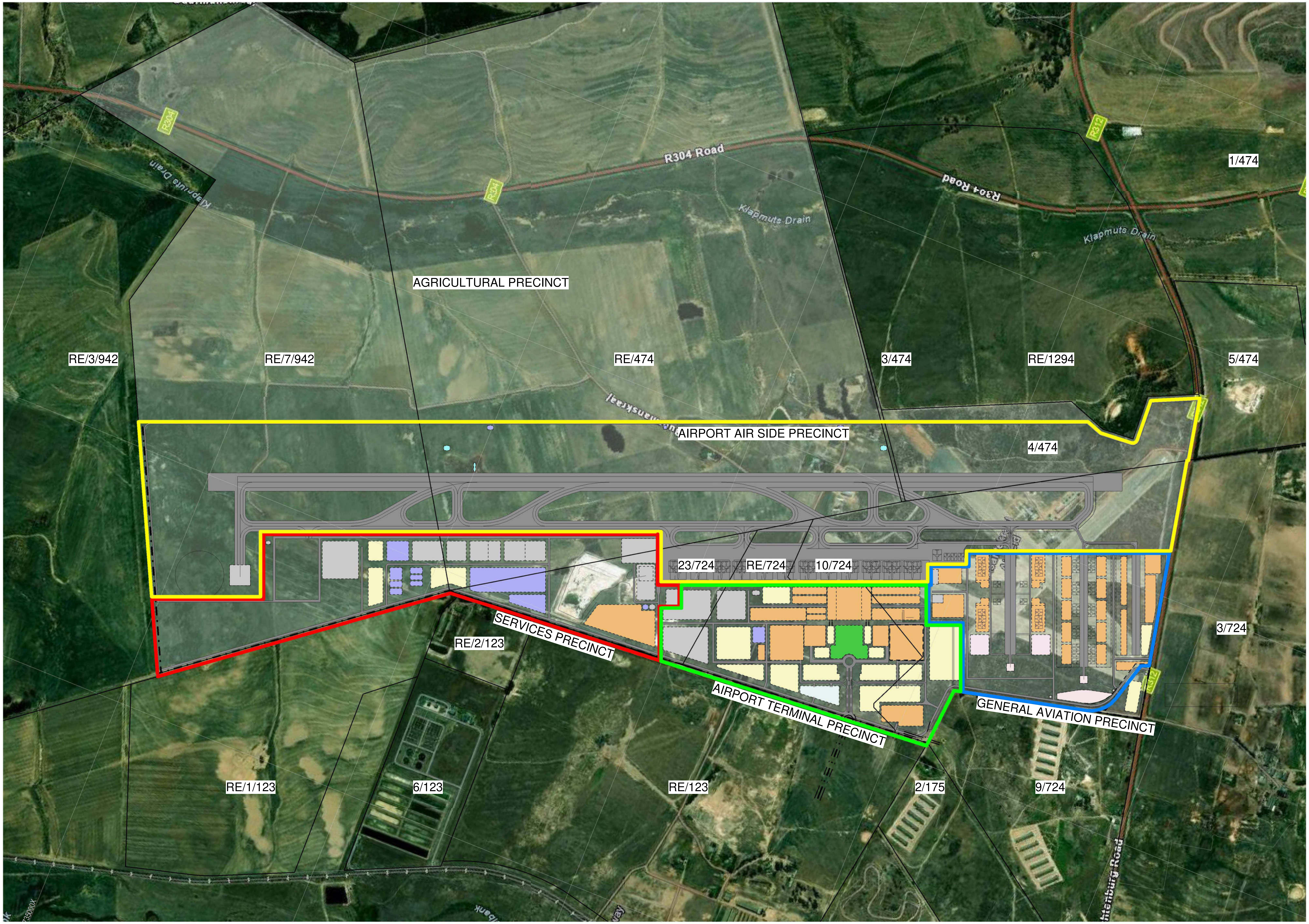
Personal Computer Stormwater Management Model (PCSWMM) (2023). PCSWMM 2023 Professional, Computational Hydraulics Institute (CHI).

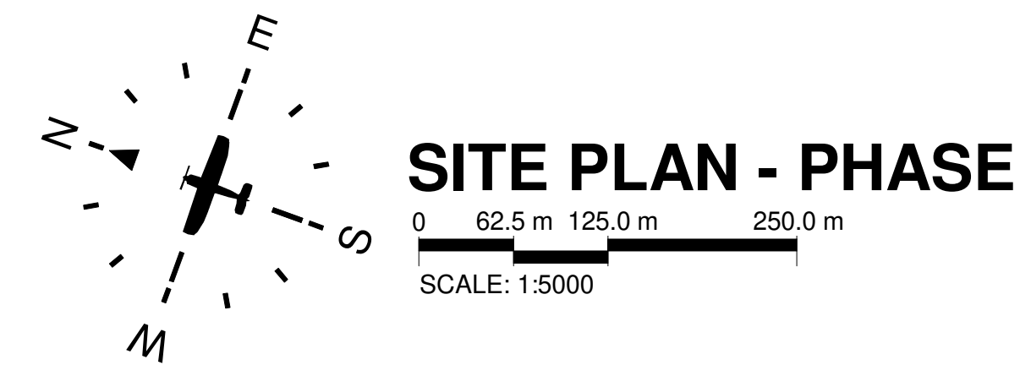
Woods Ballard, B., Wilson, S., Udale-Clark, H., Illman, S., Scott, T., Ashley, R., & Kellagher, R. (2015). The SuDS Manual. CIRIA: C753 (6). London, UK. ISBN 978-0-86017-760-9

Appendix A

Drawings

- **2311-VIVID-A-9002 - Site Development Plan (PAL4)**
- **A89083-0000-DRG-CC-001 Locality Map**
- **A89083-0000-DRG-CC-101 Concept Grading Plan**
- **A89083-0000-DRG-CC-302 Concept Stormwater Layout**
- **A89083-0000-DRG-CC-303 Concept Stormwater Ponds Layout**
- **A89083-0000-DRG-CC-310 Quarry as Stormwater Attenuation Pond**





SITE PLAN - PHASE 2

SCALE: 1:5000

GENERAL NOTES

* ALL BUILDING WORK AND BUILDING REQUIREMENTS ARE TO BE CARRIED OUT IN STRICT ACCORDANCE WITH THE REQUIREMENTS OF THE NATIONAL BUILDING REGULATIONS AND BUILDING STANDARDS ACT (No 103 OF 1977).
* THIS DRAWING IS NOT TO BE SCALED. USE FIGURED DIMENSIONS ONLY.
* ALL DIMENSIONS AND LEVELS, ETC., TO BE CHECKED ON SITE, BEFORE ANY WORK IS COMMENCED.
* ANY DISCREPANCIES, QUERIES, ETC., RELATED TO THIS DRAWING ARE TO BE REFERRED TO CAPEX PROJECTS, BEFORE ANY WORK IS COMMENCED.
* REINFORCED CONCRETE AND STRUCTURAL STEELWORK IS TO BE IN ACCORDANCE WITH THE STRUCTURAL ENGINEER'S DESIGN AND SPECIFICATIONS.

DRAINAGE NOTES

* ALL DRAINAGE RUNS TO BE ACCESSIBLE ALONG THEIR ENTIRE LENGTH.
* V.P.'s TO BE CARRIED UP TO 2m ABOVE ANY WINDOW OR DOOR OPENING IN THE BUILDING OR ANY OTHER BUILDING WITHIN A DISTANCE OF 6m.
* INSPECTION EYES (i.e.'s) TO BE PROVIDED AT ALL BENDS AND JUNCTIONS OF SOIL AND WASTE PIPES.
* RODDING EYES (r.e.'s) TO BE PROVIDED AT HEADS OF DRAINS AND AT A MAXIMUM OF 25m SPACINGS ALONG RUNS OF DRAINS.
* MARKED COVERS TO BE PROVIDED AT GROUND LEVEL FOR i.e's BELOW PAVING
* RESEAL TRAPS TO BE PROVIDED TO ALL WASTE FITTINGS.
* SOIL WATER DRAINS PASSING UNDER BUILDINGS TO BE ENCASED IN 150mm CONCRETE ALL ROUND AND BE PROVIDED WITH r.e.'s AS CLOSE TO THE BUILDING AS POSSIBLE AT BOTH ENDS.
* SOIL WATER PIPES HAVING A VERTICAL DROP EXCEEDING 1200mm TO THE MAIN DRAIN TO BE ANTI-SYPHONED.
* ALL BRANCH DRAINS EXCEEDING 6m IN LENGTH TO BE VENTED.
* uPVC PIPES ARE TO BE LAID IN ACCORDANCE WITH THE MANUFACTURERS TECHNICAL SPECIFICATIONS.

FIRE DEPARTMENT'S REQUIREMENTS

* ALL WORK IS TO COMPLY WITH SABS 400.
* a) EXTINGUISHERS TO BE INSTALLED IN ACCORDANCE WITH SABS 0105.
  b) HOSE REELS TO BE INSTALLED IN ACCORDANCE WITH SABS 543.
  c) HYDRANTS TO BE INSTALLED IN ACCORDANCE WITH SABS 1128 PART 1.
* PORTABLE FIRE EXTINGUISHERS TO BE HUNG ON PURPOSE MADE BOARDS AND LOCATED IN SECURE POSITIONS AS INDICATED ON PLAN.
* CLASS "B" FIRE DOORS TO COMPLY WITH SABS 1253 AND TO BE FITTED WITH APPROVED SELF CLOSING OR AUTOMATIC CLOSING DEVICES.
* STRUCTURAL ELEMENTS AND COMPONENTS TO COMPLY WITH TT7.
* FIRE EXIT DOORS ARE TO BE FITTED WITH EMERGENCY EXIT LOCKSETS.
* SYMBOLIC SAFETY SIGNS TO BE IN ACCORDANCE WITH S.A.B.S. CODE 1186 AND POSITIONED AS REQUIRED BY THE FIRE DEPARTMENT.

Rev	Description	Revision Date
11	ISSUED TO PROFESSIONALS	2024-07-24
10	ISSUED	2024-07-24
9	ISSUED	2024-07-24
8	ISSUED	2024-07-23
7	Revised SDP/EIA For Comment	2024-07-23
6	Revised SDP/EIA For Comment	2024-07-23
5	Added ATCT and Helipad	2024-05-24
4	FOR REVIEW	2024-04-10
3	FOR REVIEW	2024-04-03
2	FOR REVIEW	2024-04-03
1	FOR REVIEW	2024-03-28

CAPEX PROJECTS
UNIT 10 First Floor
BOSKRUIN BUSINESS PARK
BOSKRUIN
cnr Kelly & Bosbok street
2188

Tel: 011 792 4260/ 8169

CLIENT

CAPE WINELANDS AERO

Client

Engineer

Registration NO: Designer

SACAP NO: ..

CLIENT
ENVIRONMENTAL CONSULTANT

TITLE
PHASE 2

DRAWING
CWA - PRECINCT PLANS

SIZE		DWG NO	REV
A0		2024-3297 400	11

SCALE 1 : 5000
DATE 2024-07-24
DRAWN BY: CW DENNIS

Appendix B

Flood Line Risk Assessment Report

Project report

Cape Winelands Airport Development

Cape Winelands Airport Development Flood Risk Assessment

Cape Winelands

Submission date: 2024/06/05

Document number: A89083-0000-REP-CC-0002

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Client contact		Mr. Stuart Walls	**Client reference**			
Rev	**Date**	**Revision details/status**	**Author**	**Reviewer**	**Verifier** **(if required)**	**Approver**
0	2024/06/05	Final	M Sundermann	M Kleynhans		C Talip
Current revision		**0**				

Approval			
Author signature	Sundermann	Approver signature	
Name	M Sundermann	Name	C Talip
Title	Civil Engineer	Title	Technical Director

Contents

Figures

Tables

1 Introduction

1.1 Purpose of Report

This report presents a flood risk assessment conducted for the Cape Winelands Airport Development project located north of Durbanville. The aim of the assessment is to determine the impact of the development on flood risk in surrounding areas for the 1:100-Year recurrence interval (RI) flood. The evaluation considers the geographical location, hydrological characteristics, and the hydraulic structures within the site boundary and included hydraulic modelling to determine flood risk.

1.2 Study Area

The Cape Winelands Airport study area is bordered by three main roadways, R312, R302, and R304, forming a distinct boundary. It is located on the highest elevation within the study area. To the west of the site flows the Mosselbank River, which is a relatively significant river. To the east lies a tributary of the Klapmuts River. Furthermore, the site drains to sixteen tributaries that serve as conduits for runoff, which is directed to the Mosselbank River and Klapmuts tributary. These tributaries play an important role in drainage from the airport site. Figure 1-1 describes the study area.

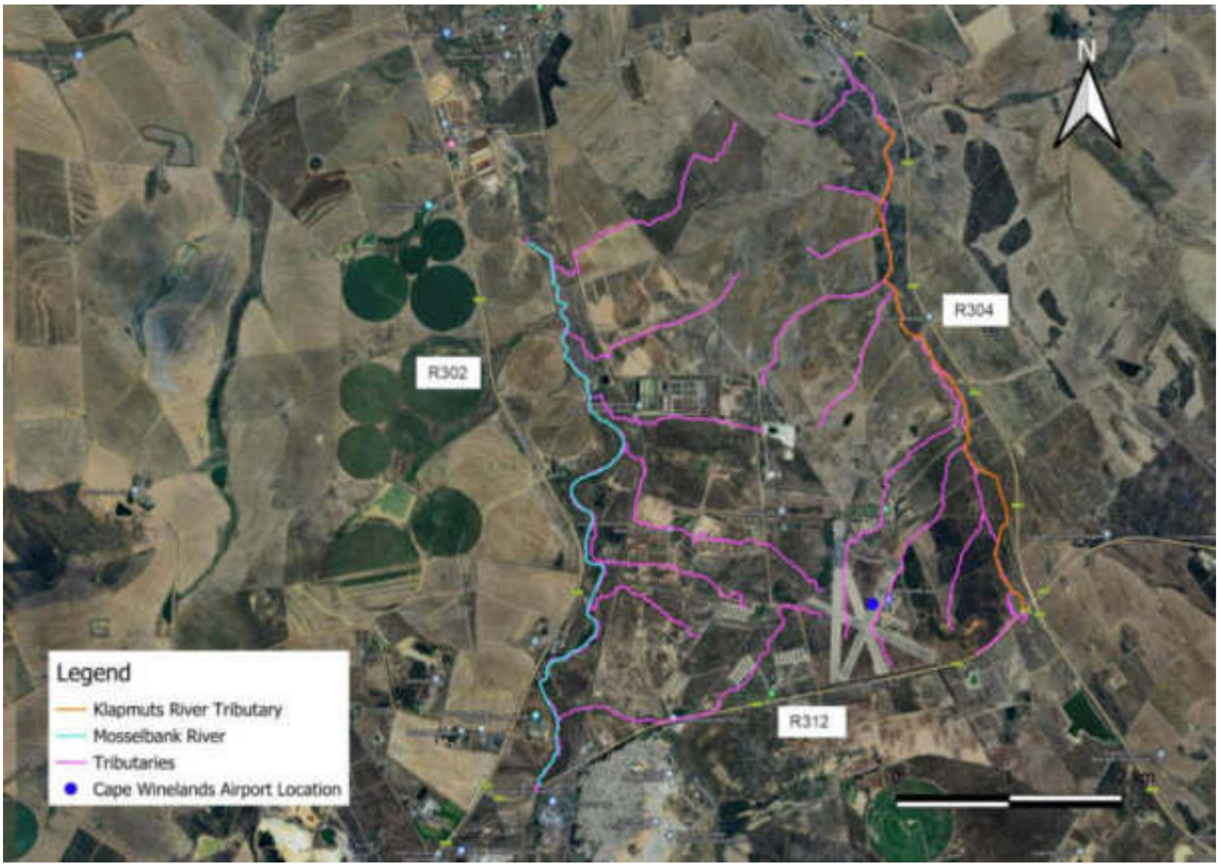

Figure 1-1: Flood Risk Assessment study area for Cape Winelands Airport Development.

Figure 1-2 shows the location and layout of the proposed airport along the watershed between the Mosselbank and Klapmuts Rivers.

Figure 1-2: Proposed Cape Winelands Airport Development layout.

1.3 Methodology

The determination of flood risk for the study area included the following components, which are explained in more detail in the following sections:

- Data collection
- Catchment delineation
- Flood risk assessment.
- Hydraulic model configuration and execution
- Floodplain mapping and analysis

2 Design Flood Determination

2.1 Introduction

Catchments were delineated to determine catchment characteristics using a 5 m Digital Elevation Model that was developed using Light Detection and Ranging (LiDAR) information, obtained from the City of Cape Town. The characteristics and rainfall were used as parameters for deterministic methods to calculate flow peaks and hydrographs.

The peak flows for the tributary catchments were determined using a Personal Computer Storm Water Management Model (PCSWMM) model, while deterministic methods were utilized to calculate the peak flows for the main river catchments.

2.2 Catchment Delineation

Catchments for each tributary within the study area were delineated. Additionally, the upstream catchments for the Mosselbank and Klapmuts Rivers were delineated to determine the inflows for the two main rivers. The basic catchment characteristics included catchment area, longest water course, water course slope, and average catchment slope. Catchment characteristics for the main rivers, are shown in Table 2-1.

Table 2-1: Main rivers catchment characteristics.

Catchment	Area (sq. km)	Longest Water Course (km)	Water Course Slope (%)	Avg. Catchment Slope (%)
Mosselbank	105	17	0.399	4.18
Klapmuts	7	4	1.131	4.96

The upstream catchments for both the Mosselbank River and Klapmuts River were delineated to calculate the inflow contributions that derive from the areas beyond the study area. The catchments delineated for the tributaries, and the water courses are shown in Figure 2-1 and Figure 2-2, respectively.

Figure 2-1: Delineated catchments for tributaries within study area.

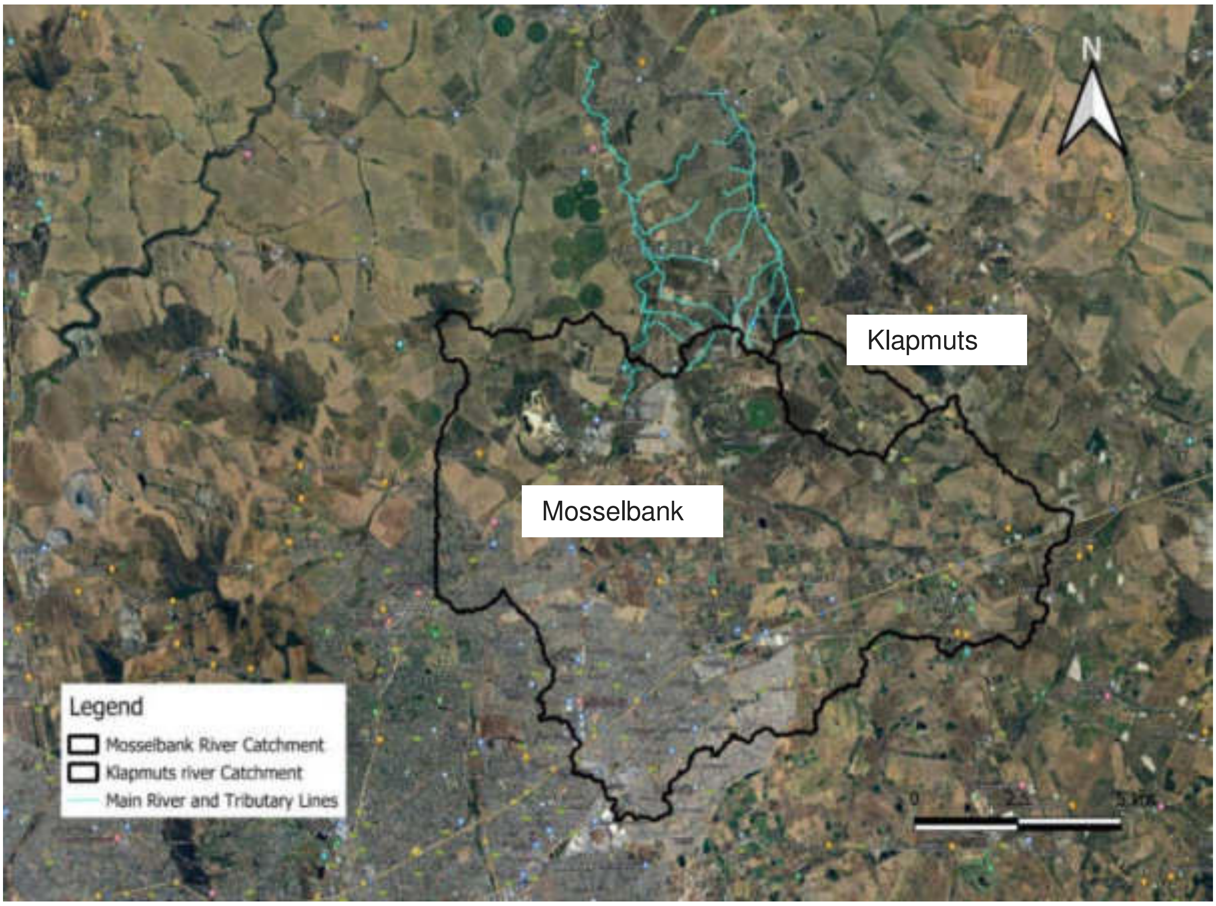

Figure 2-2: Delineated catchments for main rivers.

2.3 Design Rainfall

The design rainfall data was sourced from the City of Cape Town Rainfall Grid for the study area.

Table 2-2: CCT Rainfall Grid 24-hour design rainfall.

Return Period (Years)	24hr CCT Rainfall Grid (Includes 15% for climate change)
2	44.9
5	60.3
10	71.4
20	83
50	99.4
100	112.7
200	127

2.4 Flood Peak Results

The catchment areas were determined for both the tributaries and main rivers. The 100-Year RI flood peaks for the tributaries were estimated using a PCSWMM model configured with the United States Soil Conservation Service (SCS) design flood determination method, while the flood peaks for the main river catchments were estimated using the SCS method directly. Table 2-3 presents the flood peaks for the main river catchments, and Figure 2-3 illustrates the food peaks for each tributary catchment.

Table 2-3: 1:100-Year RI flood peaks for the Mosselbank River and Klapmuts tributary.

Catchment	100-year Flood Peak (m³/s)
Klapmuts River	37
Mosselbank River	325

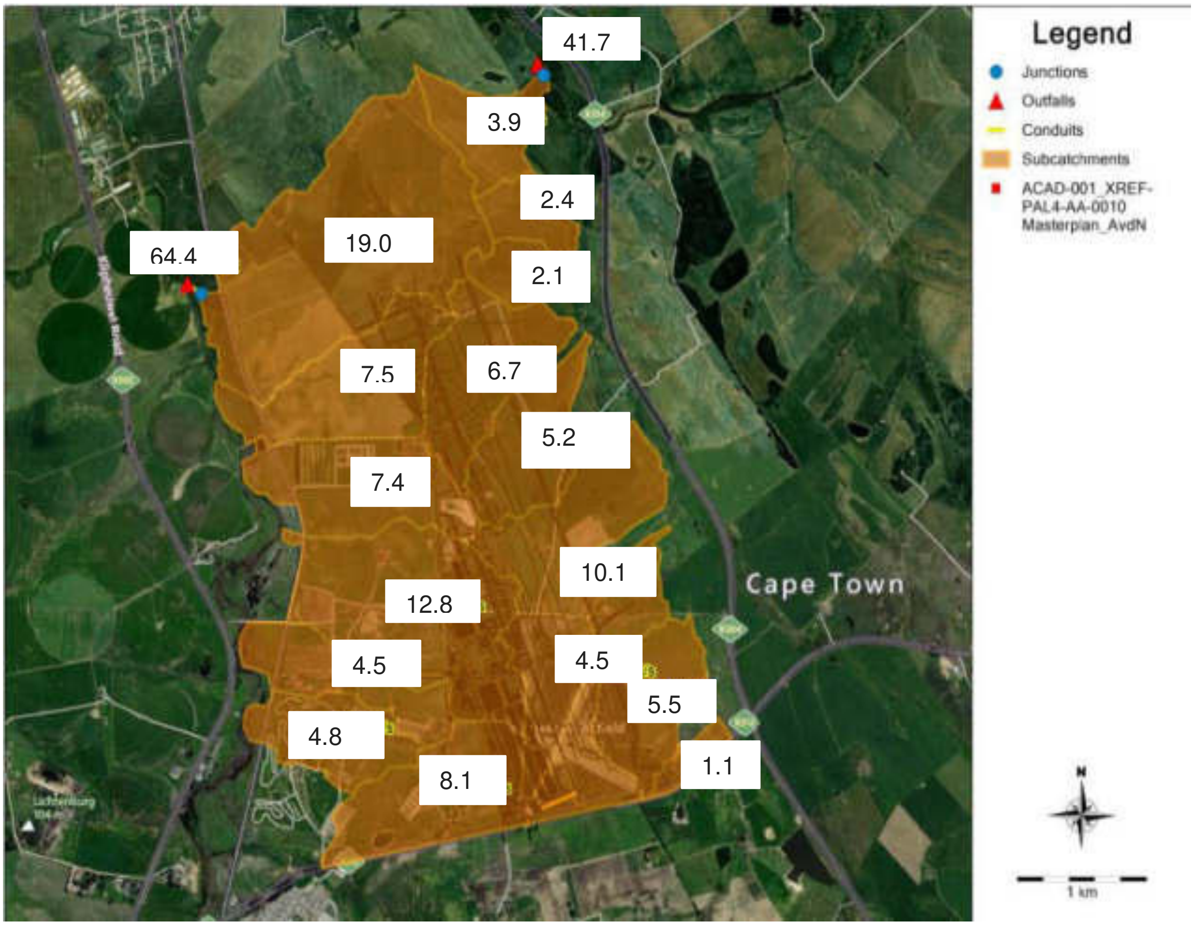

Figure 2-3: The pre-development 1:100-Year RI flood peaks for each tributary catchment area determined using PCSWMM.

Table 2-4 displays the 1:100-year RI design floods at the outfalls from the airport site. The post development floods have been attenuated in ponds on the airport property, upstream of the outfalls. None of the post development flood peaks at the airport outfalls exceed the pre-development values, and in some cases, they have been attenuated significantly by the ponds. In the case of Pond 6 the flood peak is reduced to 1% of its pre-development value.

Table 2-4: 1:100-year airport design floods for the pre- and post-development stages.

Pond ID	1:100yr Pre-Dev (m³/s)	1:100yr Post-Dev (m³/s)
Pond 1	1.01	1.33
Pond 2	3.05	2.59
Pond 3	0.65	1.09

Pond 4	0.65	0.92
Pond 5	1.23	1.65
Pond 6	0.76	0.01
Pond 7	4.89	0.83
Pond 8	0.04	0.01

3 Hydraulic Analysis

3.1 Introduction

An extensive hydraulic model was required to assess the flood risk impact of the proposed airport on the surrounding study area. The United States Army Corps of Engineers' Hydrologic Engineering Centre's River Analysis System (HEC-RAS) software was utilized to simulate the hydraulics of the watercourses in the study area. The hydraulic model was configured as a two-dimensional (2D) HEC-RAS model with a 24-hour simulation run time. The model included the representation of tributaries as steady-state flow hydrographs from the proposed airport site and the incorporation of unsteady-state flow hydrographs for the inflows of the main rivers. Hydraulic structures in the watercourses have been incorporated in the model including two box culverts and a stormwater pipe.

3.2 Hydraulic Model Configuration

3.2.1 Digital Elevation Model

A Digital Elevation Model (DEM) of the Cape Winelands Airport study area was used to model the terrain in the hydraulic model. The DEM is a 3D map of the topography of the study area and was generated from Lidar data with a 5m resolution (Figure 3-1).

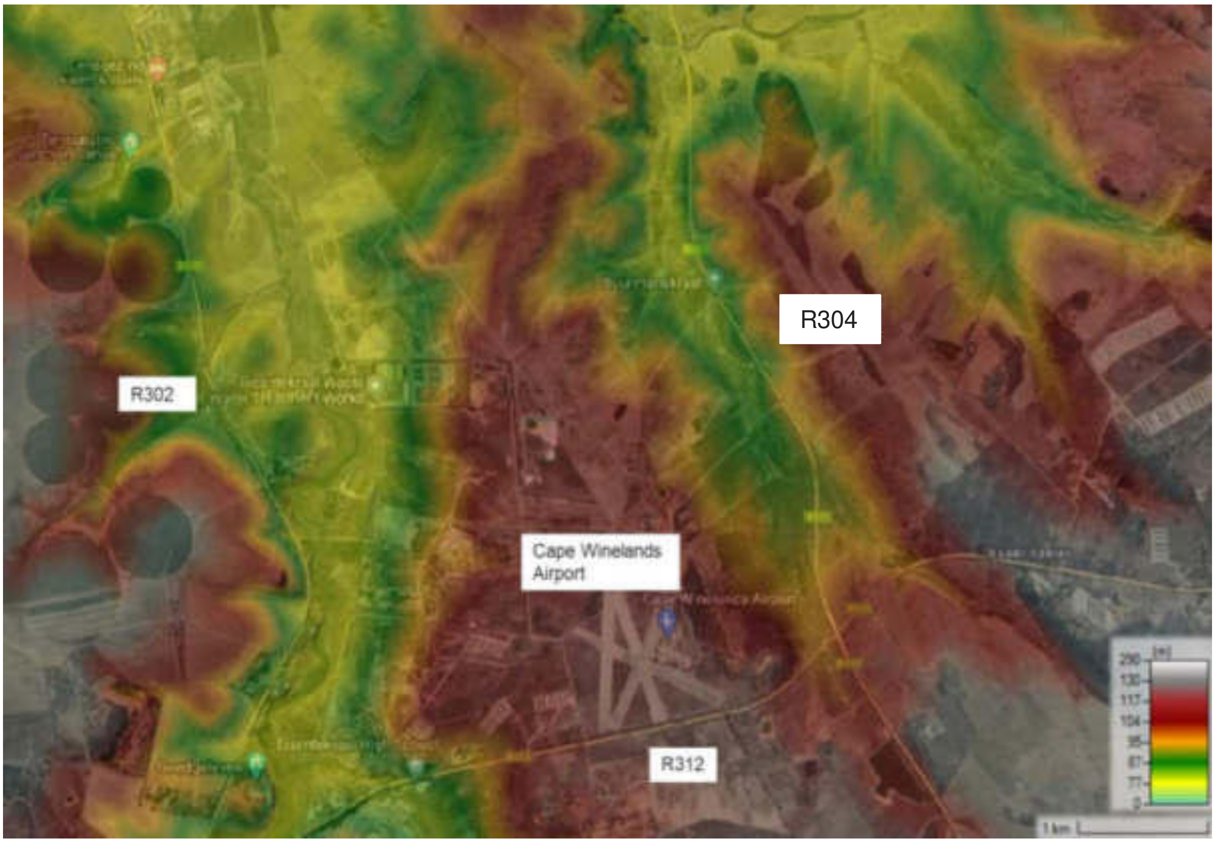

Figure 3-1: Digital Elevation Model shown in HEC-RAS for study area.

3.2.2 Computational Mesh

The 2D computational mesh in HEC-RAS for the Cape Winelands Airport study was configured with a 25m grid resolution. The centrelines of the main rivers and tributaries are represented as breaklines, indicated in red in Figure 3-2.

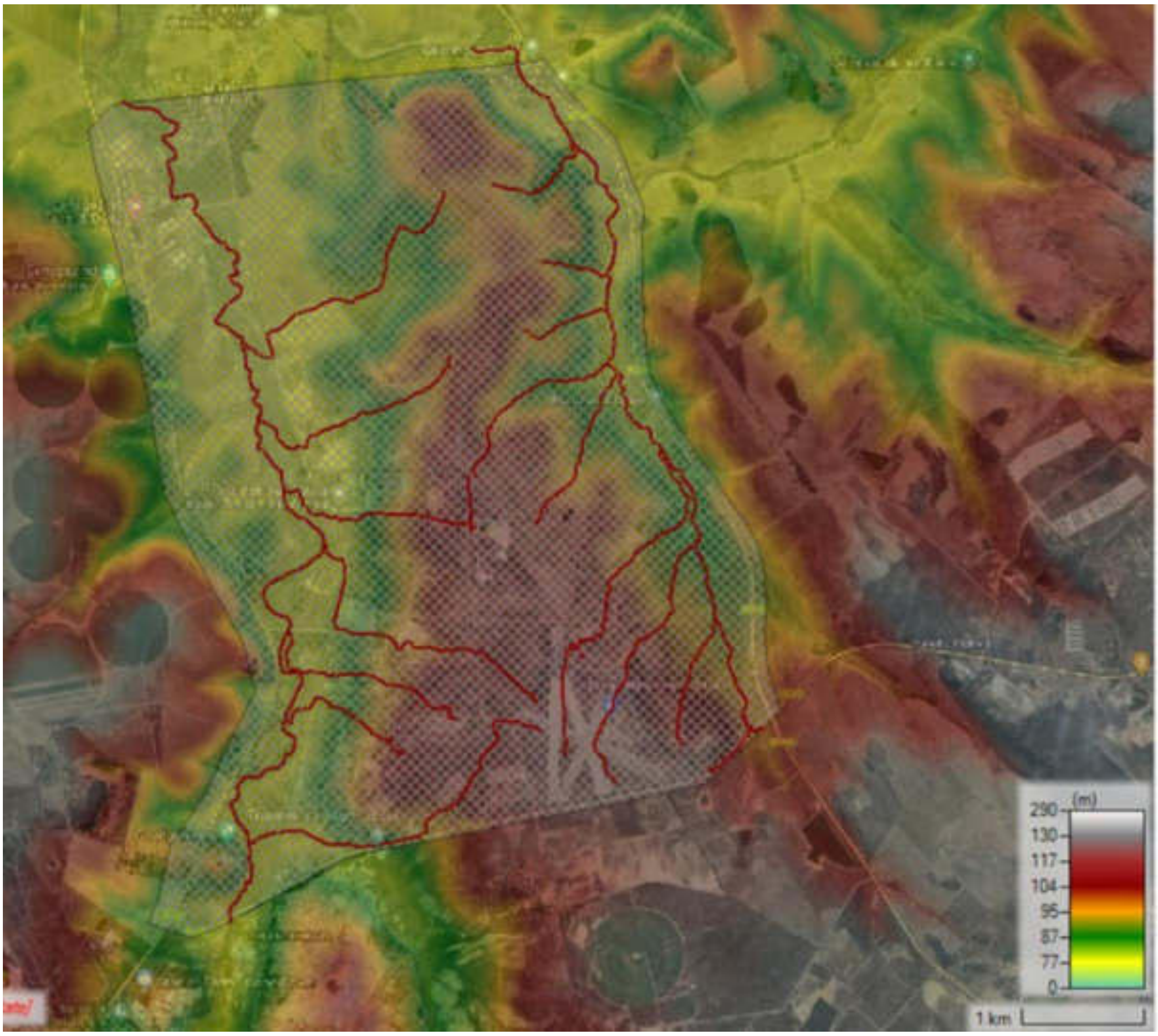

Figure 3-2: Computational mesh, perimeter, and modelled breaklines in red.

3.2.3 Hydraulic Structures

Hydraulic structures were included in the model and were configured considering typical dimensions for culvert and pipe structures. Structure data were configured based on dimensions measured from Lidar data, Google Earth, ArcGIS Earth, and Google Street View, considering typical dimensions for culvert and pipe structures. Typical dimensions required to configure the culverts included their span, rise, and length where pipes required internal diameter and length.

Four hydraulic structures were included, and these structures are presented in Figure 3-3. The structures were labelled according to their names and were included in the HEC-RAS model.

Table 3-1: Hydraulic structure descriptions.

Structure Name	Structure Type
Structure 1	Box Culvert
Structure 2	Box Culvert
Structure 3	Stormwater Pipe
Structure 4	Box Culvert

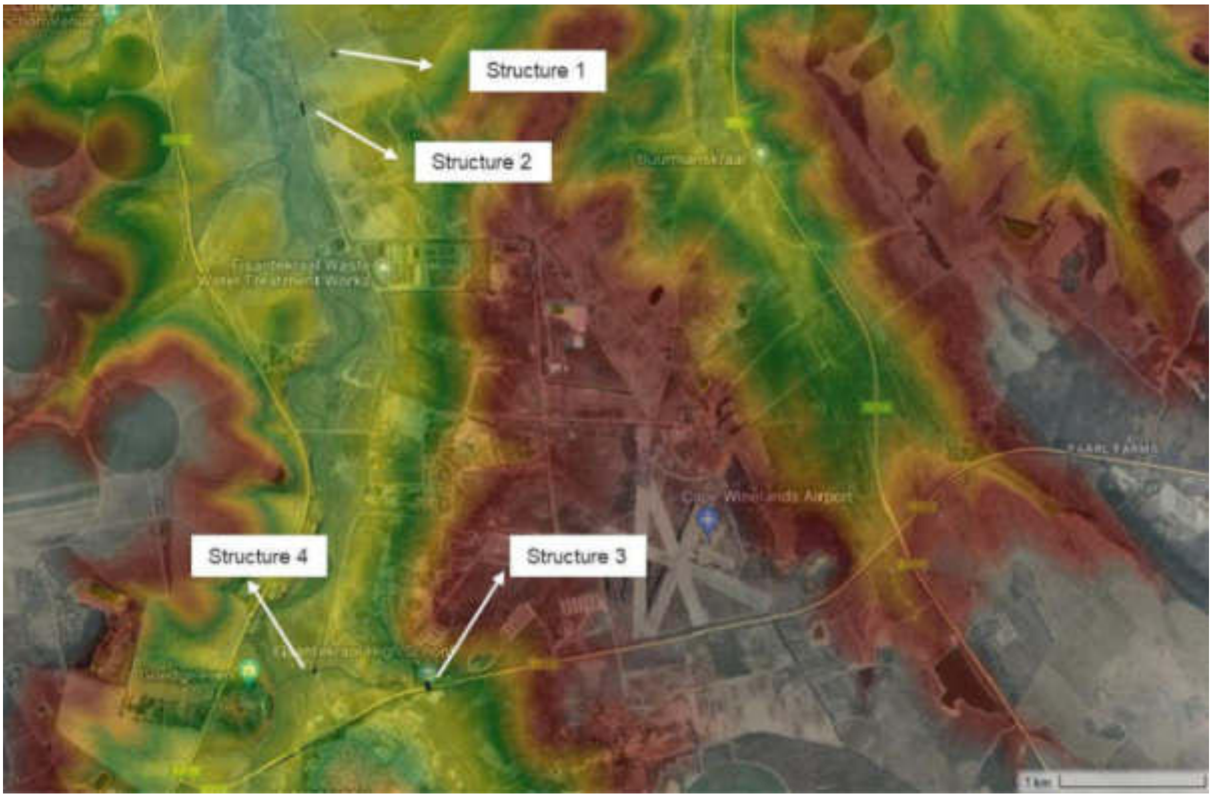

Figure 3-3: Positions of hydraulic structures.

3.2.4 Hydraulic Roughness

The hydraulic roughness was represented using the Manning's n values, which were assigned based on land cover characteristics. Manning's roughness values were assigned to specific land cover types. The South African National Land Cover (SANLC, 2018) was utilized in the model. Figure 3-4 represents the land cover layer for the study area.

Table 3-2: Top three main land cover types used.

Rank	Land Cover Type	Manning's Roughness Value
1	Commercial Annuals Crops Rain-Fed / Dryland / Non-Irrigated	0.05
2	Low Shrubland (Fynbos)	0.1
3	Herbaceous Wetlands	0.085

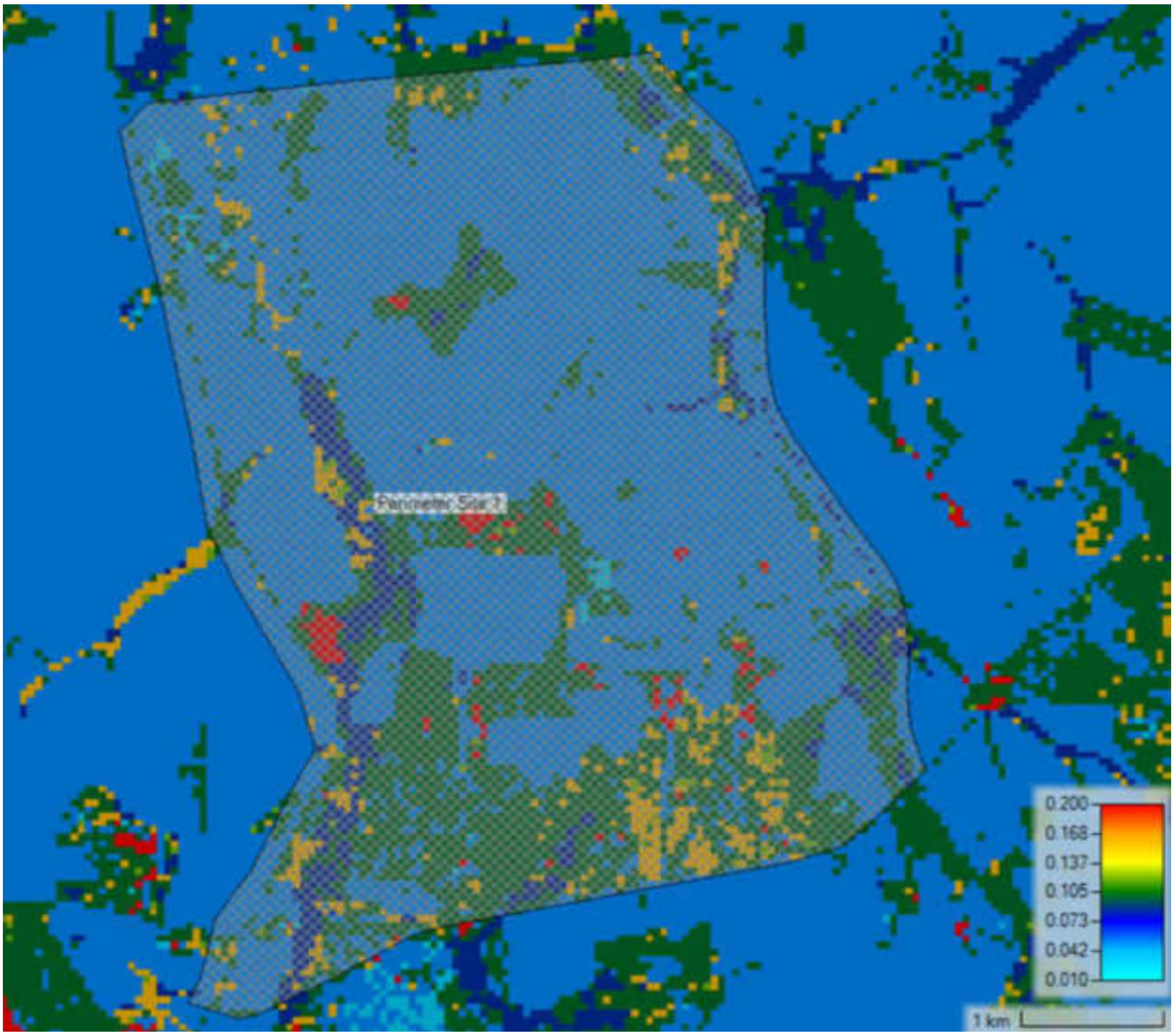

Figure 3-4: Land cover layer in association with Manning's roughness values.

3.2.5 Boundary Conditions

The model included four external boundaries: two upstream and two downstream boundaries. The two upstream boundaries were configured with the flood peak hydrographs from the catchments of the two main rivers, as mentioned in Section 2.4. The downstream boundaries were set as Normal Depth boundaries, necessitating frictional slope information. Internal boundaries were also configured, arranged with respect to the pre- and post-development of the Cape Winelands Airport. The tributary catchments will include a portion of the proposed airport in their upper parts, with the rest of the catchments remaining in their current condition. The model was configured to reflect this by including the outfall points from the airport site as internal boundaries, and the balance of the catchment contribution modelled pro-rata down the watercourse centreline to the downstream end. An example of this is illustrated in Figure 3-5.

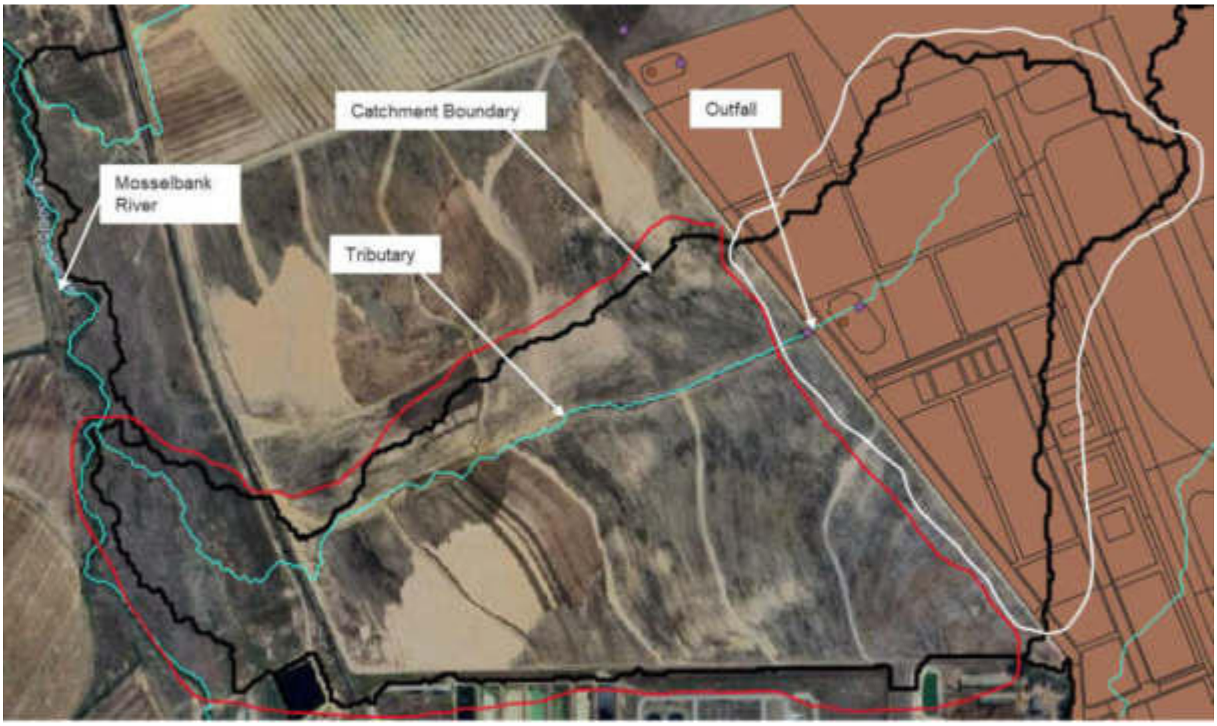

Figure 3-5: The portion of the catchment located inside the airport is bordered in white, and the rest of the catchment which will remain unchanged is bordered in red.

The flood risk assessment utilized steady-state hydrographs for the design flood peaks in the tributaries which are all relatively small catchments, and unsteady-state hydrographs for the two main rivers. This is conservative because it is likely that the flood peaks of the small catchments surrounding the airport site will occur before the peaks arrive from the main river catchments, but it was modelled assuming that they would occur at the same time.

The locations of the various model boundaries are shown in Figure 3-6.

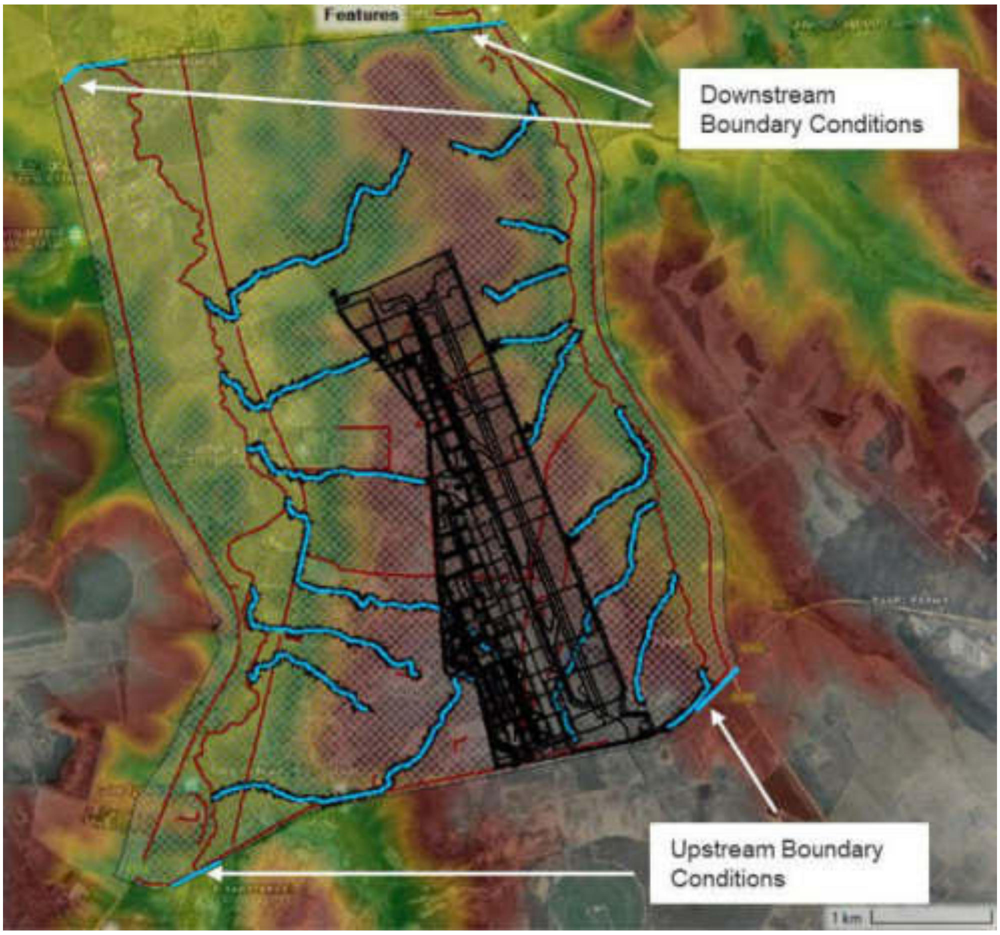

Figure 3-6: External and internal boundary conditions with proposed airport layout.

3.3 Hydraulic Model Results

3.3.1 1:100-Year RI Pre- and Post- Development Flood Extents

Figure 3-8 shows the 1:100-year RI flood inundations for the pre- and post-development scenarios. The effect of attenuation by the ponds decreased the post-development flood peaks at the outfalls from the airport site to values that were equal to or less than the pre-development flood peaks, resulting in the post-development flood inundation extents remaining similar to, or reducing in area from the pre-development flood peaks.

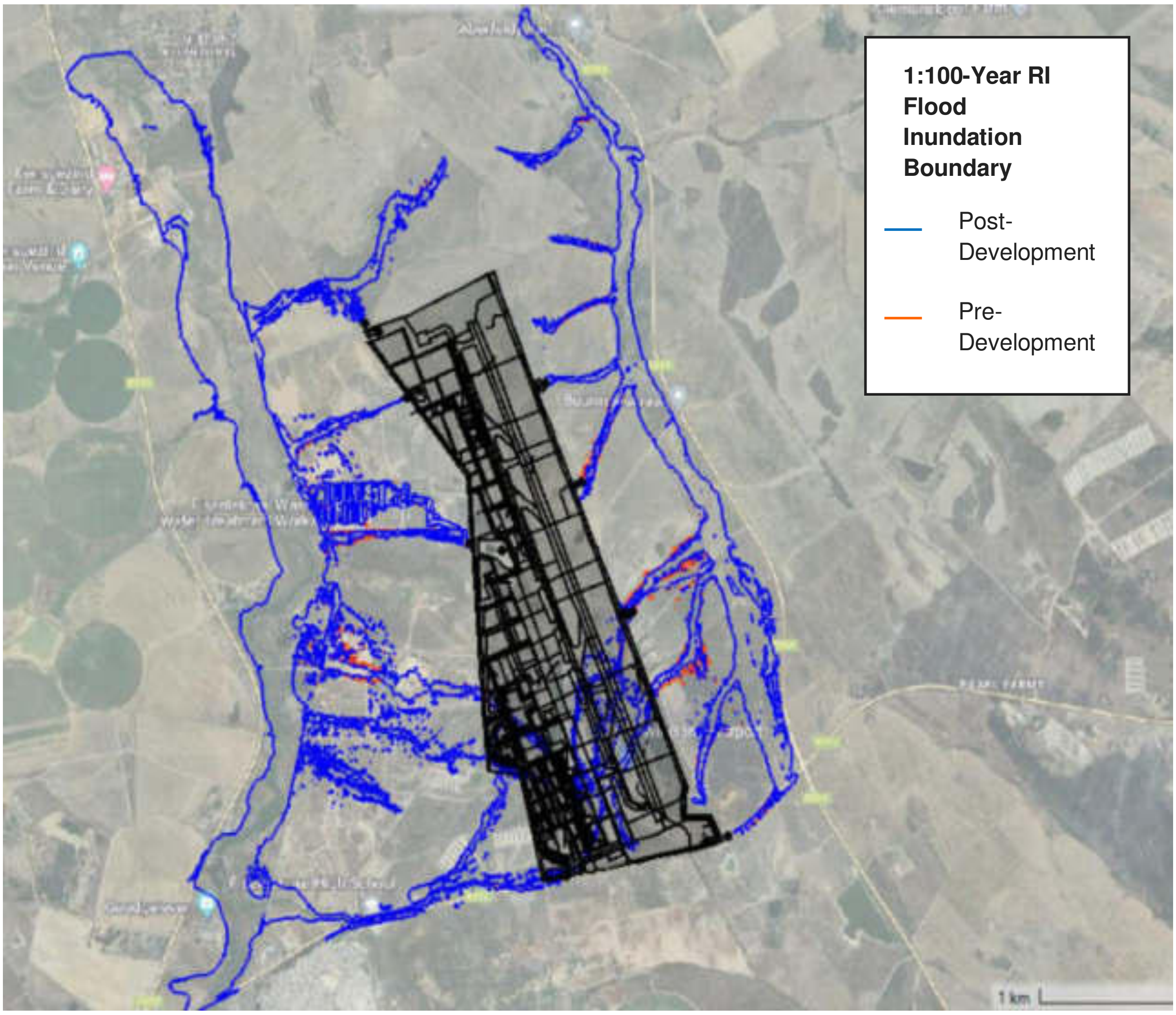

Figure 3-7: 1:100-Year RI flood inundation boundaries for Pre- and Post-Development scenarios.

4 Conclusion

This report details a study to determine the flood risk impact of the proposed Cape Winelands Airport on the downstream receiving catchments in the surrounding area. The proposed airport will be located on the watershed between the Mosselbank River and a tributary of the Klapmuts River. The airport site itself has zero risk of flooding from the surrounding rivers because of its elevated position, but runoff from the site will be altered by the airport development due to an increase in hardened surfaces (such as the runways, roads and roofs) and changes to the slopes and drainage patterns on the site due to the massive earthworks which are planned. The airport will therefore change flood risk in the catchments downstream, which has been mitigated by 8 detention ponds proposed on the airport site.

A 2D HEC-RAS hydraulic model was configured to determine the design flood inundations and depths for the 1:100-Year RI event for the pre- and post-development scenarios. It included the Mosselbank River and Klapmuts River tributary which lie to the west and east of the proposed airport site respectively, and several small tributaries that drain from the locations of the proposed detention ponds on the airport site. The model was configured incorporating flood peaks from a PCSWMM model for the tributary catchments and the proposed airport site, while employing the SCS Method to generate flood hydrographs for the Mosselbank and Klapmuts Rivers. The Zutari Land Infrastructure team developed the PCSWMM model to determine the pre- and post-development flood peaks for the outfalls from the airport site and these are detailed in a separate report.

The detention ponds have been sized to reduce the post-development flood peaks to magnitudes no greater than the pre-development flood peaks for recurrence intervals up to the 1:100-year recurrence interval. Many of the flood peaks have been reduced compared to the pre-development situation. The results of the pre- and post-development flood risk modelling indicate similar or slightly reduced flood inundations in the post-development situation compared to the pre-development situation.

5 References

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Appendix C

Geotechnical Investigation Report

Geotechnical Reconnaissance Investigation for Proposed Cape Winelands Airport, Fisantekraal, Western Cape.

REPORT: GEOSS Report No: 2022/02-19 ***PREPARED FOR:*** Paul Slabbert PHS Consulting PO Box 1752 Hermanus 7200 082 740 8046 / 028 312 1734 paul@phsconsulting.co.za	***PREPARED BY:*** Shane Teek & Michael Baleta GEOSS South Africa (Pty) Ltd Unit 12, Technostell Building, 9 Quantum Street, Technopark Stellenbosch 7600 Tel: (021) 880-1079 Email: info@geoss.co.za (www.geoss.co.za)

(Version 2.0)

31 May 2022

EXECUTIVE SUMMARY

GEOSS South Africa (Pty) Ltd was requested by Mr Paul Slabbert of PHS Consulting, on behalf of Capex Projects, to complete a geotechnical investigation for the proposed Cape Winelands Airport (CWA).

The investigation involved undertaking a desk study, a site walk-over, an intrusive investigation (i.e. trial pit investigation), field and laboratory testing, and compilation and interpretation of the gathered data. This report covers aspects of preliminary road, drainage, foundation and pavement design and construction.

The most pertinent findings highlighted in this report are as follows:

- Five Geotechnical Zones have been delineated based on the investigation results:
    - A – Residual materials derived from granitoid sources.
    - B – Residual Materials derived from pelitic sources.
    - C – Area falling within Zones A and B with residual soils exhibiting characteristics of potentially expansive materials, and/or soils that are prone to settlement.
    - D - Areas of relatively deep/thick transported aeolian sand.
    - E – Areas of surficial ferricrete and/or silcrete.
- From a geotechnical standpoint, site development should proceed.
- Potential geotechnical challenges are associated with the intended development.
- All materials encountered in the trial pits classified as soft to intermediate excavation (SANS 1200D). The hardpan ferricrete horizons may require rock-breaking apparatus in areas of the site.
- A series of site-specific follow-up geotechnical investigations will be required prior to the construction of individual structures.
- In the case of structures with heavy structural loadings, where deeper foundations/piling are/is required, it would be prudent to consider a series of exploratory drilling as part of the site-specific investigations to determine whether core stones exist at depth, particularly in areas underlain by residual granitoids.
- A perched groundwater table was intersected on-site at between 0.85 and 1.4 mbgl. Excavations deeper than 1.0 mbgl will require battering to ensure safe working conditions. Final designs will have to cater for aggressive and corrosive groundwater and/or soil conditions. Drainage precaution will be required.
- The foundation solutions adopted for each structure on-site will depend on the cost of implementation, and the risk associated with the said solution.
- Due to the variation in topography within the northern extent of the property, considerable fill will be required
- During construction, potential geotechnical variations in the subsurface should be inspected and approved by a suitably qualified professional.

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ABBREVIATIONS & SYMBOLS

BH	Borehole
CBR	California bearing ratio
CGS	Council for Geoscience
c’	Effective cohesion (kPa)
DCP	Dynamic Cone Penetrometer
DWS	Department of Water Affairs and Sanitation
EAM	Engineering and Asset Management
EC	electrical conductivity
EOH	End of hole
kPa	Kilopascals
LL	Liquid Limit
LS	Linear Shrinkage
L/s	Litres per second
m	metres
MCCSSO	Moisture content, colour, consistency, structure, soil type, and origin.
MDD	Maximum Dry Density
mm	millimetre
MOD	Modified AASHTO
mS/m	milli-Siemens per metre
NGA	National Groundwater Archive
NHBRC	National Home Builders Registration Council
OMC	Optimum moisture content
PI	Plasticity index
SABS	South African Bureau of Standards
SANS	South African National Standards
TLB	Tractor loader backhoe
Q3	Third quartile
φ'	Effective angle of internal friction

GLOSSARY OF TERMS

Quartile: Equal groups into which a population can be divided according to the distribution of values of a particular variable. Here, the third quartile represents the value under which all data points (within the given group) fall.

Dynamic Cone Penetrometer: Device with a 20 mm 60° cone driven into the ground by an 8 kg weight dropped through 575 mm. The penetration resistance is recorded in mm/blow. This provides an indication of soil consistency (relative density).

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Suggested citation for this report:

GEOSS (2022). Geotechnical Reconnaissance Investigation for Proposed Cape Winelands Airport, Fisantekraal, Western Cape. Report Number: 2022/02-19. GEOSS South Africa (Pty) Ltd. Stellenbosch, South Africa.

Cover photo:

Photo south-eastern corner of the site, near TP04.

GEOSS project number:

2021_09-4505 (Phase E)

1. INTRODUCTION

1.1 Terms of Reference

GEOSS South Africa (Pty) Ltd was requested by Mr Paul Slabbert of PHS Consulting, on behalf of Capex Projects, to complete a geotechnical investigation for the proposed Cape Winelands Airport (CWA). The site that has been proposed to be upgraded and developed is located at the existing Fisantekraal airfield, some 2 km north-east of the township of Fisantekraal (**Map 1**).

1.2 Objectives and Methodology

The primary aim of the geotechnical investigation was to establish the soil conditions and associated soil engineering properties across the site. The intention of this report is to enable preliminary design of the proposed development. The aim of this investigation was met by undertaking of a desk study, a site walk-over, and intrusive investigation (i.e. trial pit investigation), field and laboratory testing and compilation and interpretation of the gathered data. This report covers aspects of road, pavement and foundation construction, drainage, and excavatability of the substratum.

1.3 Proposed Development

CWA is proposed to be built on the existing Fisantekraal Airfield which is an old South African Air Force airfield built circa 1943. It's existing foot print covers approximately 150 ha. Several of the neighbouring properties have been acquired therefore taking the proposed development area up to 660 ha. There are currently four concrete strips of 90m width each, in varying lengths between 700m and 1500m.

A site development plan has been provided which is included in **Appendix F** with the following information about the proposed facility:

- Runways (to be developed in phases).
- Taxiways.
- Roads.
- Stormwater lines and stormwater management system.
- Hangars.
- Aprons.
- Commercial/Industrial/Retail facilities.
- Hotel/Accommodation.
- Control Tower.
- Rescue & Firefighting facilities.
- Terminal buildings.
- Aviation Fuel Farm.
- Retail Service Station.
- Admin and office space.

- Electric Charging Stations.
- Renewable energy alternatives.
- Outdoor Media, e.g., signage and billboards.

In-depth descriptions of the above components of the project have been presented in GEOSS (2022).

Further, a possible extension has been proposed, and at this stage, for planning purposes, the additional area has been preliminarily investigated from a geotechnical standpoint. The possible extension is proposed to comprise the following elements:

- 3.0 km runway.
- Development of a full commercial terminal on the East of runway 01/19.
- Bulk still to be determined.
- Site plan still to be determined.
- Largest aircraft operable would be a Boeing 777 or Airbus A350.
- Commencement date would depend on demand.

1.4 Preliminary Loading

At present, because the project is in the planning phase the proposed structures and their final loadings and ultimate locations are still being finalised, the loading conditions are unknown. For the sake of this report, loadings of between 100 and 250 kPa have been used for preliminary modelling. Specific details pertaining to the proposed structures are not available at present.

1.5 SANS 10160-5 Classification Category

Based on the information available for the proposed structures and the conditions encountered on-site, the site can be classified as ‘Category 2’, i.e. the proposed development includes “conventional structures and foundations for which design methods are well established, where there are no exceptional risks in terms of overall stability or difficult ground conditions (e.g. conventional buildings on spread footings, rafts or piled foundations” (Day and Retief, 2009). This classification is defined by the following:

- The site presents no abnormal risks
- Routine field and laboratory tests have yielded estimated design parameters.
- No quantitative design has been presented by the Structural Engineer.
- Supervision/QC and follow up testing may be required prior to, or at the construction stage.
- Monitoring program - only if considered appropriate.

1.6 Scope and Limitations of Assessment

The geotechnical investigation had one primary aim, to determine the geotechnical character of the site.

1.7 *Information Available*

Ahead of the preparation of this report, the document titled "Cape Winelands Airport Development Project Description", dated 19 April 2022, was provided.

During the planning, desk study and compilation of the report, data was acquired from the following geological, geotechnical and hydrogeological sources:

- The 1: 50 000 geological series map – Sheet 3318DC Bellville.
- The 1: 50 000 geotechnical series map – Sheet 3318DC Bellville.
- The 1: 50 000 topocadastral map – Sheet 3318DC Bellville.
- The 1: 250 000 geological series map – Sheet 3318, Cape Town.
- The 1: 500 000 hydrogeological map – Sheet 3126, Cape Town.

Map 1: Locality map showing the location of the proposed Cape Winelands Airport, Western Cape.

2. SETTING

2.1 Site Location and Description

The site that has been proposed for development is situated some 2 km north-east of the existing Fisantekraal township, and approximately 25 km northeast of Cape Town International Airport (**Map 1**). The site is mainly surrounded by cultivated land, livestock farms and poultry farms. Some areas are also used for recreational activity, and a waste water treatment facility is also located to the north-west of the boundary.

The Cape Winelands Airport (CWA) development is proposed to be constructed across several farm portions, including those presently occupied by the existing Fisantekraal airfield. The proposed CWA is to fall across several properties with a total cumulative extent of approximately 885 ha (Cape Farm Mapper, 2022). The proposed development extends across the following Farm portions (area of each farm shown in brackets):

- 23/724 (31.2 ha).
- RE/724 (42.3 ha).
- 10/724 (114.0 ha).
- 4/474 (36.5 ha).
- RE/474 (402.4 ha).
- 7/942 (257.8 ha).

2.2 Topography, Existing Infrastructure and Site History

The topography of the site and surrounds is characterised by typical grass-covered low-relief rolling hills. The typical on-site elevation is between 90 - 130 m above mean sea level (mamsl). With natural slope surfaces rarely exceeding 12° (Stapelberg, 2009). In this region, there is a low drainage density (Stapelberg, 2009). Drainage channels and small tributaries usually occupy the lower-lying areas between the low-relief hills.

The area that is presently occupied by the airfield is characterised by generally flat terrain, with little undulation. The northern extent of the proposed development area (i.e. region earmarked for future development of extended runway) is characterised by undulous terrain with rolling hills.

2.3 Climate

The Fisantekraal area experiences a Mediterranean Climate with mild wet winters and warm dry summers. **Figure 1** shows the monthly average air temperature and **Figure 2** shows the monthly median rainfall and evaporation distribution for the Fisantekraal area (Schulze, 2009). The long term (1950 – 2000) mean annual precipitation for the Fisantekraal area is 532 mm/a. The rainfall typically exceeds evaporation rates in the winter months between May and August.

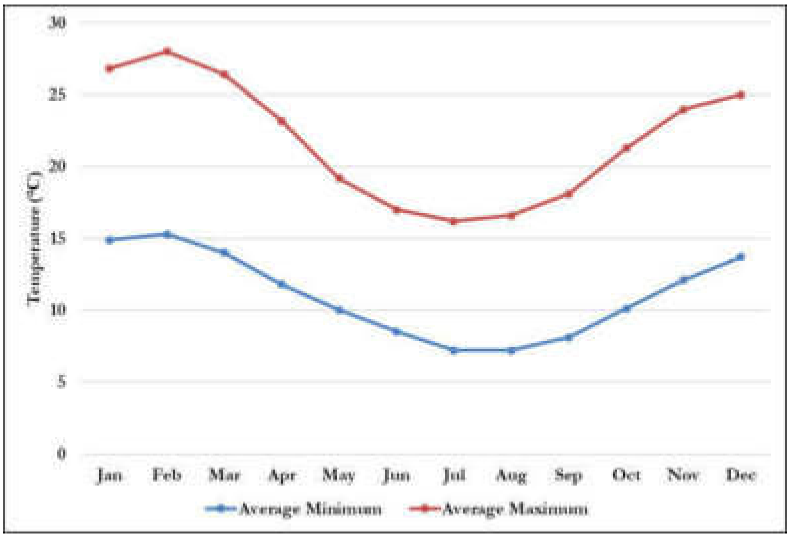


Figure 1: Monthly average air temperature for the Fisantekraal area (Schulze, 2009).

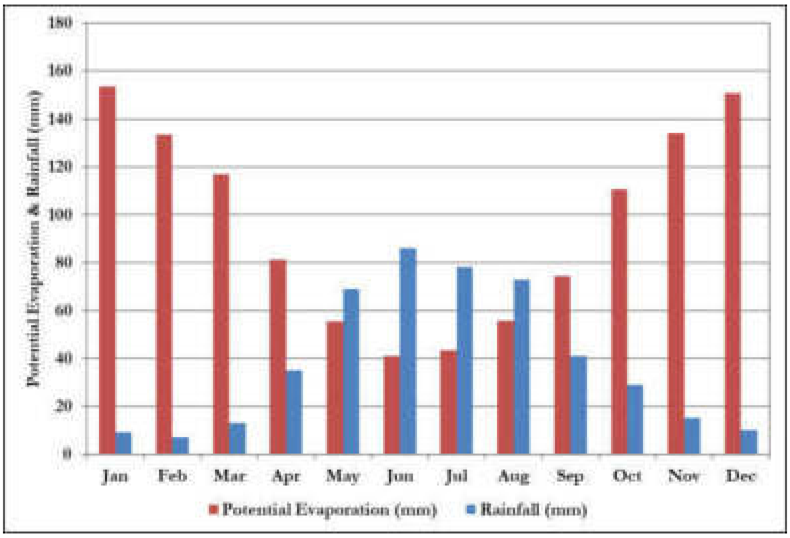


Figure 2: Monthly average air temperature for the Fisantekraal area (Schulze, 2009).

2.4 Behaviour of Existing Structures

The structures on site were briefly examined for any typical tell-tale signs of geotechnical risks/problem soils, e.g. settlement/differential heave. The structures on the site are located predominantly in the south-eastern extent of the property, none of these showed clear evidence of typical foundation-related cracks. It is important to note that none of these structures appear to be heavily loaded. In the north-western extent of the site; however, the structures located on the Remainder of Erf 724 did show signs of foundation related cracks (**Appendix C**).

2.5 Weinert 'N' Value

The present and past climate is a useful indicator of the typical soil conditions that may be encountered on a particular site (Weinert, 1975). Weinert (1975) developed a general model to categorise the climate of southern Africa based on what he termed the 'N'-value **Figure 3**.

The Weinert 'N'-value for the project area is shown to be less than 5 (Brink, 1983; Stapelberg, 2009). Weinert (1975) showed that where 'N'-values are less than 5, chemical decomposition is the dominant mode of rock weathering and relatively thin transported soil cover can be expected with deep residual profiles. Where pedocretes are developed they are generally ferricrete (Brink, 1983).

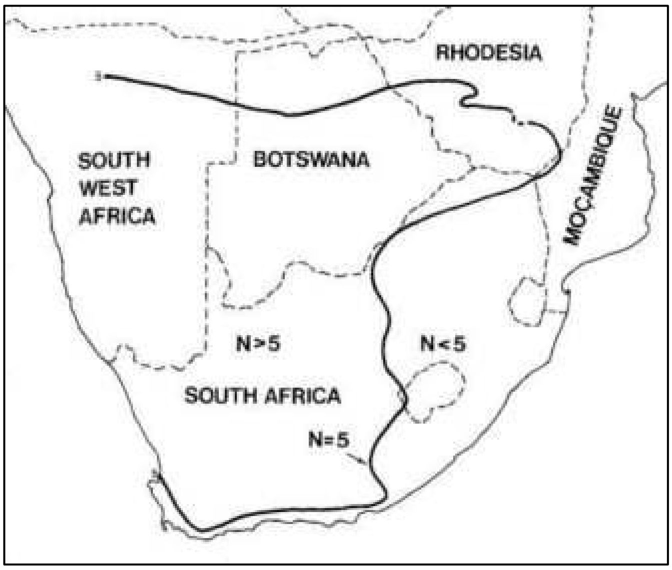


Figure 3: Climatic 'N' value = 5 plotted for southern Africa (after Weinert, 1967).

2.6 Geology & Engineering Geology

The Council for Geoscience (CGS) has mapped the area at a scale of 1: 250 000 (3318, Cape Town). The geological setting is shown in **Map 3** and the main geology of the area is listed in **Table 1**. The geology underneath the proposed Cape Winelands Airport is shale of the Tygerberg Formation (Nt), which is part of the Malmesbury Group and it is the basement rock of the area. Regionally the Malmesbury Group is overlain by different (younger) quaternary formations (Qgg, Qg, Qf and Qs).

The bedrock in the region is shown to be predominantly Malmesbury Group (Nt) rocks; these are often associated with overlying ferricrete gravels/nodules. The Malmesbury Group rocks typically dip steeply to the northwest (Stapelberg, 2006). Rapid transitions occur within this unit between easy-weathering siltstone/phyllite to more competent greywacke/sandstone. This can lead to large differences in depth of weathering/depth and development of the soil profile over relatively short distances (Stapelberg, 2006).

Although intrusions of the Cape Granite Suite are not indicated (**Map 3**), indications of minor intrusive, or fault-bounded bodies of granite occur in this region (Stapelberg, 2006). These are considered extensions/satellite intrusions of the Kuilsriver–Helderberg pluton.

Table 1: Geological formations within the study area.

Code	Formation/Pluton	Group/Suite	Description
〰	Alluvium	Quaternary Group	Unconsolidated sand
Qgg	-		Gravelly clay/loam soil
Qg	-		Loam and sandy loam
Qf	-		Limestone and calcrete
Qs	Springfontyn Formation		Light-grey to pale red sandy soil
Cpo	Populierbos Formation	Klipheuwel Group	Shale, mudstone and sandy shale, mainly reddish
Cm	Magrug Formation		Conglomerate, grit and sandstone, often reddish brown
Nf	Franschhoek Formation	Malmesbury Group	Grey, feldspathic conglomerate, grit and sandstone, with minor shale
Nt	Tygerberg Formation		Nt - Greywacke, phyllite and quartzitic sandstone, interbedded lava and tuff
Nm	Moorreesburg Formation		Greywacke and phyllite with beds and lenses of quartz schist, limestone and grit; quartz-sericite schist with occasional limestone lenses

Note: N/A – Not Applicable.

2.7 ***Geotechnical Conditions***

The geotechnical conditions of the region were mapped at 1:50 000 scale by the CGS in 2006 (3318DC Bellville - Geotechnical Series), see **Map 4**. The geotechnical series provide an indication of the likely soil conditions and construction constraints at a particular location, for example, the soil beneath the site has been classified (according to the CGS) as 'M8', indicating that "*some precautionary measures needed to overcome engineering-geological problems*". Potential problems/conditions that may be experienced with subsoils of this classification are shown in **Table 2**. Note that the map codes in the legend correspond to the map codes shown in **Table 2.**

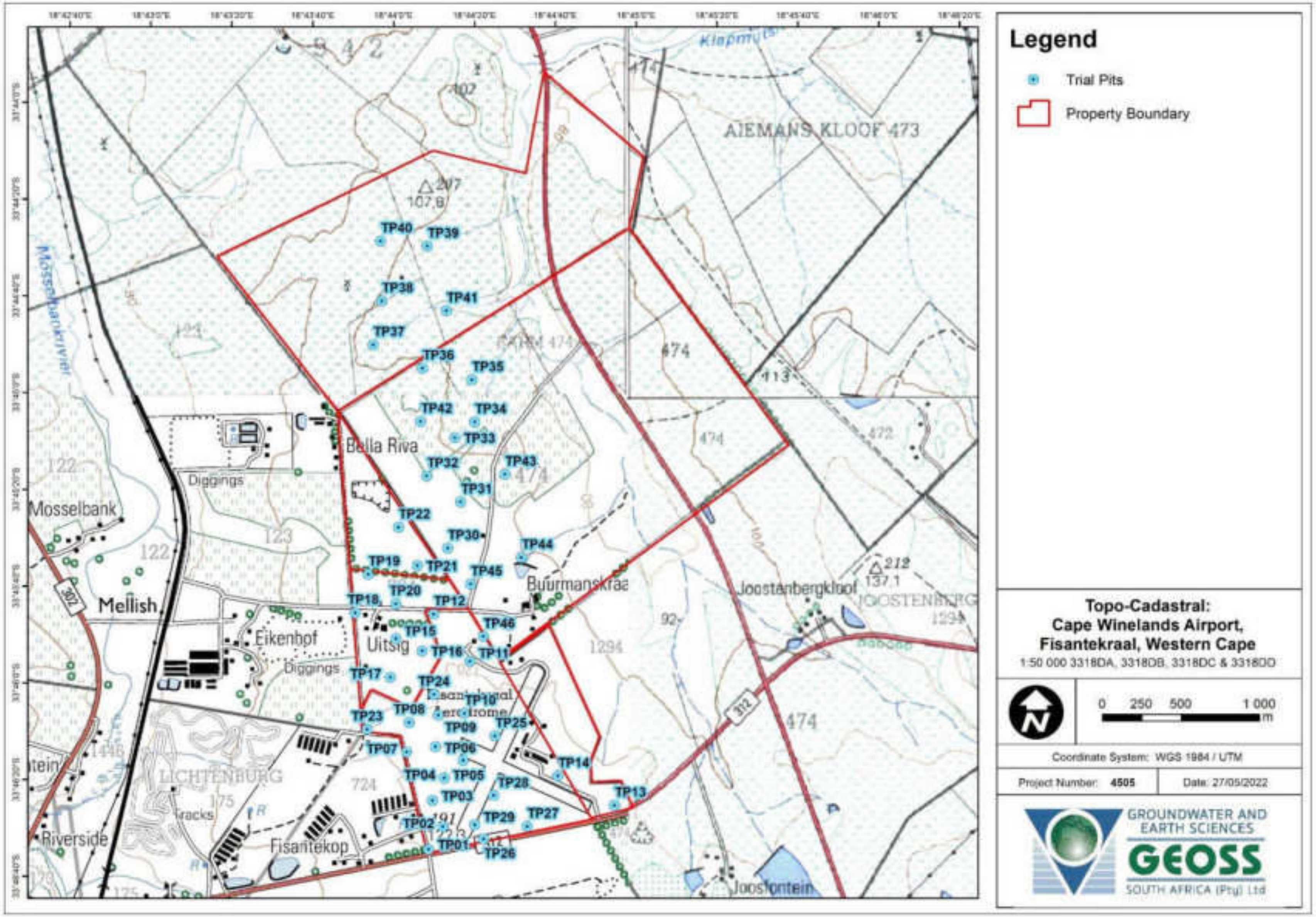
Table 2: Potential geological constraints in the region of the site (after CGS, 2009).

Geotechnical Condition/ Property	Description	Severity Class / Resulting Cost Implication
Permeability (Map Code: Per)	Permeability measures the flow of water through saturated soil. This is determined by the grain size and shape and the degree of compaction of the soil.	Low permeability (< 3 x 10 cm/s)
Shallow water table (Map Code: Sha)	Water table occurring at shallow depth - often seasonal.	Moderate
Loose sand (consolidation) (Map Code: Con)	Material susceptible to excessive consolidation when used as foundation horizon. Non-cohesive sands.	Low
Active clay (Map Code: Act2-Act3)	The degree of expansion experienced when dry clayey soils are moistened to full saturation. In addition to the activity, the clay horizon depth and thickness contribute towards determining the amount of surface movement (expansion/contraction).	The residual soils of the Tygerberg Formation may exhibit low to medium expansiveness. Medium cost implications may be incurred due to this type of material

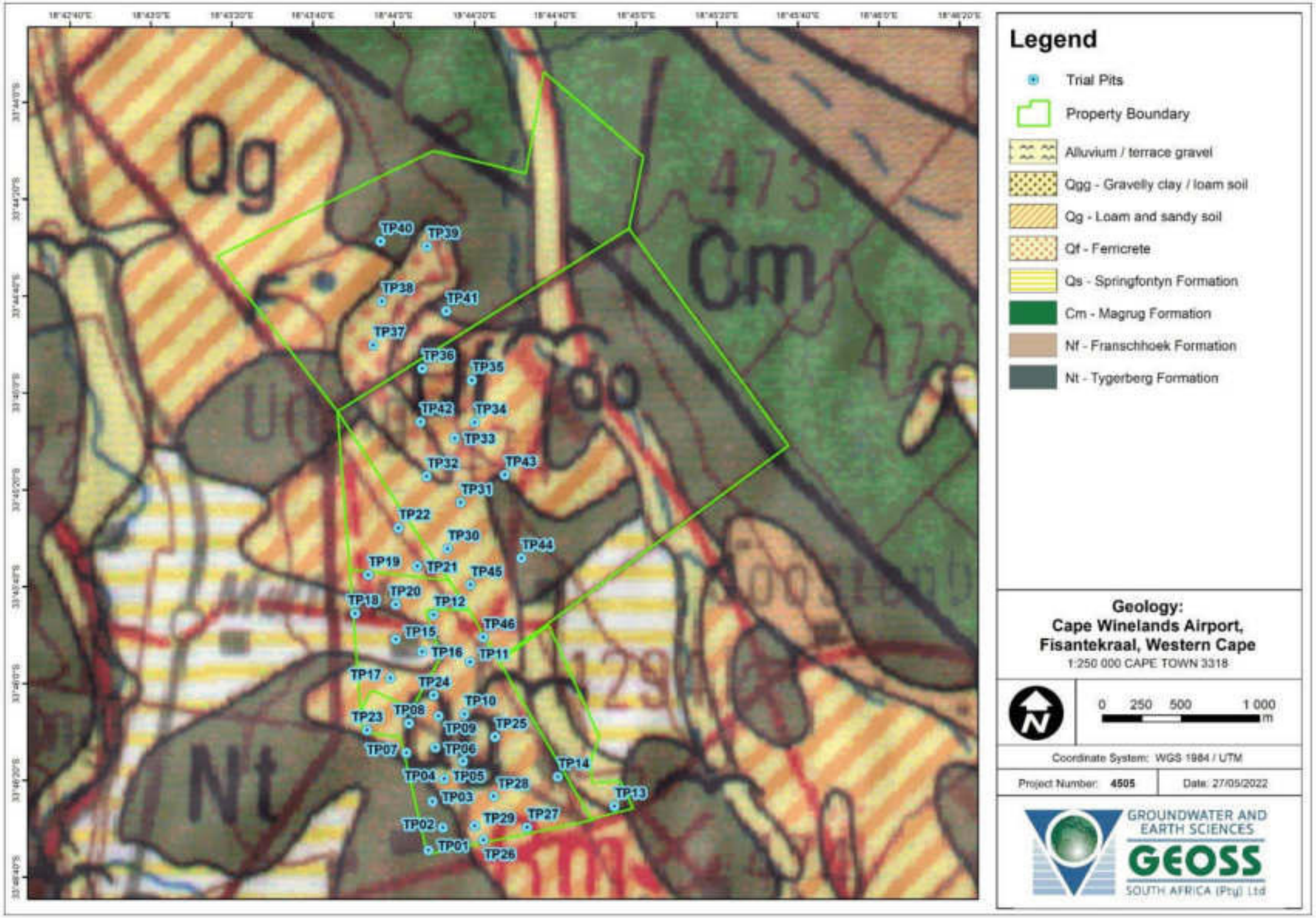
Selected results from Stapelberg (2009) have been presented in **Table 14** that were collected in the region (**Appendix G**). Relative to the existing CWA infrastructure Sample 5/3 is located to the north on Erf RE/474; Sample 5/8 within the development area on Erf 10/724, and; Sample 5/10 to the south on Erf 4. Of interest is the variation indicated between the lithologies, i.e., soils of granitic/intrusive (Cape Granite Suite) and pelitic/sedimentary (Malmesbury Group) origin. Similar conditions were encountered during the undertaking of the field investigation. The representative trial pit logs devised by F. Stapelberg were also consulted during compilation of this report.

2.8 Hydrogeology

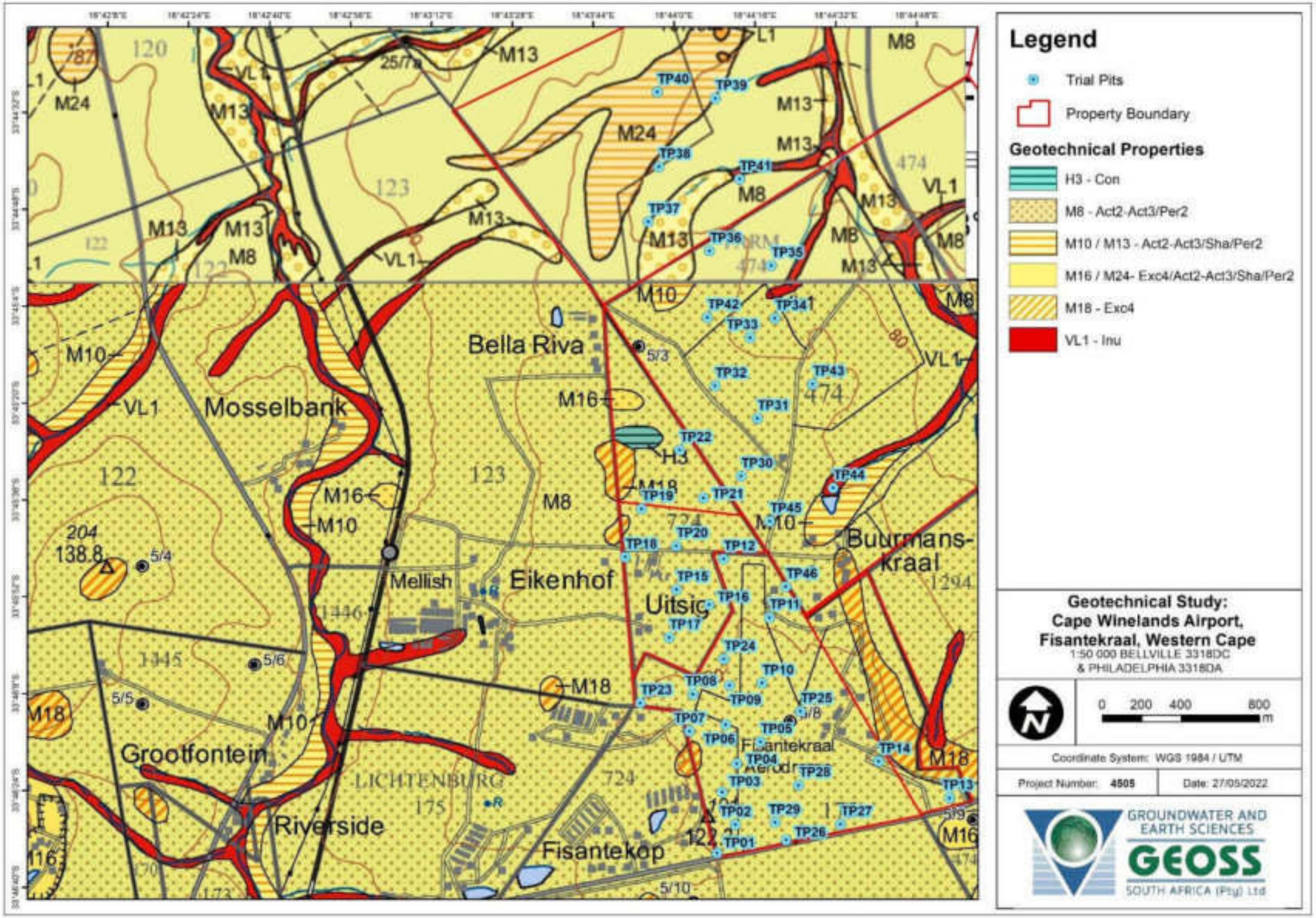
The regional aquifer directly underlying the site is classified by the Department of Water Affairs and Forestry (DWAF, 2002) as a fractured aquifer with an average yield potential that range from 0.5 – 0.5 L/s. A fractured aquifer describes an aquifer where groundwater only occurs in narrow fractures within the bedrock. The groundwater quality for study area ranges from “ideal” to “poor” with an associated electrical conductivity (EC) of between 70 – 1000 mS/m generally improving in quality (i.e. reducing EC) toward the south (DWAF, 2002). This information was derived from regional datasets. For more information on the groundwater status of the site, consult GEOSS (2022).



Map 2: Topocadastral map showing the locations of trial pits in relation to the proposed Cape Winelands Airport and surrounds.



Map 3: Geological setting of the area (3318DC – Bellville, GCS 1984).



Map 4: Geotechnical conditions of the site and surrounds showing the positions of the trial pits (3318DC – Bellville, GCS 2008).

3. INVESTIGATION METHODOLOGY

The geotechnical assessment has been undertaken primarily to characterise the engineering properties of soils underlying the site, confirm the local geology and the hydrogeological conditions. This investigation was also aimed to identify any potential geotechnical risks or 'problem soils' that may be present beneath the site.

The procedure adopted for this study involved a desktop study followed by site work. The initial desktop study involved gathering and reviewing all relevant data to the project. During this time, the GEOSS internal database was consulted, and geotechnical and hydrogeological investigation reports for work previously undertaken in the area were reviewed.

A site visit was then conducted to verify as much of this data as possible, collect additional data and make on-site observations (e.g. describe and document soil profiles), and collect representative soil samples from the trial pits to be submitted for laboratory analysis.

The following tasks were conducted on site, these are discussed and included in this report:

- A total of forty six (46) trial pits were excavated using a JCB 3DX Super Tractor Loader Backhoe. An image of the TLB is supplied in **Appendix C**.
    - Twenty nine (29) trial pits (TP01 to TP29) were excavated over a three (3) day period, from the 25 to the 27 January, during the summer of 2022.
    - Seventeen (17) trial pits (TP30 to TP46) were excavated over a two (2) day period, on 13 and 14 April, during the Autumn of 2022.
- The soil profiles exposed were described in terms of standard terminology as recommended by Jennings et al. (1973) and SAIEG (2001). A representative photograph of each trial pit has been supplied (**Appendix A**) and the trial logs have been captured using a commercially available hatching software dotPLOT (**Appendix B**). The spatial locations of the 29 trial pits is shown in relation to the topocadastral series map (**Map 2**).
- Dynamic Cone Penetrometer (DCP) tests were conducted adjacent to several trial pits to confirm and analyse representative soil consistencies / relative density across the site.
- Bulk samples of the dominant soil types were extracted from to best represent the soil profile(s) on-site. The following laboratory tests were undertaken on the collected bulk samples, and the results are presented in **Section 4**:
    - Foundation Indicators (Grading analysis, Hydrometer Analysis, Atterberg Limits);
    - Moisture/Density relationship (Mod. AASHTO)
    - California Bearing Ratio (CBR);
    - Basson Index test (on groundwater sample collected from TP25).
- A single undisturbed sample was collected, and the are presented in **Section 4**:

All of the collected data was analysed and interpreted to assess the potential geotechnical risks associated with the intended development, general recommendations have been made, and guidance on preliminary foundation solutions have been presented.

4. RESULTS

4.1 Field Investigation

The geotechnical reconnaissance investigation involved a site walk over, the excavation of a total of forty-six (46) trial pits and the performance of thirty five (35) drop-weight cone penetrometer (DCP) tests across the site. Excavation and documenting of trial pits TP01 to TP29 took place between 25 and 27 January 2022; and trial pits TP30 to TP46 between 13 and 14 April 2022. The reconnaissance investigation sought to identify and confirm hydrological, hydrogeological and geotechnical features of interest. Relevant surface features were also documented, trial pits excavation was supervised and notes were made on the relative ease of excavation, exposed soil profiles were documented, and representative bulk soil samples were extracted from the exposed soil profiles (**Table 7**). Following excavation of the trial pits each exposed soil profile was logged and photographed (**Appendix A & Appendix B**).

The locations of the trial pits and DCP tests are listed in **Table 7**; spatial locations of the trial pits are shown in on the aerial imagery in **Map 5**. The DCP tests were labelled according to the trial pits next to which they were conducted. The DCP tests were conducted in selected horizons within the trial pits to confirm the soil consistencies recorded during profiling. The DCP results are elaborated upon in **Section 4.3.**

Once the trial pits were logged, DCP tests were conducted and representative soil samples were collected, the general soil conditions across the site were evaluated.

4.2 General Soil Profile & Geotechnical Zones

Following the completion of trial pits, DCP testing and the site walkover, the site was divided into several zones which exhibit similar soil profile characteristics based on the descriptions of the material encountered in the trial pits. Five Geotechnical Zones were delineated, based on laboratory tests and observations made in the trial pits, the Zones have been named and are defined by the following:

- Zone A: Weathered relics fault-bounded blocks/satellite intrusions of the Kuilsriver-Helderberg granitoid of the Cape Granite Suite which is of igneous origin (**Table 3**).
- Zone B: Weathered Tygerberg Formation of the Malmesbury Group rocks of pelitic/sedimentary origin (**Table 4**).
- Zone C: Areas exhibiting characteristics of potentially expansive material, or material prone to settlement, derived from sediments of either the Kuilsriver-Helderberg intrusion or the Weathered sediments of the Tygerberg Formation (or a combination of both) (**Table 5**).
- Zone D: Areas of relatively deep transported aeolian sand (**Table 6**).
- Zone E: Areas with visible ferricrete and/or silcrete present on surface/in outcrop (**Figure 58**).

Note that the descriptions contained in the tables set out below are based on disturbed samples excavated from the trial pits. The Geotechnical Zones are shown spatially in **Map 6.**

Table 3: Generalised soil profile for Geotechnical Zone A.

Depth (mbgl)	**Generalised Soil Profile**
0.0 – 0.1/0.9	Pale grey to grey-brown to black (humified) intact to slightly voided very <u>loose to medium</u> dense SAND to gravelly SAND. Transported/hillwash. Note: (i) Roots generally present in upper 200 to 500 mm of horizon. (ii) Often includes ferricrete nodules and/or gravels. (i) Poorly developed in areas.
0.0/0.1 – 0.3/1.4	Red-, yellow- and/or orange-brown medium dense to very dense intact partially cemented NODULAR to HARDPAN FERRICRETE in a sandy matrix. Pedogenic. Note: (i) Many times induced refusal. (ii) Nodular and Hardpan horizons often exhibiting honeycomb texture.
0.3/1.4 – 0.6/1.4	Yellow-/orange-/grey-brown <u>very loose to medium dense</u> intact to pinholed sandy fine GRAVEL. Transported. Note: (i) Often partially cemented. (ii) Poorly developed or not present in places. (iii) Typically encountered beneath the ferricrete horizon, except for in TP24.
0.6/1.4 – 0.8/2.2+	Grey to white blotched/streaked/speckled/strained red-yellow-orange <u>firm to very stiff</u> intact to fissured/shattered gravelly sandy SILT/sandy SILT/sandy clayey SILT/silty CLAY to <u>medium dense to very dense</u> silty SAND or gravelly silty SAND. Residual. Note: (i) Often contains ferricrete nodules which increases the gravel content. (ii) Believed to be derived from weathered granitic Kuilsriver-Helderberg Pluton rocks. (iii) Perched water table at between 0.85 and 1.4 mbgl.

Table 4: Generalised soil profile for Geotechnical Zone B.

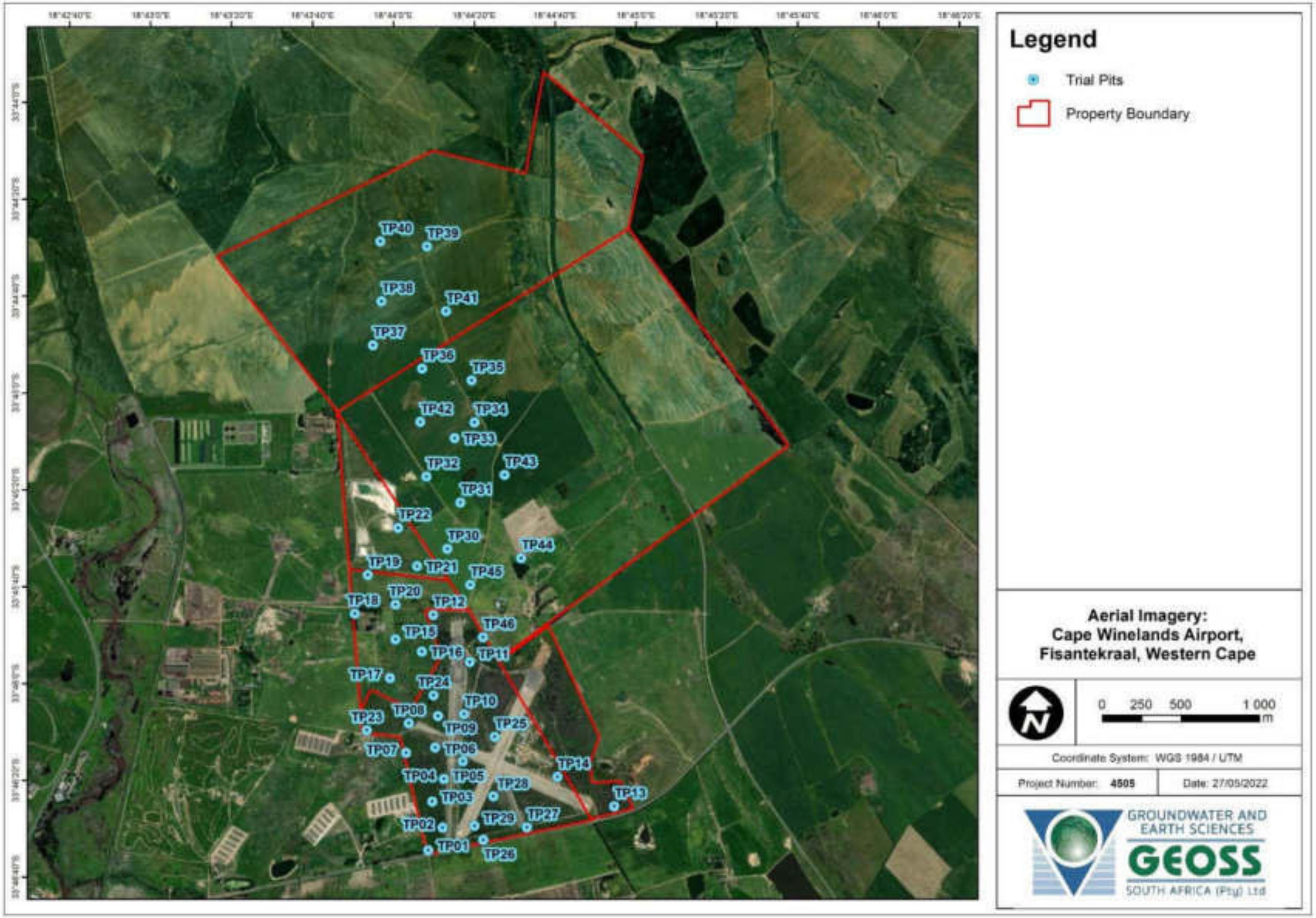
Depth (mbgl)	**Generalised Soil Profile**
0.0 – 0.15/0.6	Light brown to black (humified) very loose to medium dense intact to slightly voided SAND with variable amounts and sizes of ferricrete nodules and/or gravels. Transported/hillwash.
0.15/0.6 – 0.25/0.9	Red-, yellow- and/or orange-brown medium dense to very dense intact partially cemented NODULAR to HARDPAN FERRICRETE in a sandy matrix. Pedogenic. Note: (i) Many times induced refusal. (ii) Nodular and Hardpan horizons often exhibiting honeycomb texture. (iii) This could be considered an extension of the uppermost horizon as the ferricrete nodule concentration typically increases with depth.
0.25/0.9 – 1.6+	Grey-orange very dense intact gravelly clayey to silty SAND. Residual. Note: (i) Usually encountered in the southern areas. (ii) Believed to underly hardpan ferricrete. OR Grey blotched/streaked/speckled brown-orange-red and yellow firm to very stiff slightly shattered/fissured silty CLAY. Residual. Note: Believed to be derived from pelitic Malmsbury Group rocks.

Table 5: Generalised soil profile for Geotechnical Zone C.

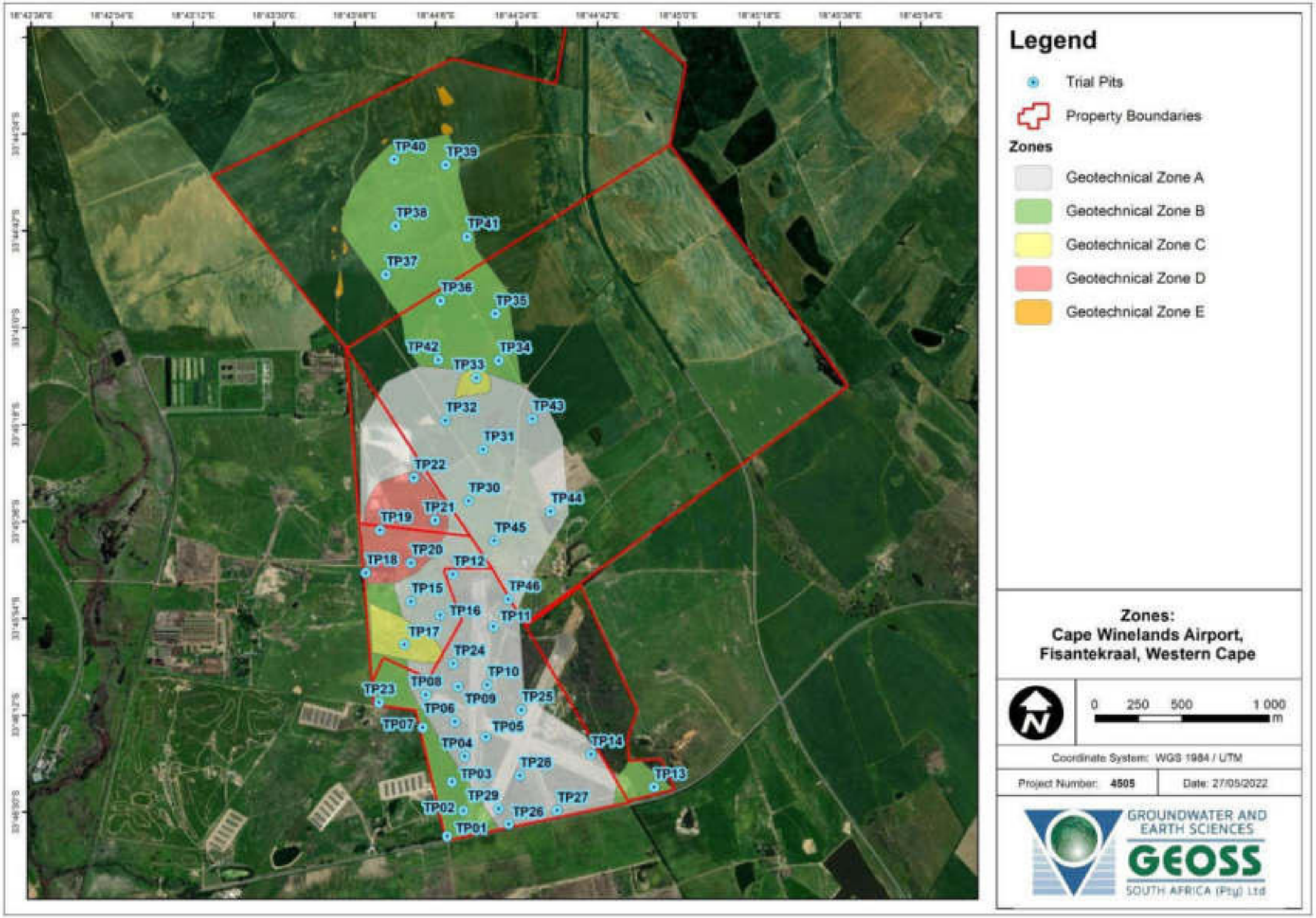
Depth (mbgl)	**Generalised Soil Profile**
0.0 – 0.1/0.9	Light brown to black (humified) very loose to medium dense intact to slightly voided SAND with variable amounts and sizes of ferricrete nodules and/or gravels. Transported/hillwash. OR Pale grey to grey-brown to black (humified) intact to slightly voided very loose to medium dense SAND to gravelly SAND. Transported/hillwash. Note: (i) Roots generally present in upper 200 to 500 mm of horizon. (ii) Often includes ferricrete nodules and/or gravels. (i) Poorly developed in areas.
0.1/0.9 – 0.3/1.4	Red-, yellow- and/or orange-brown medium dense to very dense intact partially cemented NODULAR to HARDPAN FERRICRETE in a sandy matrix. Pedogenic. Note: (i) Many times induced refusal. (ii) Nodular and Hardpan horizons often exhibiting interlocked honeycomb texture. (iii) This could be considered an extension of the nodular horizon as the ferricrete nodule concentration typically increases with depth.
0.3/1.4 – 0.6/1.4	Yellow-/orange-/grey-brown very loose to medium dense intact to pinholed sandy fine GRAVEL. Transported. Note: (i) Most often overlies sediments of weathered residual Malmesbury Group.
0.6/1.4 – 0.8/2.2+	Grey blotched/streaked/speckled brown-orange-red and yellow shattered/fissured firm to very stiff silty CLAY. Residual. Note: (i) Typically derived from Malmesbury Group. OR Grey to white blotched/streaked/speckled/strained red-yellow-orange firm to very stiff intact to shattered/fissured sandy SILT/sandy clayey SILT/silty CLAY Note: (i) Typically derived from Kuilsriver-Helderberg Pluton.

Table 6: Generalised soil profile for Geotechnical Zone D.

Depth (mbgl)	**Generalised Soil Profile**
0.0 - >0.5	Yellow-brown loose to medium dense slightly voided to intact medium SAND. Transported. Note: (i) Area of substantial transported cover. (ii) Underlain by either Malmesbury Group or Cape Granite residual soils and/or bedrock. (iii) Fine grass roots in upper 0.5 m.



Map 5: Aerial imagery showing trial pit positions in relation to the property boundaries.



Map 6: Aerial imagery showing interpreted Geotechnical Zone boundaries.

4.3 DCP Test Results

Drop-weight cone penetrometer (DCP) tests were undertaken at selected locations across the site (**Table 7**). A summary of the DCP test data collected on site is shown in **Figure 4.** The DCP tests undertaken within the uppermost (<1 mbgl) transported/hillwash material revealed a high degree of variability. The consistency of the mostly cohesionless SAND with ferricrete and/or gravel showed variation between very loose and very dense (or very soft and very stiff; **Figure 4**). The variation is believed to be due to the considerable variation in depth at which the NODULAR to HARPAN FERRICRETE pedogenic was intersected (ranging from surface to about 1.1 mbgl. The NODULAR to HARPAN FERRICRETE pedogenic horizon exhibited variation in consistency between loose and very/extremely dense (or soft to very stiff; **Figure 4**). Generally, the greater the degree of cementation was greater the consistency was greater. The material underlying the ferricrete ranged from mostly granular to mostly cohesive materials with consistencies ranging between medium dense and dense or firm and very stiff (**Figure 4**).

To gain an appreciation of the general consistencies of the materials beneath the site, the third quartile (Q3) of the DCP data was plotted with depth increments of 0.3 mbgl (**Figure 4**). These data show that for the same units described above (that 75% of all data points/on average) range in consistency as indicated below (the bounds of consistencies shown in brackets are displayed on figure):

- Transported materials (assumed to be ~0.3 mbgl): loose (or firm).
- Mostly ferricrete horizons (assumed to be between 0.3 and 1.0 mbgl): medium dense (or very stiff).
- Mostly residual materials (assumed >1.5 mbgl): stiff to very stiff; increasing with depth (medium dense to very dense with depth).

The high degree of variability (and outliers) displayed by most (if not all) horizons is likely due to notes mentioned above as well as the disturbed nature of some of the soils when undertaking the DCP tests. Disturbance is due to excavation of the respective horizons, e.g. to expose the underlying material beneath the nodular to hardpan ferricrete horizon the TLB excavated the ferricrete out exposing and disturbing the uppermost surface of the underlying material.

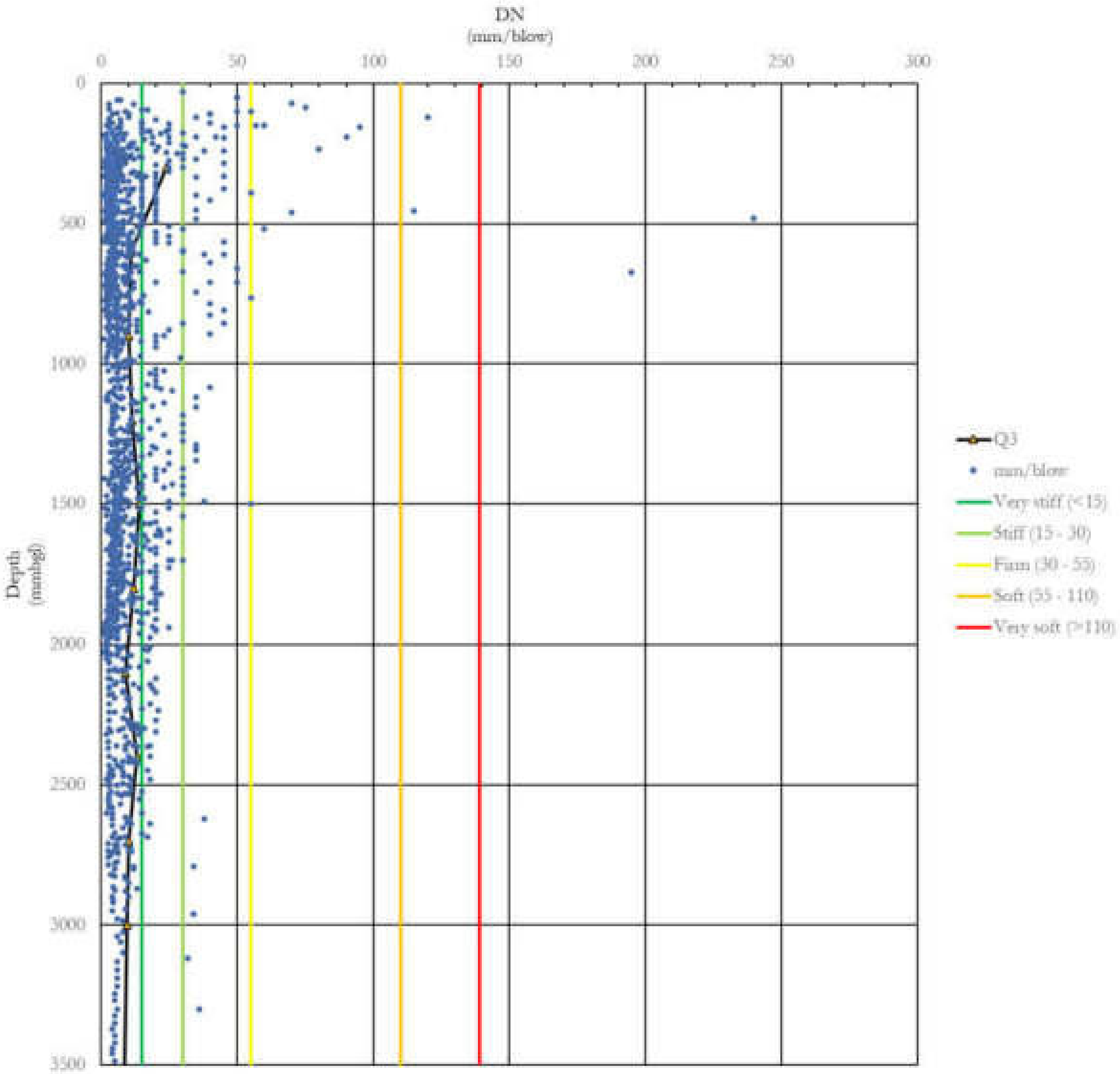


Figure 4: DCP Test results plotted with the third quartile (Q3) of all tests undertaken; cohesive material interpretation boundaries shown.

4.4 Laboratory Test Results

A total of sixteen (16) bulk disturbed soil samples were collected from selected trial pits and submitted to a commercial laboratory for analysis. The laboratory classification tests served to determine the general mechanical/engineering properties of the soils encountered on-site. The samples were analysed for the following:

- Foundation Indicators (particle size/grading, hydrometer, and Atterberg Limits tests) (**Table 8**) and/or;
- Moisture density relationships, Specific Gravity (SG) and California Bearing Ratios (**Table 9**).
- Double oedometer analysis (**Appendix E**).

The single double oedometer test sought to determine the compressibility and heave properties of the residual material, as a typical example for the area. It should be noted; however, that conditions may vary locally.

Further, groundwater was intersected in two trial pits TP15 and TP25 in January 2022, and in a single trial pit TP33 in April 2022. A single groundwater sample was collected from TP25 and was submitted to a commercial laboratory for chemical analysis (**Appendix E**). A summary of the results is contained in **Table 10**. The pH of the groundwater sample is 6.7, which classes the water as moderately aggressive (Basson 1989). The Final Aggressiveness Index of 1777 classes the water as Very highly aggressive (Basson, 1989). Therefore, counter measures will be required, i.e. the concrete of the foundation bases in contact with groundwater will require protection, and any steel reinforcement within such bases should be covered by at least 30 mm of concrete. The advice of a specialist concrete and/or steel technologist/manufacturer should be sought in regard to final designs of cement coating and concrete protection of steel reinforcement. General guides for the assessment of the Final Aggressiveness Index have been presented in **Appendix E & G**.

Table 7: Summary of trial pit data.

ID	Latitude (DD, WGS84)	Longitude (DD, WGS84)	Elevation (mamsl)	TP EOH (mbgl)	Samples	DCP No.:
TP01	-33.7763	18.7356	125	0.7	-	-
TP02	-33.7750	18.7366	127	0.7	-	-
TP03	-33.7735	18.7359	126	0.6	-	-
TP04	-33.7722	18.7367	126	1.8	18589	4
TP05	-33.7712	18.7380	126	0.8	-	-
TP06	-33.7704	18.7361	126	2.0	-	6
TP07	-33.7707	18.7341	123	2.0	-	7
TP08	-33.7690	18.7343	124	1.9	-	
TP09	-33.7686	18.7363	125	0.8	-	-
TP10	-33.7685	18.7381	124	0.8	-	10
TP11	-33.7655	18.7385	123	2.1	-	11
TP12	-33.7628	18.7360	120	2.0	18590; 18591	12
TP13	-33.7738	18.7484	126	1.6	-	-
TP14	-33.7721	18.7445	128	2.0	18592; 18593	14
TP15	-33.7642	18.7334	117	1.7	18594	15
TP16	-33.7649	18.7352	119	1.6	-	-
TP17	-33.7664	18.7330	119	1.9	18595	17
TP18	-33.7627	18.7306	122	1.2	18596; 18597	18
TP19	-33.7605	18.7315	117	0.8	-	-
TP20	-33.7622	18.7334	120	0.8	-	-
TP21	-33.7600	18.7349	119	2.2	-	21
TP22	-33.7578	18.7336	119	1.8	18598	22
TP23	-33.7694	18.7314	121	1.9	-	23
TP24	-33.7674	18.7360	123	2.0	-	24
TP25	-33.7698	18.7402	125	1.4	18599; 18600	25
TP26	-33.7757	18.7394	128	1.7	18601	26
TP27	-33.7750	18.7424	127	1.9	-	27
TP28	-33.7732	18.7401	126	1.75	-	28
TP29	-33.7749	18.7388	126	0.8	-	-
TP30	-33.7590	18.7370	115	1.5	-	30
TP31	-33.7564	18.7379	113	3.0	-	31
TP32	-33.7549	18.7356	112	2.4	-	32
TP33	-33.7527	18.7375	103	2.5	-	33
TP34	-33.7518	18.7389	97	3.0	20003	34
TP35	-33.7493	18.7387	94	1.6	-	35
TP36	-33.7487	18.7353	105	1.5	-	36
TP37	-33.7473	18.7319	99	1.5	-	37
TP38	-33.7448	18.7325	100	1.4	-	38
TP39	-33.7417	18.7356	97	1.6	-	39
TP40	-33.7414	18.7324	107	2.1	20001	40
TP41	-33.7454	18.7369	89	1.7	-	41
TP42	-33.7517	18.7351	111	1.5	20002	42
TP43	-33.7548	18.7409	106	2.0	-	43
TP44	-33.7596	18.7420	104	1.6	-	44
TP45	-33.7611	18.7386	116	2.0	-	45
TP46	-33.7641	18.7394	120	1.6	-	46

Note: EOH – End of Hole.

Table 8: Summary of grading analysis.

Sample No. (TP##)	Depth (m)	Soil Type	Grading Analysis				LS %	LL %	PI %	Pot. Exp.	GM	USCS
			Clay %	Silt %	Sand %	Gravel %						
18589 (TP4)	1.7	Red-white sandy clayey SILT	17	19	47	17	8.1	33	15	Low	1.10	SC
18590 (TP12)	0.0 – 0.6	Brown gravelly SAND	2	7	82	9	0.0	NP	NP	Low	1.42	SP
18591 (TP12)	0.75 – 1.2	Yellow-brown/orange gravelly SAND	2	5	66	27	0.0	NP	NP	Low	1.82	SP
18592 (TP14)	0.0 – 0.45	Orange-brown sandy GRAVEL	1	3	34	62	0.0	NP	NP	Low	2.35	SP
18593 (TP14)	1.5 – 2.0	Red-grey gravelly silty SAND	12	11	58	19	7.9	32.2	15.7	Low	1.44	SC
18594 (TP15)	0.9 – 1.7	Orange-grey gravelly silty SAND	16	11	61	12	6.0	27	9.8	Low	1.17	SC
18595 (TP17)	0.0 – 1.9	Brown SAND	3	3	93	1	0.0	NP	NP	Low	1.13	SW
18596 (TP18)	0.2 – 0.6	Brown sandy GRAVEL	6	1	32	61	0.0	NP	NP	Low	2.29	GP
18597 (TP18)	0.6 – 1.0	Red-brown silty CLAY	55	30	11	4	18.9	79.9	41.8	V.High	0.25	MH or OH
18598 (TP22)	0.5 – 2.0	White-grey silty CLAY	24	74	1	1	6.2	48	16.8	Med.	0.04	ML or OL
18599 (TP25)	0.0 – 0.7	Reddish-brown gravelly SAND	3	5	47	45	0.0	NP	NP	Low	2.02	SP - SC
18600 (TP25)	0.9 – 1.4	Orange-grey sandy SILT	15	18	60	7	4.5	24	8.6	Low	1.06	SC
18601 (TP26)	1.0 – 1.7	Orange-grey gravelly silty SAND	12	10	66	12	7.3	36.9	13	Low	1.38	SC
20003 (TP34)	1.2	Brown sandy CLAY	44	7	49	-	9.2	43.5	19.2	Low		
20001 (TP40)	0.5 – 1.1	Orange clayey SILT	19	62	18	1	7.8	28.8	14.6	Med.		
20002 (TP42)	0.8	Grey-orange clayey SILT	24	69	5	2	7.6	34.6	15.6	Med.		

NOTES: LL - Liquid Limit LS - Linear Shrinkage USCS – Unified Soil Classification System
NP – Non-plastic GM – Grading Modulus Pot. Exp. – Potential Expansiveness
PI - Plasticity index

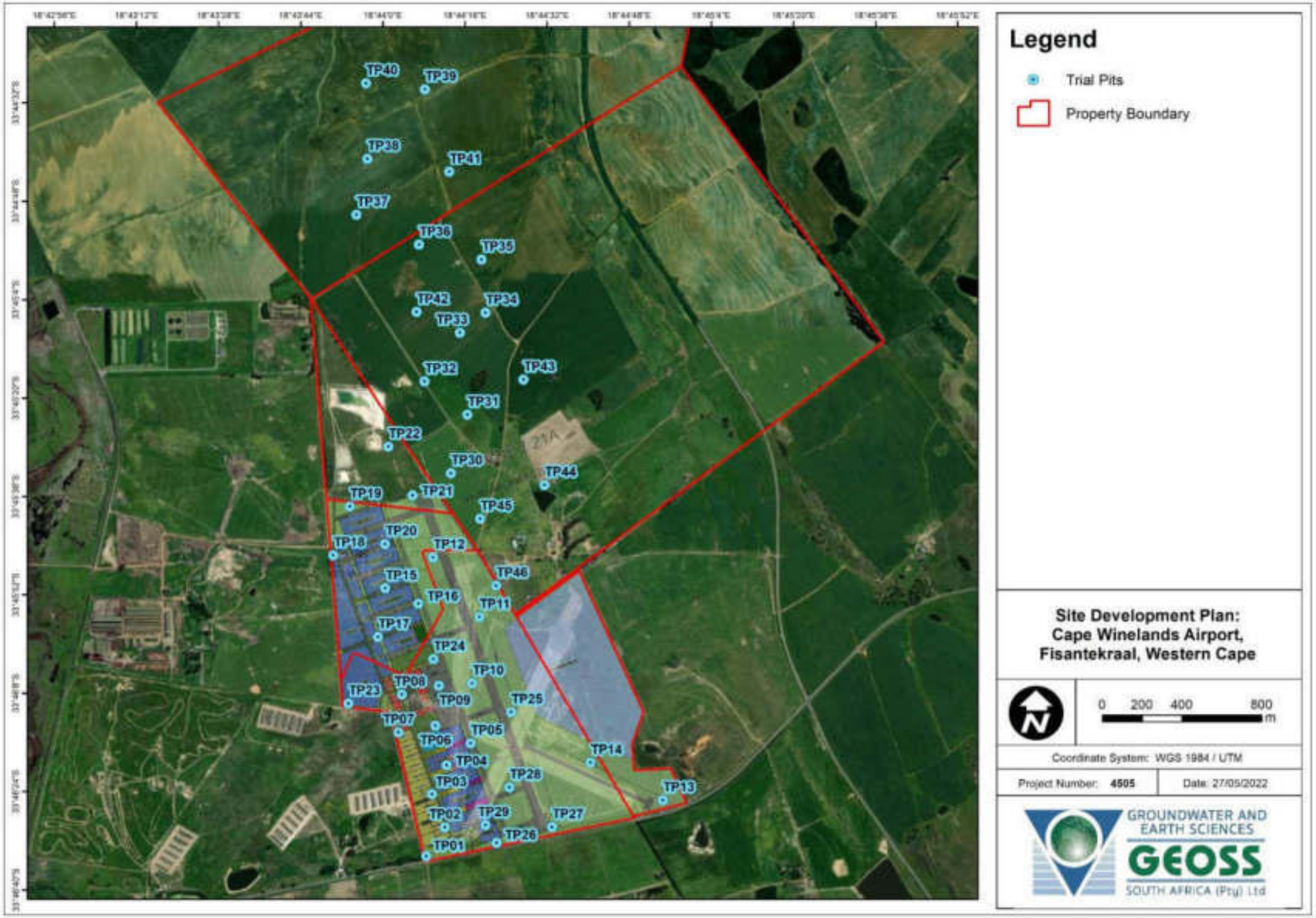
Table 9: Summary of CBR and moisture density analyses.

Sample No. (TP##)	Sample depth (mbgl)	CBR @ (##%)					Gs	MDD kg/m³	OMC %	NMC %
		100	98	95	93	90				
18589 (TP4)	1.7	4	3	2	1	1	2.660	2102	10.2	1.5
18590 (TP12)	0.0 – 0.6	17	14	10	8	5	2.604	1909	12.1	2.1
18591 (TP12)	0.75 – 1.2	16	13	9	7	5	2.577	2030	9.2	1.2
18592 (TP14)	0.0 – 0.45	75	50	40	30	21	2.604	2120	8.3	1.2
18593 (TP14)	1.5 – 2.0	19	14	8	5	3	2.632	2025	12.2	4.2
18594 (TP15)	0.9 – 1.7	17	11	5	3	2	2.660	2022	12.5	7.3
18595 (TP17)	0.0 – 1.9	14	10	7	6	4	2.577	1808	12.3	4.5
18596 (TP18)	0.2 – 0.6	50	39	26	20	13	2.632	2240	7.3	4.5
18597 (TP18)	0.6 – 1.0	1	1	1	1	1	2.747	1788	14.3	15.8
18598 (TP22)	0.5 – 2.0	1	1	1	1	1	2.747	1745	13.4	15.6
18599 (TP25)	0.0 – 0.7	27	20	13	10	6	2.577	2047	9.2	4.4
18600 (TP25)	0.9 – 1.4	14	12	9	7	5	2.632	2143	8.2	4.5
18601 (TP26)	1.0 – 1.7	15	11	8	6	4	2.632	2008	12.4	5.9
20003 (TP34)	1.2	-	-	-	-	-	2.747	-	-	13.5
20001 (TP40)	0.5 – 1.1	-	-	-	-	-	2.660	-	-	15.7
20002 (TP42)	0.8	-	-	-	-	-	2.688	-	-	11.4

NOTES: CBR - California bearing ratio Gs – Specific Gravity MDD - Maximum Dry Density
OMC - Optimum moisture content NP – Non-plastic NMC – Natural Moisture Content

Table 10: Summary of Basson Index analyses results.

Sample No. (Trial Pit No.)	4505_C_TP25 (TP25)
Depth (mbgl)	0.85
pH	6.7
EC (mS/m)	31.8
Chloride as Cl	31
Sulphate as SO_4	34
Langelier Index	-2.0
Leaching Index	1772
Ryznar Index	10.7
Corrosivity Ratio	2.5
Spalling Index	5
Final Aggressiveness Index	1777



Map 7: Aerial map showing locations of trial pits superimposed on the Site Development Plan.

5. GEOTECHNICAL INTERPRETATION & RECOMMENDATIONS

5.1 Site Geology and Soils Profile

Based on the following:

- Published geological data,
- Geological, geotechnical and geophysical investigations undertaken by GEOSS in the region, and;
- Geotechnical reconnaissance investigations carried out by the Council for Geoscience in the area,

the site is known to be situated an area that typically shows surficial sandy and/or loamy quaternary/transported sediments of variable thickness and quantities of quartzitic sand and ferricrete gravel (which may also be present at the surface). These more recent deposits overly a basement rocks that are of variable origins, i.e. either of igneous (granitic) or sedimentary (pelitic).

5.2 Groundwater and drainage

Groundwater was intersected in trial pits TP14 and TP25 in February 2022; and in TP33 in April 2022. General seepages were encountered at 1.5, 0.9, and 1.4 mbgl, respectively in TP14, TP25, and TP33. These seepages were observed to emanate from the lower transported sandy angular fine GRAVEL unit, which typically occurred beneath the pedogenic horizon. The perched water table rose to 1.0 and 0.85, respectively for TP14 and TP25 after approximately 1 hour of the trial pits remaining open.

Although groundwater/seepage was not encountered in the other trial pits excavated across the site, the development of a perched water table should not be discounted; particularly after periods of heavy rainfall, or following a winter season of above average annual rainfall. Due to occurrence of perched water table and low permeability of substratum across the site - storm water that cannot be directed to natural topographic run-offs will need to be directed to appropriately designed & engineered soakaways.

Open excavations in sand-dominated materials exceeding 1 m in depth should be shored to 30°, and excavations in cohesive soils can be battered to 45°.

Stormwater should be directed to municipal stormwater infrastructure, or an appropriately designed stormwater soakaway.

5.3 Slope stability and bracing

It is important to mention that beneath a depth as shallow as 0.85 mbgl groundwater seepage is encountered. This induces slumping/collapse of the granular mostly cohesionless material horizons. Excavations should be suitably battered for foundation placement, additional support in the form of sand bags (placed at toe of excavations) or other suitable temporary support measures may be required.

Hazardous conditions must be expected when the trenches are exposed to wet weather conditions. Collapse of the sidewalls normally occurs without any warning. Safe working conditions must therefore be ensured in all trenches deeper than 1.0 mbgl, or beneath the nodular to hardpan ferricrete horizons. This can be achieved by either shoring the sidewalls or battering them back at a safe angle, e.g. 30° for mostly cohesionless materials and 45° for materials which are largely cohesive.

5.4 Excavation Conditions

5.4.1 Transported materials

The granular surficial gravelly sands are classified as soft excavation in terms of SANS 1200D.

5.4.2 Pedogenic materials

The pedogenic material encountered in the trial pits is variably cemented across the site. In general, the pedogenic material classifies as soft to intermediate excavation (SANS 1200D). Indurated hardpan ferricrete horizons may require pneumatic/hydraulic rock-breaking apparatus (e.g. a Montabert) during excavation.

5.4.3 Residual materials

Residual horizons showed excavation of soft to intermediate with depth (SANS 1200D).

5.5 Preliminary Foundation Modelling

5.5.1 Pad foundations

Based on the observations made in the trial pits, the results of the dynamic cone penetrometer tests, and preliminary modelling, the maximum bearing capacities have been calculated based on Meyerhoff method (**Table 11**). The following parameters were used during the preliminary modelling:

- Friction angle (φ'): 33°
- Cohesion (c'): 0 kPa
- Bulk unit weight: 19.5 kN/m^3
- Saturated unit weight: 21 kN/m^3
- Water table depth: 0.5 mbgl (worst case).
- Founding depth: 1.0 mbgl.

Table 11: Allowable bearing capacities

Pad Dimension (m^2)	Allowable Bearing Capacity (kPa)
0.75	278
1.00	282
1.25	291
1.50	301
2.00	325

The final depth and design of the founding(s) should be subject to the discretion of the engineer and based on site specific geotechnical investigations for each of the structures as per the SAICE code of practice.

5.5.2 Strip footings

The nodular to hardpan ferricrete horizons will very likely provide more than adequate bearing capacity for typical supporting infrastructure, e.g. single story masonry structures. However, due to the laterally discontinuous nature of the ferricrete horizon, site specific investigations should be conducted for such structures.

5.5.3 Anticipated settlements

Estimated immediate settlements range between 17 and 29 mm, depending on the loads imposed on the founding stratum (**Table 12**).

Table 12: Estimated immediate settlement results

	Settlement (mm) for a given pressure (*kPa*) :		
Pad dimensions (m^2)	***150***	***200***	***250***
2.0	16.6	22.7	28.9

5.5.4 Anticipated heave

The area delineated as 'Geotechnical Zone D', has been interpreted to be potentially expansive, based on observations made in the trial pits and the characterisation test results obtained from the laboratory. Anticipated heave was calculated based on the Weston (1980) method of heave determination. Weston's method of heave determination is based on the weighted liquid limit, moisture content and overburden pressure the material is subjected to, the following percentage swell can be expected at the surface (**Table 13**). The predicted heave varied between 0.05% and 50% of the layer thickness. It is important to point out that heave has been predicted by Weston (1980) outside the region delineated as potentially expansive due to elevated liquid limits of the residual material encountered in TP4 (sample 18598).

Table 13: Anticipated heave at given pressures and layer thicknesses for pad footings.

Pressure (kPa)		1	1	1	50	50	50	200	200	200
Layer thickness beneath footing (mm)		*500*	*1000*	*2000*	*500*	*1000*	*2000*	*500*	*1000*	*2000*
TP04 (1.7m)	Heave at surface (mm)	249	499	998	55	110	220	32	65	129
TP14 (1.5 – 2.0)		5	9	18	1	2	4	1	1	2
TP15 (0.9 – 1.7)		3	5	10	1	1	2	0	1	1
TP18 (0.6 – 1.0)		180	360	721	40	80	159	23	47	93
TP22 (0.5 – 2.0)		33	67	134	7	15	30	4	9	17
TP25 (0.9 – 1.4)		5	9	19	1	2	4	1	1	2
TP26 (1.0 – 1.7)		4	7	15	1	2	3	0	1	2

Potentially expansive materials were also encountered within the region that has been proposed for future development, i.e. within trial pits TP30 to TP46. The materials tested showed low to medium potential expansiveness, which are similar to the results presented in the table above. Structures should be preliminarily designed accordingly.

5.5.5 Compressibility Index

A sample of undisturbed residual material was extracted at a depth of 0.8 mbgl from trial pit TP42. This sample was submitted to an accredited laboratory for the determination of compressibility and expansive properties. The coefficient of volume compressibility (M_v) of this sample was computed based on the results of the saturated double oedometer test:

$M_v = 0.0004431\ m^2/kN$

A stress increment of 100 kN/m^2 was used to determine the above result (Knappett and Craig, 2012).

5.6 Sub-Grade Modulus

5.6.1 Transported Materials

The modulus variation (n_h) of the sand-dominated materials is anticipated to be as low as 2.5 MN/m^3, or less, to about 20.0 MN/m^3 with depth. Based on the modulus of variation the expected modulus of subgrade reaction (k_h) can be calculated for piles using the following formula:

$$k_h = n_h x \, Z/B$$

Where, Z is the depth in metres and B is the pile breadth (m) (after, Franki 2019).

5.6.2 Transported Materials

The modulus subgrade reaction of the firm mostly cohesive residual materials is anticipated to be greater than 18 MN/m^3, increasing proportionally with increased consistency (after, Franki 2019).

5.7 *Reuse of in-situ soil*

5.7.1 Material classifications according to TRH14

The transported materials encountered in Geotechnical Zone D do not meet the classification criteria of G9 materials, due to insufficient CBR values at 93% Mod AASHTO density.

The transported sediments mixed with considerable proportions of ferricrete nodules and gravels classify as at least G8. With increasing proportions of ferricrete nodules this CBR value is anticipated to increase.

The residual materials encountered in all of the trial pits classify as G9 or worse due to the often low CBR values.

5.7.2 Runway & Layer Works

Regarding the preparation of the runway, all surficial materials (0 – 0.2 mbgl) containing vegetation or other organics must be removed and either spoiled off site, or stockpiled for later incorporation in future landscaping operations. The resultant surface (that is free of organics) should be 'ripped and mixed' to a depth of about 0.5 m below the prepared surface of the transported horizon, which is devoid of organics. This serves to blend the remaining transported sediments and nodular ferricrete horizon (refer to samples 18599, 18596, 18590, 18592). The ripped and mixed material should be placed in 150 mm thick layers and compacted to at least 95% MOD AASHTO density. The resultant surface must yield a minimum CBR value of 15 (once compacted). The resultant prepared surface is anticipated to serve as an appropriate lower and upper subbase. The project engineer is to advise on the final design for the subbase, base and seal for runway and taxiing areas according to expected design air traffic loadings.

The resultant densities achieved for the respective layer works horizons should checked in 10 m intervals using a Troxler density device, for the length of the runway.

It is important to mention that material encountered in the northern extent of the property, i.e. north of trial pits TP12 and TP15, residual materials possess considerably greater cohesive components, which dramatically reduce the CBR values (TP18 to TP22, refer samples 18591, 18597, 18598). For reference see **Table 7**. Such cohesive materials should be removed and spoiled off site.

The ripped and compacted material from the southern extent of the site should be sufficient to infill the resultant 'void' created by the removal of the spoiled mostly cohesive material in the northern extent of the present site. Further, any additional material required to supplement the construction of the runway and taxiing area, could be sourced from south- and north-western portions of the site, particularly from excavations required for the construction of the commercial and aviation development areas in the southwestern portion of the site.

Reuse of excavated material for general pavement construction should be at the site engineers' discretion, and is expected to only be suitable for LSSG course. The following generalised layer works are recommended:

Seal	Cape Seal	13/19 mm	to be specified by engineer
Base	Imported G2/G3	150 mm	100% MMD
Subbase	Imported G5	150 mm	95% MDD
USSG	Imported G7	150 mm	93% MDD
LSSG	Imported / in-situ G7	150 mm	100 % MMD

6. CONCLUSIONS

This report summarises the results from a Phase I Geotechnical Investigation that aimed to determine and classify the engineering properties on the site proposed for development, and to provide preliminary recommendations for the geotechnical design and further investigations required for the proposed structures. The most pertinent findings from this Phase I investigation are as follows:

- The site is covered by a surficial horizon of mostly cohesive transported soil, which is underlain by a laterally discontinuous and variably cemented nodular to hardpan ferricrete pedogenic horizon. These strata are underlain by residual materials derived from either the Cape Granite Suite or the Malmesbury Group.
- From a geotechnical standpoint, site development should proceed; however, there are potential geotechnical challenges with development of this site. There is a great degree of variability within the composition of the residual materials, and consequently, there are areas across the site that present a risk of highly expansive soils, and may be subject to high consolidation.
- Due to the variation in topography within the northern extent of the property, considerable fill will be required, should the development be extended from the present level at which the Fisantekraal Airport is situated. In this case a suitable granular fill will need to be imported; materials could be sourced locally, but would need to be sieved and mixed in appropriate proportions.
- The tractor loader backhoe was unable to penetrate materials with consistencies of very dense and/or very stiff, and beyond. However, it is anticipated that in unrestricted excavations, and/or with prior ripping, conventional light earth-moving equipment could carry out the bulk of the earthworks. All materials encountered in the trial pits classified as soft to intermediate excavation (SANS 1200D). The hardpan ferricrete horizons may require rock-breaking apparatus in areas of the site.
- A series of site-specific follow-up geotechnical investigations will be required prior to the construction of individual structures, which should include field and laboratory tests to more accurately reflect/characterise the mechanical properties (e.g. consolidation settlement) of the variable residual soils.
- In the case of larger structures, where deeper foundations/piling is required, it would be prudent to consider a series of exploratory drilling to determine whether core stones exist within the areas underlain by residual granite as these may present challenges for construction. Consolidation settlement is anticipated to guide the foundation design of larger structures.
- The site is characterised by a laterally discontinuous perched water table, which may be seasonally exacerbated. The perched groundwater table was intersected on-site at between 0.85 and 1.0 mbgl in trial pits TP14 and TP25, respectively; and at 1.4 mbgl in TP33. Excavations deeper than 1.0 mbgl will require battering to ensure safe working conditions. Excavation required should be undertaken during the summer, when rainfall is at a minimum, which provides for more favourable safe working conditions.
- Final designs should appropriately cater for aggressive and corrosive groundwater and/or soil conditions.

- Drainage precaution will be required on-site, this would entail diverting rainwater away from the perimeter walls of structures and paved areas (i.e. taxi areas and runway) to limit the ingress of moisture into the founding stratum and basecourse horizons.
- Preliminary modelling has been carried out to determine potential bearing capacities, using assumed loads and several foundation dimensions. Structure specific investigations and additional testing would be required to verify these results. The foundation solution that is to be adopted each structure on-site will depend on the cost and of implementation, and the risk associated with the said solution.
- Every effort has been made to ensure the accuracy of the information presented in this report. It must be stressed that naturally occurring materials are never uniform, and results of a field investigation only provide a limited view of the subsurface conditions. Considerable lateral and vertical variation can occur over short distances, and deviations from the presented results may be encountered on-site. Therefore, as a precautionary measure, potential geotechnical variations in the subsurface (i.e. inspection of excavation slopes, pile and founding conditions) should be inspected and approved by a suitably qualified professional.

7. ASSUMPTIONS AND LIMITATIONS

It should be noted that the results of the laboratory analyses presented in this report were undertaken on representative bulk disturbed samples, and therefore, some degree of variability may be encountered on-site. We have assumed that the laboratory results accurately reflect the in-situ conditions.

The results presented are based on trial pits excavated to depths of between 0.6 and 2.2 mbgl, this only provides information at discrete locations across the site, and interpolation was conducted across considerable distances. Geotechnical zones have been delineated using such interpolation, using trial pit, dynamic cone penetrometer and laboratory data; therefore, variation across/within the zone boundaries may be encountered on-site. Geotechnical Zone D was delineated based on two trial pits (TP17 and TP33), which have been interpreted to be transported sediments that had infilled a low-lying areas.

Due to the variability in soil conditions encountered on-site, the results contained in this report cannot be applied to all structures across the site. The settlement results presented reflect settlements expected during the construction period, more investigation should be undertaken prior to modelling of consolidation settlements. Little information is available for the design of the proposed structures, and therefore, the results presented in this report are of a preliminary nature. The results presented are subject to confirmation during site specific investigation and more detailed testing.

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9. APPENDIX A: TRIAL PIT PHOTOS

Figure 5: TP01 to TP04.

TP05	***TP06***
	
TP07	***TP08***
	

Figure 6: TP05 to TP08.

TP09	***TP10***
	
TP11	***TP12***
	

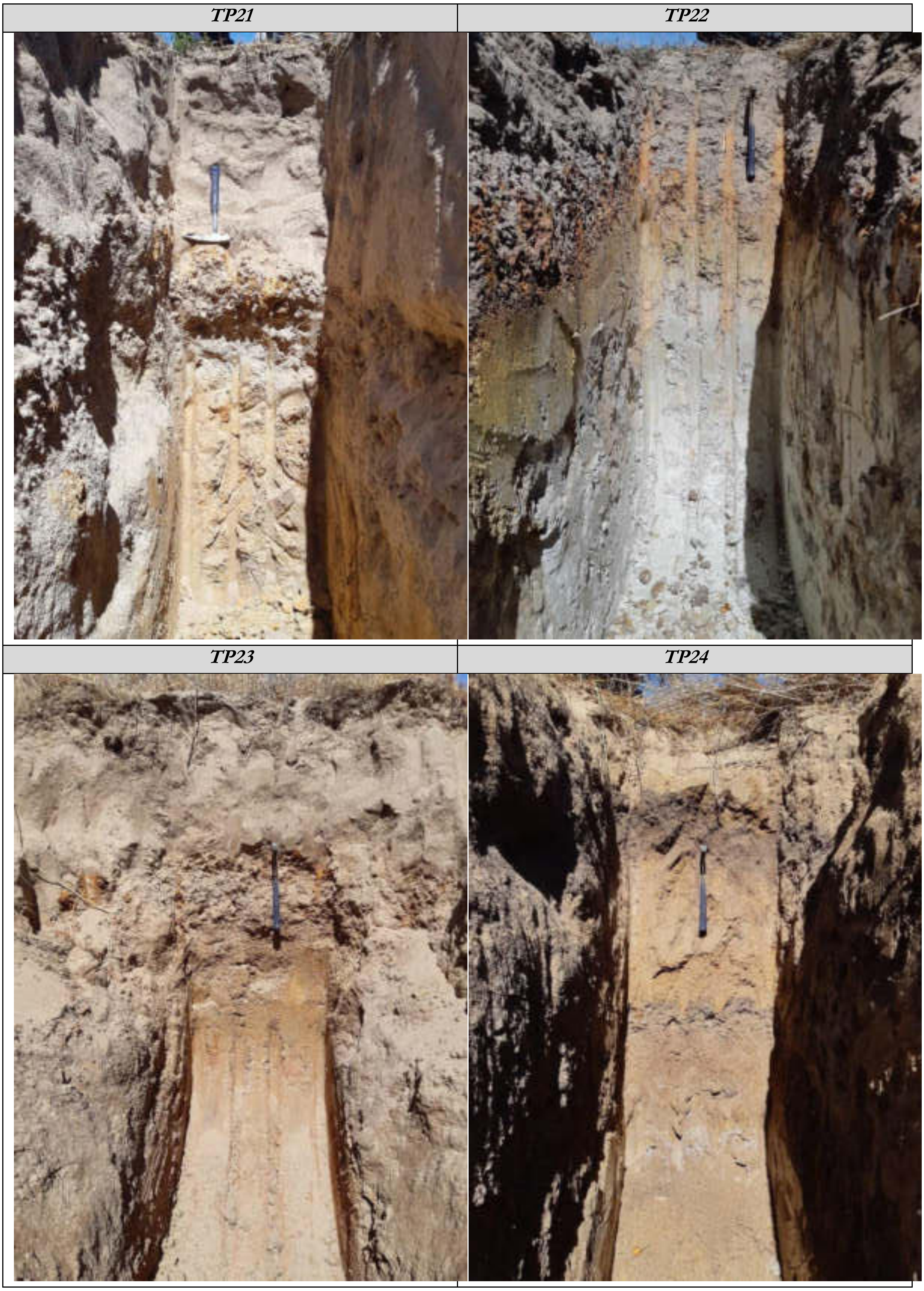
Figure 7: TP09 to TP12.

TP13	***TP14***
	
TP15	***TP16***
	

Figure 8: TP13 to TP16.

TP17	***TP18***
	
TP19	***TP20***
	

Figure 9: TP17 to TP20.


TP21

TP22

TP23

TP24

Figure 10: TP21 to TP24.

TP25	***TP26***
	
TP27	***TP28***
	

Figure 11: TP25 to TP28.

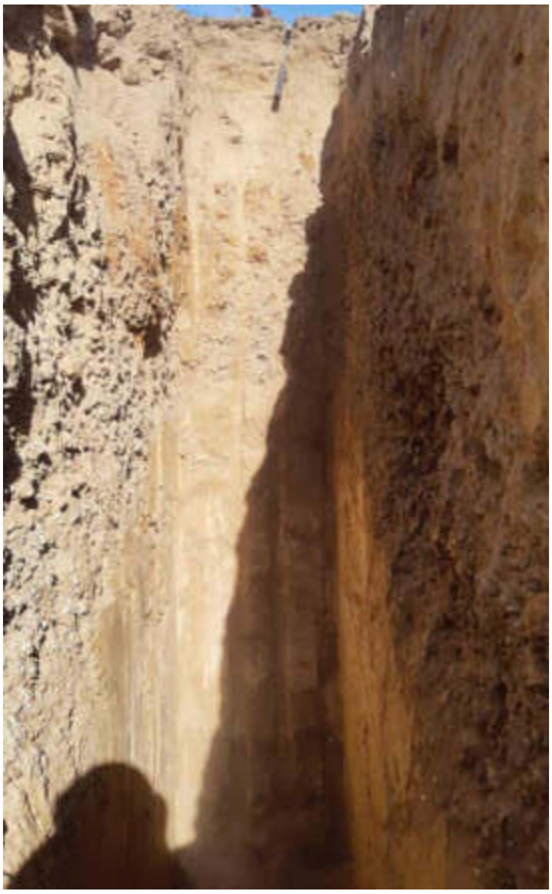
TP29	***TP30***
	
TP31	***TP32***
	

Figure 12: TP29 to TP32.

TP33	***TP34***
	
TP35	***TP36***
	

Figure 13: TP33 to TP36.

TP37	***TP38***
	
TP39	***TP40***
	

Figure 14: TP37 to TP40.

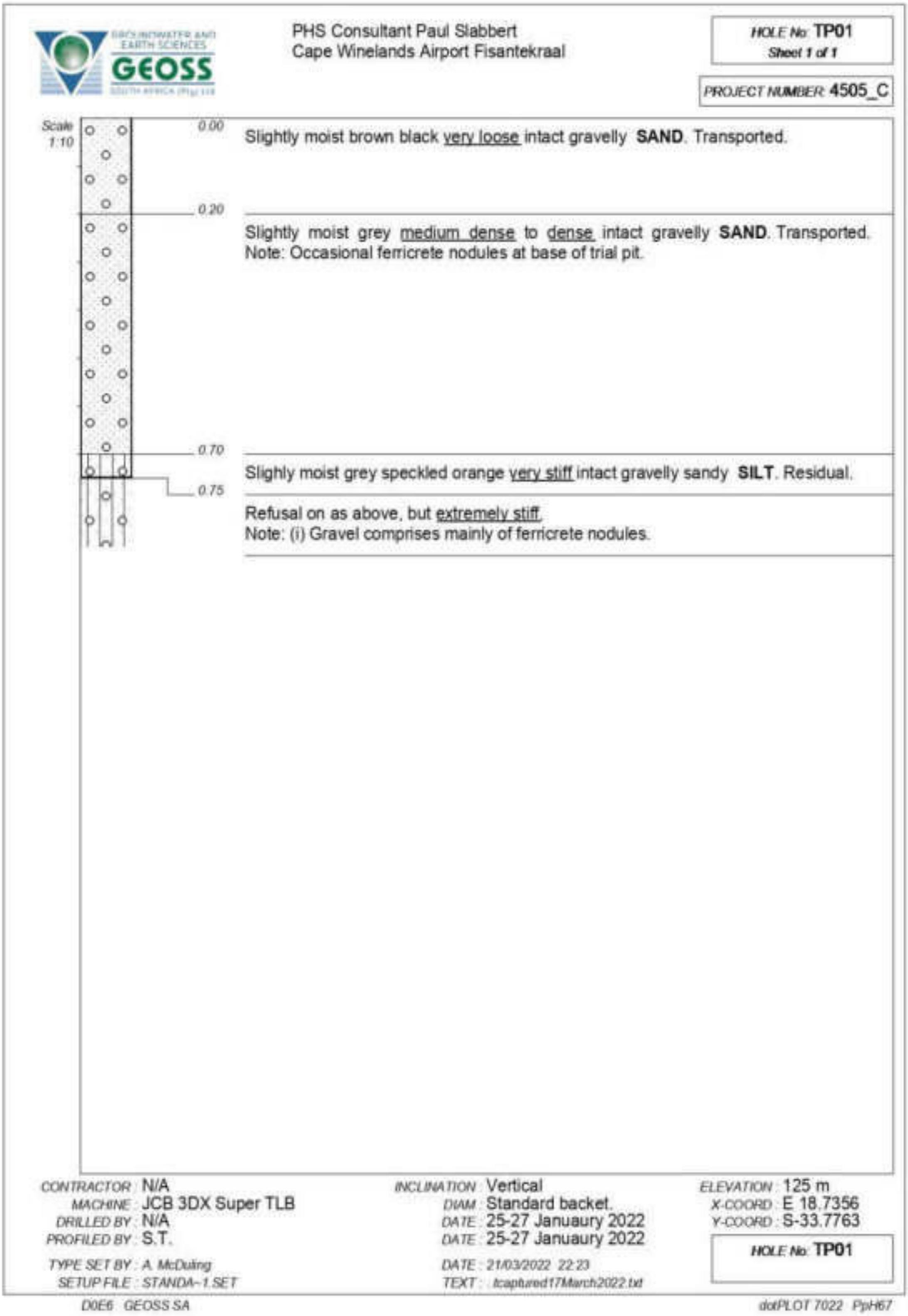
TP41	***TP42***
	
TP43	***TP44***
	

Figure 15: TP41 to TP44.

TP45	*TP46*
No Photo Available	

Figure 16: TP45 to TP46.

10. APPENDIX B: TRIAL PIT LOGS



PHS Consultant Paul Slabbert
Cape Winelands Airport Fisantekraal

HOLE No: **TP01**
Sheet 1 of 1

PROJECT NUMBER: **4505_C**

Scale 1:10

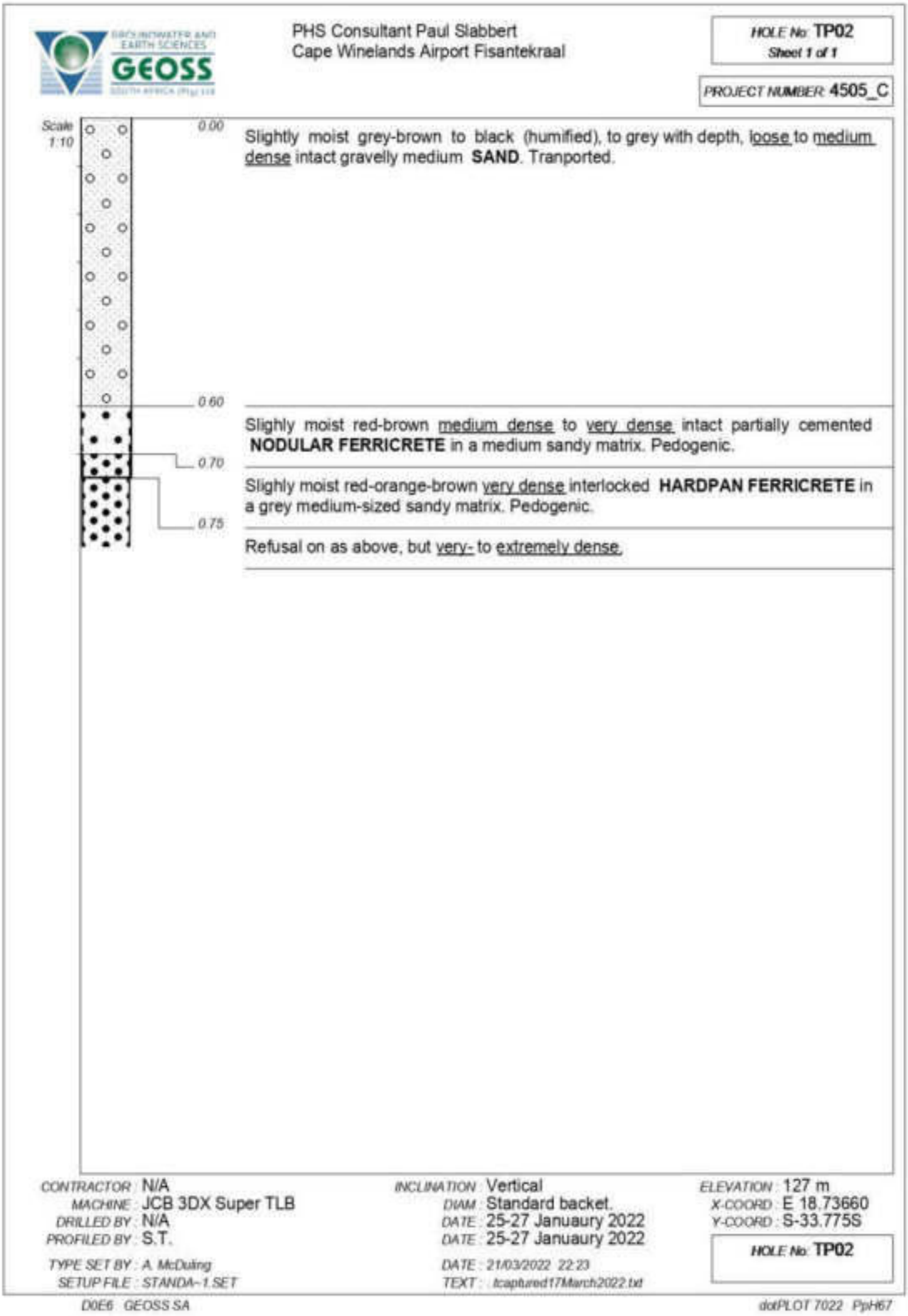
0.00	Slightly moist brown black very loose intact gravelly **SAND**. Transported.
0.20	Slightly moist grey medium dense to dense intact gravelly **SAND**. Transported. Note: Occasional ferricrete nodules at base of trial pit.
0.70	Slighly moist grey speckled orange very stiff intact gravelly sandy **SILT**. Residual.
0.75	Refusal on as above, but extremely stiff. Note: (i) Gravel comprises mainly of ferricrete nodules.

CONTRACTOR	N/A	*INCLINATION*	Vertical	*ELEVATION*	125 m
MACHINE	JCB 3DX Super TLB	*DIAM*	Standard backet.	*X-COORD*	E 18.7356
DRILLED BY	N/A	*DATE*	25-27 Januaury 2022	*Y-COORD*	S-33.7763
PROFILED BY	S.T.	*DATE*	25-27 Januaury 2022		
TYPE SET BY	A. McDuling	*DATE*	21/03/2022 22:23		
SETUP FILE	STANDA~1.SET	*TEXT*	..tcaptured17March2022.txt		

HOLE No: **TP01**

D0E6 GEOSS SA

dotPLOT 7022 PpH67



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HOLE No: **TP02**
Sheet 1 of 1

PROJECT NUMBER: **4505_C**

Scale 1:10

Depth	Description
0.00	Slightly moist grey-brown to black (humified), to grey with depth, loose to medium dense intact gravelly medium **SAND**. Tranported.
0.60	Slighly moist red-brown medium dense to very dense intact partially cemented **NODULAR FERRICRETE** in a medium sandy matrix. Pedogenic.
0.70	Slighly moist red-orange-brown very dense interlocked **HARDPAN FERRICRETE** in a grey medium-sized sandy matrix. Pedogenic.
0.75	Refusal on as above, but very- to extremely dense.

CONTRACTOR : N/A
MACHINE : JCB 3DX Super TLB
DRILLED BY : N/A
PROFILED BY : S.T.
TYPE SET BY : A. McDuling
SETUP FILE : STANDA~1.SET

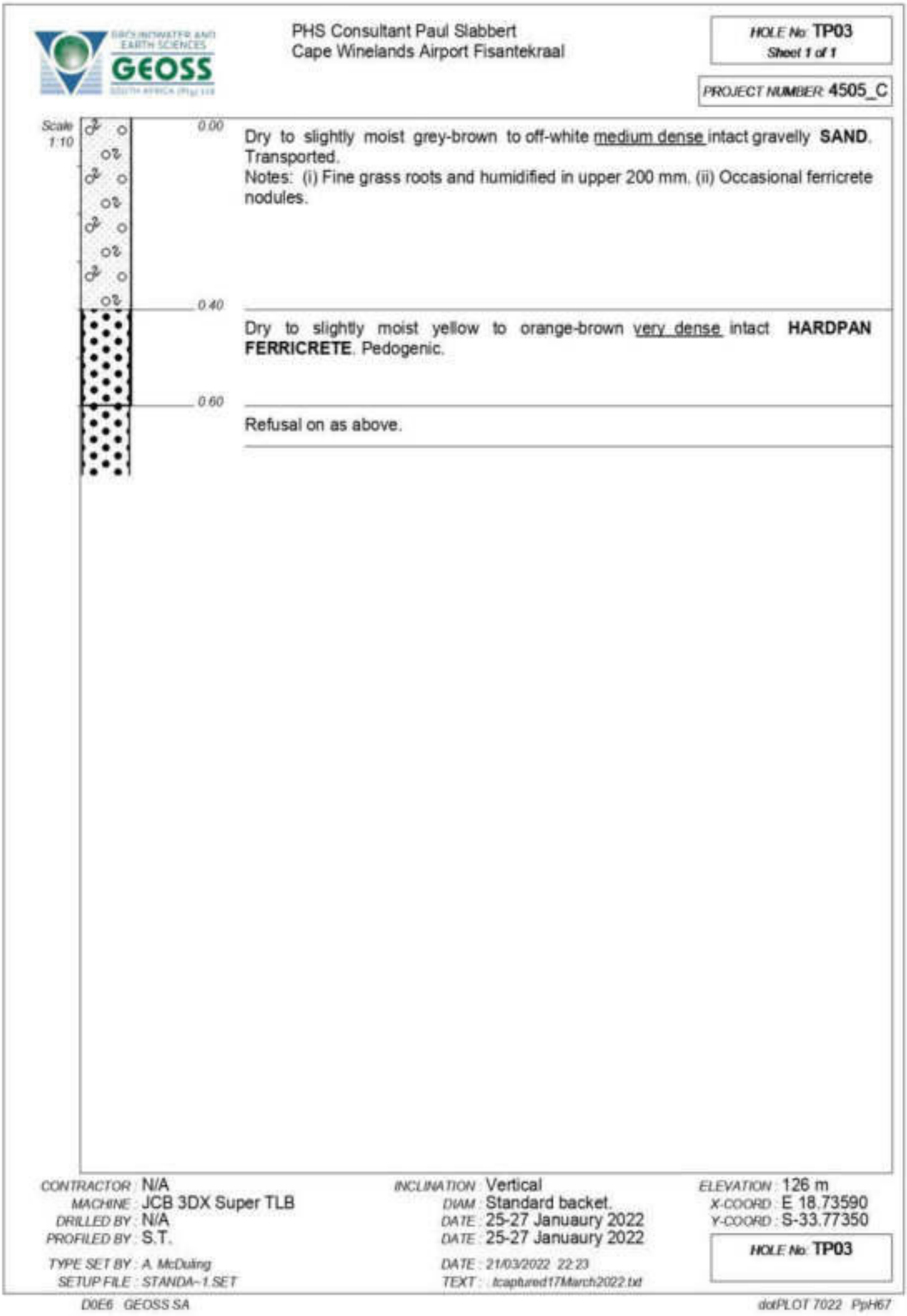
INCLINATION : Vertical
DIAM : Standard backet.
DATE : 25-27 Janauary 2022
DATE : 25-27 Janauary 2022
DATE : 21/03/2022 22:23
TEXT : ..tcaptured17March2022.txt

ELEVATION : 127 m
X-COORD : E 18.73660
Y-COORD : S-33.775S

HOLE No: **TP02**

D0E6 GEOSS SA

dotPLOT 7022 PpH67



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Cape Winelands Airport Fisantekraal

HOLE No: **TP03**
Sheet 1 of 1

PROJECT NUMBER: **4505_C**

Scale
1:10

0.00

Dry to slightly moist grey-brown to off-white medium dense intact gravelly **SAND**. Transported.
Notes: (i) Fine grass roots and humidified in upper 200 mm. (ii) Occasional ferricrete nodules.

0.40

Dry to slightly moist yellow to orange-brown very dense intact **HARDPAN FERRICRETE**. Pedogenic.

0.60

Refusal on as above.

CONTRACTOR : N/A
MACHINE : JCB 3DX Super TLB
DRILLED BY : N/A
PROFILED BY : S.T.

TYPE SET BY : A. McDuling
SETUP FILE : STANDA~1.SET

INCLINATION : Vertical
DIAM : Standard backet.
DATE : 25-27 Januaury 2022
DATE : 25-27 Januaury 2022

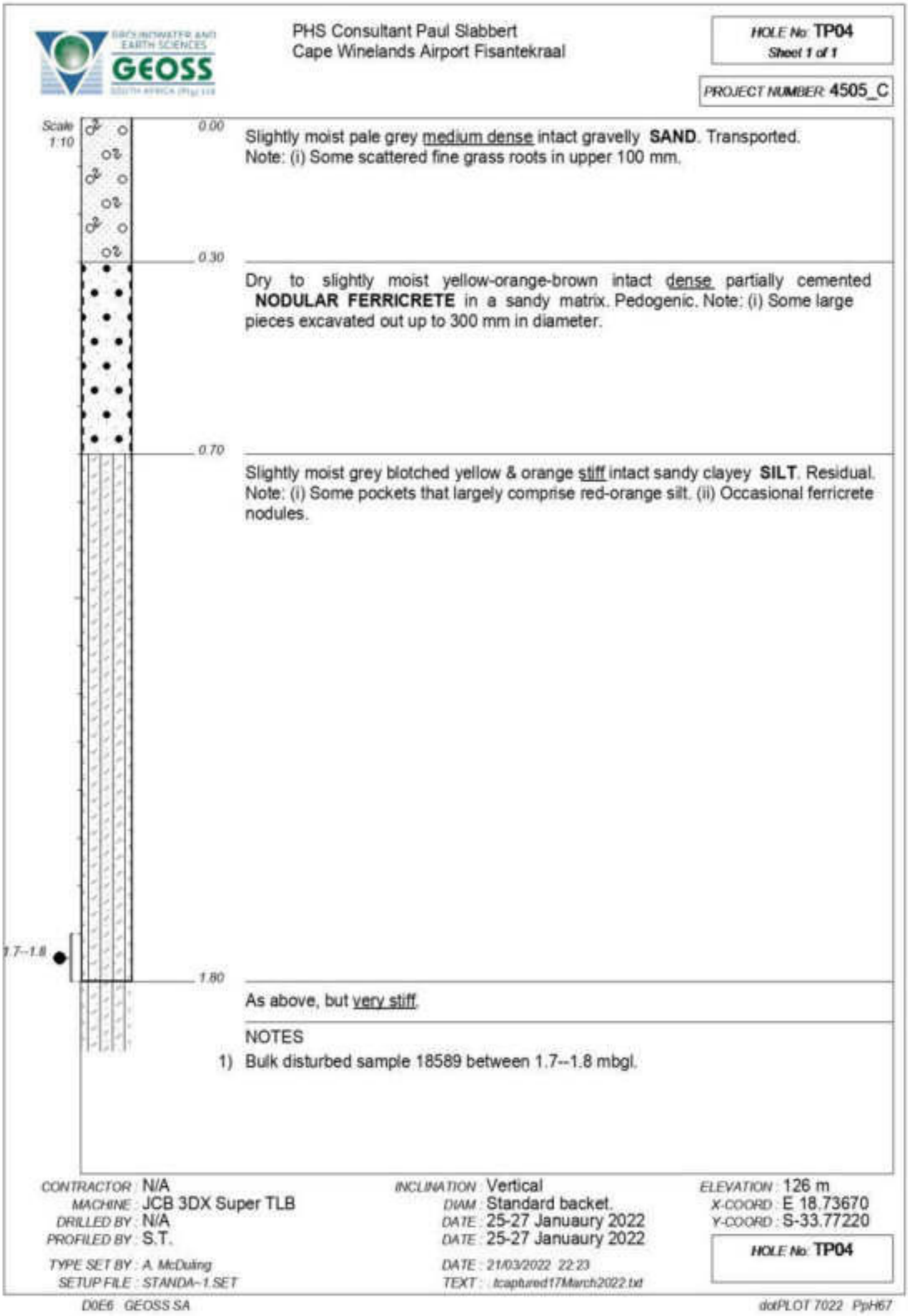
DATE : 21/03/2022 22:23
TEXT : ..\captured17March2022.txt

ELEVATION : 126 m
X-COORD : E 18.73590
Y-COORD : S-33.77350

HOLE No: **TP03**

D0E6 GEOSS SA

dotPLOT 7022 PpH67



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Cape Winelands Airport Fisantekraal

HOLE No: **TP04**
Sheet 1 of 1

PROJECT NUMBER: **4505_C**

Scale 1:10

0.00 Slightly moist pale grey medium dense intact gravelly **SAND**. Transported.
Note: (i) Some scattered fine grass roots in upper 100 mm.

0.30 Dry to slightly moist yellow-orange-brown intact dense partially cemented **NODULAR FERRICRETE** in a sandy matrix. Pedogenic. Note: (i) Some large pieces excavated out up to 300 mm in diameter.

0.70 Slightly moist grey blotched yellow & orange stiff intact sandy clayey **SILT**. Residual. Note: (i) Some pockets that largely comprise red-orange silt. (ii) Occasional ferricrete nodules.

1.7--1.8 ●

1.80 As above, but very stiff.

NOTES

1) Bulk disturbed sample 18589 between 1.7--1.8 mbgl.

CONTRACTOR : N/A
MACHINE : JCB 3DX Super TLB
DRILLED BY : N/A
PROFILED BY : S.T.

TYPE SET BY : A. McDuling
SETUP FILE : STANDA~1.SET

INCLINATION : Vertical
DIAM : Standard backet.
DATE : 25-27 Januaury 2022
DATE : 25-27 Januaury 2022

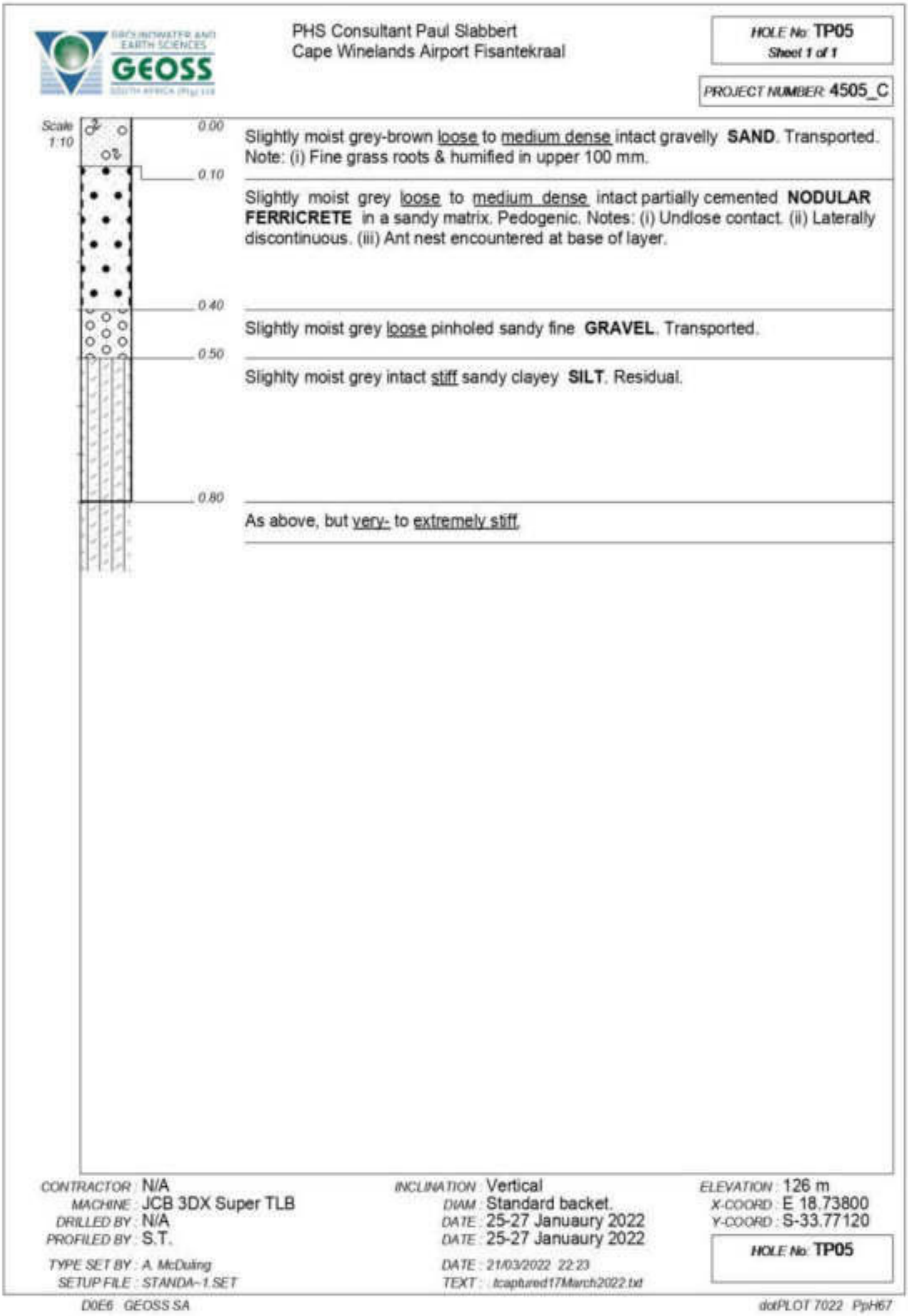
DATE : 21/03/2022 22:23
TEXT : ..tcaptured17March2022.txt

ELEVATION : 126 m
X-COORD : E 18.73670
Y-COORD : S-33.77220

HOLE No: **TP04**

D0E6 GEOSS SA

dotPLOT 7022 PpH67



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HOLE No: **TP05**
Sheet 1 of 1

PROJECT NUMBER: **4505_C**

Scale 1:10

0.00	Slightly moist grey-brown <u>loose</u> to <u>medium dense</u> intact gravelly **SAND**. Transported. Note: (i) Fine grass roots & humified in upper 100 mm.
0.10	Slightly moist grey <u>loose</u> to <u>medium dense</u> intact partially cemented **NODULAR FERRICRETE** in a sandy matrix. Pedogenic. Notes: (i) Undlose contact. (ii) Laterally discontinuous. (iii) Ant nest encountered at base of layer.
0.40	Slightly moist grey <u>loose</u> pinholed sandy fine **GRAVEL**. Transported.
0.50	Slighlty moist grey intact <u>stiff</u> sandy clayey **SILT**. Residual.
0.80	As above, but <u>very-</u> to <u>extremely stiff</u>.

CONTRACTOR : N/A
MACHINE : JCB 3DX Super TLB
DRILLED BY : N/A
PROFILED BY : S.T.
TYPE SET BY : A. McDuling
SETUP FILE : STANDA~1.SET

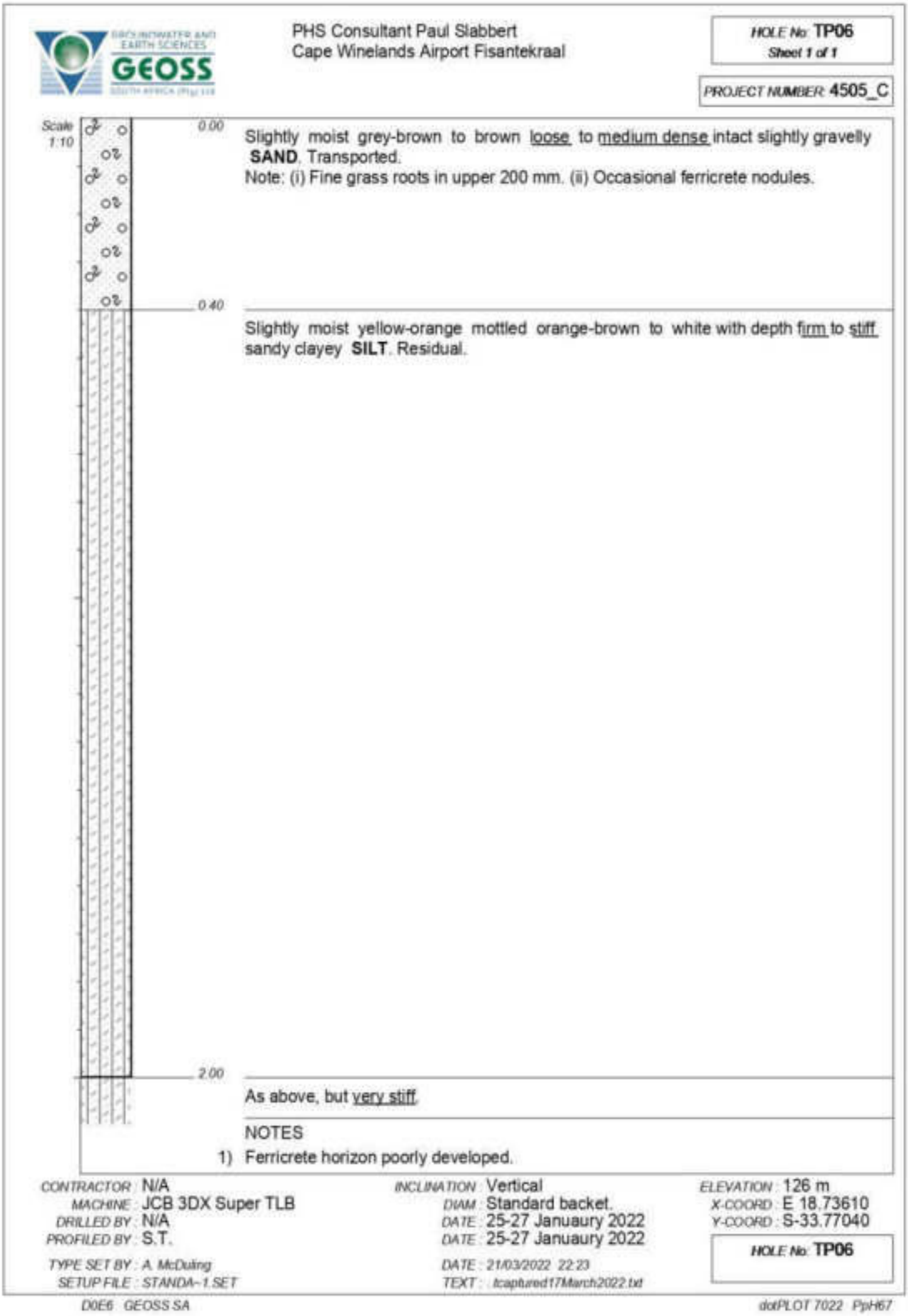
INCLINATION : Vertical
DIAM : Standard backet.
DATE : 25-27 Januaury 2022
DATE : 25-27 Januaury 2022
DATE : 21/03/2022 22:23
TEXT : ..tcaptured17March2022.txt

ELEVATION : 126 m
X-COORD : E 18.73800
Y-COORD : S-33.77120

HOLE No: **TP05**

D0E6 GEOSS SA

dotPLOT 7022 PpH67



PHS Consultant Paul Slabbert
Cape Winelands Airport Fisantekraal

HOLE No: **TP06**
Sheet 1 of 1

PROJECT NUMBER: **4505_C**

Scale 1:10

0.00

Slightly moist grey-brown to brown loose to medium dense intact slightly gravelly **SAND**. Transported.
Note: (i) Fine grass roots in upper 200 mm. (ii) Occasional ferricrete nodules.

0.40

Slightly moist yellow-orange mottled orange-brown to white with depth firm to stiff sandy clayey **SILT**. Residual.

2.00

As above, but very stiff.

NOTES

1) Ferricrete horizon poorly developed.

CONTRACTOR : N/A
MACHINE : JCB 3DX Super TLB
DRILLED BY : N/A
PROFILED BY : S.T.

TYPE SET BY : *A. McDuling*
SETUP FILE : *STANDA~1.SET*

INCLINATION : Vertical
DIAM : Standard backet.
DATE : 25-27 Januaury 2022
DATE : 25-27 Januaury 2022

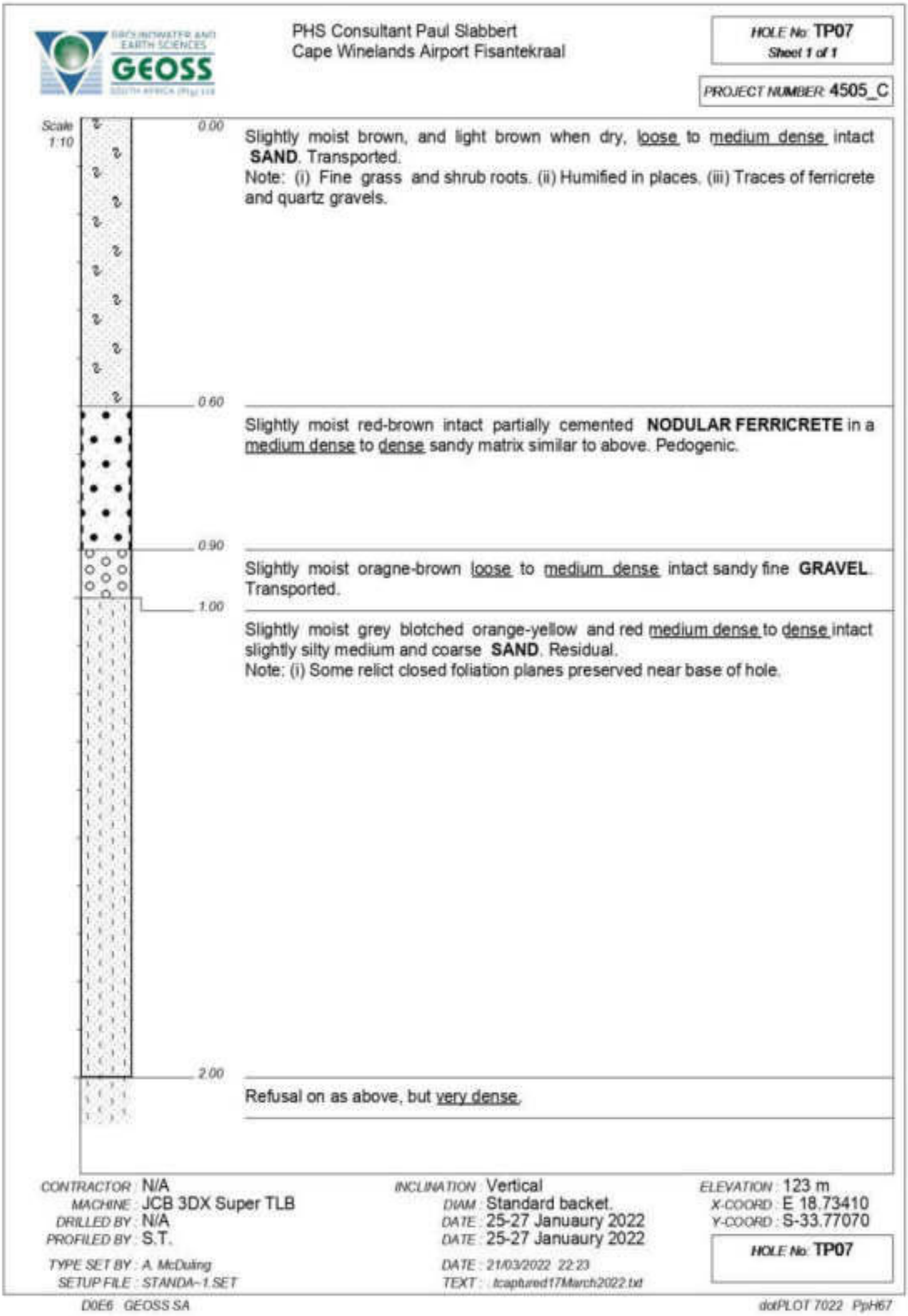
DATE : *21/03/2022 22:23*
TEXT : *.tcaptured17March2022.txt*

ELEVATION : 126 m
X-COORD : E 18.73610
Y-COORD : S-33.77040

HOLE No: **TP06**

D0E6 GEOSS SA

dotPLOT 7022 PpH67



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HOLE No: TP07
Sheet 1 of 1

PROJECT NUMBER: 4505_C

Scale
1:10

0.00	Slightly moist brown, and light brown when dry, loose to medium dense intact **SAND**. Transported. Note: (i) Fine grass and shrub roots. (ii) Humified in places. (iii) Traces of ferricrete and quartz gravels.
0.60	Slightly moist red-brown intact partially cemented **NODULAR FERRICRETE** in a medium dense to dense sandy matrix similar to above. Pedogenic.
0.90	Slightly moist oragne-brown loose to medium dense intact sandy fine **GRAVEL**. Transported.
1.00	Slightly moist grey blotched orange-yellow and red medium dense to dense intact slightly silty medium and coarse **SAND**. Residual. Note: (i) Some relict closed foliation planes preserved near base of hole.
2.00	Refusal on as above, but very dense.

CONTRACTOR : N/A
MACHINE : JCB 3DX Super TLB
DRILLED BY : N/A
PROFILED BY : S.T.

TYPE SET BY : A. McDuling
SETUP FILE : STANDA~1.SET

INCLINATION : Vertical
DIAM : Standard backet.
DATE : 25-27 Januaury 2022
DATE : 25-27 Januaury 2022

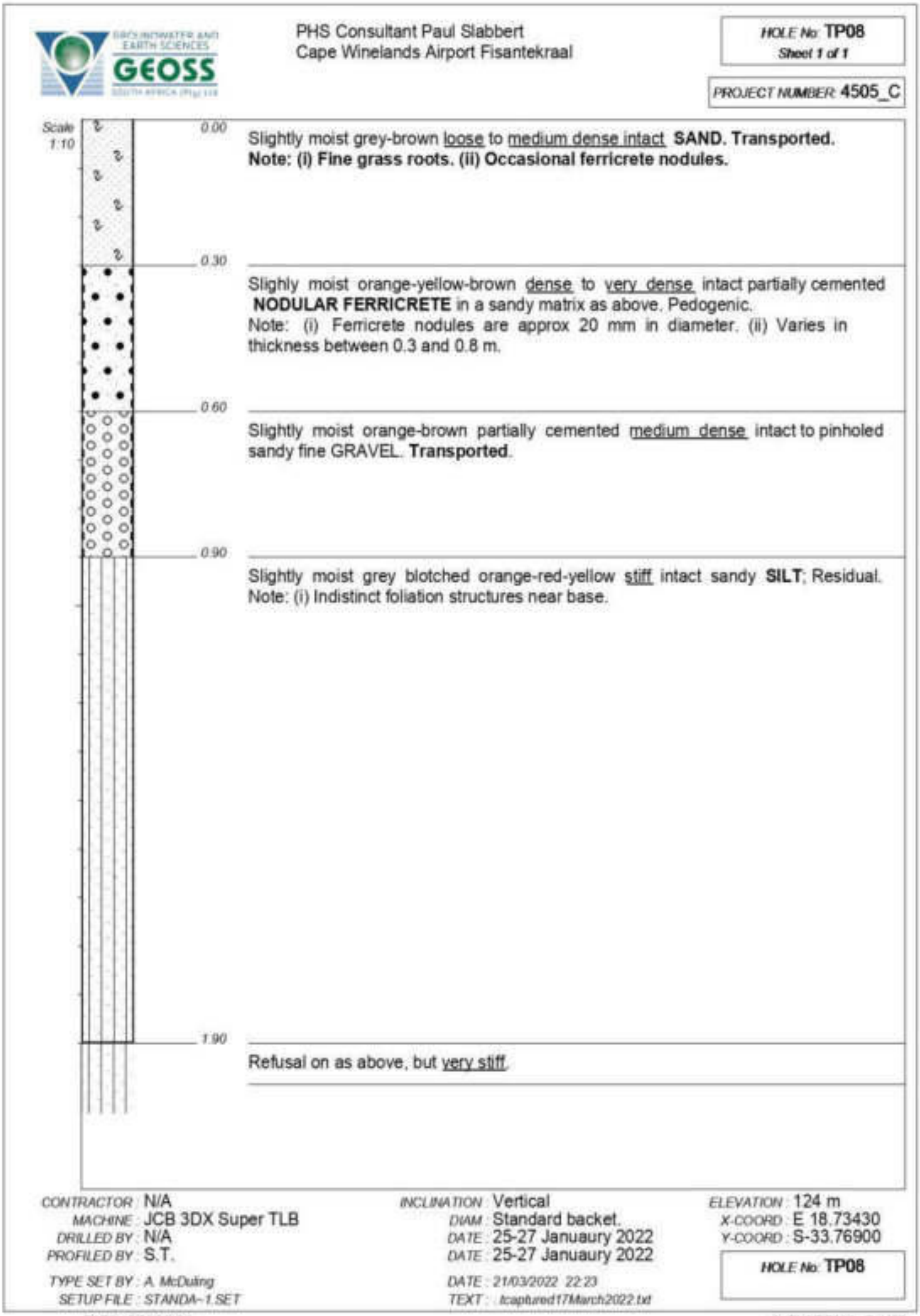
DATE : 21/03/2022 22:23
TEXT : ..tcaptured17March2022.txt

ELEVATION : 123 m
X-COORD : E 18.73410
Y-COORD : S-33.77070

HOLE No: TP07

D0E6 GEOSS SA

dotPLOT 7022 PpH67



GROUNDWATER AND EARTH SCIENCES
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Cape Winelands Airport Fisantekraal

HOLE No: **TP08**
Sheet 1 of 1

PROJECT NUMBER: **4505_C**

Scale 1:10

0.00	Slightly moist grey-brown loose to medium dense intact **SAND. Transported.** **Note: (i) Fine grass roots. (ii) Occasional ferricrete nodules.**
0.30	Slighly moist orange-yellow-brown dense to very dense intact partially cemented **NODULAR FERRICRETE** in a sandy matrix as above. Pedogenic. Note: (i) Ferricrete nodules are approx 20 mm in diameter. (ii) Varies in thickness between 0.3 and 0.8 m.
0.60	Slightly moist orange-brown partially cemented medium dense intact to pinholed sandy fine GRAVEL. **Transported**.
0.90	Slightly moist grey blotched orange-red-yellow stiff intact sandy **SILT**; Residual. Note: (i) Indistinct foliation structures near base.
1.90	Refusal on as above, but very stiff.

CONTRACTOR : N/A
MACHINE : JCB 3DX Super TLB
DRILLED BY : N/A
PROFILED BY : S.T.
TYPE SET BY : A. McDuling
SETUP FILE : STANDA~1.SET

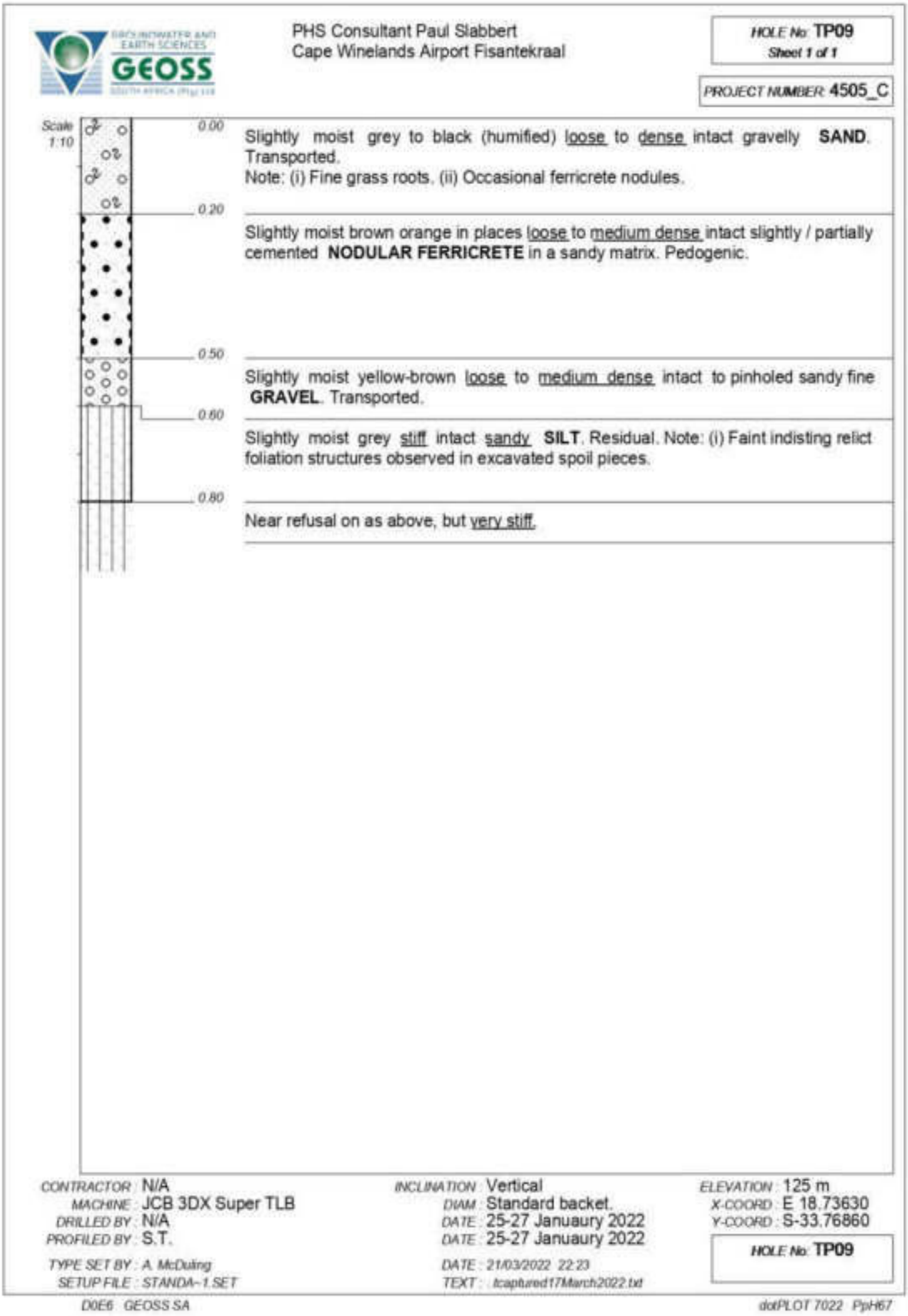
INCLINATION : Vertical
DIAM : Standard backet.
DATE : 25-27 Januaury 2022
DATE : 25-27 Januaury 2022
DATE : 21/03/2022 22:23
TEXT : ..tcaptured17March2022.txt

ELEVATION : 124 m
X-COORD : E 18.73430
Y-COORD : S-33.76900

HOLE No: **TP08**

D0E6 GEOSS SA

dotPLOT 7022 PpH67



PHS Consultant Paul Slabbert
Cape Winelands Airport Fisantekraal

HOLE No: **TP09**
Sheet 1 of 1

PROJECT NUMBER: **4505_C**

Scale 1:10

Depth	Description
0.00	Slightly moist grey to black (humified) loose to dense intact gravelly **SAND**. Transported. Note: (i) Fine grass roots. (ii) Occasional ferricrete nodules.
0.20	Slightly moist brown orange in places loose to medium dense intact slightly / partially cemented **NODULAR FERRICRETE** in a sandy matrix. Pedogenic.
0.50	Slightly moist yellow-brown loose to medium dense intact to pinholed sandy fine **GRAVEL**. Transported.
0.60	Slightly moist grey stiff intact sandy **SILT**. Residual. Note: (i) Faint indisting relict foliation structures observed in excavated spoil pieces.
0.80	Near refusal on as above, but very stiff.

CONTRACTOR : N/A
MACHINE : JCB 3DX Super TLB
DRILLED BY : N/A
PROFILED BY : S.T.
TYPE SET BY : A. McDuling
SETUP FILE : STANDA~1.SET

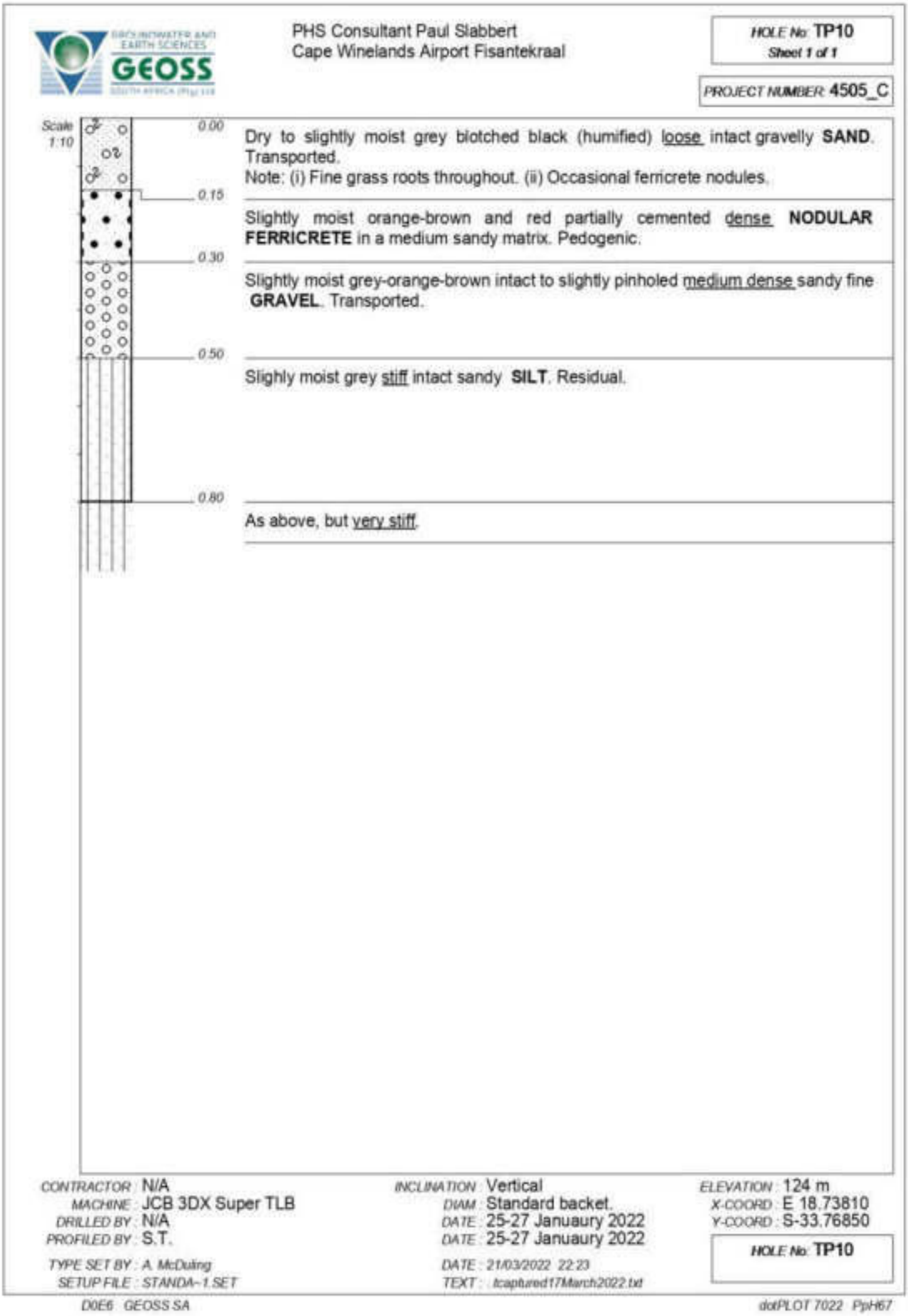
INCLINATION : Vertical
DIAM : Standard backet.
DATE : 25-27 Januaury 2022
DATE : 25-27 Januaury 2022
DATE : 21/03/2022 22:23
TEXT : ..tcaptured17March2022.txt

ELEVATION : 125 m
X-COORD : E 18.73630
Y-COORD : S-33.76860

HOLE No: **TP09**

D0E6 GEOSS SA

dotPLOT 7022 PpH67



GEOSS

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Cape Winelands Airport Fisantekraal

HOLE No: TP10
Sheet 1 of 1

PROJECT NUMBER: 4505_C

Scale 1:10

Depth	Description
0.00	Dry to slightly moist grey blotched black (humified) loose intact gravelly **SAND**. Transported. Note: (i) Fine grass roots throughout. (ii) Occasional ferricrete nodules.
0.15	Slightly moist orange-brown and red partially cemented dense **NODULAR FERRICRETE** in a medium sandy matrix. Pedogenic.
0.30	Slightly moist grey-orange-brown intact to slightly pinholed medium dense sandy fine **GRAVEL**. Transported.
0.50	Slighly moist grey stiff intact sandy **SILT**. Residual.
0.80	As above, but very stiff.

CONTRACTOR : N/A
MACHINE : JCB 3DX Super TLB
DRILLED BY : N/A
PROFILED BY : S.T.

TYPE SET BY : A. McDuling
SETUP FILE : STANDA~1.SET

INCLINATION : Vertical
DIAM : Standard backet.
DATE : 25-27 Januaury 2022
DATE : 25-27 Januaury 2022

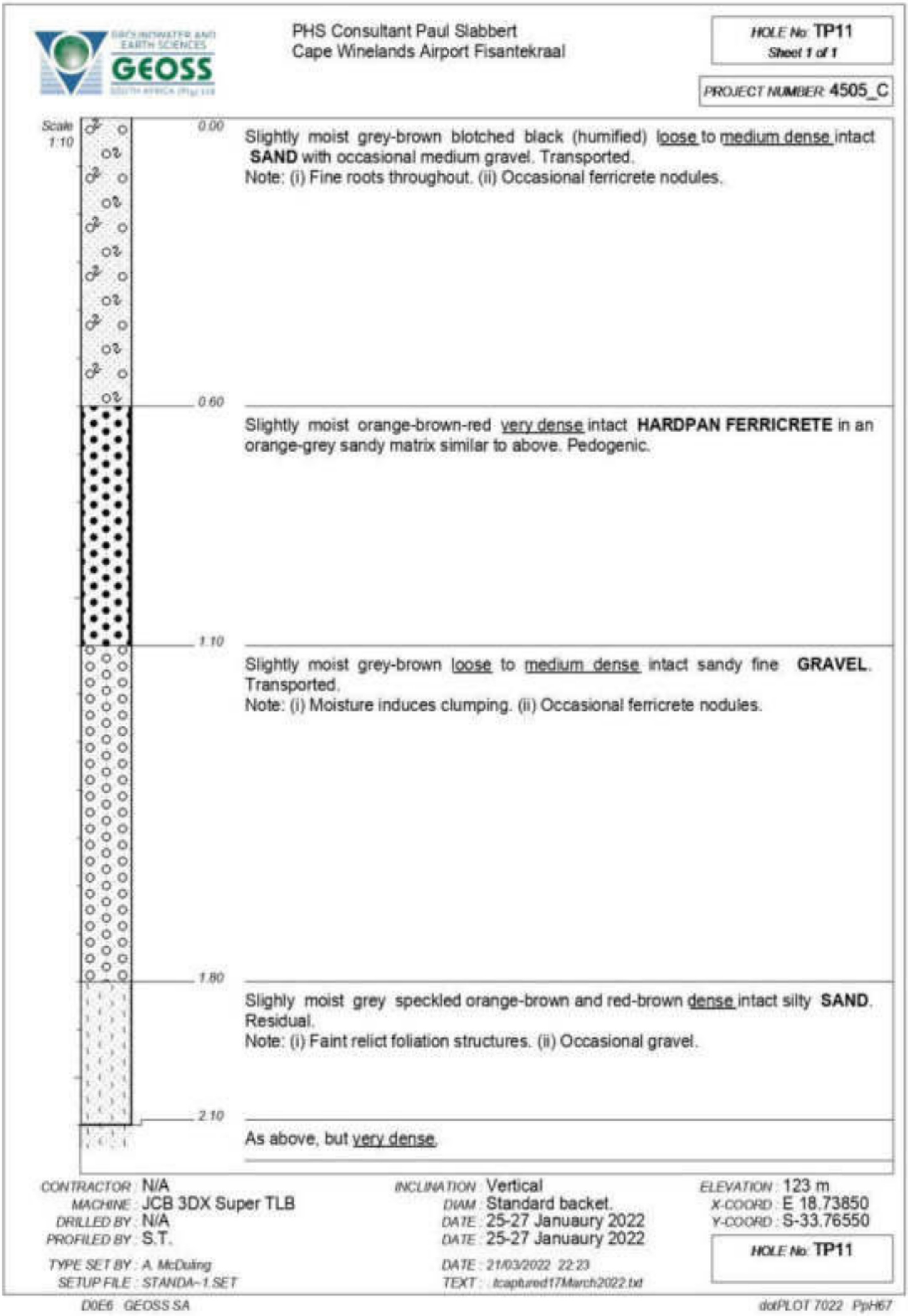
DATE : 21/03/2022 22:23
TEXT : ..tcaptured17March2022.txt

ELEVATION : 124 m
X-COORD : E 18.73810
Y-COORD : S-33.76850

HOLE No: TP10

D0E6 GEOSS SA

dotPLOT 7022 PpH67



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Cape Winelands Airport Fisantekraal

HOLE No: **TP11**
Sheet 1 of 1

PROJECT NUMBER: **4505_C**

Scale 1:10

0.00	Slightly moist grey-brown blotched black (humified) loose to medium dense intact **SAND** with occasional medium gravel. Transported. Note: (i) Fine roots throughout. (ii) Occasional ferricrete nodules.
0.60	Slightly moist orange-brown-red very dense intact **HARDPAN FERRICRETE** in an orange-grey sandy matrix similar to above. Pedogenic.
1.10	Slightly moist grey-brown loose to medium dense intact sandy fine **GRAVEL**. Transported. Note: (i) Moisture induces clumping. (ii) Occasional ferricrete nodules.
1.80	Slighly moist grey speckled orange-brown and red-brown dense intact silty **SAND**. Residual. Note: (i) Faint relict foliation structures. (ii) Occasional gravel.
2.10	As above, but very dense.

CONTRACTOR : N/A
MACHINE : JCB 3DX Super TLB
DRILLED BY : N/A
PROFILED BY : S.T.
TYPE SET BY : A. McDuling
SETUP FILE : STANDA~1.SET

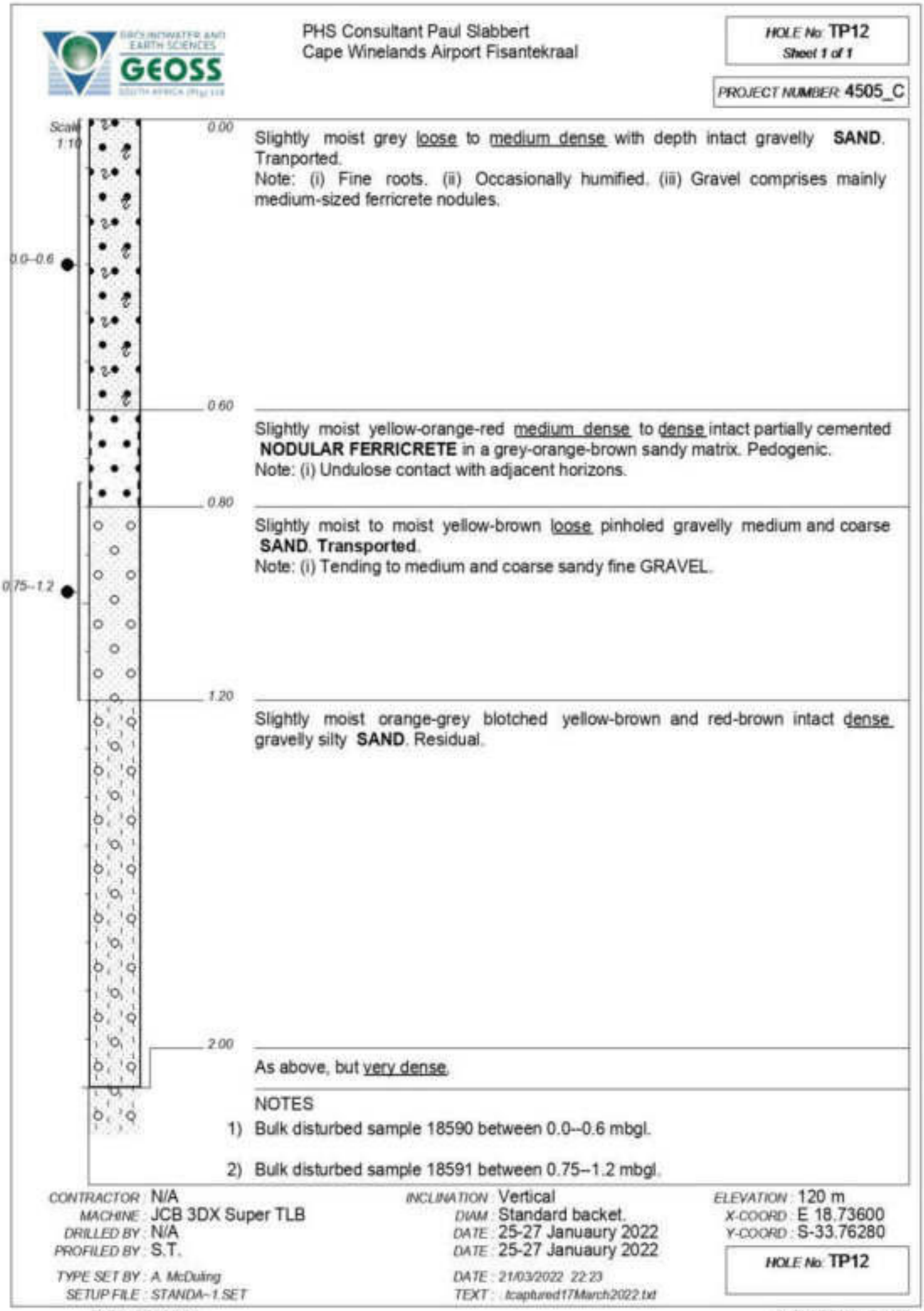
INCLINATION : Vertical
DIAM : Standard backet.
DATE : 25-27 Januaury 2022
DATE : 25-27 Januaury 2022
DATE : 21/03/2022 22:23
TEXT : ..\captured17March2022.txt

ELEVATION : 123 m
X-COORD : E 18.73850
Y-COORD : S-33.76550

HOLE No: **TP11**

D0E6 GEOSS SA

dotPLOT 7022 PpH67



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HOLE No: **TP12**
Sheet 1 of 1

PROJECT NUMBER: **4505_C**

0.00	Slightly moist grey <u>loose</u> to <u>medium dense</u> with depth intact gravelly **SAND**. Tranported. Note: (i) Fine roots. (ii) Occasionally humified. (iii) Gravel comprises mainly medium-sized ferricrete nodules.
0.60	Slightly moist yellow-orange-red <u>medium dense</u> to <u>dense</u> intact partially cemented **NODULAR FERRICRETE** in a grey-orange-brown sandy matrix. Pedogenic. Note: (i) Undulose contact with adjacent horizons.
0.80	Slightly moist to moist yellow-brown <u>loose</u> pinholed gravelly medium and coarse **SAND**. **Transported**. Note: (i) Tending to medium and coarse sandy fine GRAVEL.
1.20	Slightly moist orange-grey blotched yellow-brown and red-brown intact <u>dense</u> gravelly silty **SAND**. Residual.
2.00	As above, but <u>very dense</u>.

NOTES

1) Bulk disturbed sample 18590 between 0.0--0.6 mbgl.

2) Bulk disturbed sample 18591 between 0.75--1.2 mbgl.

CONTRACTOR : N/A
MACHINE : JCB 3DX Super TLB
DRILLED BY : N/A
PROFILED BY : S.T.

TYPE SET BY : *A. McDuling*
SETUP FILE : *STANDA~1.SET*

INCLINATION : Vertical
DIAM : Standard backet.
DATE : 25-27 Januaury 2022
DATE : 25-27 Januaury 2022

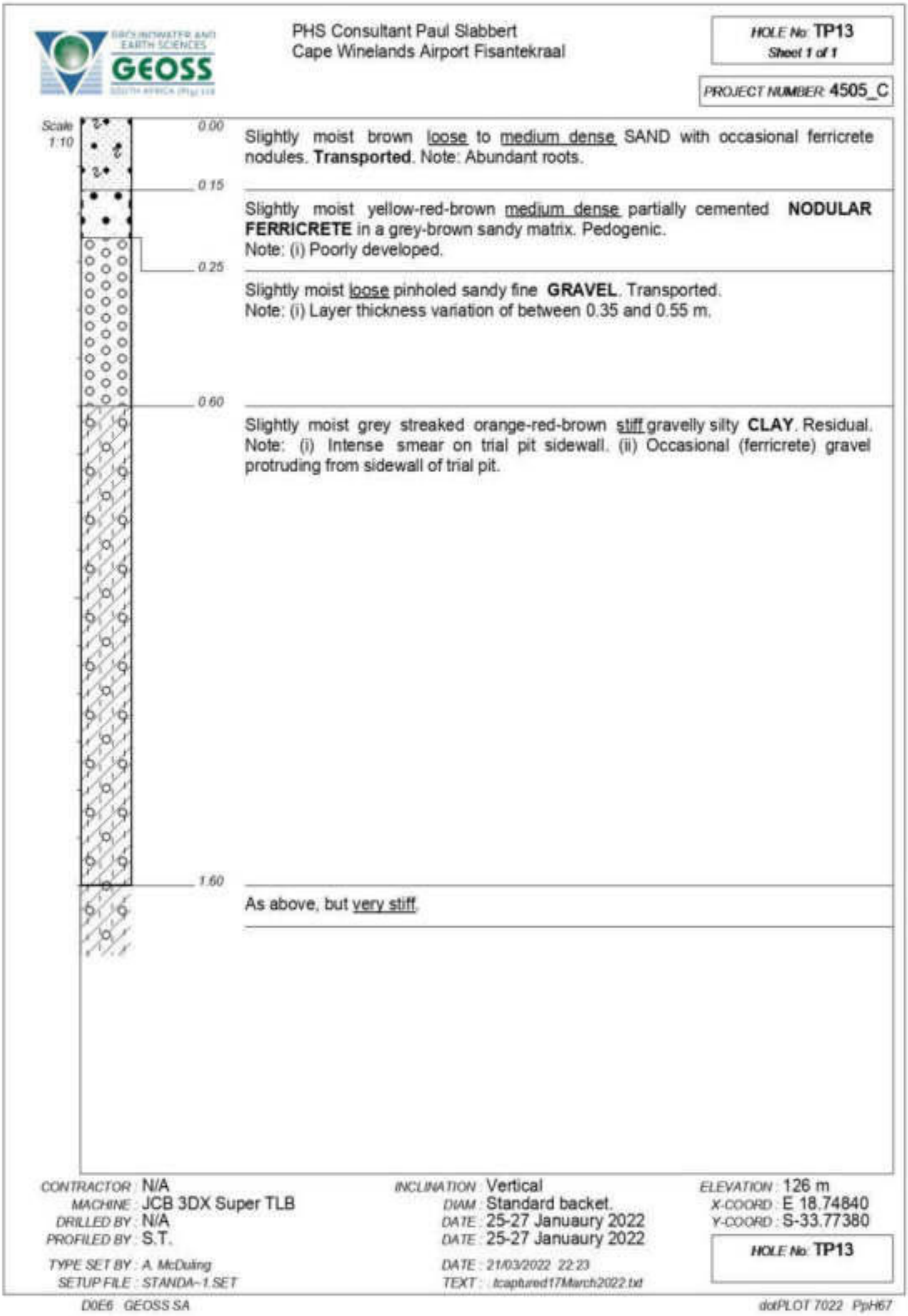
DATE : *21/03/2022 22:23*
TEXT : *.\captured17March2022.txt*

ELEVATION : 120 m
X-COORD : E 18.73600
Y-COORD : S-33.76280

HOLE No: **TP12**

D0E6 GEOSS SA

dotPLOT 7022 PpH67



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HOLE No: **TP13**
Sheet 1 of 1

PROJECT NUMBER: **4505_C**

0.00	Slightly moist brown loose to medium dense SAND with occasional ferricrete nodules. **Transported**. Note: Abundant roots.
0.15	Slightly moist yellow-red-brown medium dense partially cemented **NODULAR FERRICRETE** in a grey-brown sandy matrix. Pedogenic. Note: (i) Poorly developed.
0.25	Slightly moist loose pinholed sandy fine **GRAVEL**. Transported. Note: (i) Layer thickness variation of between 0.35 and 0.55 m.
0.60	Slightly moist grey streaked orange-red-brown stiff gravelly silty **CLAY**. Residual. Note: (i) Intense smear on trial pit sidewall. (ii) Occasional (ferricrete) gravel protruding from sidewall of trial pit.
1.60	As above, but very stiff.

CONTRACTOR : N/A
MACHINE : JCB 3DX Super TLB
DRILLED BY : N/A
PROFILED BY : S.T.

TYPE SET BY : A. McDuling
SETUP FILE : STANDA~1.SET

INCLINATION : Vertical
DIAM : Standard backet.
DATE : 25-27 Januaury 2022
DATE : 25-27 Januaury 2022

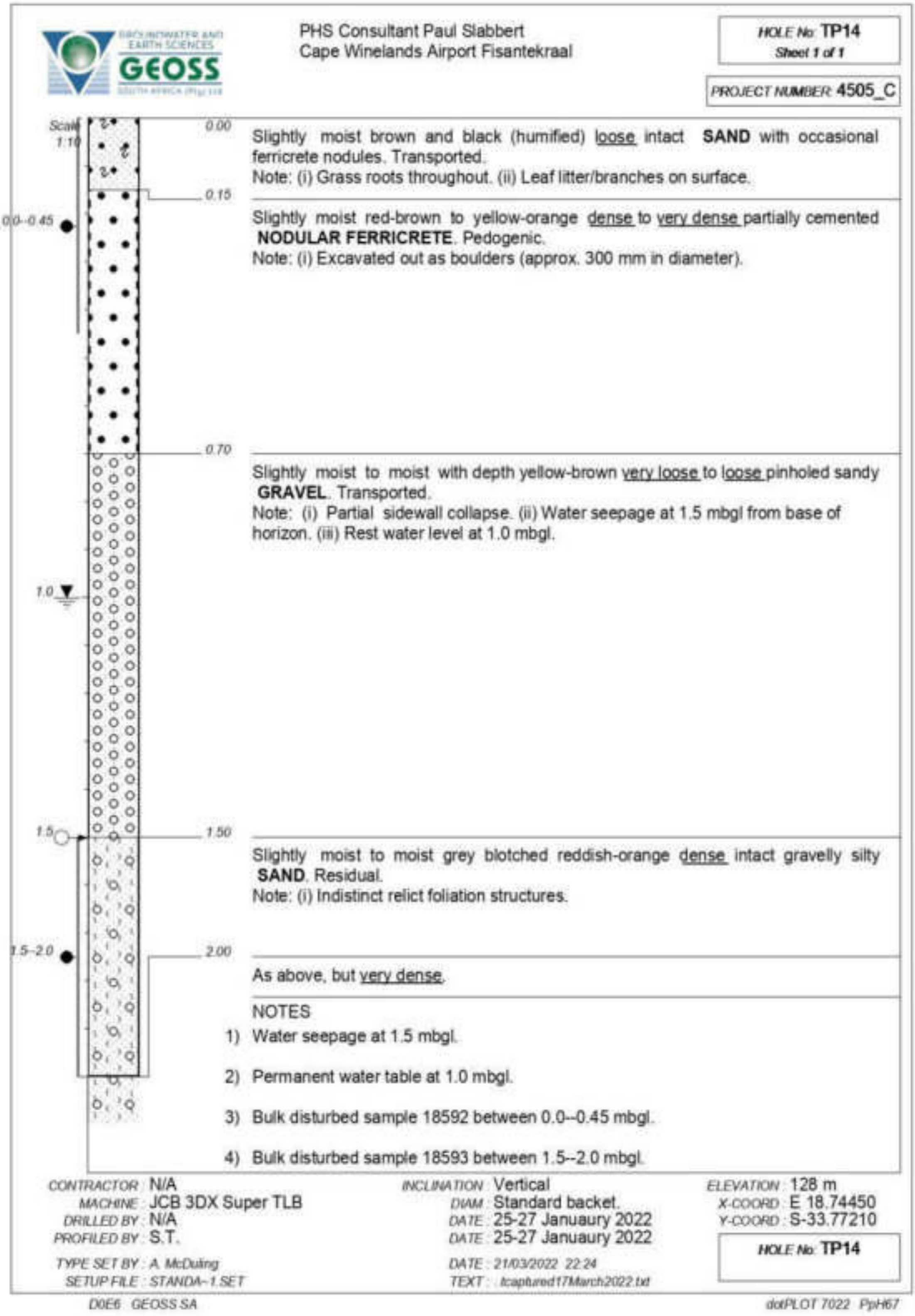
DATE : 21/03/2022 22:23
TEXT : ..tcaptured17March2022.txt

ELEVATION : 126 m
X-COORD : E 18.74840
Y-COORD : S-33.77380

HOLE No: **TP13**

D0E6 GEOSS SA

dotPLOT 7022 PpH67



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Cape Winelands Airport Fisantekraal

HOLE No: TP14
Sheet 1 of 1

PROJECT NUMBER: 4505_C

Depth	Description
0.00	Slightly moist brown and black (humified) loose intact **SAND** with occasional ferricrete nodules. Transported. Note: (i) Grass roots throughout. (ii) Leaf litter/branches on surface.
0.15	Slightly moist red-brown to yellow-orange dense to very dense partially cemented **NODULAR FERRICRETE**. Pedogenic. Note: (i) Excavated out as boulders (approx. 300 mm in diameter).
0.70	Slightly moist to moist with depth yellow-brown very loose to loose pinholed sandy **GRAVEL**. Transported. Note: (i) Partial sidewall collapse. (ii) Water seepage at 1.5 mbgl from base of horizon. (iii) Rest water level at 1.0 mbgl.
1.50	Slightly moist to moist grey blotched reddish-orange dense intact gravelly silty **SAND**. Residual. Note: (i) Indistinct relict foliation structures.
2.00	As above, but very dense.

NOTES

1) Water seepage at 1.5 mbgl.
2) Permanent water table at 1.0 mbgl.
3) Bulk disturbed sample 18592 between 0.0--0.45 mbgl.
4) Bulk disturbed sample 18593 between 1.5--2.0 mbgl.

CONTRACTOR : N/A
MACHINE : JCB 3DX Super TLB
DRILLED BY : N/A
PROFILED BY : S.T.
TYPE SET BY : A. McDuling
SETUP FILE : STANDA~1.SET

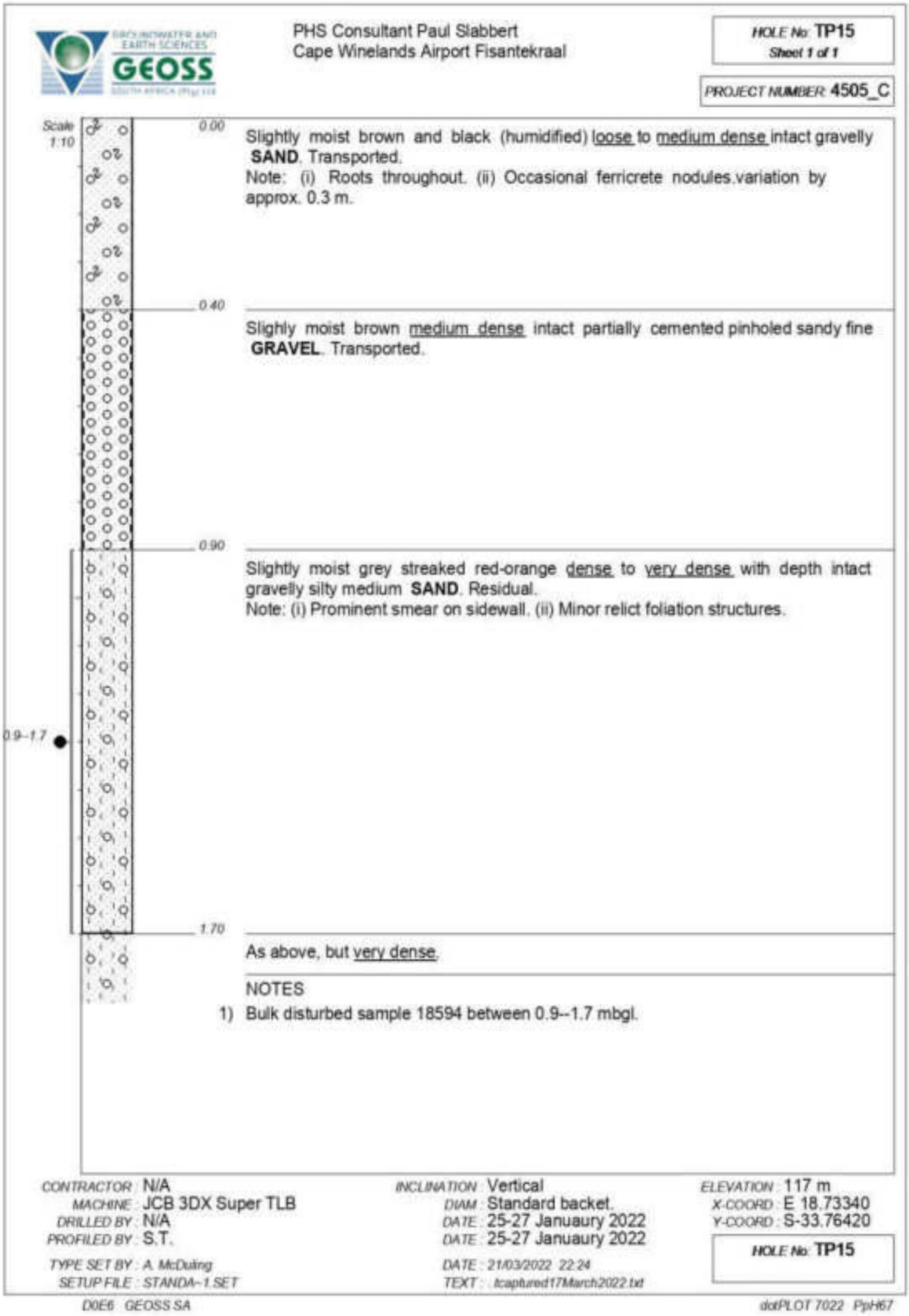
INCLINATION : Vertical
DIAM : Standard backet.
DATE : 25-27 Januaury 2022
DATE : 25-27 Januaury 2022
DATE : 21/03/2022 22:24
TEXT : ..\captured17March2022.txt

ELEVATION : 128 m
X-COORD : E 18.74450
Y-COORD : S-33.77210

HOLE No: TP14

D0E6 GEOSS SA

dotPLOT 7022 PpH67



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SOUTH AFRICA (Pty) Ltd

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Cape Winelands Airport Fisantekraal

HOLE No: **TP15**
Sheet 1 of 1

PROJECT NUMBER: **4505_C**

Scale 1:10

Depth	Description
0.00	Slightly moist brown and black (humidified) loose to medium dense intact gravelly **SAND**. Transported. Note: (i) Roots throughout. (ii) Occasional ferricrete nodules.variation by approx. 0.3 m.
0.40	Slighly moist brown medium dense intact partially cemented pinholed sandy fine **GRAVEL**. Transported.
0.90	Slightly moist grey streaked red-orange dense to very dense with depth intact gravelly silty medium **SAND**. Residual. Note: (i) Prominent smear on sidewall. (ii) Minor relict foliation structures.
1.70	As above, but very dense.

0.9--1.7 ●

NOTES

1) Bulk disturbed sample 18594 between 0.9--1.7 mbgl.

CONTRACTOR : N/A
MACHINE : JCB 3DX Super TLB
DRILLED BY : N/A
PROFILED BY : S.T.
TYPE SET BY : A. McDuling
SETUP FILE : STANDA~1.SET

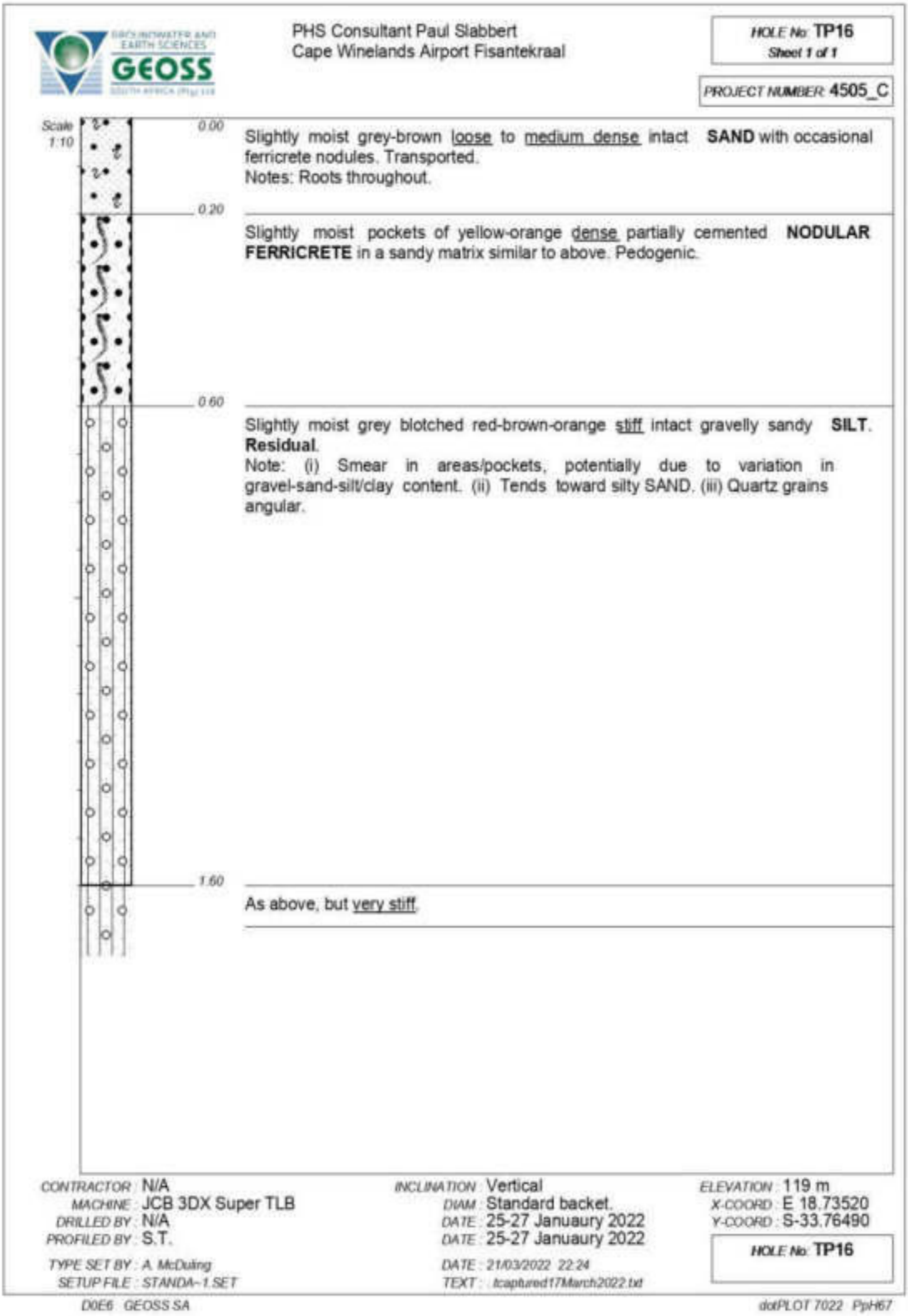
INCLINATION : Vertical
DIAM : Standard backet.
DATE : 25-27 Januaury 2022
DATE : 25-27 Januaury 2022
DATE : 21/03/2022 22:24
TEXT : ..\captured17March2022.txt

ELEVATION : 117 m
X-COORD : E 18.73340
Y-COORD : S-33.76420

HOLE No: **TP15**

D0E6 GEOSS SA

dotPLOT 7022 PpH67



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HOLE No: **TP16**
Sheet 1 of 1

PROJECT NUMBER: **4505_C**

Scale 1:10

0.00	Slightly moist grey-brown <u>loose</u> to <u>medium dense</u> intact **SAND** with occasional ferricrete nodules. Transported. Notes: Roots throughout.
0.20	Slightly moist pockets of yellow-orange <u>dense</u> partially cemented **NODULAR FERRICRETE** in a sandy matrix similar to above. Pedogenic.
0.60	Slightly moist grey blotched red-brown-orange <u>stiff</u> intact gravelly sandy **SILT. Residual.** Note: (i) Smear in areas/pockets, potentially due to variation in gravel-sand-silt/clay content. (ii) Tends toward silty SAND. (iii) Quartz grains angular.
1.60	As above, but <u>very stiff</u>.

CONTRACTOR : N/A
MACHINE : JCB 3DX Super TLB
DRILLED BY : N/A
PROFILED BY : S.T.
TYPE SET BY : A. McDuling
SETUP FILE : STANDA~1.SET

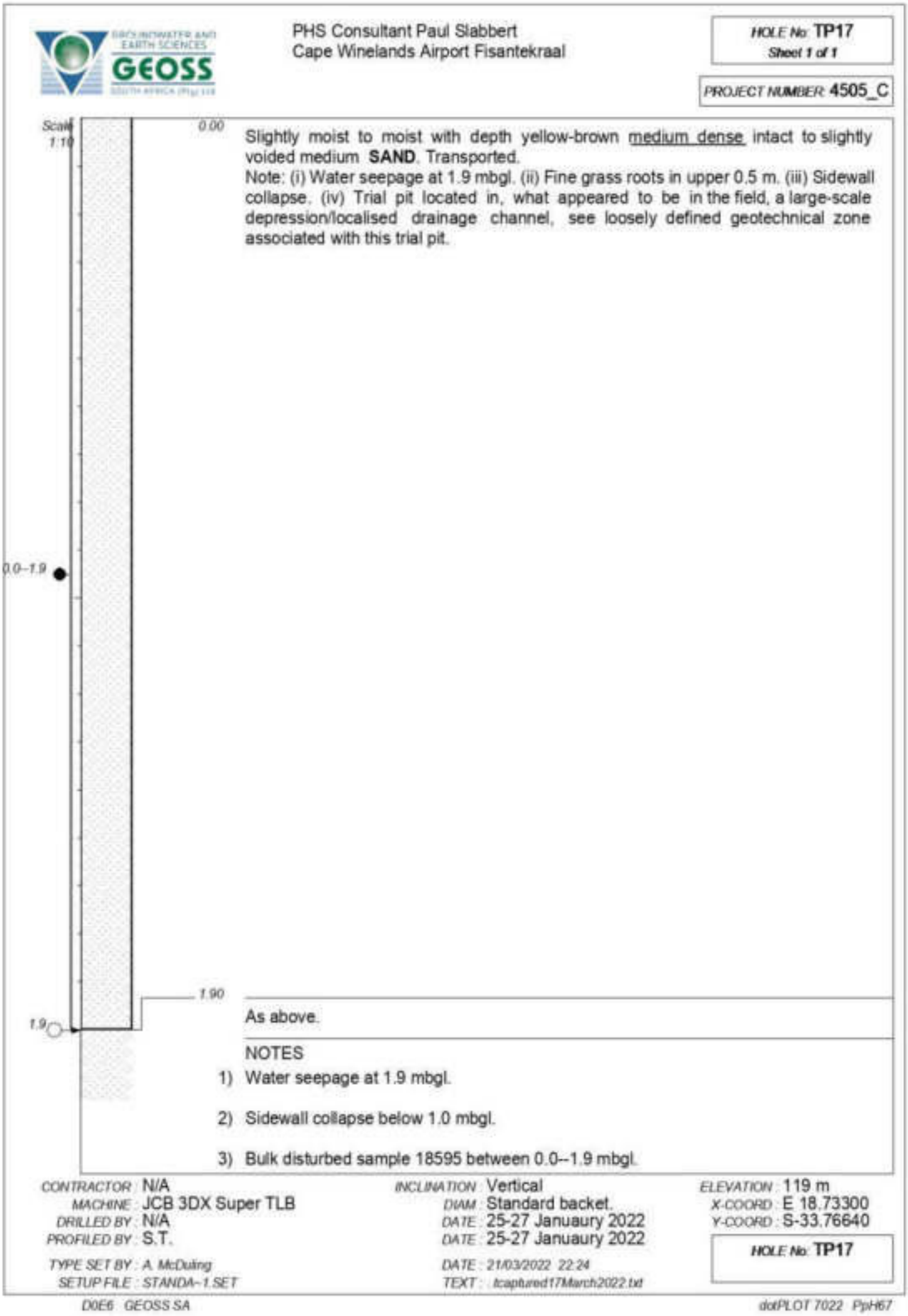
INCLINATION : Vertical
DIAM : Standard backet.
DATE : 25-27 Januaury 2022
DATE : 25-27 Januaury 2022
DATE : 21/03/2022 22:24
TEXT : ..\captured17March2022.txt

ELEVATION : 119 m
X-COORD : E 18.73520
Y-COORD : S-33.76490

HOLE No: **TP16**

D0E6 GEOSS SA

dotPLOT 7022 PpH67



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Cape Winelands Airport Fisantekraal

HOLE No: **TP17**
Sheet 1 of 1

PROJECT NUMBER: **4505_C**

0.00 Slightly moist to moist with depth yellow-brown medium dense intact to slightly voided medium **SAND**. Transported.
Note: (i) Water seepage at 1.9 mbgl. (ii) Fine grass roots in upper 0.5 m. (iii) Sidewall collapse. (iv) Trial pit located in, what appeared to be in the field, a large-scale depression/localised drainage channel, see loosely defined geotechnical zone associated with this trial pit.

1.90 As above.

NOTES
1) Water seepage at 1.9 mbgl.
2) Sidewall collapse below 1.0 mbgl.
3) Bulk disturbed sample 18595 between 0.0--1.9 mbgl.

CONTRACTOR : N/A
MACHINE : JCB 3DX Super TLB
DRILLED BY : N/A
PROFILED BY : S.T.
TYPE SET BY : A. McDuling
SETUP FILE : STANDA~1.SET

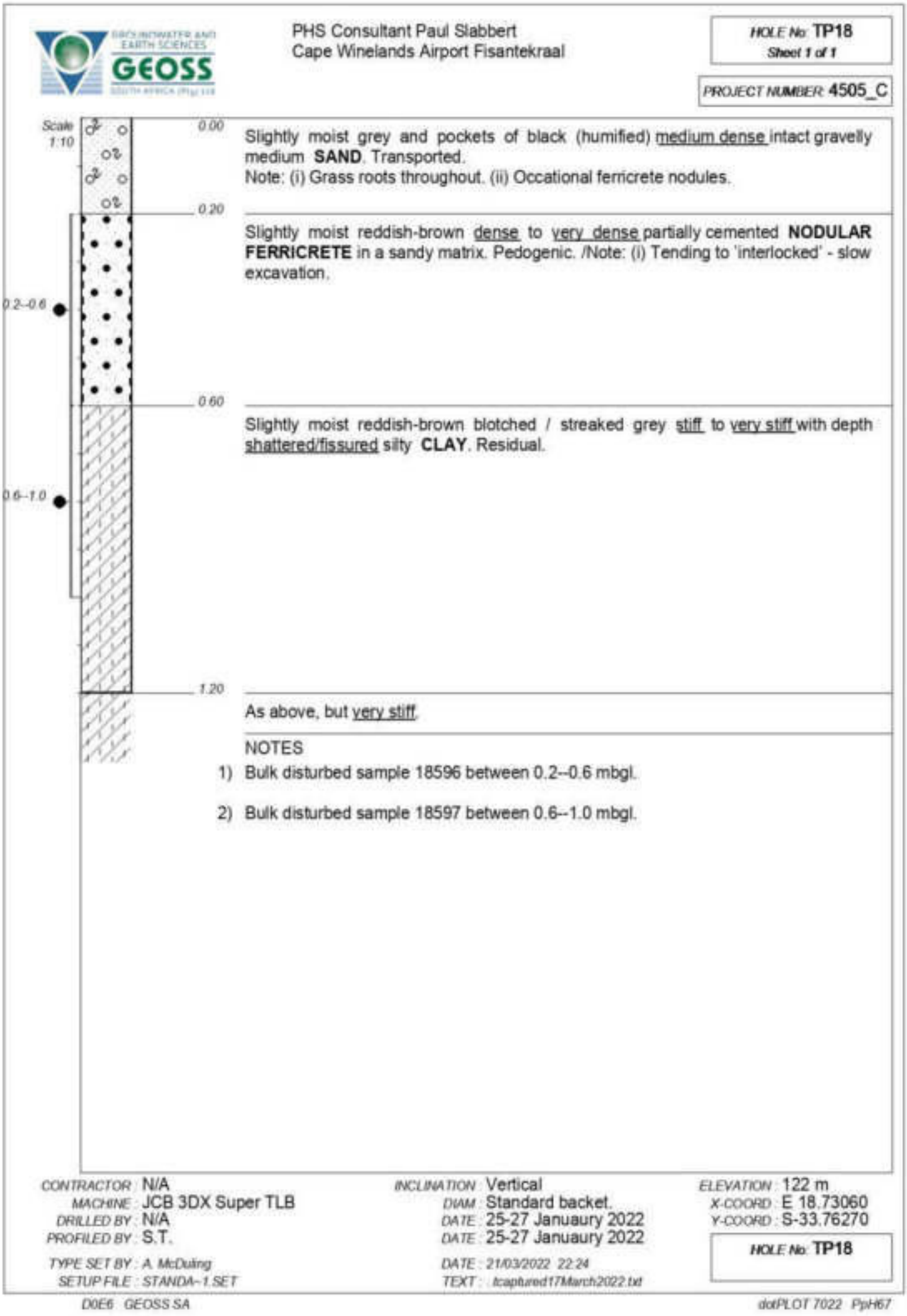
INCLINATION : Vertical
DIAM : Standard backet.
DATE : 25-27 Januaury 2022
DATE : 25-27 Januaury 2022
DATE : 21/03/2022 22:24
TEXT : ..lcaptured17March2022.txt

ELEVATION : 119 m
X-COORD : E 18.73300
Y-COORD : S-33.76640

HOLE No: **TP17**

D0E6 GEOSS SA

dotPLOT 7022 PpH67



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HOLE No: **TP18**
Sheet 1 of 1

PROJECT NUMBER: **4505_C**

0.00	Slightly moist grey and pockets of black (humified) medium dense intact gravelly medium **SAND**. Transported. Note: (i) Grass roots throughout. (ii) Occational ferricrete nodules.
0.20	Slightly moist reddish-brown dense to very dense partially cemented **NODULAR FERRICRETE** in a sandy matrix. Pedogenic. /Note: (i) Tending to 'interlocked' - slow excavation.
0.60	Slightly moist reddish-brown blotched / streaked grey stiff to very stiff with depth shattered/fissured silty **CLAY**. Residual.
1.20	As above, but very stiff.

NOTES

1) Bulk disturbed sample 18596 between 0.2--0.6 mbgl.

2) Bulk disturbed sample 18597 between 0.6--1.0 mbgl.

CONTRACTOR : N/A
MACHINE : JCB 3DX Super TLB
DRILLED BY : N/A
PROFILED BY : S.T.

TYPE SET BY : A. McDuling
SETUP FILE : STANDA~1.SET

INCLINATION : Vertical
DIAM : Standard backet.
DATE : 25-27 Januaury 2022
DATE : 25-27 Januaury 2022

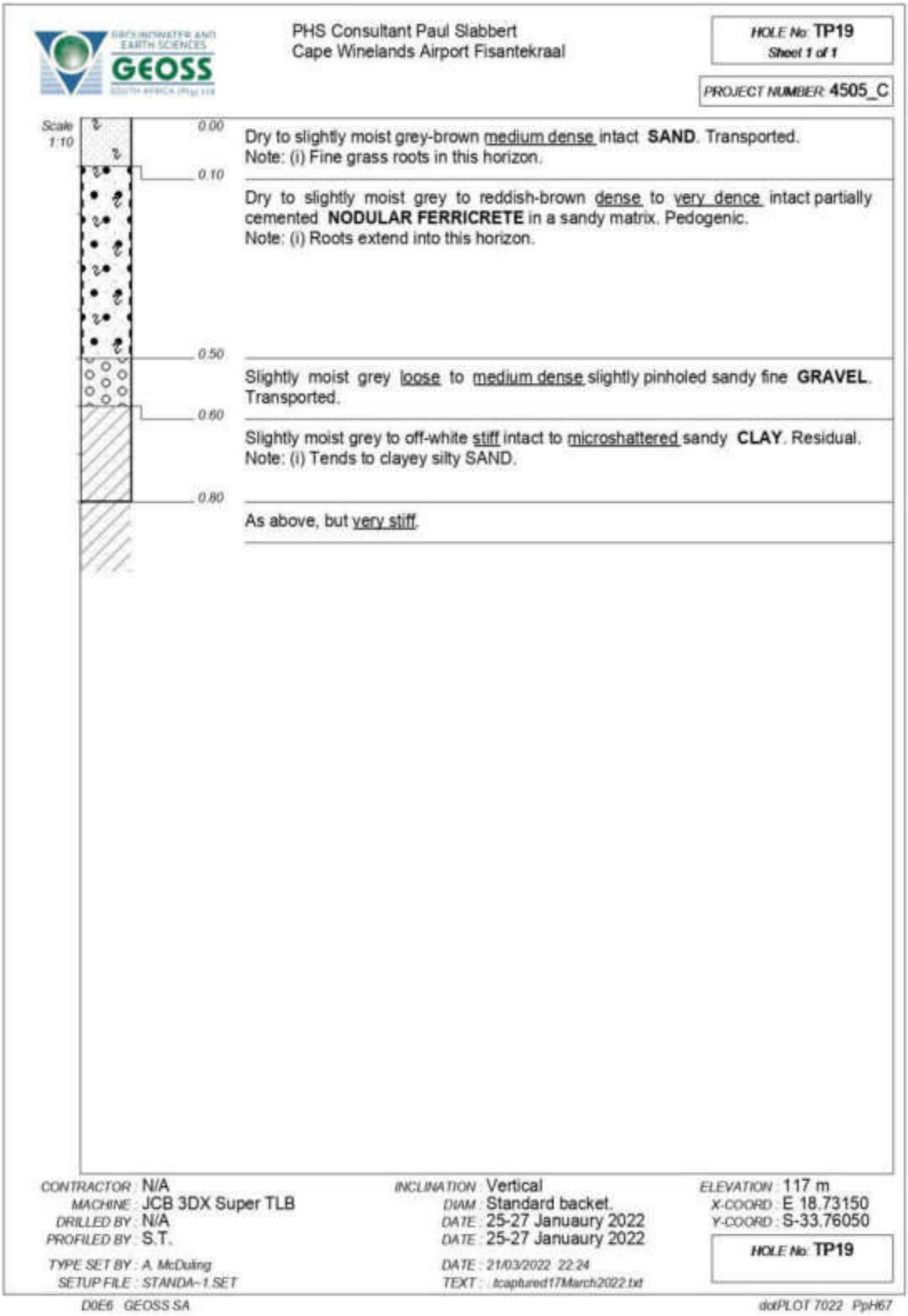
DATE : 21/03/2022 22:24
TEXT : ..\captured17March2022.txt

ELEVATION : 122 m
X-COORD : E 18.73060
Y-COORD : S-33.76270

HOLE No: **TP18**

D0E6 GEOSS SA

dotPLOT 7022 PpH67



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Cape Winelands Airport Fisantekraal

HOLE No: **TP19**
Sheet 1 of 1

PROJECT NUMBER: **4505_C**

Scale
1:10

0.00	Dry to slightly moist grey-brown medium dense intact **SAND**. Transported. Note: (i) Fine grass roots in this horizon.
0.10	Dry to slightly moist grey to reddish-brown dense to very dence intact partially cemented **NODULAR FERRICRETE** in a sandy matrix. Pedogenic. Note: (i) Roots extend into this horizon.
0.50	Slightly moist grey loose to medium dense slightly pinholed sandy fine **GRAVEL**. Transported.
0.60	Slightly moist grey to off-white stiff intact to microshattered sandy **CLAY**. Residual. Note: (i) Tends to clayey silty SAND.
0.80	As above, but very stiff.

CONTRACTOR : N/A
MACHINE : JCB 3DX Super TLB
DRILLED BY : N/A
PROFILED BY : S.T.
TYPE SET BY : A. McDuling
SETUP FILE : STANDA~1.SET

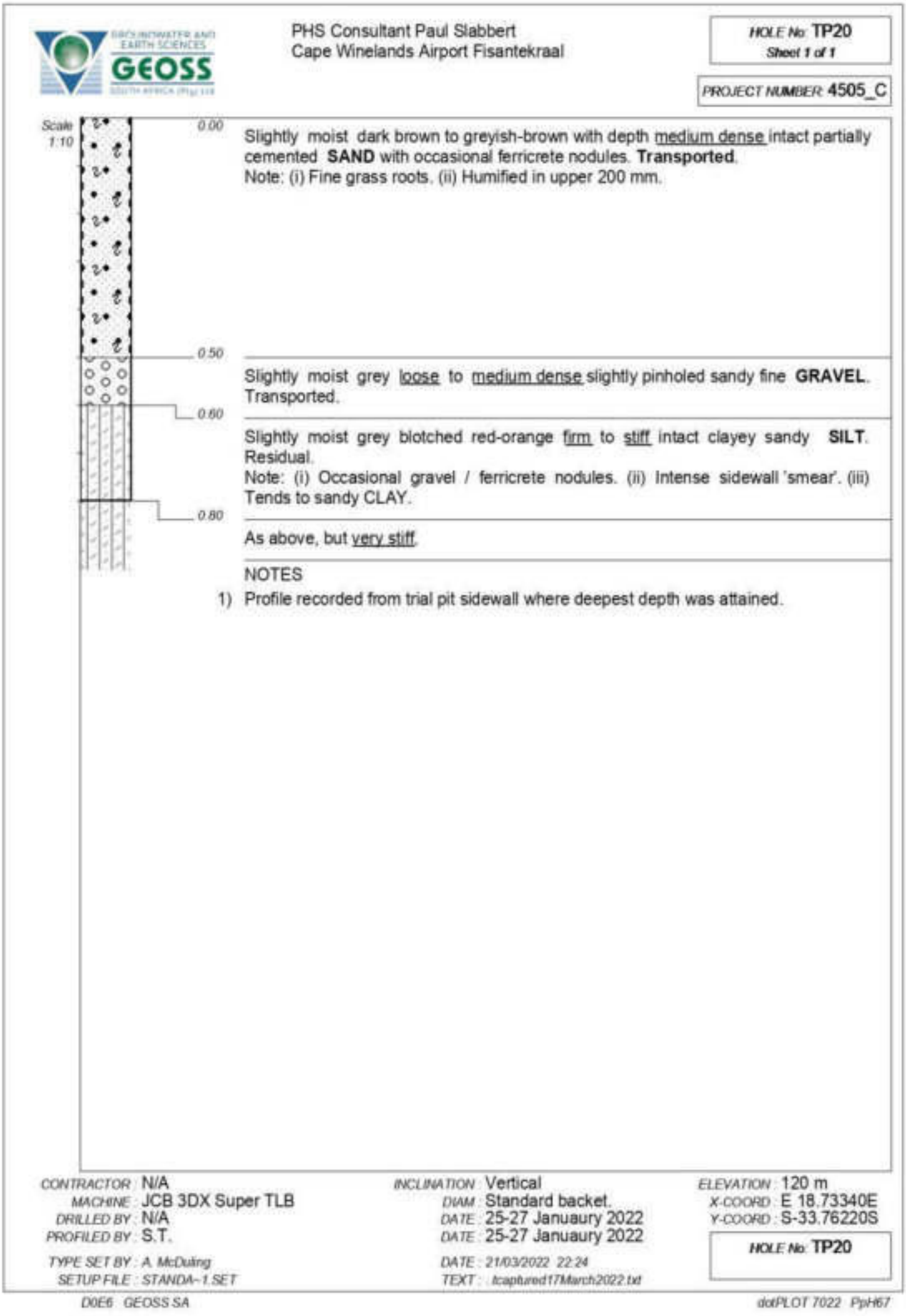
INCLINATION : Vertical
DIAM : Standard backet.
DATE : 25-27 Januaury 2022
DATE : 25-27 Januaury 2022
DATE : 21/03/2022 22:24
TEXT : ..\captured17March2022.txt

ELEVATION : 117 m
X-COORD : E 18.73150
Y-COORD : S-33.76050

HOLE No: **TP19**

D0E6 GEOSS SA

dotPLOT 7022 PpH67



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Cape Winelands Airport Fisantekraal

HOLE No: **TP20**
Sheet 1 of 1

PROJECT NUMBER: **4505_C**

Scale
1:10

0.00
Slightly moist dark brown to greyish-brown with depth medium dense intact partially cemented **SAND** with occasional ferricrete nodules. **Transported**.
Note: (i) Fine grass roots. (ii) Humified in upper 200 mm.

0.50
Slightly moist grey loose to medium dense slightly pinholed sandy fine **GRAVEL**. Transported.

0.60
Slightly moist grey blotched red-orange firm to stiff intact clayey sandy **SILT**. Residual.
Note: (i) Occasional gravel / ferricrete nodules. (ii) Intense sidewall 'smear'. (iii) Tends to sandy CLAY.

0.80
As above, but very stiff.

NOTES

1) Profile recorded from trial pit sidewall where deepest depth was attained.

CONTRACTOR : N/A
MACHINE : JCB 3DX Super TLB
DRILLED BY : N/A
PROFILED BY : S.T.
TYPE SET BY : A. McDuling
SETUP FILE : STANDA~1.SET

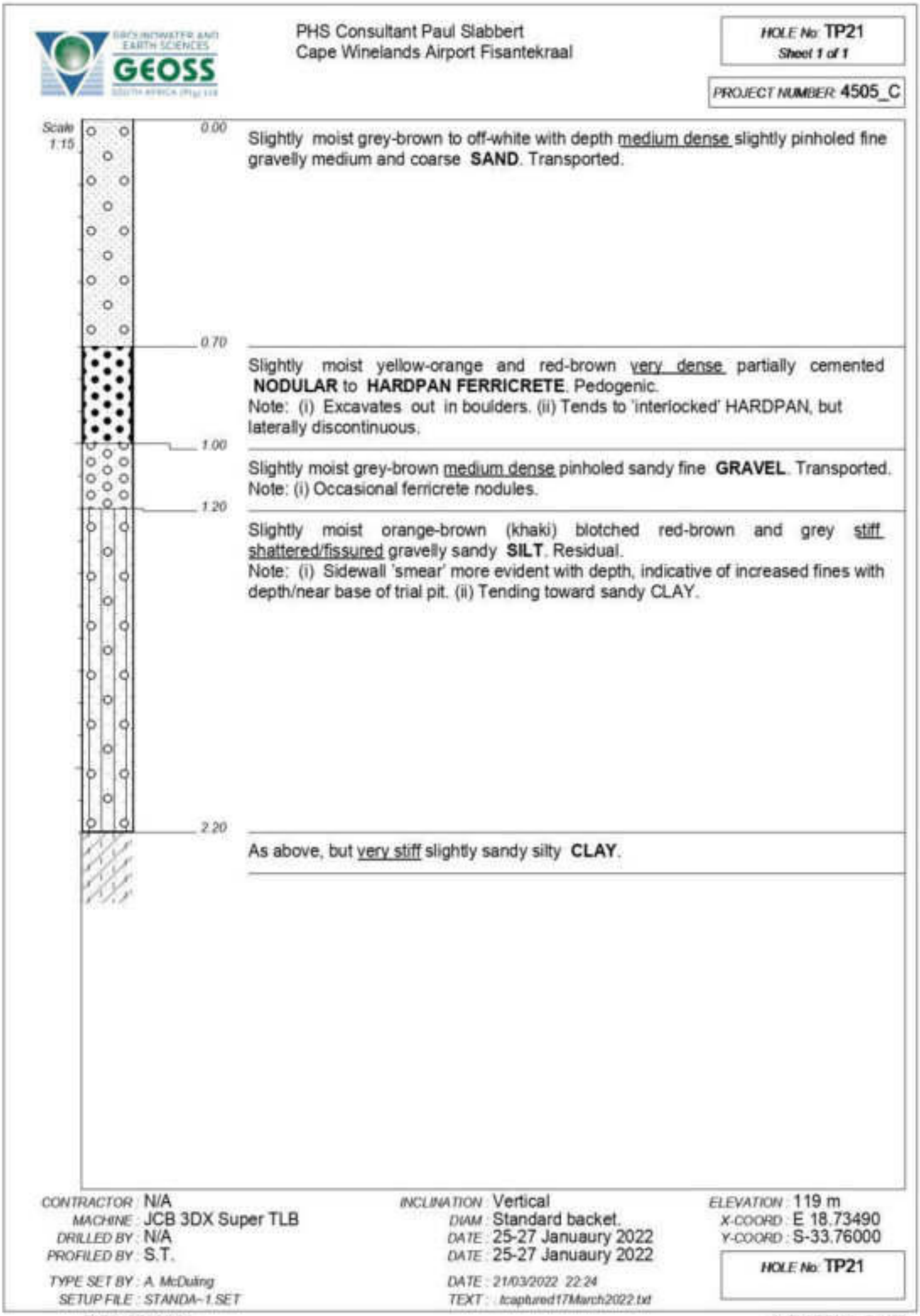
INCLINATION : Vertical
DIAM : Standard backet.
DATE : 25-27 Januaury 2022
DATE : 25-27 Januaury 2022
DATE : 21/03/2022 22:24
TEXT : ..\captured17March2022.txt

ELEVATION : 120 m
X-COORD : E 18.73340E
Y-COORD : S-33.76220S

HOLE No: **TP20**

D0E6 GEOSS SA

dotPLOT 7022 PpH67



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Cape Winelands Airport Fisantekraal

HOLE No: **TP21**
Sheet 1 of 1

PROJECT NUMBER: **4505_C**

Scale 1:15

0.00	Slightly moist grey-brown to off-white with depth medium dense slightly pinholed fine gravelly medium and coarse **SAND**. Transported.
0.70	Slightly moist yellow-orange and red-brown very dense partially cemented **NODULAR** to **HARDPAN FERRICRETE**. Pedogenic. Note: (i) Excavates out in boulders. (ii) Tends to 'interlocked' HARDPAN, but laterally discontinuous.
1.00	Slightly moist grey-brown medium dense pinholed sandy fine **GRAVEL**. Transported. Note: (i) Occasional ferricrete nodules.
1.20	Slightly moist orange-brown (khaki) blotched red-brown and grey stiff shattered/fissured gravelly sandy **SILT**. Residual. Note: (i) Sidewall 'smear' more evident with depth, indicative of increased fines with depth/near base of trial pit. (ii) Tending toward sandy CLAY.
2.20	As above, but very stiff slightly sandy silty **CLAY**.

CONTRACTOR: N/A
MACHINE: JCB 3DX Super TLB
DRILLED BY: N/A
PROFILED BY: S.T.
TYPE SET BY: A. McDuling
SETUP FILE: STANDA~1.SET

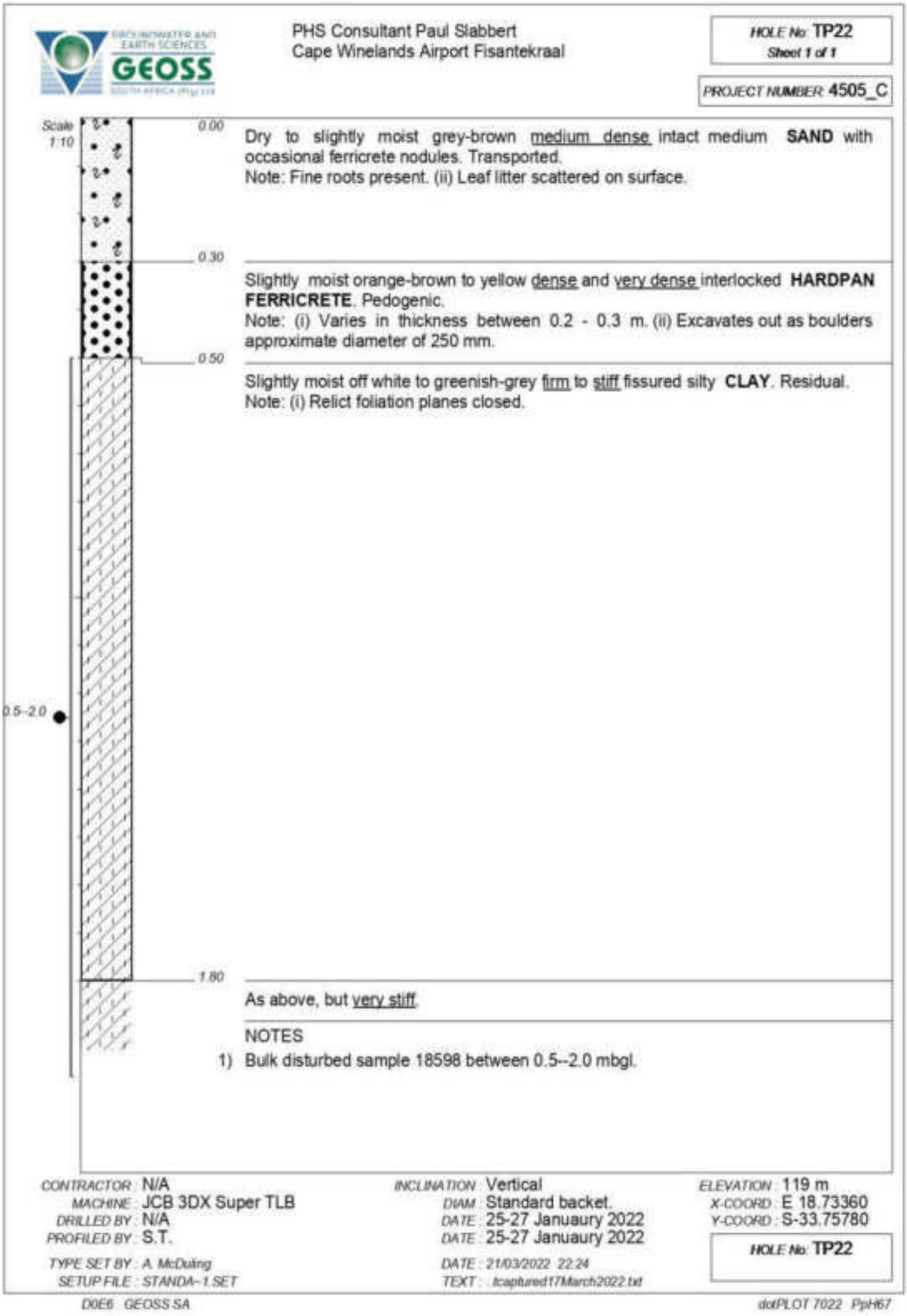
INCLINATION: Vertical
DIAM: Standard backet.
DATE: 25-27 Januaury 2022
DATE: 25-27 Januaury 2022
DATE: 21/03/2022 22:24
TEXT: ..tcaptured17March2022.txt

ELEVATION: 119 m
X-COORD: E 18.73490
Y-COORD: S-33.76000

HOLE No: **TP21**

D0E6 GEOSS SA

dotPLOT 7022 PpH67



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Cape Winelands Airport Fisantekraal

HOLE No: **TP22**
Sheet 1 of 1

PROJECT NUMBER: **4505_C**

Scale 1:10

Depth	Description
0.00	Dry to slightly moist grey-brown medium dense intact medium **SAND** with occasional ferricrete nodules. Transported. Note: Fine roots present. (ii) Leaf litter scattered on surface.
0.30	Slightly moist orange-brown to yellow dense and very dense interlocked **HARDPAN FERRICRETE**. Pedogenic. Note: (i) Varies in thickness between 0.2 - 0.3 m. (ii) Excavates out as boulders approximate diameter of 250 mm.
0.50	Slightly moist off white to greenish-grey firm to stiff fissured silty **CLAY**. Residual. Note: (i) Relict foliation planes closed.
1.80	As above, but very stiff.

0.5–2.0 ●

NOTES

1) Bulk disturbed sample 18598 between 0.5--2.0 mbgl.

CONTRACTOR : N/A
MACHINE : JCB 3DX Super TLB
DRILLED BY : N/A
PROFILED BY : S.T.
TYPE SET BY : A. McDuling
SETUP FILE : STANDA~1.SET

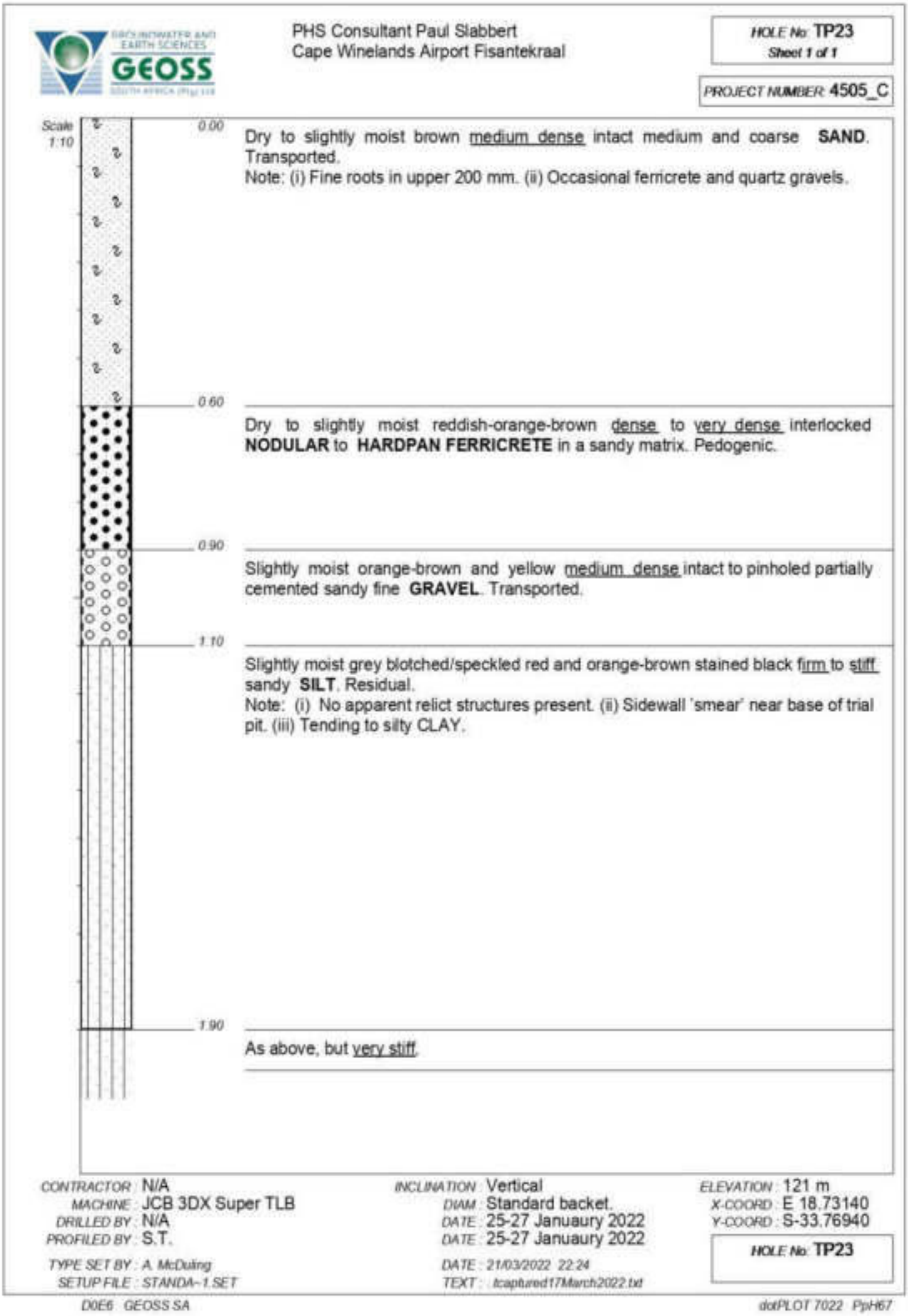
INCLINATION : Vertical
DIAM : Standard backet.
DATE : 25-27 Januaury 2022
DATE : 25-27 Januaury 2022
DATE : 21/03/2022 22:24
TEXT : ..tcaptured17March2022.txt

ELEVATION : 119 m
X-COORD : E 18.73360
Y-COORD : S-33.75780

HOLE No: **TP22**

D0E6 GEOSS SA

dotPLOT 7022 PpH67



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HOLE No: **TP23**
Sheet 1 of 1

PROJECT NUMBER: **4505_C**

Scale 1:10

0.00	Dry to slightly moist brown <u>medium dense</u> intact medium and coarse **SAND**. Transported. Note: (i) Fine roots in upper 200 mm. (ii) Occasional ferricrete and quartz gravels.
0.60	Dry to slightly moist reddish-orange-brown <u>dense</u> to <u>very dense</u> interlocked **NODULAR** to **HARDPAN FERRICRETE** in a sandy matrix. Pedogenic.
0.90	Slightly moist orange-brown and yellow <u>medium dense</u> intact to pinholed partially cemented sandy fine **GRAVEL**. Transported.
1.10	Slightly moist grey blotched/speckled red and orange-brown stained black <u>firm</u> to <u>stiff</u> sandy **SILT**. Residual. Note: (i) No apparent relict structures present. (ii) Sidewall 'smear' near base of trial pit. (iii) Tending to silty CLAY.
1.90	As above, but <u>very stiff</u>.

CONTRACTOR : N/A
MACHINE : JCB 3DX Super TLB
DRILLED BY : N/A
PROFILED BY : S.T.
TYPE SET BY : A. McDuling
SETUP FILE : STANDA~1.SET

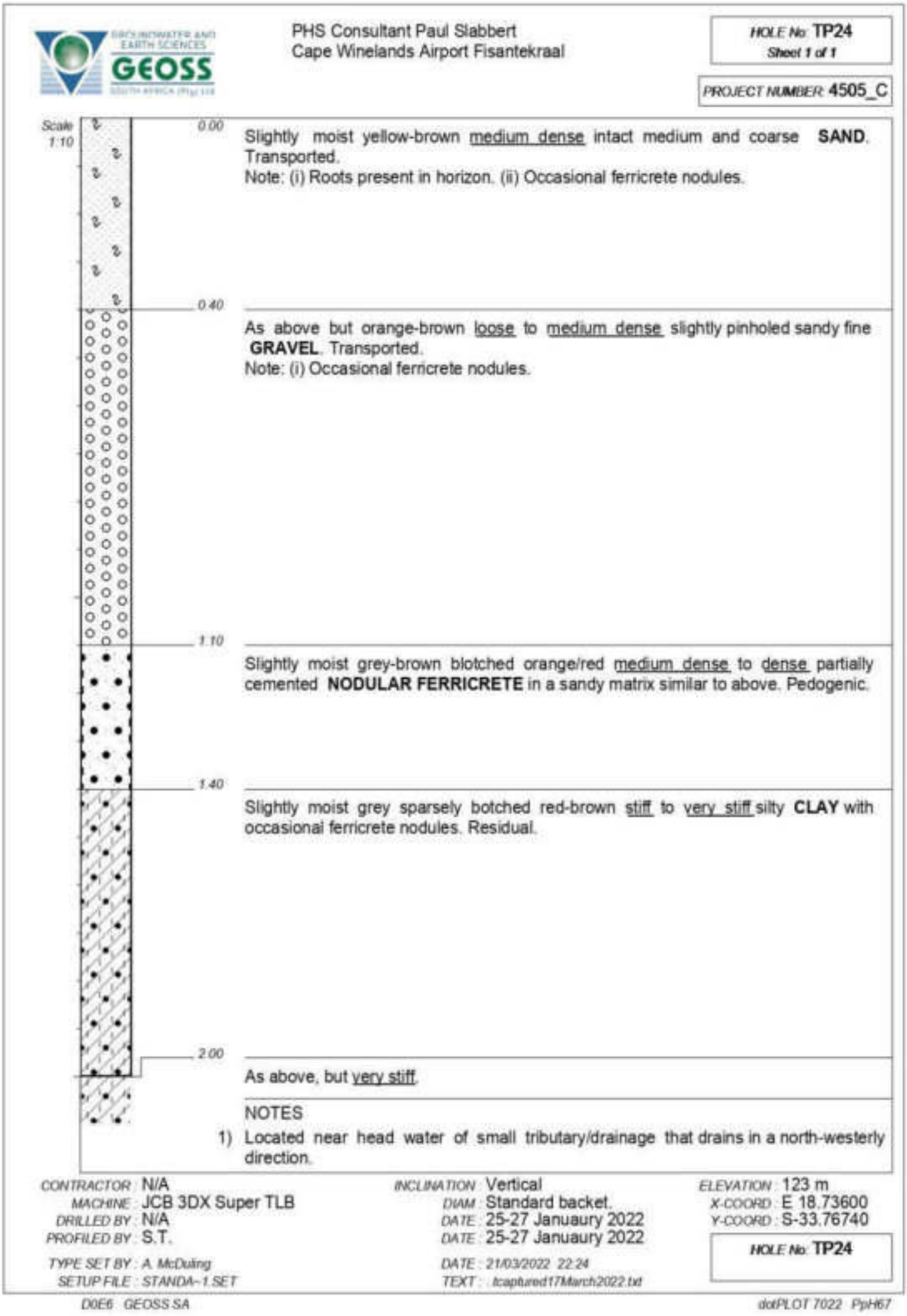
INCLINATION : Vertical
DIAM : Standard backet.
DATE : 25-27 Januaury 2022
DATE : 25-27 Januaury 2022
DATE : 21/03/2022 22:24
TEXT : ..\captured17March2022.txt

ELEVATION : 121 m
X-COORD : E 18.73140
Y-COORD : S-33.76940

HOLE No: **TP23**

D0E6 GEOSS SA

dotPLOT 7022 PpH67



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HOLE No: **TP24**
Sheet 1 of 1

PROJECT NUMBER: **4505_C**

Scale 1:10

Depth	Description
0.00	Slightly moist yellow-brown medium dense intact medium and coarse **SAND**. Transported. Note: (i) Roots present in horizon. (ii) Occasional ferricrete nodules.
0.40	As above but orange-brown loose to medium dense slightly pinholed sandy fine **GRAVEL**. Transported. Note: (i) Occasional ferricrete nodules.
1.10	Slightly moist grey-brown blotched orange/red medium dense to dense partially cemented **NODULAR FERRICRETE** in a sandy matrix similar to above. Pedogenic.
1.40	Slightly moist grey sparsely botched red-brown stiff to very stiff silty **CLAY** with occasional ferricrete nodules. Residual.
2.00	As above, but very stiff.

NOTES

1) Located near head water of small tributary/drainage that drains in a north-westerly direction.

CONTRACTOR: N/A
MACHINE: JCB 3DX Super TLB
DRILLED BY: N/A
PROFILED BY: S.T.
TYPE SET BY: A. McDuling
SETUP FILE: STANDA~1.SET

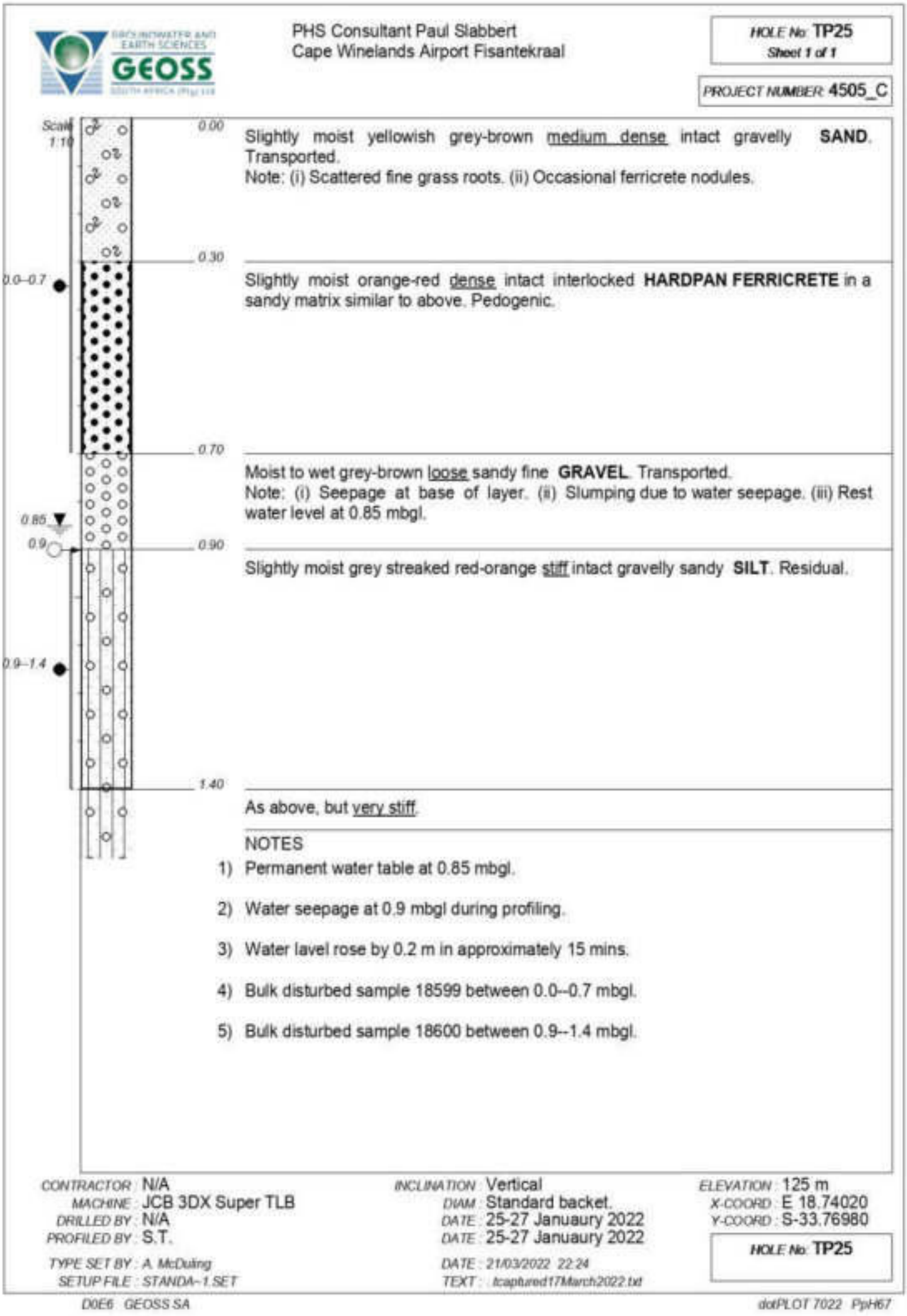
INCLINATION: Vertical
DIAM: Standard backet.
DATE: 25-27 Januaury 2022
DATE: 25-27 Januaury 2022
DATE: 21/03/2022 22:24
TEXT: ..\captured17March2022.txt

ELEVATION: 123 m
X-COORD: E 18.73600
Y-COORD: S-33.76740

HOLE No: **TP24**

D0E6 GEOSS SA

dotPLOT 7022 PpH67



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

PROJECT NUMBER: **4505_C**

0.00

Slightly moist yellowish grey-brown medium dense intact gravelly **SAND**. Transported.
Note: (i) Scattered fine grass roots. (ii) Occasional ferricrete nodules.

0.30

Slightly moist orange-red dense intact interlocked **HARDPAN FERRICRETE** in a sandy matrix similar to above. Pedogenic.

0.70

Moist to wet grey-brown loose sandy fine **GRAVEL**. Transported.
Note: (i) Seepage at base of layer. (ii) Slumping due to water seepage. (iii) Rest water level at 0.85 mbgl.

0.90

Slightly moist grey streaked red-orange stiff intact gravelly sandy **SILT**. Residual.

1.40

As above, but very stiff.

NOTES

1) Permanent water table at 0.85 mbgl.
2) Water seepage at 0.9 mbgl during profiling.
3) Water lavel rose by 0.2 m in approximately 15 mins.
4) Bulk disturbed sample 18599 between 0.0--0.7 mbgl.
5) Bulk disturbed sample 18600 between 0.9--1.4 mbgl.

CONTRACTOR : N/A
MACHINE : JCB 3DX Super TLB
DRILLED BY : N/A
PROFILED BY : S.T.
TYPE SET BY : A. McDuling
SETUP FILE : STANDA~1.SET

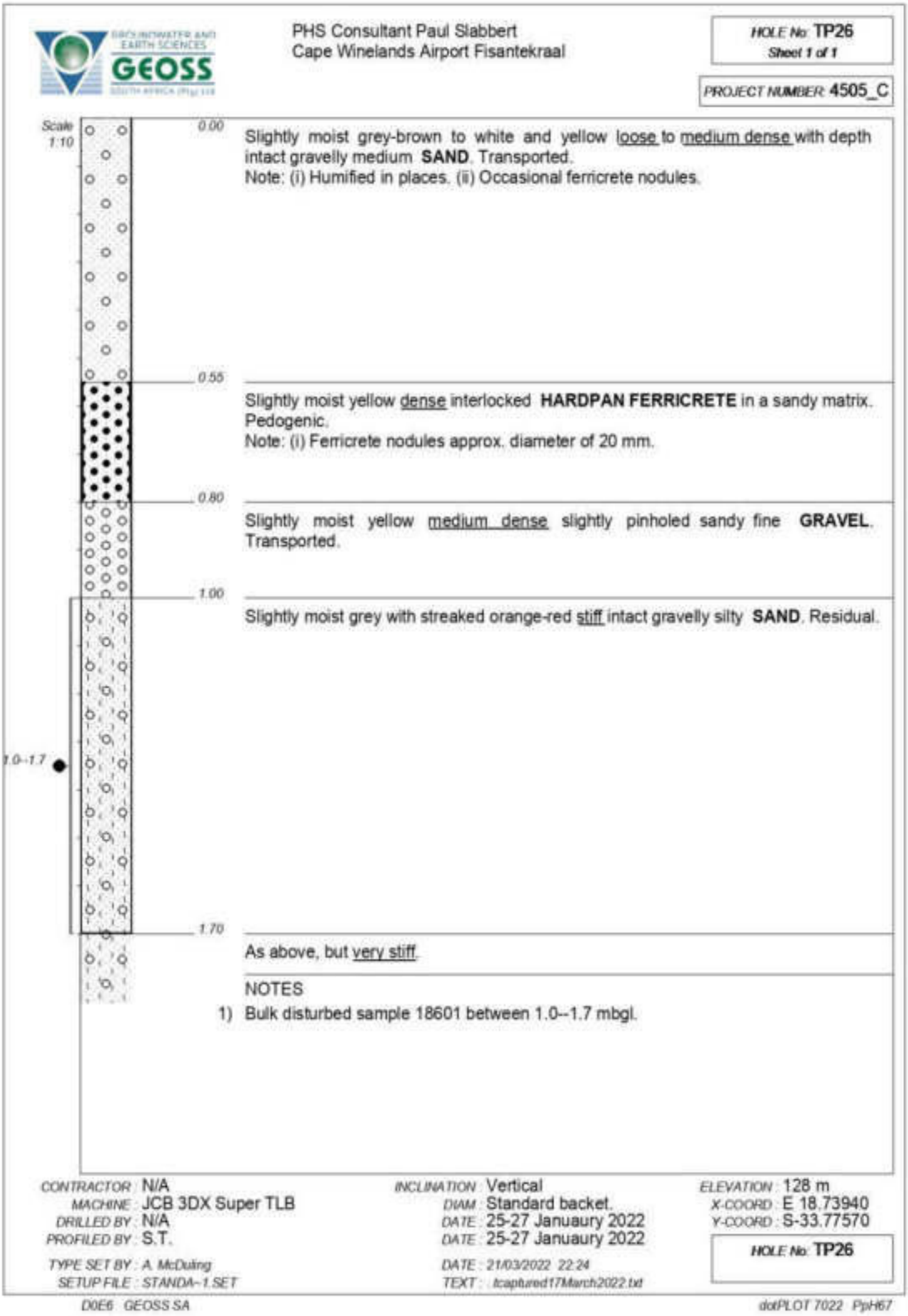
INCLINATION : Vertical
DIAM : Standard backet.
DATE : 25-27 Januaury 2022
DATE : 25-27 Januaury 2022
DATE : 21/03/2022 22:24
TEXT : ..\captured17March2022.txt

ELEVATION : 125 m
X-COORD : E 18.74020
Y-COORD : S-33.76980

HOLE No: **TP25**

D0E6 GEOSS SA

dotPLOT 7022 PpH67



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HOLE No: **TP26**
Sheet 1 of 1

PROJECT NUMBER: **4505_C**

Scale 1:10

0.00	Slightly moist grey-brown to white and yellow loose to medium dense with depth intact gravelly medium **SAND**. Transported. Note: (i) Humified in places. (ii) Occasional ferricrete nodules.
0.55	Slightly moist yellow dense interlocked **HARDPAN FERRICRETE** in a sandy matrix. Pedogenic. Note: (i) Ferricrete nodules approx. diameter of 20 mm.
0.80	Slightly moist yellow medium dense slightly pinholed sandy fine **GRAVEL**. Transported.
1.00	Slightly moist grey with streaked orange-red stiff intact gravelly silty **SAND**. Residual.
1.70	As above, but very stiff.

1.0--1.7 ●

NOTES

1) Bulk disturbed sample 18601 between 1.0--1.7 mbgl.

CONTRACTOR : N/A
MACHINE : JCB 3DX Super TLB
DRILLED BY : N/A
PROFILED BY : S.T.
TYPE SET BY : A. McDuling
SETUP FILE : STANDA~1.SET

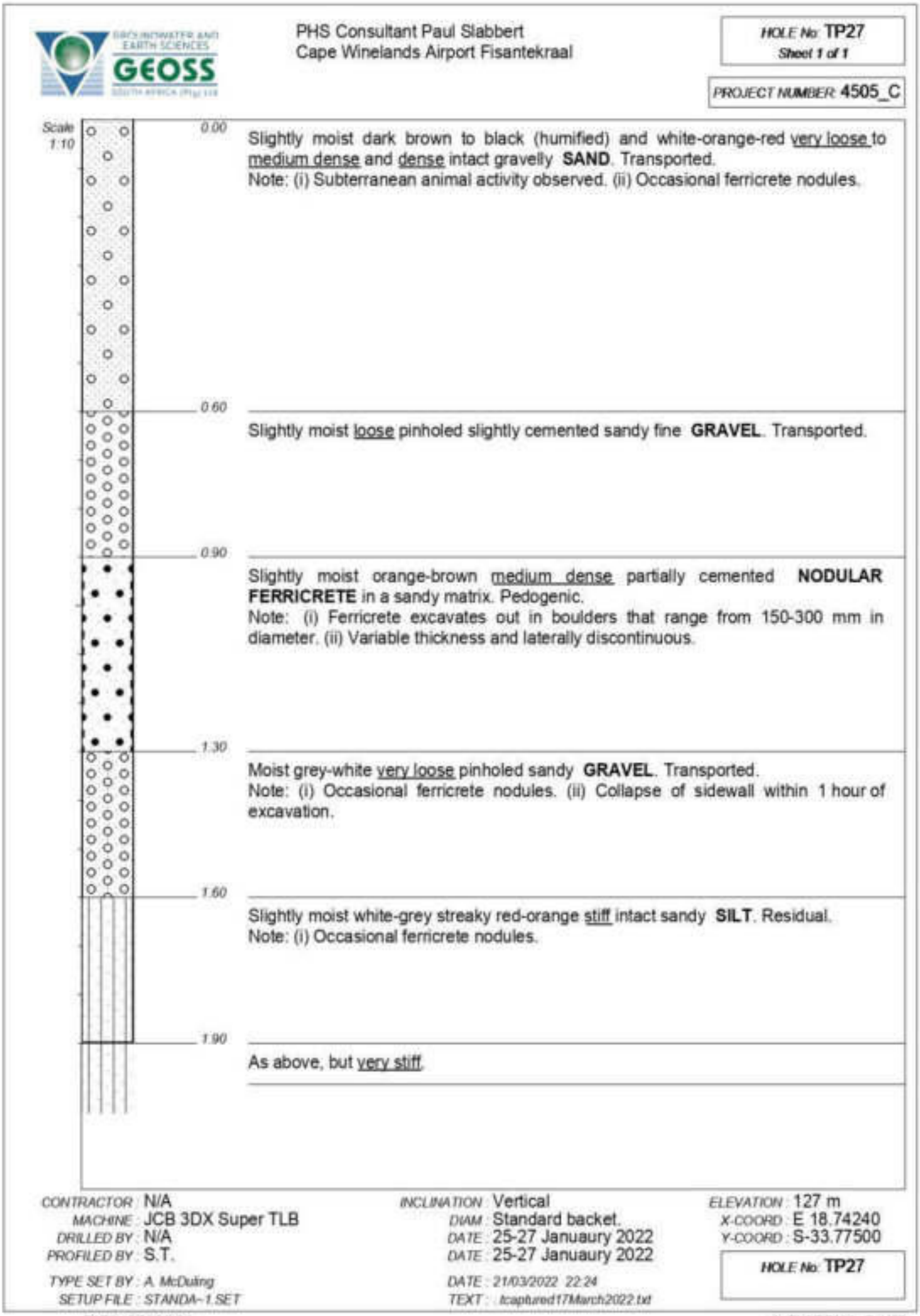
INCLINATION : Vertical
DIAM : Standard backet.
DATE : 25-27 Januaury 2022
DATE : 25-27 Januaury 2022
DATE : 21/03/2022 22:24
TEXT : ..tcaptured17March2022.txt

ELEVATION : 128 m
X-COORD : E 18.73940
Y-COORD : S-33.77570

HOLE No: **TP26**

D0E6 GEOSS SA

dotPLOT 7022 PpH67



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HOLE No: TP27
Sheet 1 of 1

PROJECT NUMBER: 4505_C

Scale 1:10

Depth	Description
0.00	Slightly moist dark brown to black (humified) and white-orange-red very loose to medium dense and dense intact gravelly **SAND**. Transported. Note: (i) Subterranean animal activity observed. (ii) Occasional ferricrete nodules.
0.60	Slightly moist loose pinholed slightly cemented sandy fine **GRAVEL**. Transported.
0.90	Slightly moist orange-brown medium dense partially cemented **NODULAR FERRICRETE** in a sandy matrix. Pedogenic. Note: (i) Ferricrete excavates out in boulders that range from 150-300 mm in diameter. (ii) Variable thickness and laterally discontinuous.
1.30	Moist grey-white very loose pinholed sandy **GRAVEL**. Transported. Note: (i) Occasional ferricrete nodules. (ii) Collapse of sidewall within 1 hour of excavation.
1.60	Slightly moist white-grey streaky red-orange stiff intact sandy **SILT**. Residual. Note: (i) Occasional ferricrete nodules.
1.90	As above, but very stiff.

CONTRACTOR : N/A
MACHINE : JCB 3DX Super TLB
DRILLED BY : N/A
PROFILED BY : S.T.
TYPE SET BY : A. McDuling
SETUP FILE : STANDA~1.SET

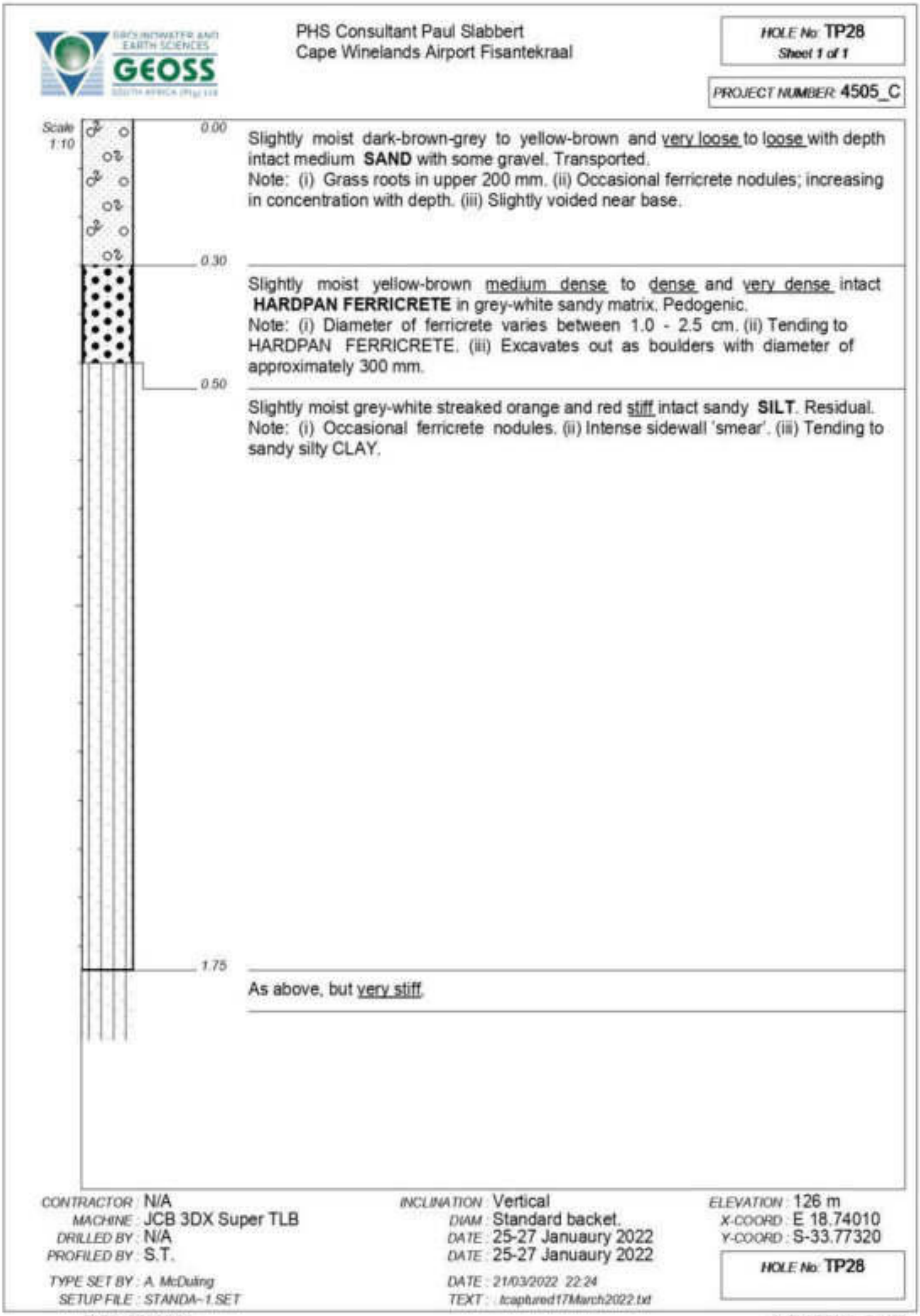
INCLINATION : Vertical
DIAM : Standard backet.
DATE : 25-27 Januaury 2022
DATE : 25-27 Januaury 2022
DATE : 21/03/2022 22:24
TEXT : ..\captured17March2022.txt

ELEVATION : 127 m
X-COORD : E 18.74240
Y-COORD : S-33.77500

HOLE No: TP27

D0E6 GEOSS SA

dotPLOT 7022 PpH67



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HOLE No: **TP28**
Sheet 1 of 1

PROJECT NUMBER: **4505_C**

Scale 1:10

0.00	Slightly moist dark-brown-grey to yellow-brown and very loose to loose with depth intact medium **SAND** with some gravel. Transported. Note: (i) Grass roots in upper 200 mm. (ii) Occasional ferricrete nodules; increasing in concentration with depth. (iii) Slightly voided near base.
0.30	Slightly moist yellow-brown medium dense to dense and very dense intact **HARDPAN FERRICRETE** in grey-white sandy matrix. Pedogenic. Note: (i) Diameter of ferricrete varies between 1.0 - 2.5 cm. (ii) Tending to HARDPAN FERRICRETE. (iii) Excavates out as boulders with diameter of approximately 300 mm.
0.50	Slightly moist grey-white streaked orange and red stiff intact sandy **SILT**. Residual. Note: (i) Occasional ferricrete nodules. (ii) Intense sidewall 'smear'. (iii) Tending to sandy silty CLAY.
1.75	As above, but very stiff.

CONTRACTOR : N/A
MACHINE : JCB 3DX Super TLB
DRILLED BY : N/A
PROFILED BY : S.T.

TYPE SET BY : *A. McDuling*
SETUP FILE : *STANDA~1.SET*

INCLINATION : Vertical
DIAM : Standard backet.
DATE : 25-27 Januaury 2022
DATE : 25-27 Januaury 2022

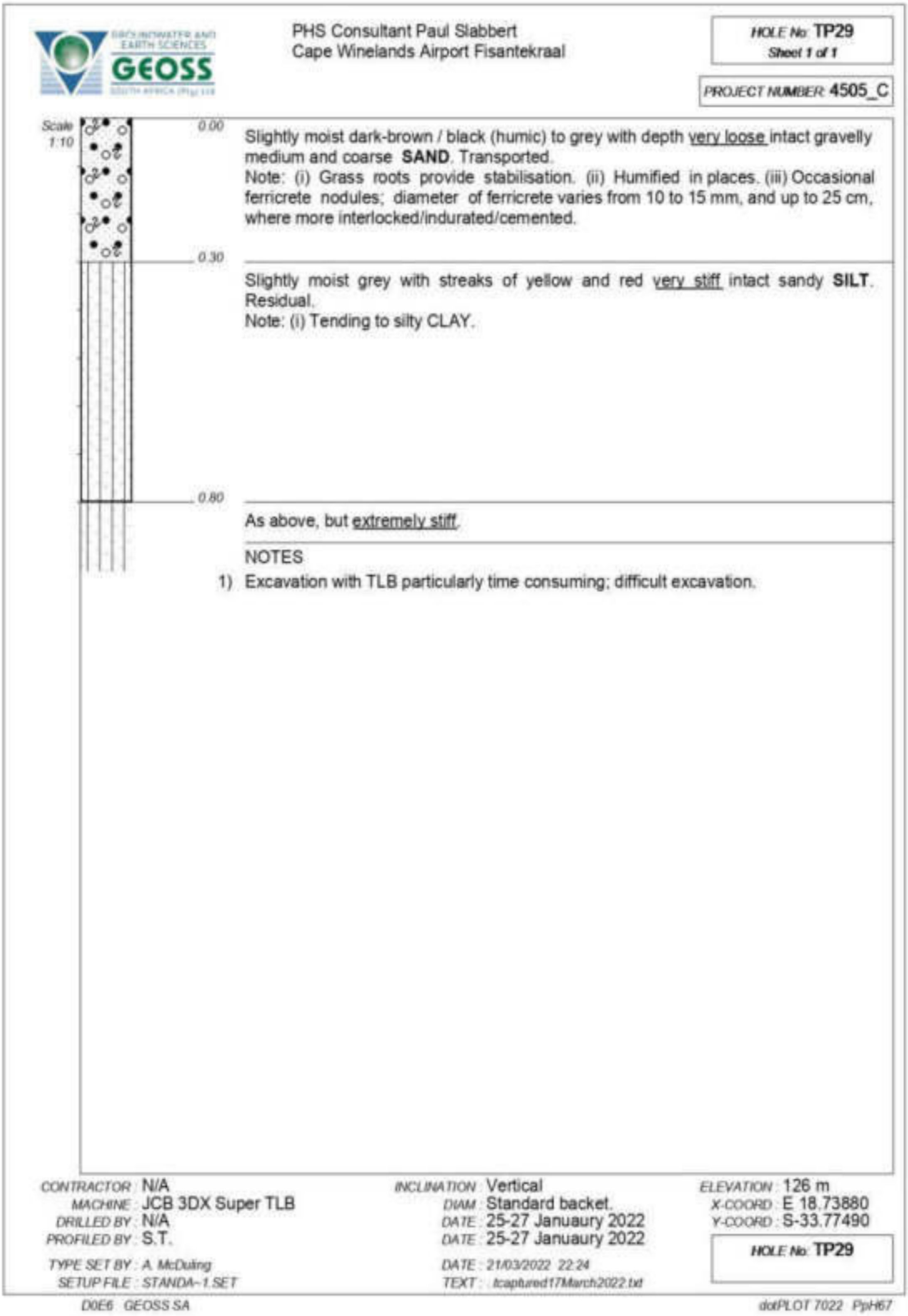
DATE : *21/03/2022 22:24*
TEXT : *..\captured17March2022.txt*

ELEVATION : 126 m
X-COORD : E 18.74010
Y-COORD : S-33.77320

HOLE No: **TP28**

D0E6 GEOSS SA

dotPLOT 7022 PpH67



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HOLE No: **TP29**
Sheet 1 of 1

PROJECT NUMBER: **4505_C**

Scale 1:10

0.00

Slightly moist dark-brown / black (humic) to grey with depth very loose intact gravelly medium and coarse **SAND**. Transported.
Note: (i) Grass roots provide stabilisation. (ii) Humified in places. (iii) Occasional ferricrete nodules; diameter of ferricrete varies from 10 to 15 mm, and up to 25 cm, where more interlocked/indurated/cemented.

0.30

Slightly moist grey with streaks of yellow and red very stiff intact sandy **SILT**. Residual.
Note: (i) Tending to silty CLAY.

0.80

As above, but extremely stiff.

NOTES

1) Excavation with TLB particularly time consuming; difficult excavation.

CONTRACTOR : N/A
MACHINE : JCB 3DX Super TLB
DRILLED BY : N/A
PROFILED BY : S.T.
TYPE SET BY : A. McDuling
SETUP FILE : STANDA~1.SET

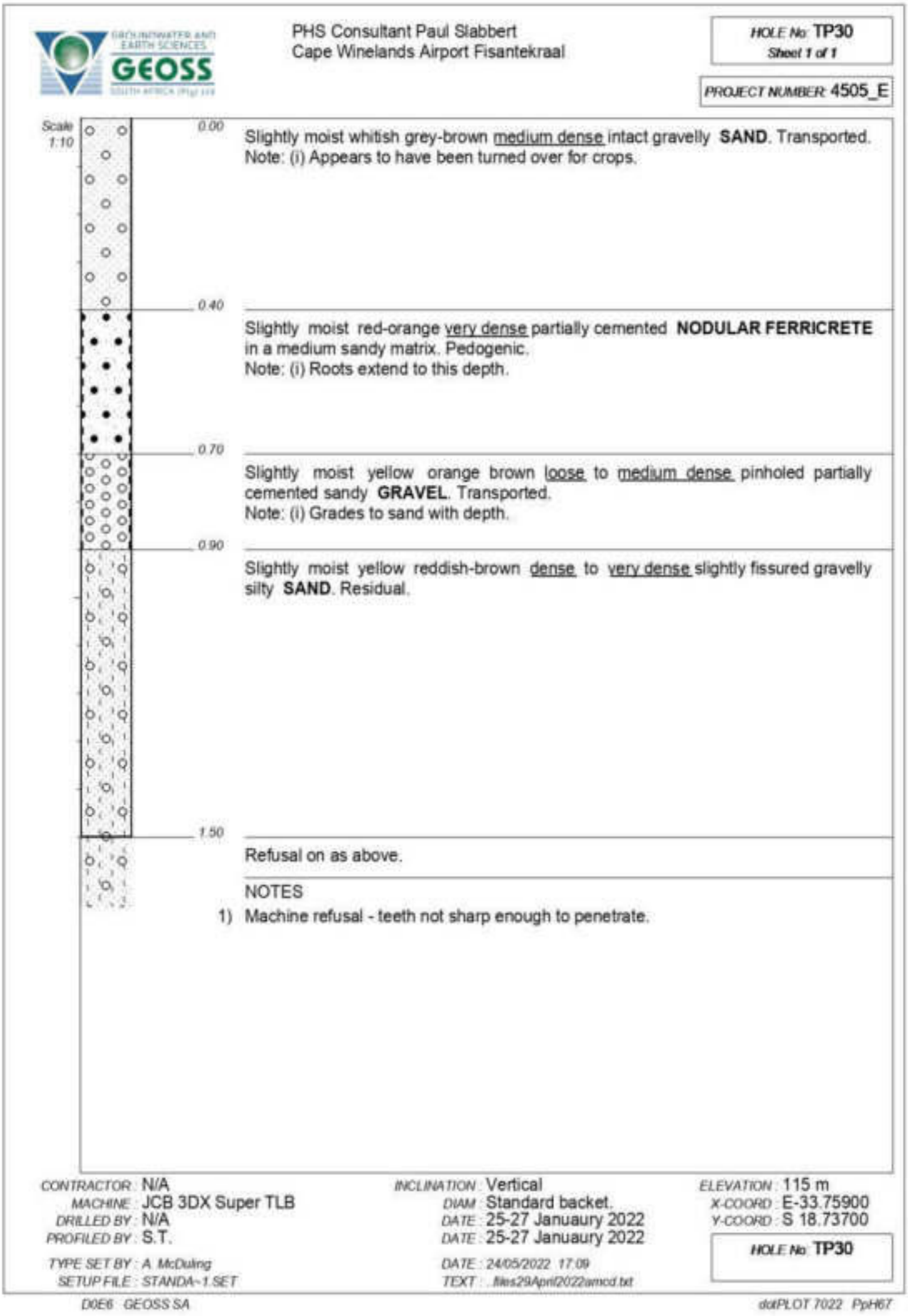
INCLINATION : Vertical
DIAM : Standard backet.
DATE : 25-27 Januaury 2022
DATE : 25-27 Januaury 2022
DATE : 21/03/2022 22:24
TEXT : ..tcaptured17March2022.txt

ELEVATION : 126 m
X-COORD : E 18.73880
Y-COORD : S-33.77490

HOLE No: **TP29**

D0E6 GEOSS SA

dotPLOT 7022 PpH67



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Cape Winelands Airport Fisantekraal

HOLE No: **TP30**
Sheet 1 of 1

PROJECT NUMBER: 4505_E

Scale 1:10

0.00	Slightly moist whitish grey-brown medium dense intact gravelly **SAND**. Transported. Note: (i) Appears to have been turned over for crops.
0.40	Slightly moist red-orange very dense partially cemented **NODULAR FERRICRETE** in a medium sandy matrix. Pedogenic. Note: (i) Roots extend to this depth.
0.70	Slightly moist yellow orange brown loose to medium dense pinholed partially cemented sandy **GRAVEL**. Transported. Note: (i) Grades to sand with depth.
0.90	Slightly moist yellow reddish-brown dense to very dense slightly fissured gravelly silty **SAND**. Residual.
1.50	Refusal on as above.

NOTES

1) Machine refusal - teeth not sharp enough to penetrate.

CONTRACTOR: N/A
MACHINE: JCB 3DX Super TLB
DRILLED BY: N/A
PROFILED BY: S.T.
TYPE SET BY: A. McDuling
SETUP FILE: STANDA~1.SET

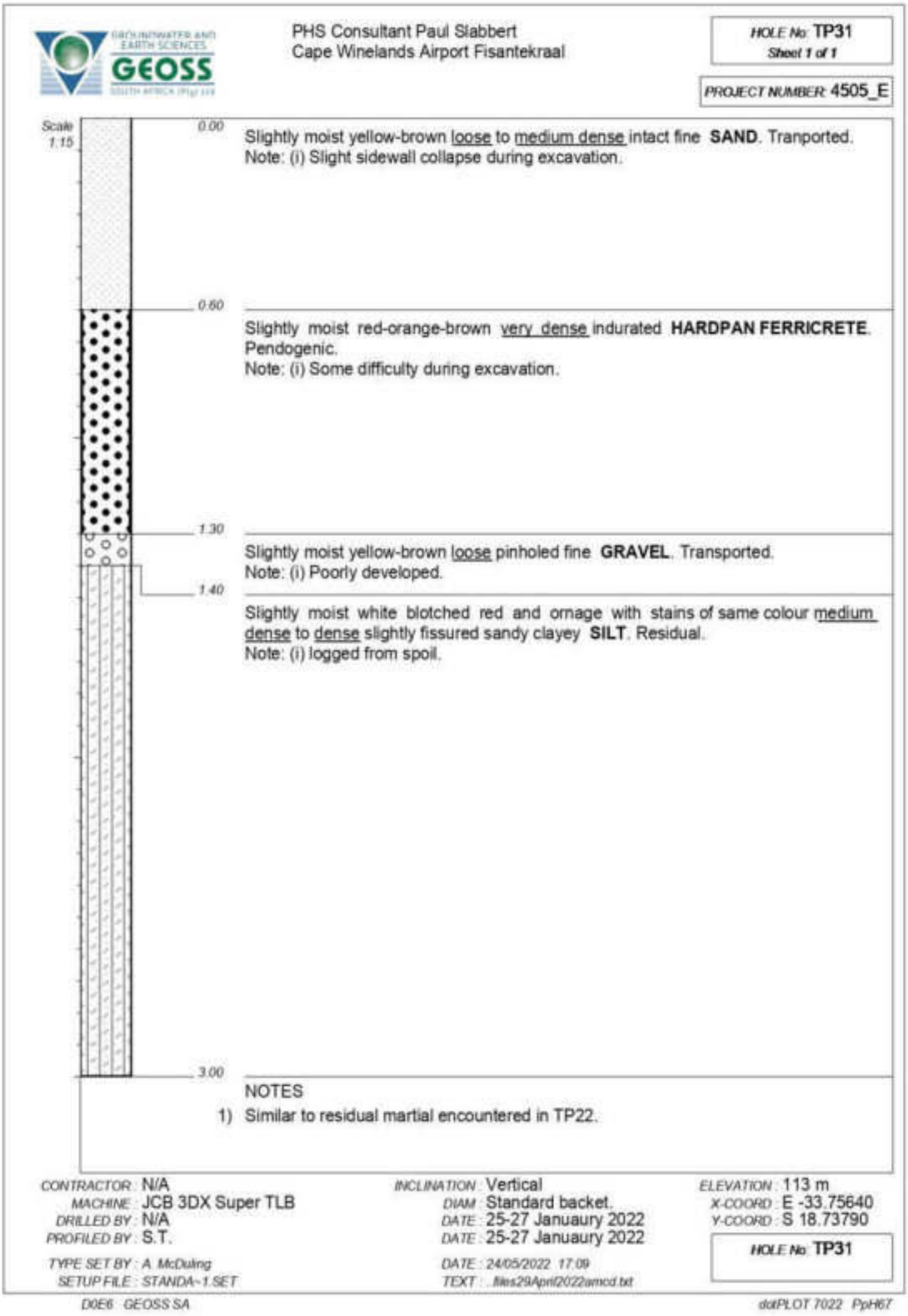
INCLINATION: Vertical
DIAM: Standard backet.
DATE: 25-27 Januaury 2022
DATE: 25-27 Januaury 2022
DATE: 24/05/2022 17:09
TEXT: ..files29April2022amcd.txt

ELEVATION: 115 m
X-COORD: E-33.75900
Y-COORD: S 18.73700

HOLE No: **TP30**

D0E6 GEOSS SA

dotPLOT 7022 PpH67



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HOLE No: TP31
Sheet 1 of 1

PROJECT NUMBER: 4505_E

Scale
1:15

0.00

Slightly moist yellow-brown loose to medium dense intact fine **SAND**. Tranported.
Note: (i) Slight sidewall collapse during excavation.

0.60

Slightly moist red-orange-brown very dense indurated **HARDPAN FERRICRETE**. Pendogenic.
Note: (i) Some difficulty during excavation.

1.30

Slightly moist yellow-brown loose pinholed fine **GRAVEL**. Transported.
Note: (i) Poorly developed.

1.40

Slightly moist white blotched red and ornage with stains of same colour medium dense to dense slightly fissured sandy clayey **SILT**. Residual.
Note: (i) logged from spoil.

3.00

NOTES

1) Similar to residual martial encountered in TP22.

CONTRACTOR : N/A
MACHINE : JCB 3DX Super TLB
DRILLED BY : N/A
PROFILED BY : S.T.

TYPE SET BY : A. McDuling
SETUP FILE : STANDA~1.SET

INCLINATION : Vertical
DIAM : Standard backet.
DATE : 25-27 Januaury 2022
DATE : 25-27 Januaury 2022

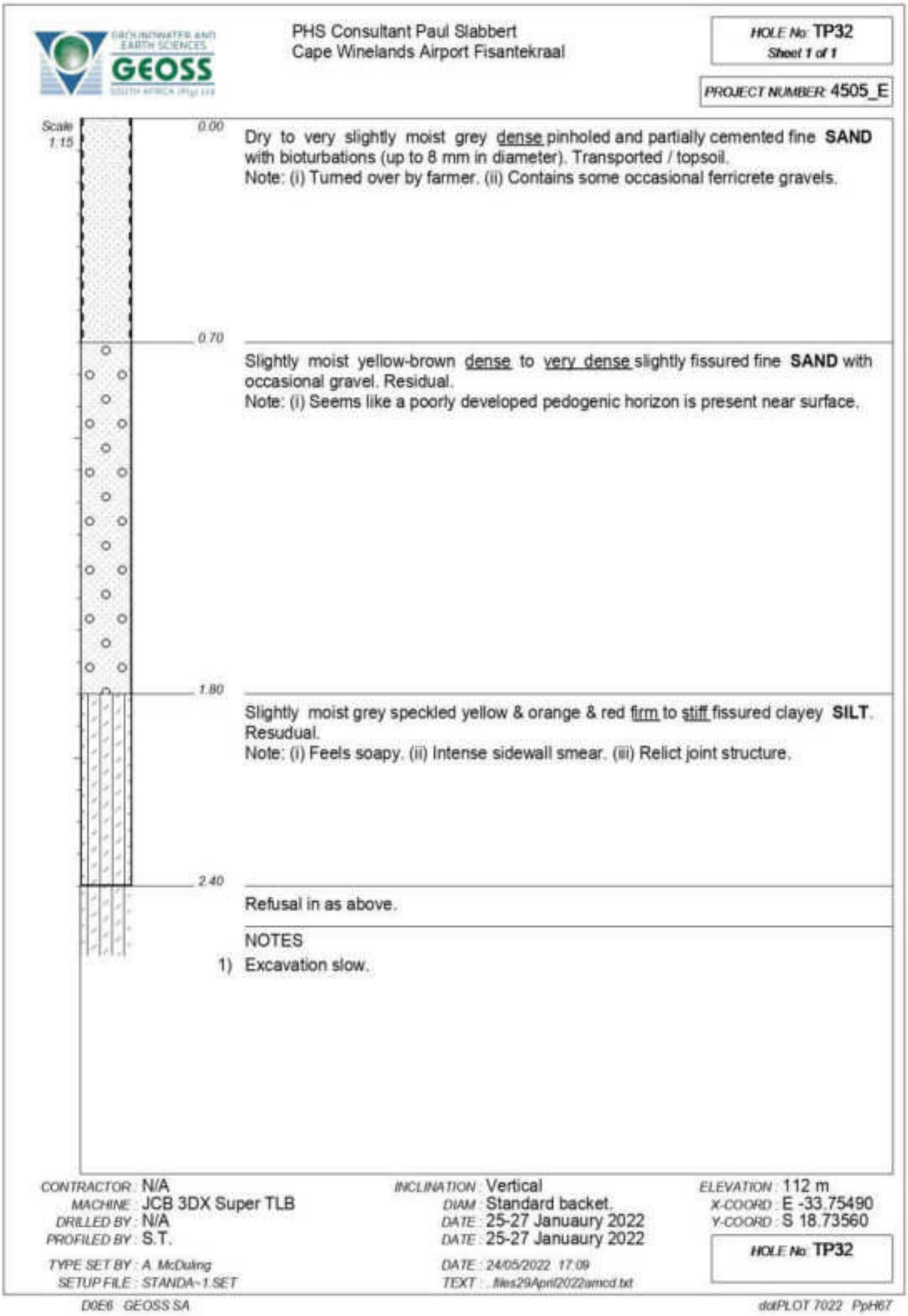
DATE : 24/05/2022 17:09
TEXT : ..files29April2022amcd.txt

ELEVATION : 113 m
X-COORD : E -33.75640
Y-COORD : S 18.73790

HOLE No: TP31

D0E6 GEOSS SA

dotPLOT 7022 PpH67



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HOLE No: **TP32**
Sheet 1 of 1

PROJECT NUMBER: 4505_E

Scale 1:15

0.00	Dry to very slightly moist grey dense pinholed and partially cemented fine **SAND** with bioturbations (up to 8 mm in diameter). Transported / topsoil. Note: (i) Turned over by farmer. (ii) Contains some occasional ferricrete gravels.
0.70	Slightly moist yellow-brown dense to very dense slightly fissured fine **SAND** with occasional gravel. Residual. Note: (i) Seems like a poorly developed pedogenic horizon is present near surface.
1.80	Slightly moist grey speckled yellow & orange & red firm to stiff fissured clayey **SILT**. Resudual. Note: (i) Feels soapy. (ii) Intense sidewall smear. (iii) Relict joint structure.
2.40	Refusal in as above.

NOTES

1) Excavation slow.

CONTRACTOR : N/A
MACHINE : JCB 3DX Super TLB
DRILLED BY : N/A
PROFILED BY : S.T.
TYPE SET BY : A. McDuling
SETUP FILE : STANDA~1.SET

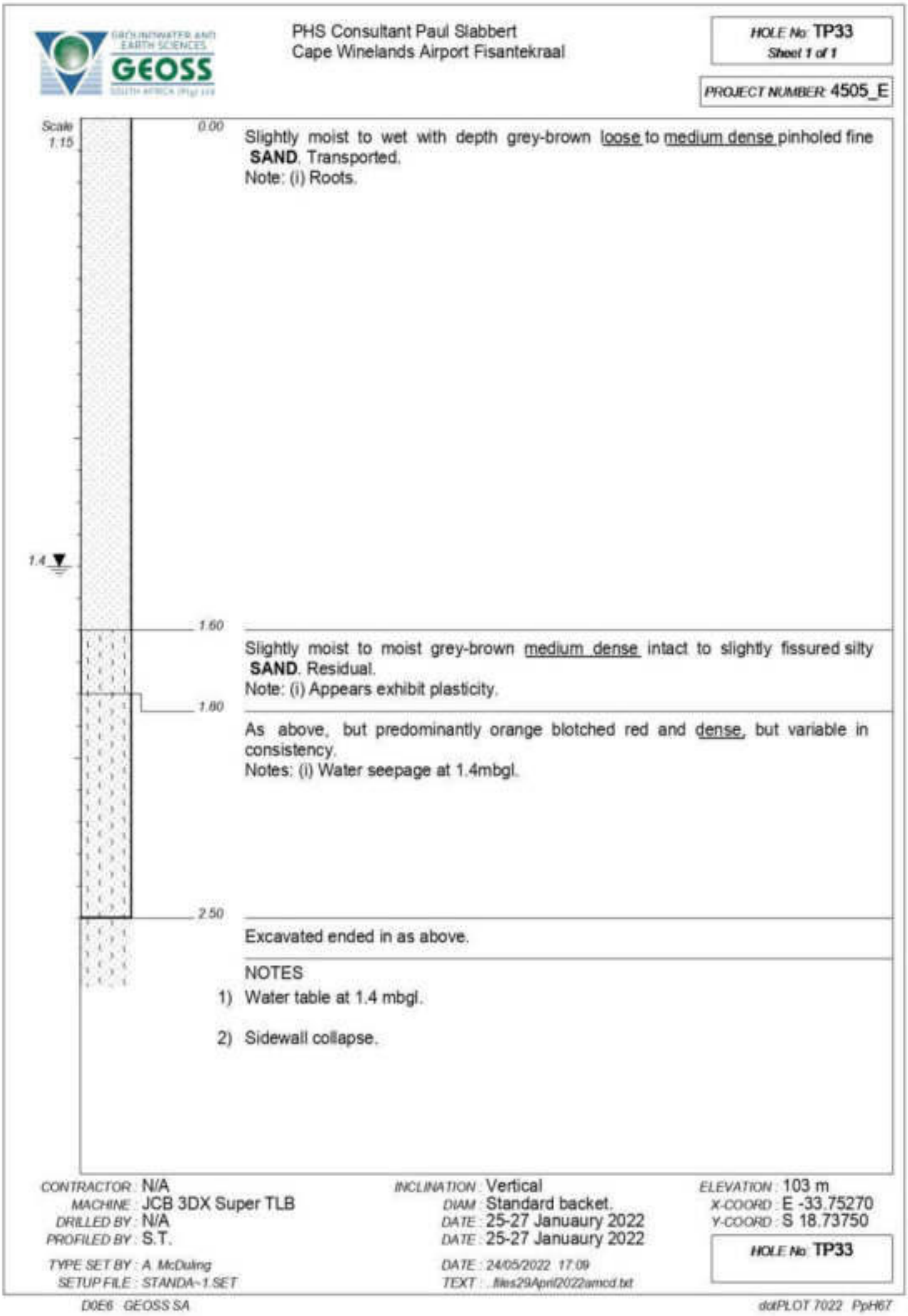
INCLINATION : Vertical
DIAM : Standard backet.
DATE : 25-27 Januaury 2022
DATE : 25-27 Januaury 2022
DATE : 24/05/2022 17:09
TEXT : ..files29April2022amcd.txt

ELEVATION : 112 m
X-COORD : E -33.75490
Y-COORD : S 18.73560

HOLE No: **TP32**

D0E6 GEOSS SA

dotPLOT 7022 PpH67



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Cape Winelands Airport Fisantekraal

HOLE No: **TP33**
Sheet 1 of 1

PROJECT NUMBER: 4505_E

Depth	Description
0.00	Slightly moist to wet with depth grey-brown loose to medium dense pinholed fine **SAND**. Transported. Note: (i) Roots.
1.60	Slightly moist to moist grey-brown medium dense intact to slightly fissured silty **SAND**. Residual. Note: (i) Appears exhibit plasticity.
1.80	As above, but predominantly orange blotched red and dense, but variable in consistency. Notes: (i) Water seepage at 1.4mbgl.
2.50	Excavated ended in as above.

NOTES
1) Water table at 1.4 mbgl.
2) Sidewall collapse.

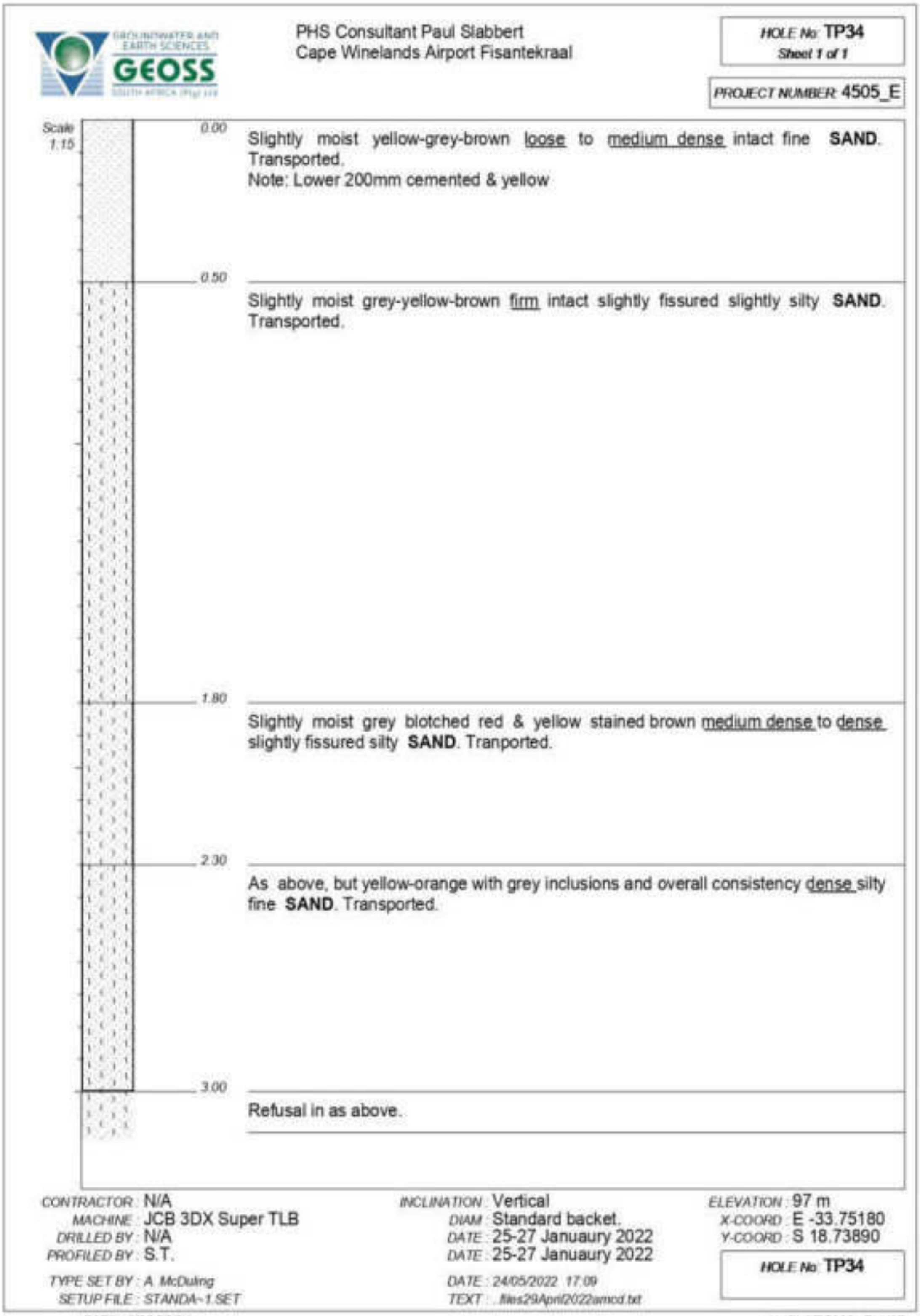
CONTRACTOR : N/A
MACHINE : JCB 3DX Super TLB
DRILLED BY : N/A
PROFILED BY : S.T.
TYPE SET BY : A. McDuling
SETUP FILE : STANDA~1.SET

INCLINATION : Vertical
DIAM : Standard backet.
DATE : 25-27 Januaury 2022
DATE : 25-27 Januaury 2022
DATE : 24/05/2022 17:09
TEXT : ..files29April2022amcd.txt

ELEVATION : 103 m
X-COORD : E -33.75270
Y-COORD : S 18.73750

HOLE No: **TP33**

D0E6 GEOSS SA
dotPLOT 7022 PpH67



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Cape Winelands Airport Fisantekraal

HOLE No: **TP34**
Sheet 1 of 1

PROJECT NUMBER: 4505_E

Scale
1:15

0.00	Slightly moist yellow-grey-brown loose to medium dense intact fine **SAND**. Transported. Note: Lower 200mm cemented & yellow
0.50	Slightly moist grey-yellow-brown firm intact slightly fissured slightly silty **SAND**. Transported.
1.80	Slightly moist grey blotched red & yellow stained brown medium dense to dense slightly fissured silty **SAND**. Tranported.
2.30	As above, but yellow-orange with grey inclusions and overall consistency dense silty fine **SAND**. Transported.
3.00	Refusal in as above.

CONTRACTOR: N/A
MACHINE: JCB 3DX Super TLB
DRILLED BY: N/A
PROFILED BY: S.T.
TYPE SET BY: A. McDuling
SETUP FILE: STANDA~1.SET

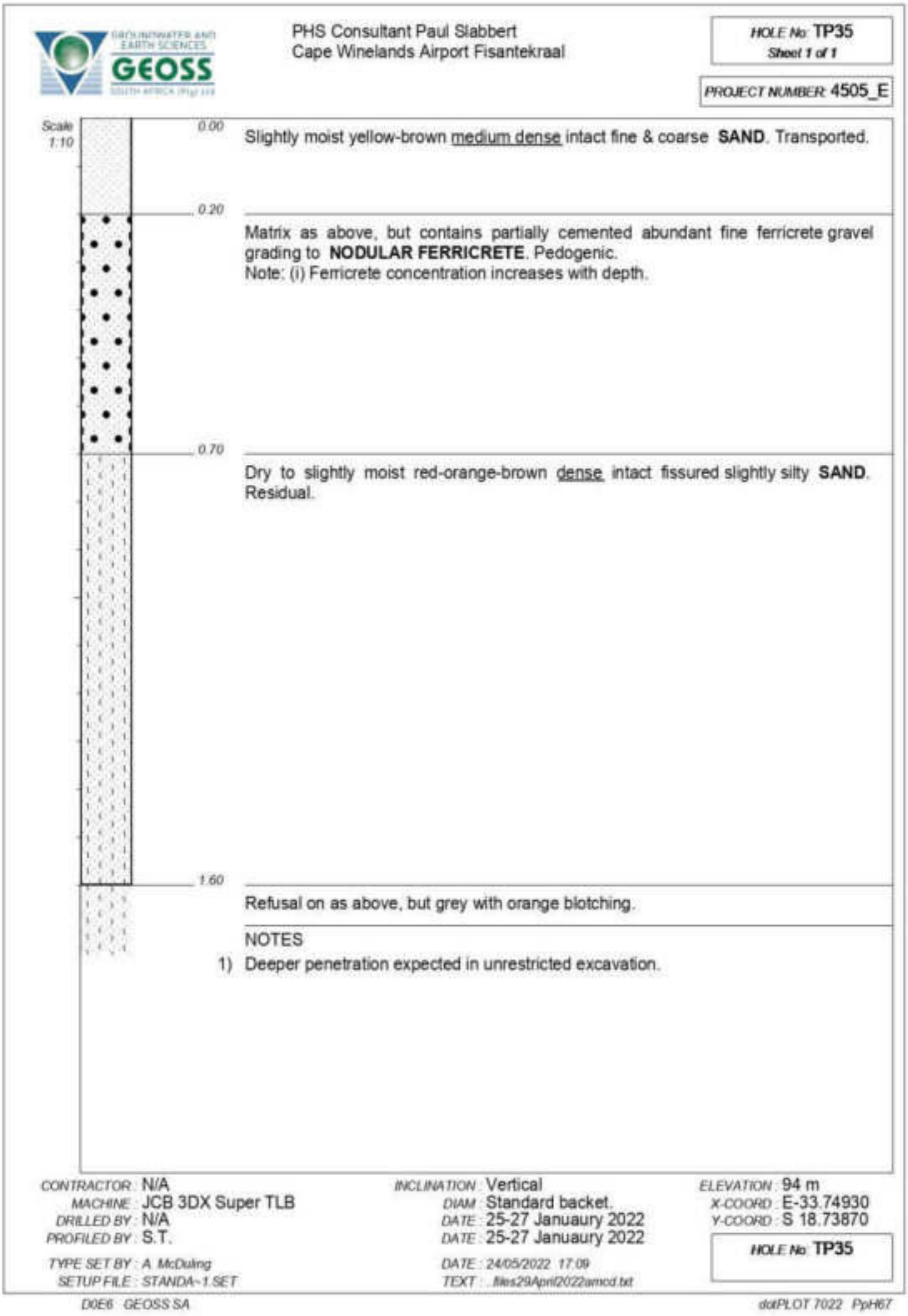
INCLINATION: Vertical
DIAM: Standard backet.
DATE: 25-27 Januaury 2022
DATE: 25-27 Januaury 2022
DATE: 24/05/2022 17:09
TEXT: ..files29April2022amcd.txt

ELEVATION: 97 m
X-COORD: E -33.75180
Y-COORD: S 18.73890

HOLE No: **TP34**

D0E6 GEOSS SA

dotPLOT 7022 PpH67



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Cape Winelands Airport Fisantekraal

HOLE No: **TP35**
Sheet 1 of 1

PROJECT NUMBER: 4505_E

Scale 1:10

0.00	Slightly moist yellow-brown <u>medium dense</u> intact fine & coarse **SAND**. Transported.
0.20	Matrix as above, but contains partially cemented abundant fine ferricrete gravel grading to **NODULAR FERRICRETE**. Pedogenic. Note: (i) Ferricrete concentration increases with depth.
0.70	Dry to slightly moist red-orange-brown <u>dense</u> intact fissured slightly silty **SAND**. Residual.
1.60	Refusal on as above, but grey with orange blotching.

NOTES

1) Deeper penetration expected in unrestricted excavation.

CONTRACTOR : N/A
MACHINE : JCB 3DX Super TLB
DRILLED BY : N/A
PROFILED BY : S.T.
TYPE SET BY : A. McDuling
SETUP FILE : STANDA~1.SET

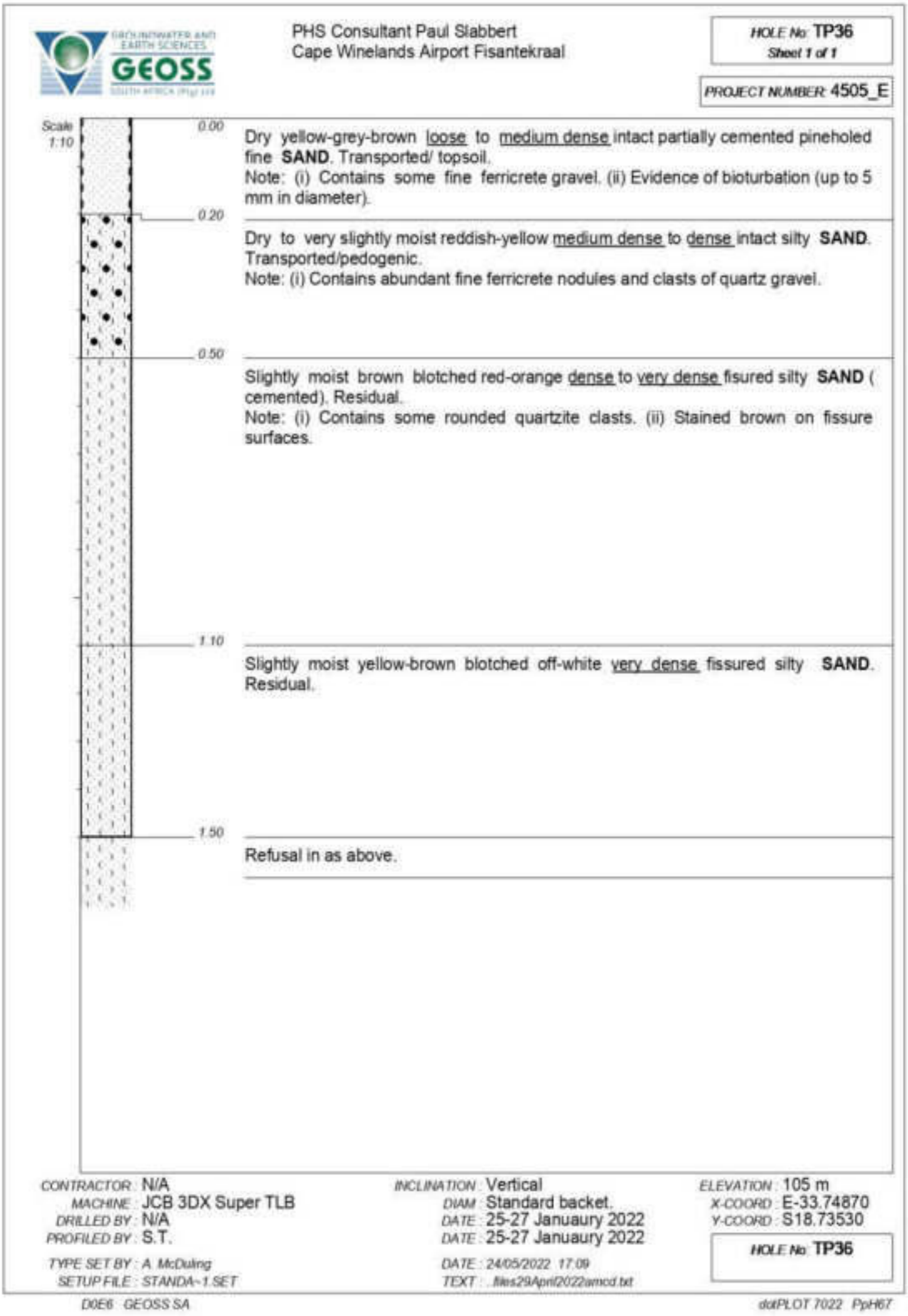
INCLINATION : Vertical
DIAM : Standard backet.
DATE : 25-27 Januaury 2022
DATE : 25-27 Januaury 2022
DATE : 24/05/2022 17:09
TEXT : ..files29April2022amcd.txt

ELEVATION : 94 m
X-COORD : E-33.74930
Y-COORD : S 18.73870

HOLE No: **TP35**

D0E6 GEOSS SA

dotPLOT 7022 PpH67



PHS Consultant Paul Slabbert
Cape Winelands Airport Fisantekraal

HOLE No: **TP36**
Sheet 1 of 1

PROJECT NUMBER: 4505_E

Scale 1:10

0.00	Dry yellow-grey-brown loose to medium dense intact partially cemented pineholed fine **SAND**. Transported/ topsoil. Note: (i) Contains some fine ferricrete gravel. (ii) Evidence of bioturbation (up to 5 mm in diameter).
0.20	Dry to very slightly moist reddish-yellow medium dense to dense intact silty **SAND**. Transported/pedogenic. Note: (i) Contains abundant fine ferricrete nodules and clasts of quartz gravel.
0.50	Slightly moist brown blotched red-orange dense to very dense fissured silty **SAND** (cemented). Residual. Note: (i) Contains some rounded quartzite clasts. (ii) Stained brown on fissure surfaces.
1.10	Slightly moist yellow-brown blotched off-white very dense fisured silty **SAND**. Residual.
1.50	Refusal in as above.

CONTRACTOR : N/A
MACHINE : JCB 3DX Super TLB
DRILLED BY : N/A
PROFILED BY : S.T.
TYPE SET BY : A. McDuling
SETUP FILE : STANDA~1.SET

INCLINATION : Vertical
DIAM : Standard backet.
DATE : 25-27 Januaury 2022
DATE : 25-27 Januaury 2022
DATE : 24/05/2022 17:09
TEXT : ..files29April2022amcd.txt

ELEVATION : 105 m
X-COORD : E-33.74870
Y-COORD : S18.73530

HOLE No: **TP36**

D0E6 GEOSS SA

dotPLOT 7022 PpH67

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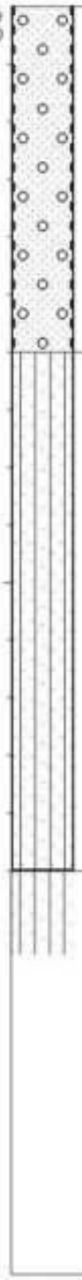
HOLE No: **TP37**
Sheet 1 of 1

PROJECT NUMBER: **4505_E**

Scale
1:10



0.00	Slightly moist grey to yellow occasionally blotched red-orange <u>loose</u> to <u>dense</u> pinholed partially cemented fine **SAND**. Transported / topsoil. Note: (i) Contains occasional fine ferricrete gravel increase in concentration near base.
0.60	Dry to slighly moist orange-brown speckeled red <u>stiff</u> to <u>very stiff</u> fissured (stained brown) sandy **SILT**. Residual.
1.50	Refusal in as above.

CONTRACTOR : N/A
MACHINE : JCB 3DX Super TLB
DRILLED BY : N/A
PROFILED BY : S.T.

TYPE SET BY : *A. McDuling*
SETUP FILE : *STANDA~1.SET*

INCLINATION : Vertical
DIAM : Standard backet.
DATE : 25-27 Januaury 2022
DATE : 25-27 Januaury 2022

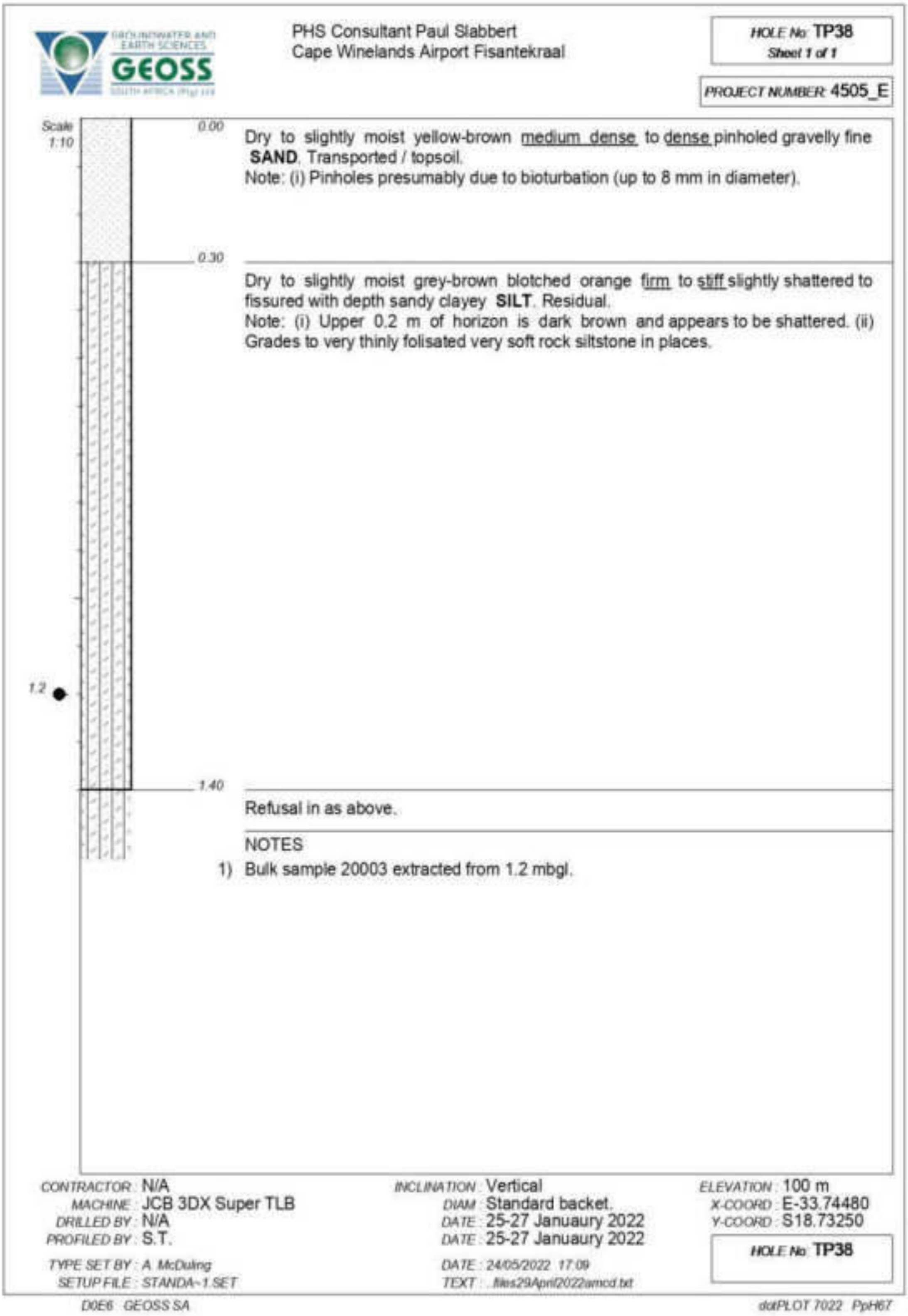
DATE : *24/05/2022 17:09*
TEXT : *..files29April2022amcd.txt*

ELEVATION : 99 m
X-COORD : E-33.74730
Y-COORD : S18.73190

HOLE No: **TP37**

D0E6 GEOSS SA

dotPLOT 7022 PpH67



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Cape Winelands Airport Fisantekraal

HOLE No: **TP38**
Sheet 1 of 1

PROJECT NUMBER: 4505_E

Scale
1:10

Depth	Description
0.00	Dry to slightly moist yellow-brown medium dense to dense pinholed gravelly fine **SAND**. Transported / topsoil. Note: (i) Pinholes presumably due to bioturbation (up to 8 mm in diameter).
0.30	Dry to slightly moist grey-brown blotched orange firm to stiff slightly shattered to fissured with depth sandy clayey **SILT**. Residual. Note: (i) Upper 0.2 m of horizon is dark brown and appears to be shattered. (ii) Grades to very thinly folisated very soft rock siltstone in places.
1.40	Refusal in as above.

NOTES

1) Bulk sample 20003 extracted from 1.2 mbgl.

CONTRACTOR : N/A
MACHINE : JCB 3DX Super TLB
DRILLED BY : N/A
PROFILED BY : S.T.

TYPE SET BY : A. McDuling
SETUP FILE : STANDA~1.SET

INCLINATION : Vertical
DIAM : Standard backet.
DATE : 25-27 Januaury 2022
DATE : 25-27 Januaury 2022

DATE : 24/05/2022 17:09
TEXT : ..files29April2022amcd.txt

ELEVATION : 100 m
X-COORD : E-33.74480
Y-COORD : S18.73250

HOLE No: **TP38**

D0E6 GEOSS SA

dotPLOT 7022 PpH67

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HOLE No: **TP39**
Sheet 1 of 1

PROJECT NUMBER: 4505_E

Scale 1:10

0.00

Dry to slightly moist grey-brown medium dense intact to pinholed fine **SAND**. Transported / topsoil.
Note: (i) 0.1 m thick yellow-brown horizon as above and partially cemented containing ferricrete gravels.

0.50

Slightly moist red-brown-orange very dense partially cemented **NODULAR FERRICRETE** in a sandy matrix. Pedogenic.

0.60

Slightly moist yellow-brown blotched red stiff to very stiff slightly sandy **SILT**. Residual.
Note: (i) Inclusions of highly weathered very intensely laminated very soft rock siltstone. (ii) TLB drove the bucket into the ground repeatedly, but still failed to penetrate.

NOTES

1) Slow excavation.

CONTRACTOR: N/A
MACHINE: JCB 3DX Super TLB
DRILLED BY: N/A
PROFILED BY: S.T.

TYPE SET BY: A. McDuling
SETUP FILE: STANDA~1.SET

INCLINATION: Vertical
DIAM: Standard backet.
DATE: 25-27 Januaury 2022
DATE: 25-27 Januaury 2022

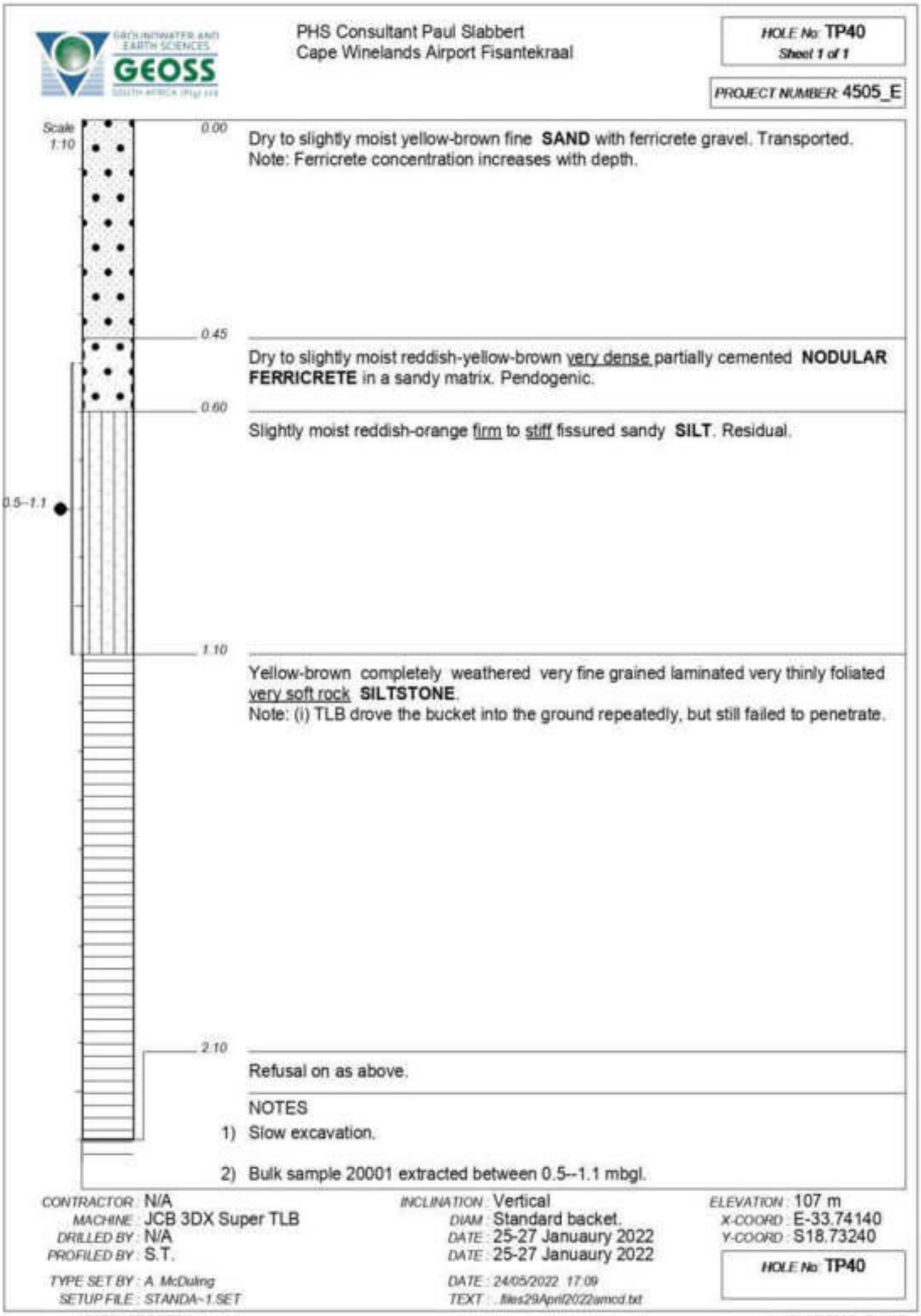
DATE: 24/05/2022 17:09
TEXT: ..files29April2022amcd.txt

ELEVATION: 97 m
X-COORD: E-33.7417
Y-COORD: S18.73560

HOLE No: **TP39**

D0E6 GEOSS SA

dotPLOT 7022 PpH67



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HOLE No: **TP40**
Sheet 1 of 1

PROJECT NUMBER: 4505_E

Scale 1:10

Depth	Description
0.00	Dry to slightly moist yellow-brown fine **SAND** with ferricrete gravel. Transported. Note: Ferricrete concentration increases with depth.
0.45	Dry to slightly moist reddish-yellow-brown <u>very dense</u> partially cemented **NODULAR FERRICRETE** in a sandy matrix. Pendogenic.
0.60	Slightly moist reddish-orange <u>firm</u> to <u>stiff</u> fissured sandy **SILT**. Residual.
1.10	Yellow-brown completely weathered very fine grained laminated very thinly foliated <u>very soft rock</u> **SILTSTONE**. Note: (i) TLB drove the bucket into the ground repeatedly, but still failed to penetrate.
2.10	Refusal on as above.

NOTES

1) Slow excavation.

2) Bulk sample 20001 extracted between 0.5--1.1 mbgl.

CONTRACTOR: N/A
MACHINE: JCB 3DX Super TLB
DRILLED BY: N/A
PROFILED BY: S.T.

TYPE SET BY: A. McDuling
SETUP FILE: STANDA~1.SET

INCLINATION: Vertical
DIAM: Standard backet.
DATE: 25-27 Januaury 2022
DATE: 25-27 Januaury 2022

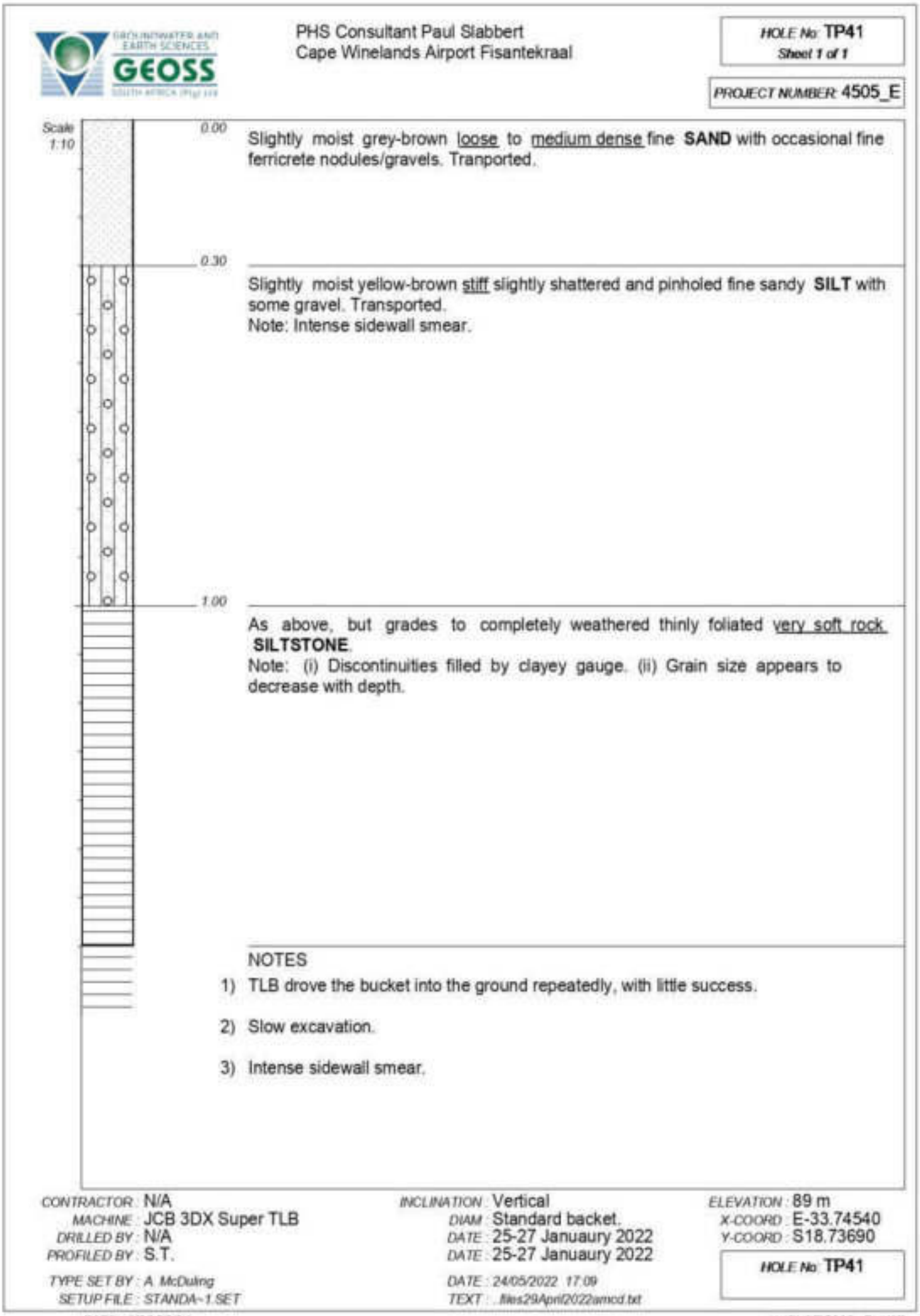
DATE: 24/05/2022 17:09
TEXT: ..files29April2022amcd.txt

ELEVATION: 107 m
X-COORD: E-33.74140
Y-COORD: S18.73240

HOLE No: **TP40**

D0E6 GEOSS SA

dotPLOT 7022 PpH67



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HOLE No: TP41
Sheet 1 of 1

PROJECT NUMBER: 4505_E

Scale 1:10

Depth	Description
0.00	Slightly moist grey-brown loose to medium dense fine **SAND** with occasional fine ferricrete nodules/gravels. Tranported.
0.30	Slightly moist yellow-brown stiff slightly shattered and pinholed fine sandy **SILT** with some gravel. Transported. Note: Intense sidewall smear.
1.00	As above, but grades to completely weathered thinly foliated very soft rock **SILTSTONE**. Note: (i) Discontinuities filled by clayey gauge. (ii) Grain size appears to decrease with depth.

NOTES

1) TLB drove the bucket into the ground repeatedly, with little success.

2) Slow excavation.

3) Intense sidewall smear.

CONTRACTOR : N/A
MACHINE : JCB 3DX Super TLB
DRILLED BY : N/A
PROFILED BY : S.T.
TYPE SET BY : A. McDuling
SETUP FILE : STANDA~1.SET

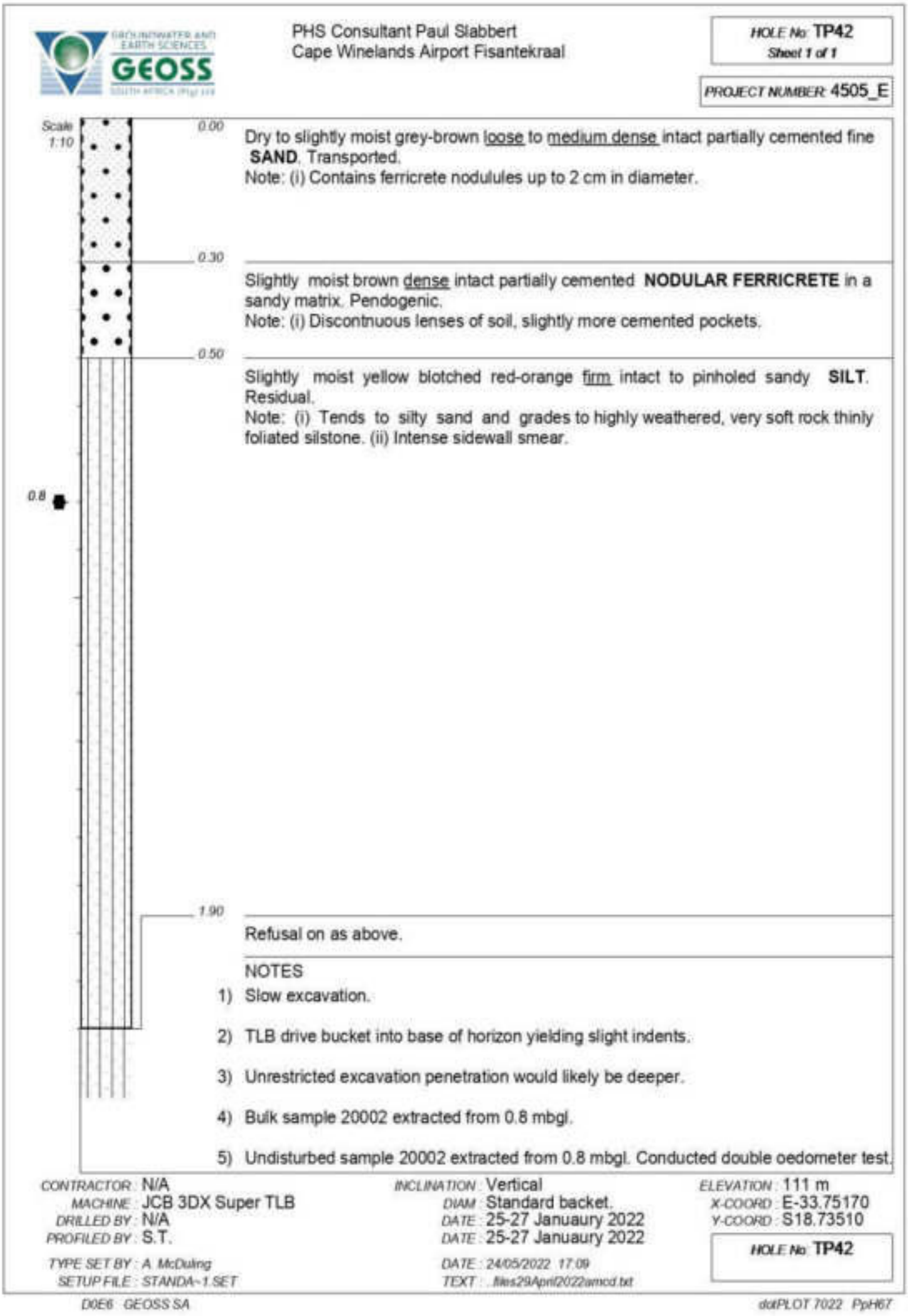
INCLINATION : Vertical
DIAM : Standard backet.
DATE : 25-27 Janauary 2022
DATE : 25-27 Janauary 2022
DATE : 24/05/2022 17:09
TEXT : ..files29April2022amcd.txt

ELEVATION : 89 m
X-COORD : E-33.74540
Y-COORD : S18.73690

HOLE No: TP41

D0E6 GEOSS SA

dotPLOT 7022 PpH67



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Cape Winelands Airport Fisantekraal

HOLE No: TP42
Sheet 1 of 1

PROJECT NUMBER: 4505_E

Scale 1:10

0.00

Dry to slightly moist grey-brown loose to medium dense intact partially cemented fine **SAND**. Transported.
Note: (i) Contains ferricrete nodulules up to 2 cm in diameter.

0.30

Slightly moist brown dense intact partially cemented **NODULAR FERRICRETE** in a sandy matrix. Pendogenic.
Note: (i) Discontnuous lenses of soil, slightly more cemented pockets.

0.50

Slightly moist yellow blotched red-orange firm intact to pinholed sandy **SILT**. Residual.
Note: (i) Tends to silty sand and grades to highly weathered, very soft rock thinly foliated silstone. (ii) Intense sidewall smear.

0.8

1.90

Refusal on as above.

NOTES

1) Slow excavation.

2) TLB drive bucket into base of horizon yielding slight indents.

3) Unrestricted excavation penetration would likely be deeper.

4) Bulk sample 20002 extracted from 0.8 mbgl.

5) Undisturbed sample 20002 extracted from 0.8 mbgl. Conducted double oedometer test.

CONTRACTOR: N/A
MACHINE: JCB 3DX Super TLB
DRILLED BY: N/A
PROFILED BY: S.T.
TYPE SET BY: A. McDuling
SETUP FILE: STANDA~1.SET

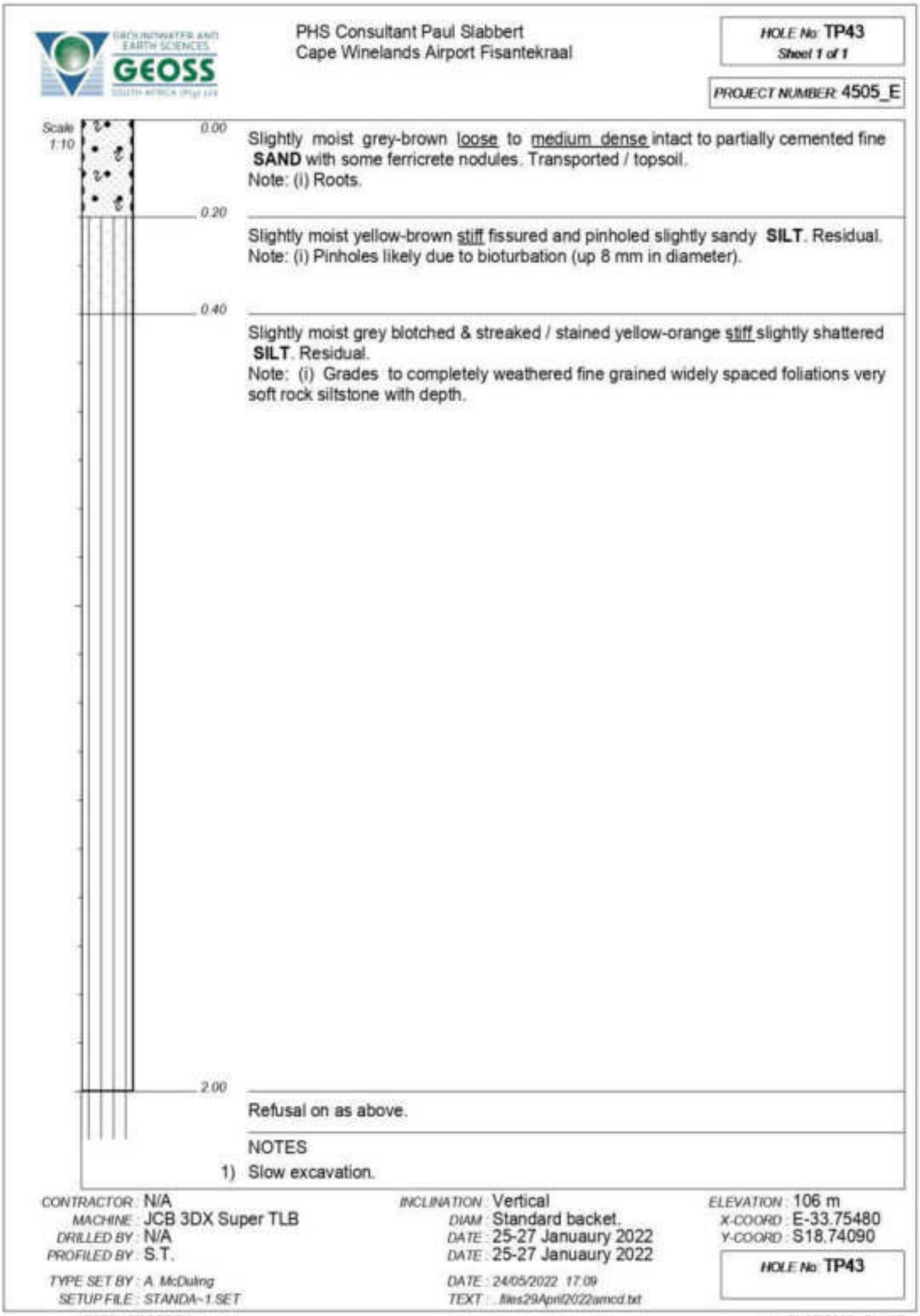
INCLINATION: Vertical
DIAM: Standard backet.
DATE: 25-27 Januaury 2022
DATE: 25-27 Januaury 2022
DATE: 24/05/2022 17:09
TEXT: ..files29April2022amcd.txt

ELEVATION: 111 m
X-COORD: E-33.75170
Y-COORD: S18.73510

HOLE No: TP42

D0E6 GEOSS SA

dotPLOT 7022 PpH67



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HOLE No: **TP43**
Sheet 1 of 1

PROJECT NUMBER: **4505_E**

Scale
1:10

0.00

Slightly moist grey-brown <u>loose</u> to <u>medium dense</u> intact to partially cemented fine **SAND** with some ferricrete nodules. Transported / topsoil.
Note: (i) Roots.

0.20

Slightly moist yellow-brown <u>stiff</u> fissured and pinholed slightly sandy **SILT**. Residual.
Note: (i) Pinholes likely due to bioturbation (up 8 mm in diameter).

0.40

Slightly moist grey blotched & streaked / stained yellow-orange <u>stiff</u> slightly shattered **SILT**. Residual.
Note: (i) Grades to completely weathered fine grained widely spaced foliations very soft rock siltstone with depth.

2.00

Refusal on as above.

NOTES

1) Slow excavation.

CONTRACTOR : N/A
MACHINE : JCB 3DX Super TLB
DRILLED BY : N/A
PROFILED BY : S.T.
TYPE SET BY : A. McDuling
SETUP FILE : STANDA~1.SET

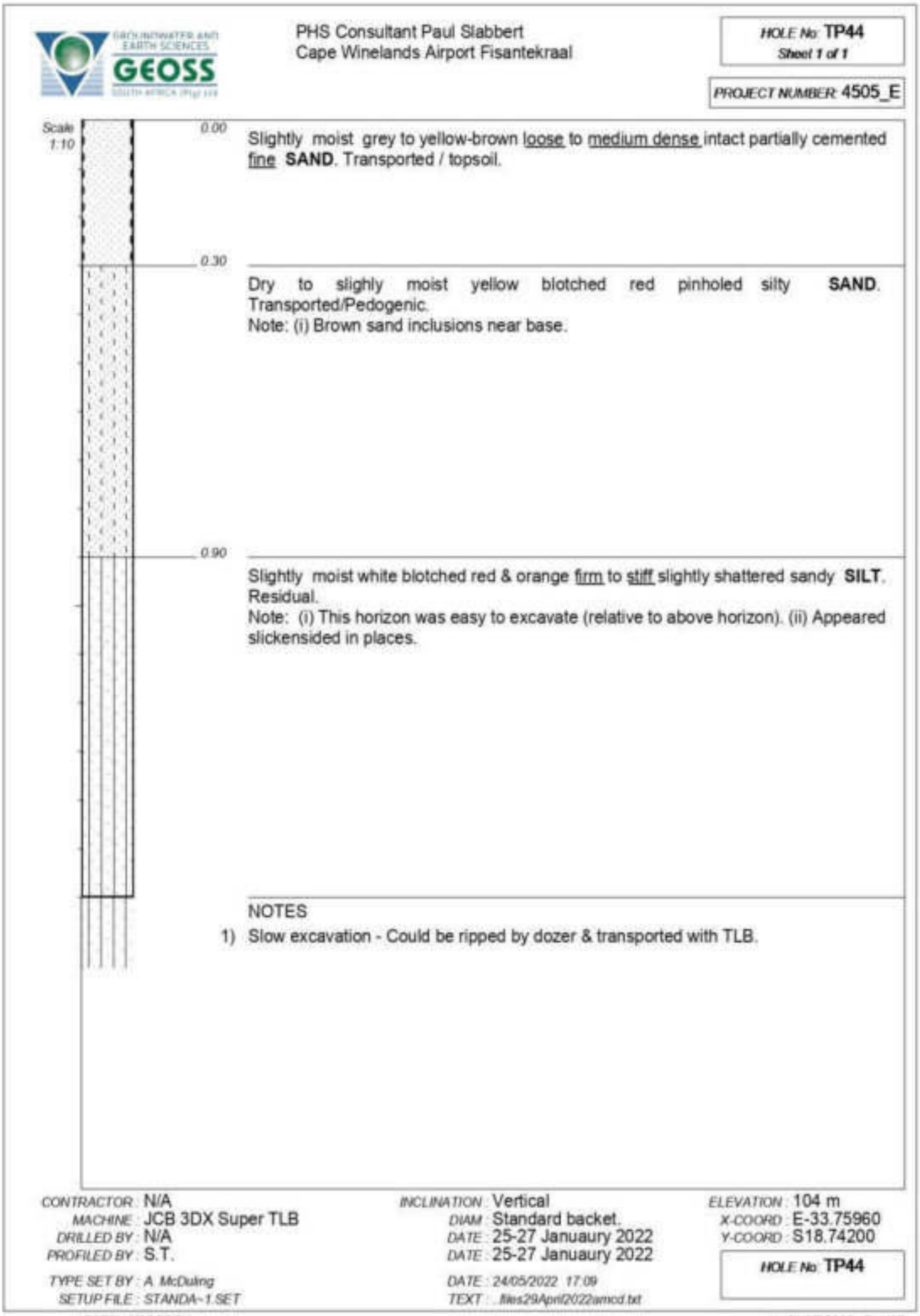
INCLINATION : Vertical
DIAM : Standard backet.
DATE : 25-27 Januaury 2022
DATE : 25-27 Januaury 2022
DATE : 24/05/2022 17:09
TEXT : ..files29April2022amcd.txt

ELEVATION : 106 m
X-COORD : E-33.75480
Y-COORD : S18.74090

HOLE No: **TP43**

D0E6 GEOSS SA

dotPLOT 7022 PpH67



GROUNDWATER AND EARTH SCIENCES GEOSS SOUTH AFRICA (Pty) Ltd

PHS Consultant Paul Slabbert
Cape Winelands Airport Fisantekraal

HOLE No: TP44
Sheet 1 of 1

PROJECT NUMBER: 4505_E

Scale 1:10

Depth	Description
0.00	Slightly moist grey to yellow-brown loose to medium dense intact partially cemented fine **SAND**. Transported / topsoil.
0.30	Dry to slighly moist yellow blotched red pinholed silty **SAND**. Transported/Pedogenic. Note: (i) Brown sand inclusions near base.
0.90	Slightly moist white blotched red & orange firm to stiff slightly shattered sandy **SILT**. Residual. Note: (i) This horizon was easy to excavate (relative to above horizon). (ii) Appeared slickensided in places.

NOTES

1) Slow excavation - Could be ripped by dozer & transported with TLB.

CONTRACTOR : N/A
MACHINE : JCB 3DX Super TLB
DRILLED BY : N/A
PROFILED BY : S.T.
TYPE SET BY : A. McDuling
SETUP FILE : STANDA~1.SET

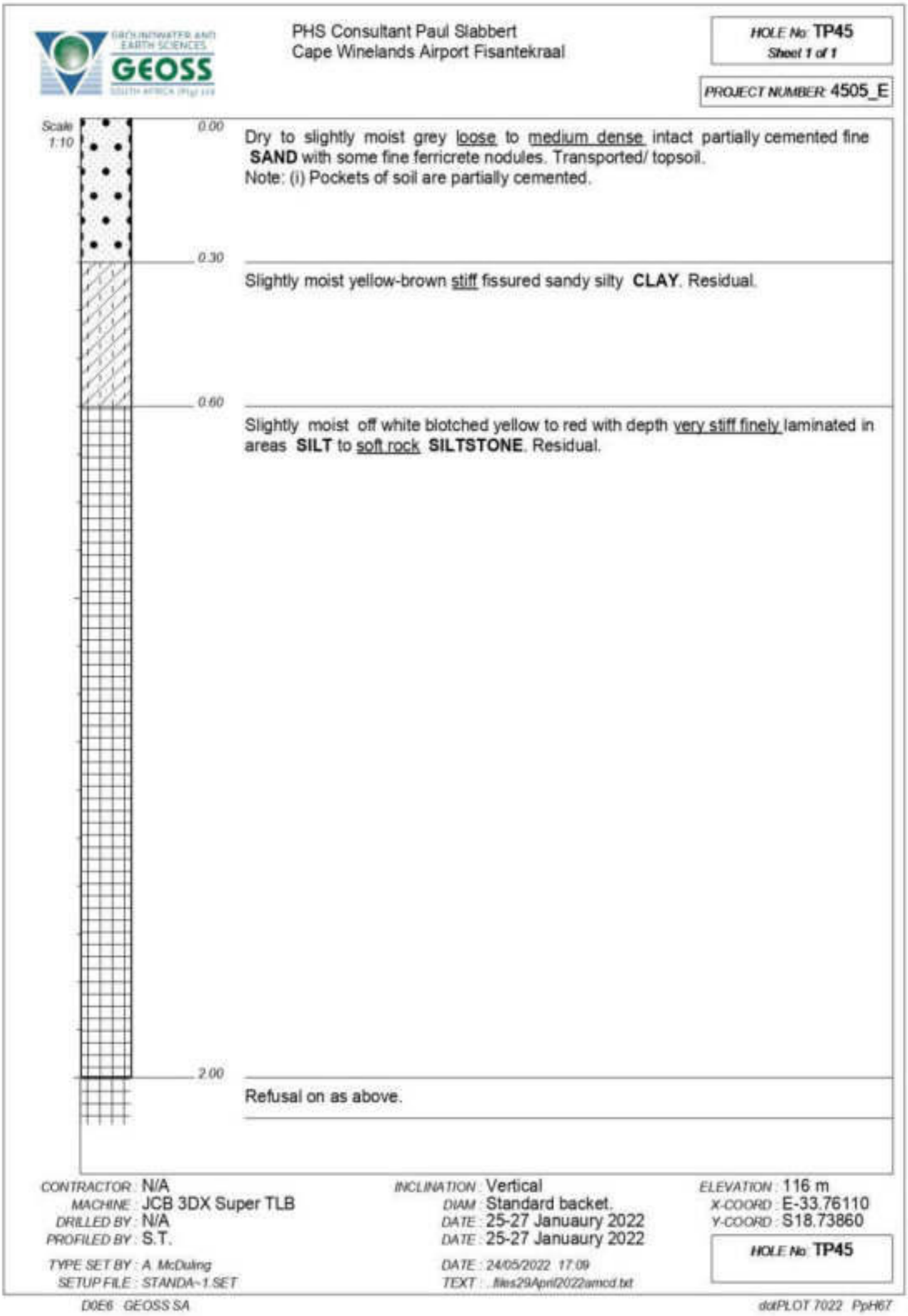
INCLINATION : Vertical
DIAM : Standard backet.
DATE : 25-27 Januaury 2022
DATE : 25-27 Januaury 2022
DATE : 24/05/2022 17:09
TEXT : ..files29April2022amcd.txt

ELEVATION : 104 m
X-COORD : E-33.75960
Y-COORD : S18.74200

HOLE No: TP44

D0E6 GEOSS SA

dotPLOT 7022 PpH67



GEOSS

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Cape Winelands Airport Fisantekraal

HOLE No: **TP45**
Sheet 1 of 1

PROJECT NUMBER: 4505_E

Scale 1:10

Depth	Description
0.00	Dry to slightly moist grey <u>loose</u> to <u>medium dense</u> intact partially cemented fine **SAND** with some fine ferricrete nodules. Transported/ topsoil. Note: (i) Pockets of soil are partially cemented.
0.30	Slightly moist yellow-brown <u>stiff</u> fissured sandy silty **CLAY**. Residual.
0.60	Slightly moist off white blotched yellow to red with depth <u>very stiff finely</u> laminated in areas **SILT** to <u>soft rock</u> **SILTSTONE**. Residual.
2.00	Refusal on as above.

CONTRACTOR: N/A
MACHINE: JCB 3DX Super TLB
DRILLED BY: N/A
PROFILED BY: S.T.
TYPE SET BY: A. McDuling
SETUP FILE: STANDA~1.SET

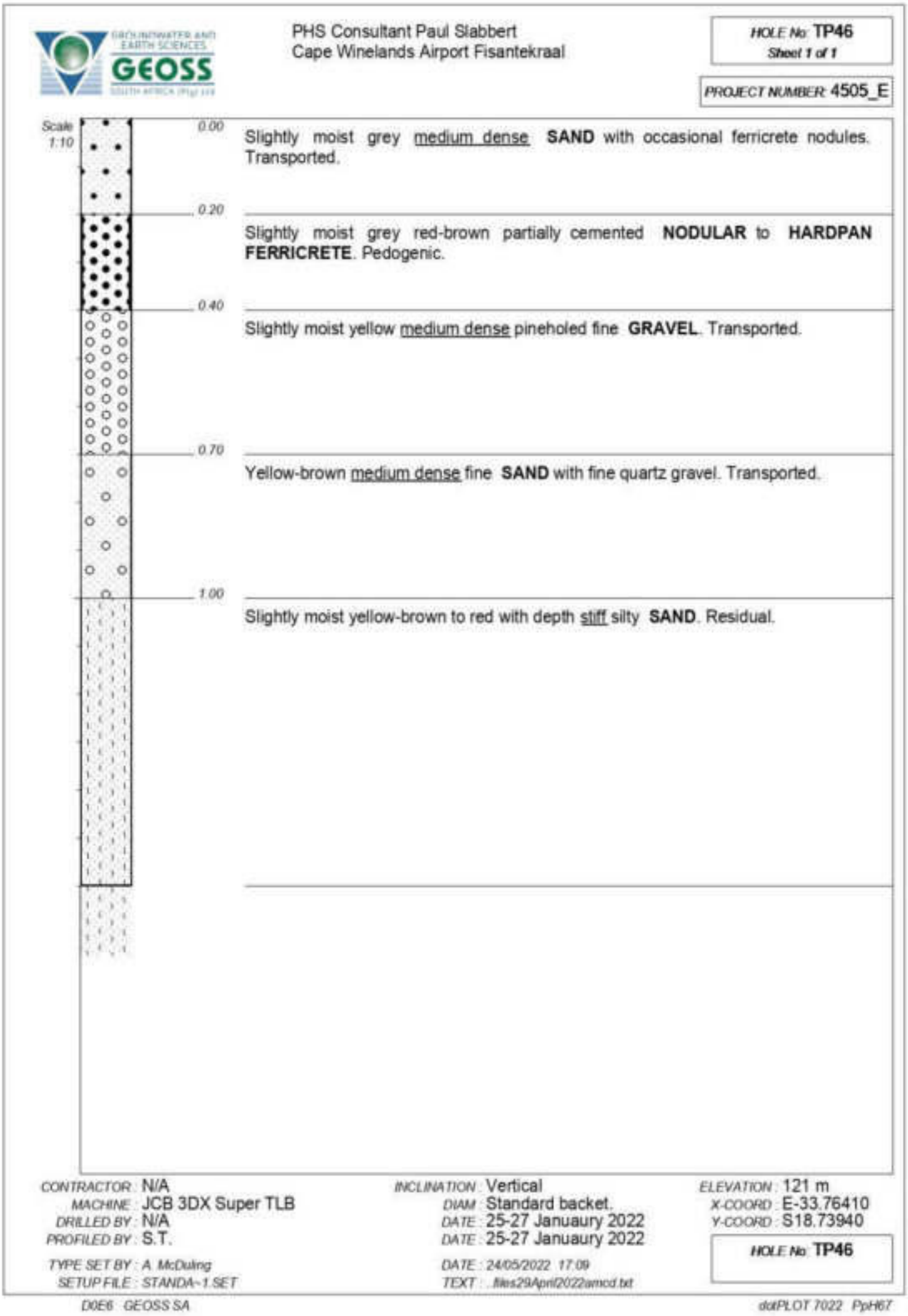
INCLINATION: Vertical
DIAM: Standard backet.
DATE: 25-27 Januaury 2022
DATE: 25-27 Januaury 2022
DATE: 24/05/2022 17:09
TEXT: ..files29April2022amcd.txt

ELEVATION: 116 m
X-COORD: E-33.76110
Y-COORD: S18.73860

HOLE No: **TP45**

D0E6 GEOSS SA

dotPLOT 7022 PpH67



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Cape Winelands Airport Fisantekraal

HOLE No: **TP46**
Sheet 1 of 1

PROJECT NUMBER: 4505_E

Scale
1:10

0.00	Slightly moist grey medium dense **SAND** with occasional ferricrete nodules. Transported.
0.20	Slightly moist grey red-brown partially cemented **NODULAR** to **HARDPAN FERRICRETE**. Pedogenic.
0.40	Slightly moist yellow medium dense pineholed fine **GRAVEL**. Transported.
0.70	Yellow-brown medium dense fine **SAND** with fine quartz gravel. Transported.
1.00	Slightly moist yellow-brown to red with depth stiff silty **SAND**. Residual.

CONTRACTOR : N/A
MACHINE : JCB 3DX Super TLB
DRILLED BY : N/A
PROFILED BY : S.T.

TYPE SET BY : A. McDuling
SETUP FILE : STANDA~1.SET

INCLINATION : Vertical
DIAM : Standard backet.
DATE : 25-27 Januaury 2022
DATE : 25-27 Januaury 2022

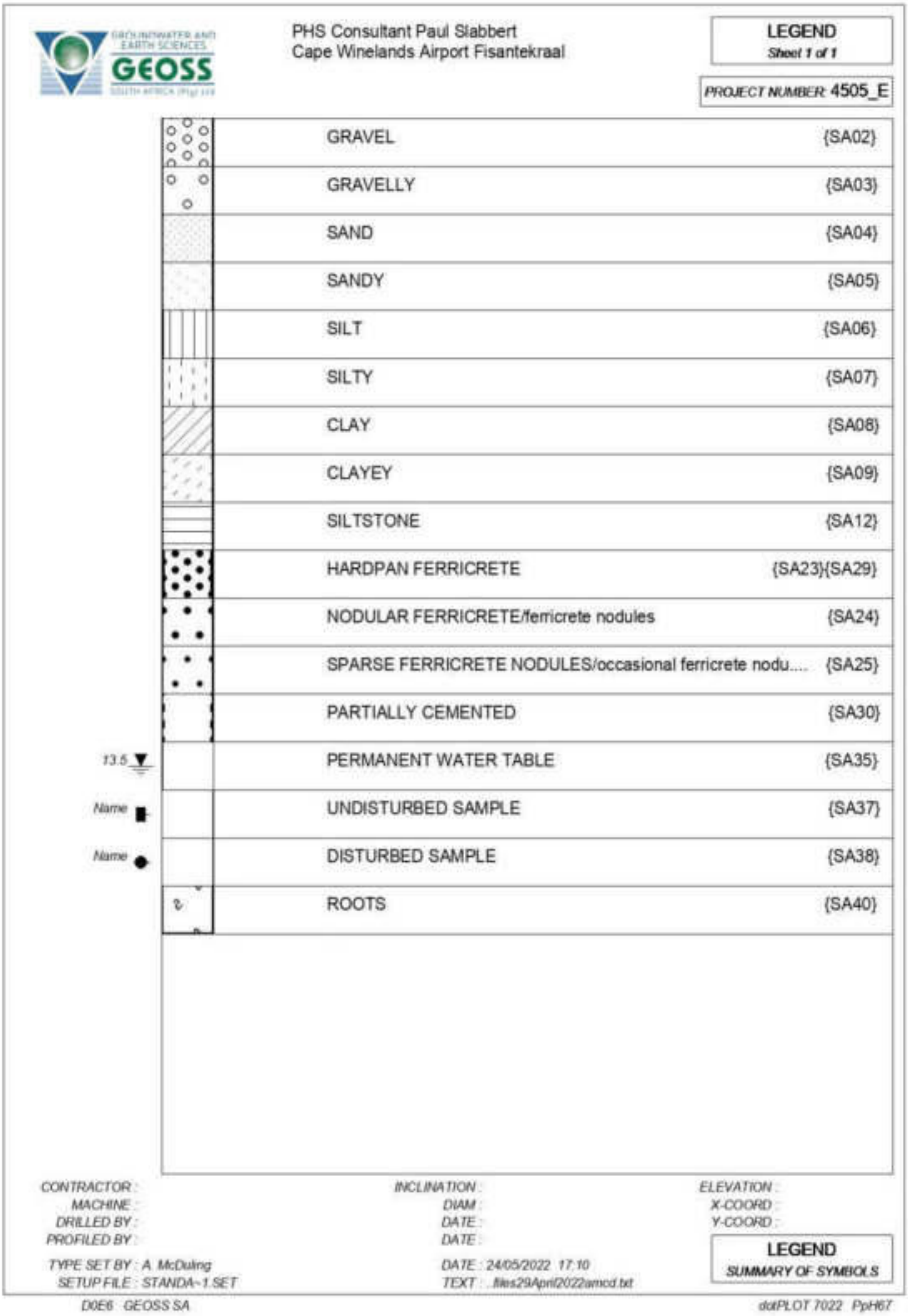
DATE : 24/05/2022 17:09
TEXT : ..files29April2022amcd.txt

ELEVATION : 121 m
X-COORD : E-33.76410
Y-COORD : S18.73940

HOLE No: **TP46**

D0E6 GEOSS SA

dotPLOT 7022 PpH67



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Cape Winelands Airport Fisantekraal

LEGEND
Sheet 1 of 1

PROJECT NUMBER: 4505_E

	GRAVEL	{SA02}
	GRAVELLY	{SA03}
	SAND	{SA04}
	SANDY	{SA05}
	SILT	{SA06}
	SILTY	{SA07}
	CLAY	{SA08}
	CLAYEY	{SA09}
	SILTSTONE	{SA12}
	HARDPAN FERRICRETE	{SA23}{SA29}
	NODULAR FERRICRETE/ferricrete nodules	{SA24}
	SPARSE FERRICRETE NODULES/occasional ferricrete nodu....	{SA25}
	PARTIALLY CEMENTED	{SA30}
13.5 ▼	PERMANENT WATER TABLE	{SA35}
Name ■	UNDISTURBED SAMPLE	{SA37}
Name ●	DISTURBED SAMPLE	{SA38}
	ROOTS	{SA40}

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY :

INCLINATION :
DIAM :
DATE :
DATE :

ELEVATION :
X-COORD :
Y-COORD :

TYPE SET BY : A. McDuling
SETUP FILE : STANDA~1.SET

DATE : 24/05/2022 17:10
TEXT : ..files29April2022amcd.txt

LEGEND
SUMMARY OF SYMBOLS

D0E6 GEOSS SA

dotPLOT 7022 PpH67

11. APPENDIX C: SUPPORTING PHOTOS

Figure 17: Close-up of TP01. Note cohesive nature of the material in the foreground, and the fine gravelly nature of material above refusal surface, i.e. next to hammer.

Figure 18: TP02 - Close-up of sidewall showing hardpan ferricrete refusal surface, note thin humified horizon on surface.

Figure 19: TP02 - Close-up of ferricrete nodules encountered near base of trial pit.

Figure 20: TP03 - Close up of sidewall; note nodular ferricrete grading to very dense hardpan ferricrete refusal surface.

Figure 21: TP04 – Nodular to hardpan ferricrete.

Figure 22: TP04: Close-up of trial pit sidewall. Note cemented nature of nodular ferricrete above hammer, and texture of sidewall 'smear' beneath hammer; sand- to clay- dominated with depth.

Figure 23: TP04 - Close-up of lower sandy clayey silt near base of trial pit.

Figure 24: TP04 – Close-up of sandy clayey silt spoil.

Figure 25: TP05 – Close-up of trial pit sidewall. Note pinch out of nodular ferricrete horizon, and pinholed nature of gravel horizon near base of hammer. Sidewall smear near base indicating high fines content.

Figure 26: TP05 – ferricrete nodules scattered on surface.

Figure 27: TP06 – Close-up of spoil excavated from lower-most sandy clayey silt horizon.

Figure 28: TP07 – Close-up of spoil excavated from residual horizon.

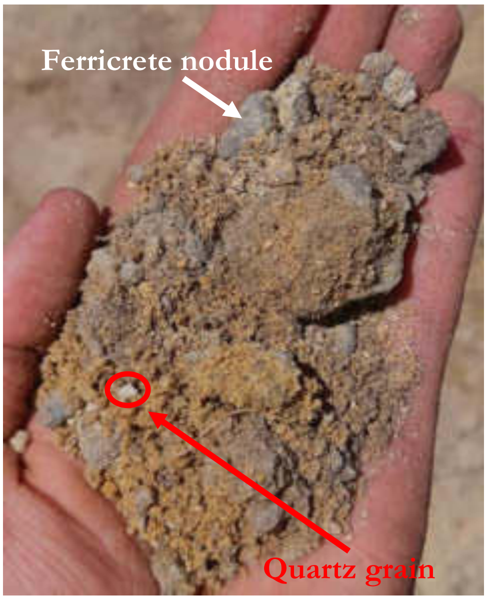

Figure 29: TP07 – Close-up of spoil from residual horizon; note angular nature of grains. Rounded grains are ferricrete.

Figure 30: TP08 – Close-up of upper transported sand horizon.

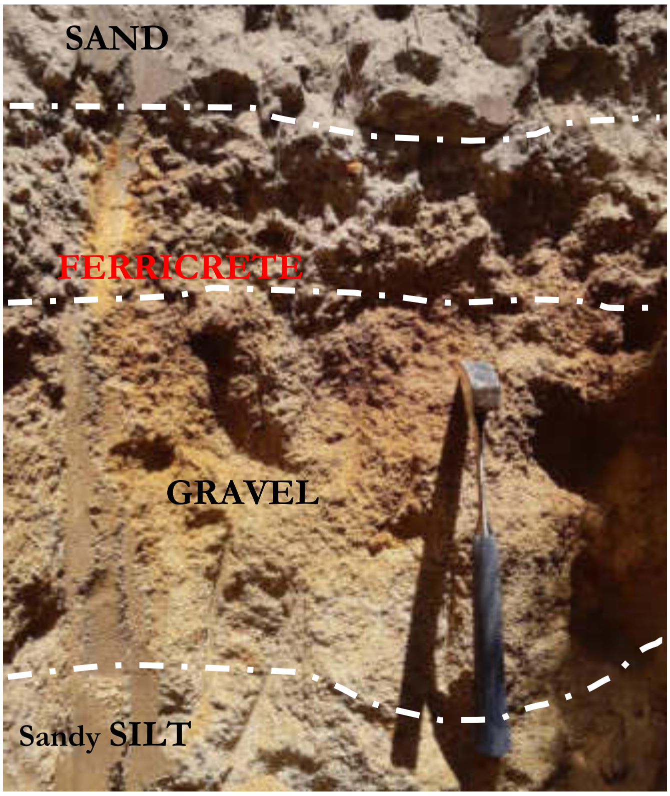

Figure 31: TP08 – Close-up of partially cemented pinholed sandy fine gravel horizon beneath nodular ferricrete. Note there is large variation in thickness of the ferricrete horizon (between 0.3 and 0.8 m thick).

Figure 32: TP10 – Close up of bottom of trial pit; note sidewall smear near base of trial pit.

Figure 33: TP10 – Close up of bottom of ferricrete nodules strewn across surface surrounding trial pit; exposed soil profile pictured on LHS of photograph.

Figure 34: TP11 – Close-up of spoil pile of ferricrete nodules excavated from trial pit.

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Figure 35: TP11 – Close-up of ferricrete nodule; note angular nature of grains stuck to nodule.

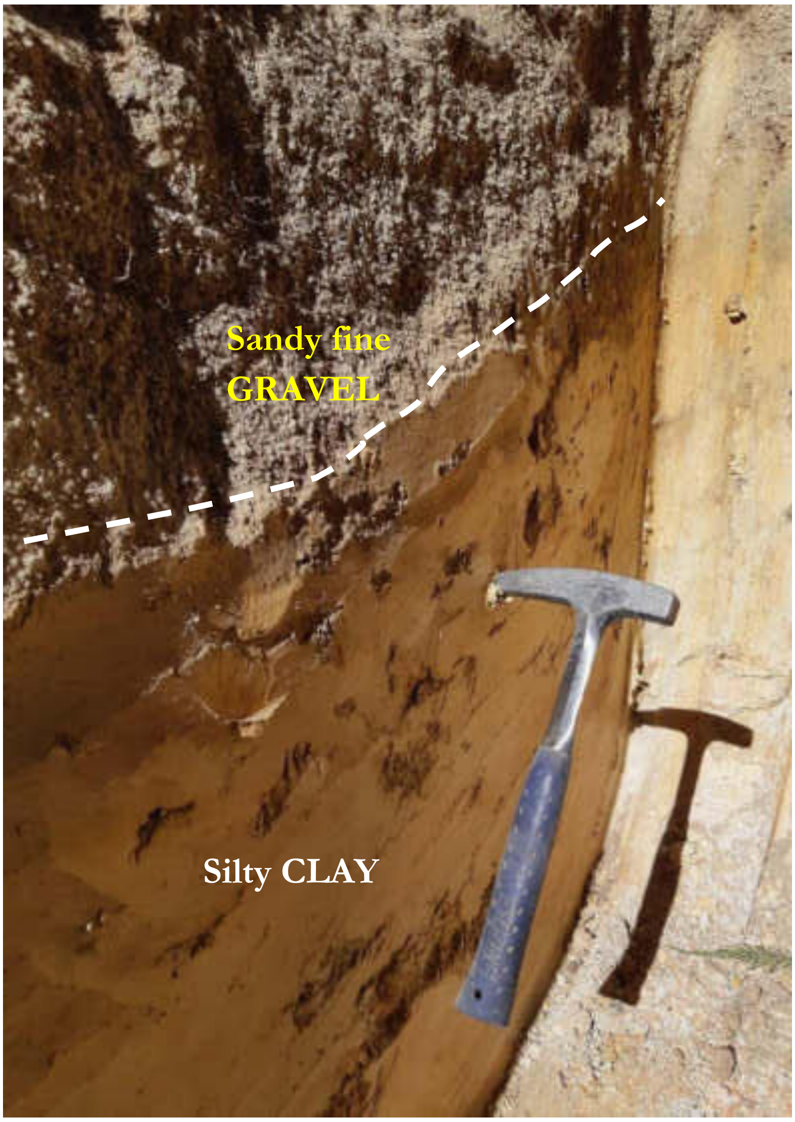


Figure 36: TP13 – Close-up of sidewall smear in silty clay residual horizon.

Figure 37: TP14 – Close-up of ferricrete boulders excavated from nodular ferricrete horizon.

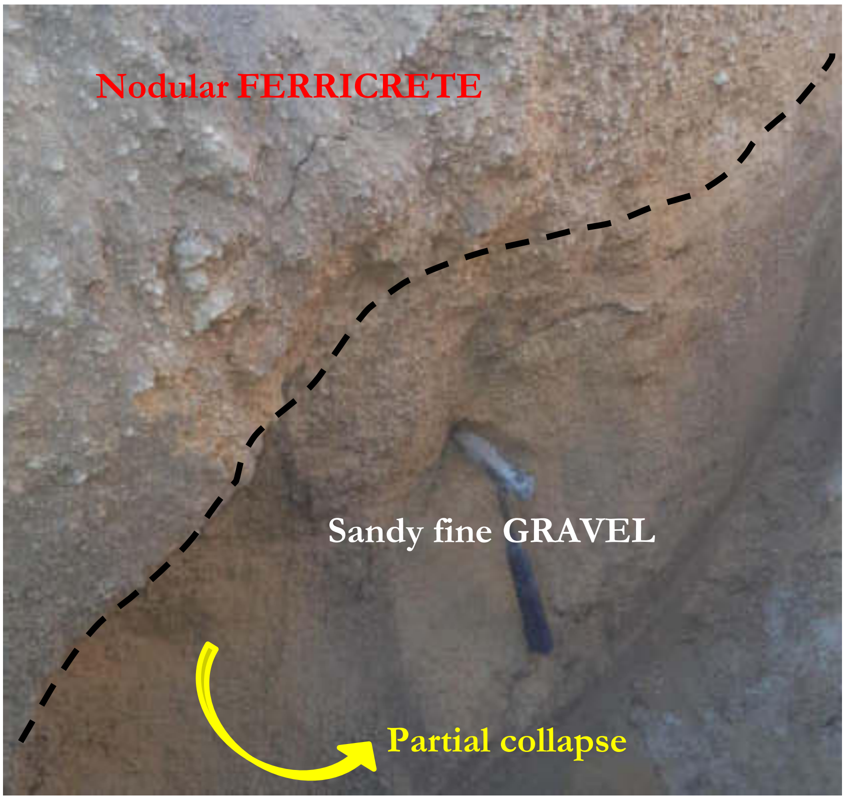


Figure 38: TP14 – Partial collapse of trial pit sidewall within the pinholed sandy fine gravel horizon; prior to water level rise.

Figure 39: TP15 – Close-up of trial pit sidewall showing various horizons encountered.

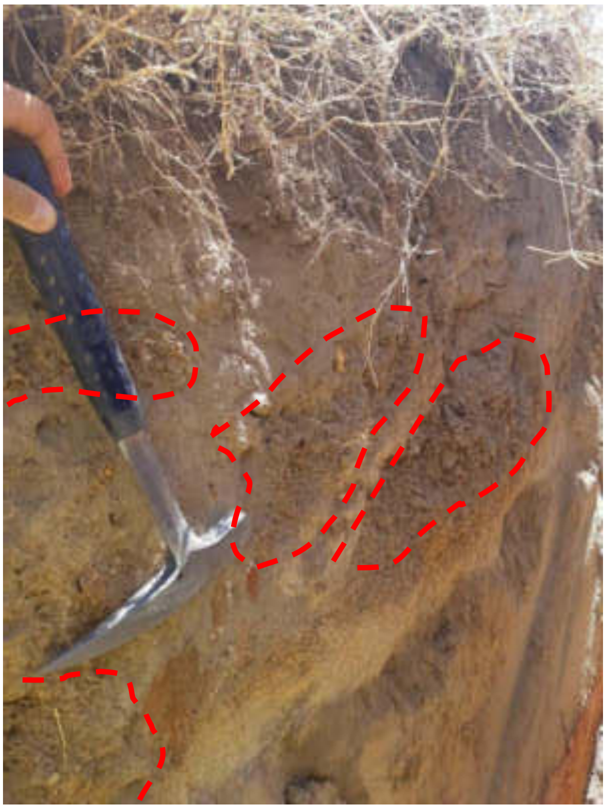


Figure 40: TP16 – Close-up of trial pit sidewall showing pockets of ferricrete nodules (annotated in red).

Figure 41: TP16 – Close-up of trial pit sidewall showing variation in 'smear' texture; material becomes less sandy toward base. Upon close inspection sandy grains are angular suggesting in-situ weathering.

Figure 42: TP18 – Close-up of trial pit upper surface of red-orange-brown nodular ferricrete horizon prior to excavation through to silty clay residual horizon.

Figure 43: TP19 – Close-up of trial pit floor; note metallic coating on base of trial pit.

Figure 44: TP21 – GEOSS team conducting DCP test beneath nodular ferricrete horizon. White clay-silt Corrobrick material pictured in the background.

Figure 45: TP22 – Close-up of transported gravelly sand horizon.

Figure 46: TP22 – Close-up of nodular ferricrete spoil pile; note this material excavated out in boulder-form occasionally. Excavation slow and time consuming.

Figure 47: TP22 – Close-up of spoil of silty clay material of the residual horizon; note blocky form of material in foreground - evidence of relict foliations.

Figure 48: TP27 – Close-up of soil profile; note the highly pinholed nature of fine gravel horizon near base of trial pit.

Figure 49: TP28 – Ferricrete boulders (approx. 300 mm in diameter) excavated from pedogenic hardpan ferricrete horizon.

Figure 50: TP29 – Close-up of trial pit sidewall; note occasional indurated ferricrete boulders in upper-most horizon. Intense sidewall 'smear' in residual clayey sandy silt horizon.

Figure 51: TP29 – Close-up of spoil of residual sandy silt horizon.

Figure 52: TP32 – Close-up of pin holed nature of transported material; likely due to bioturbation.

Figure 53: TP32 – Close-up of orange blotched red residual horizon.

Figure 54: TP43 – Close-up of voided/bioturbated residual material.

Figure 55: TP44 – Close-up of slightly smoothed/slickensided surface of residual material encountered in trial pit.

Figure 56: Corner down type crack possibly related to potentially expansive nature of subsoils; stable structure located between TP18 and TP15.

Figure 57: Vertical crack possibly related to potentially expansive nature of subsoils; storage structure located between TP18 and TP15.

Figure 58: Ferricrete outcrop exposed in northern portion of the site near TP36.

Figure 59: Fill dumped in drainage in northern portion of the site intended for future development.

Figure 60: View of JCB 3DX Super Tractor Loader Backhoe excavating a trial pit near the central portion of the site.

Figure 61: Close-up of TLB bucket tines used for conducting reconnaissance investigation.

12. APPENDIX D: DCP TESTING LOGS

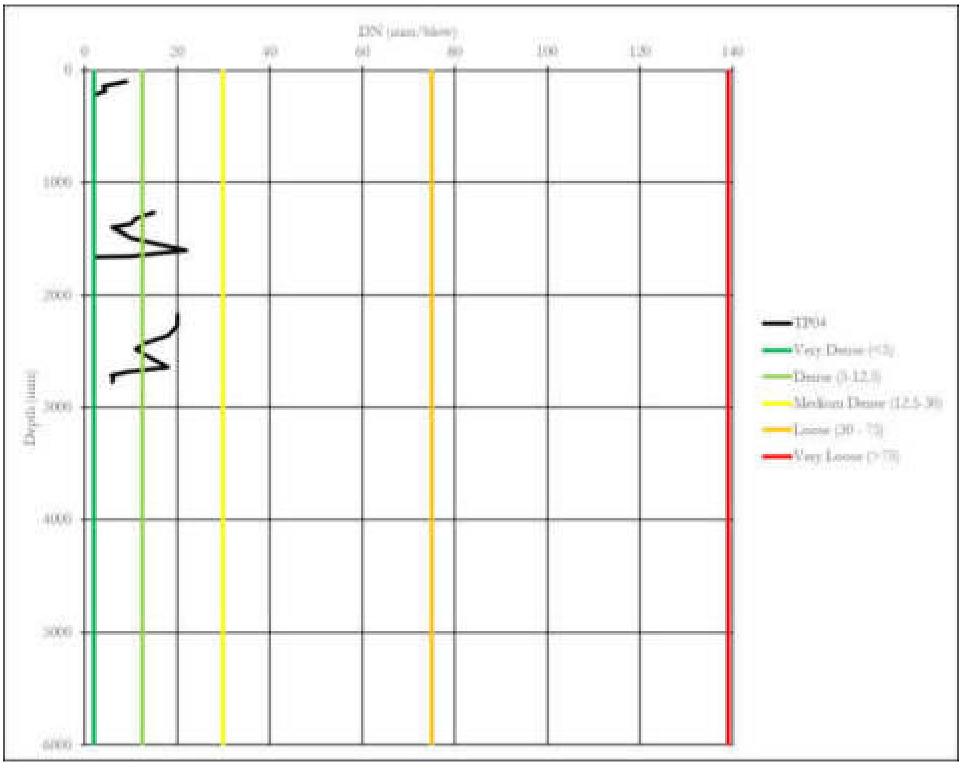


Figure 62: DCP04 Log.

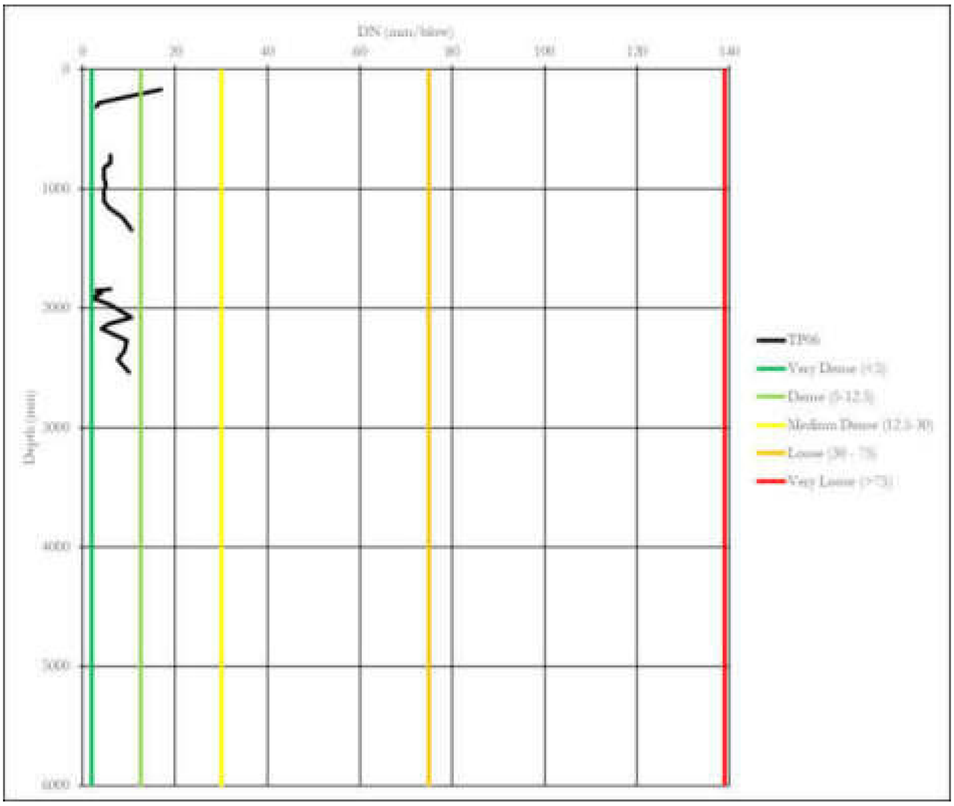


Figure 63: DCP06 Log.

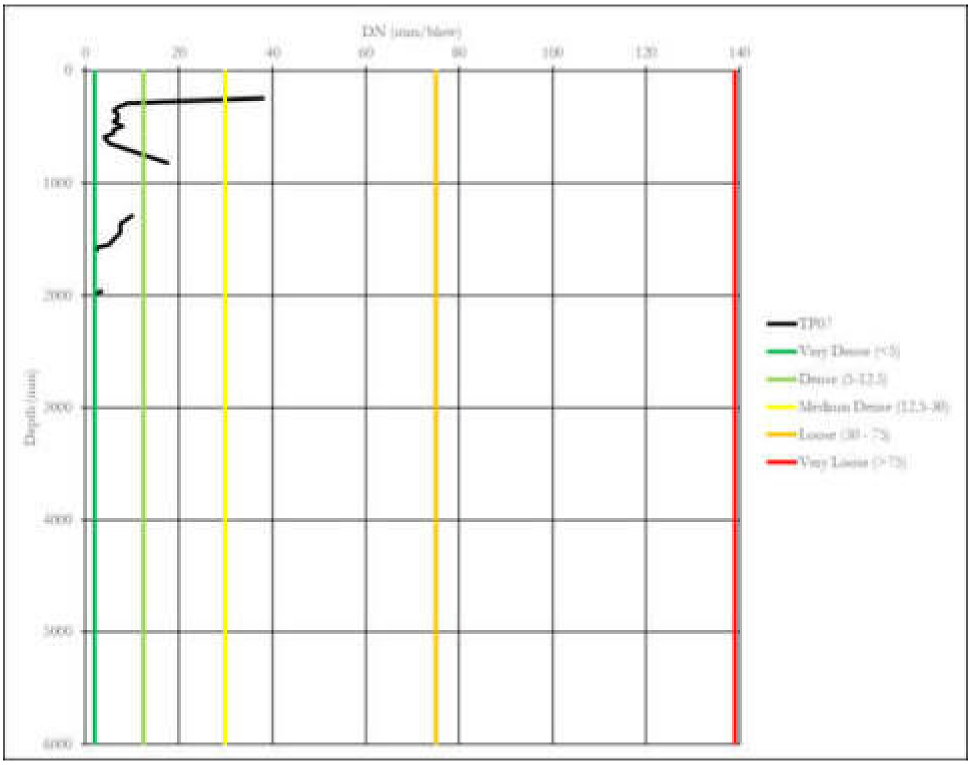


Figure 64: DCP07 Log.

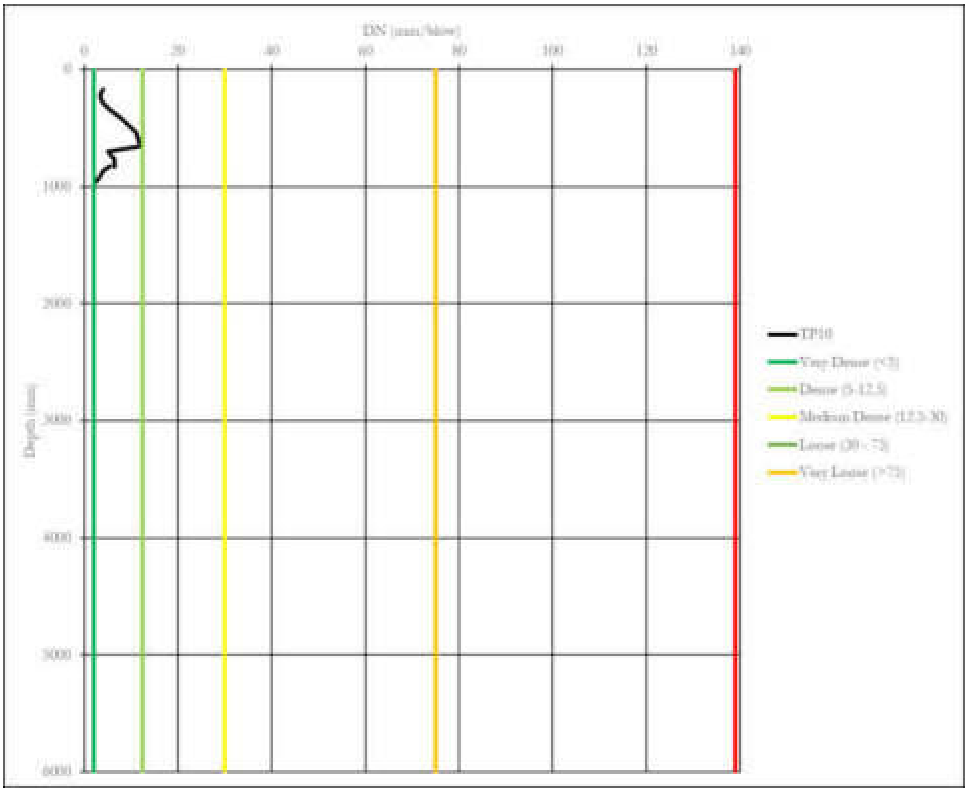


Figure 65: DCP10 Log.

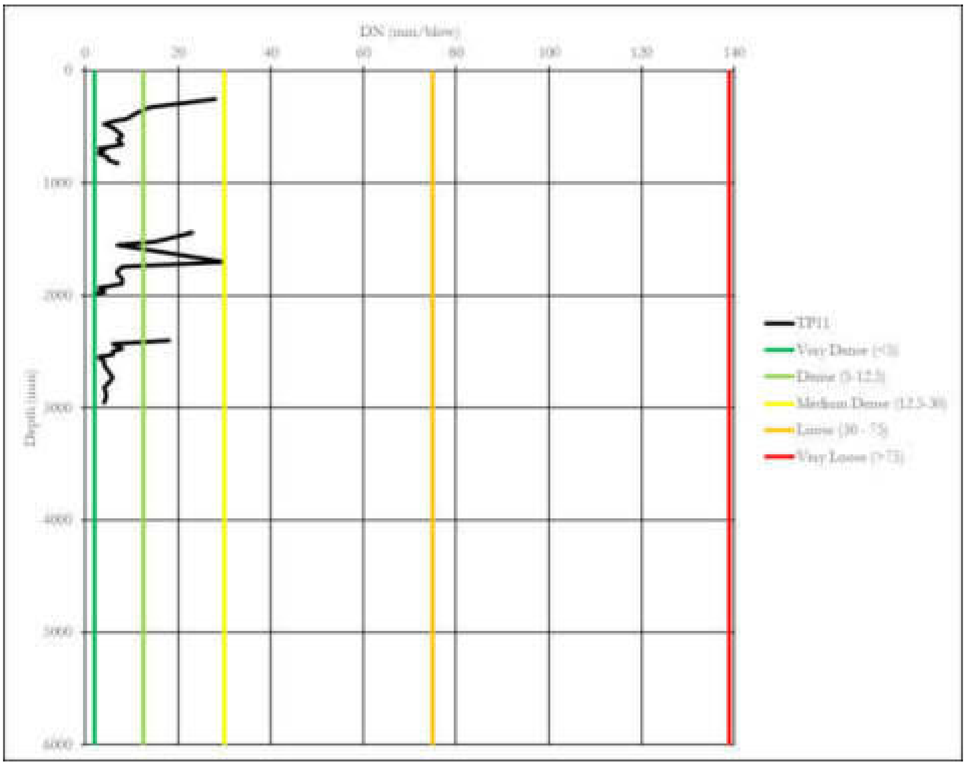


Figure 66: DCP11 Log.

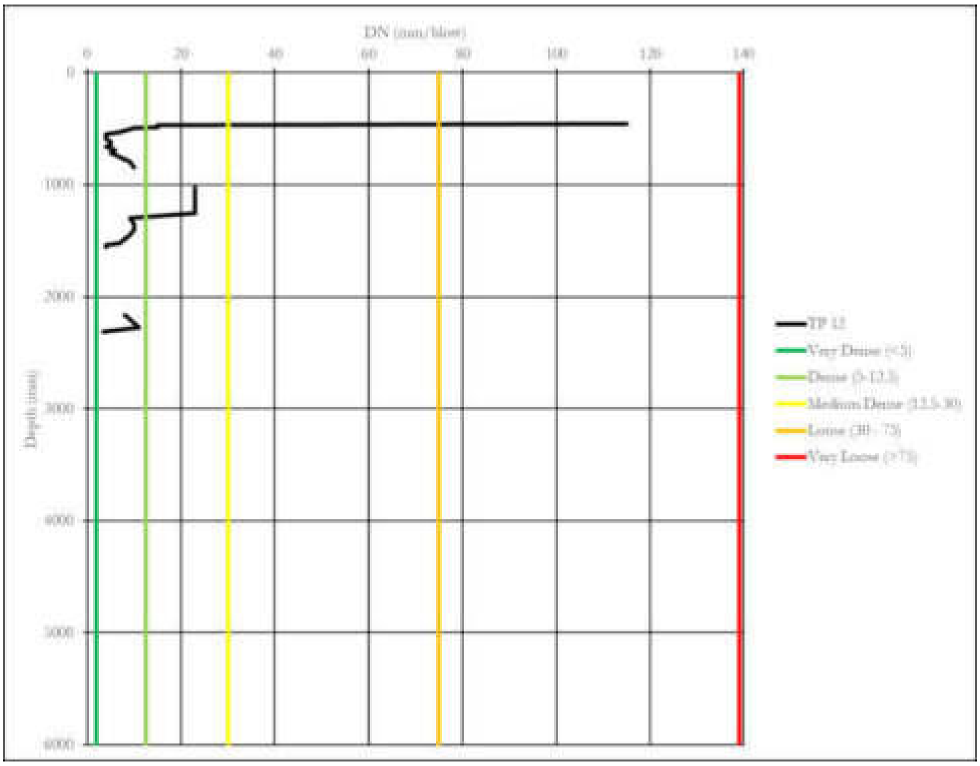


Figure 67: DCP12 Log.

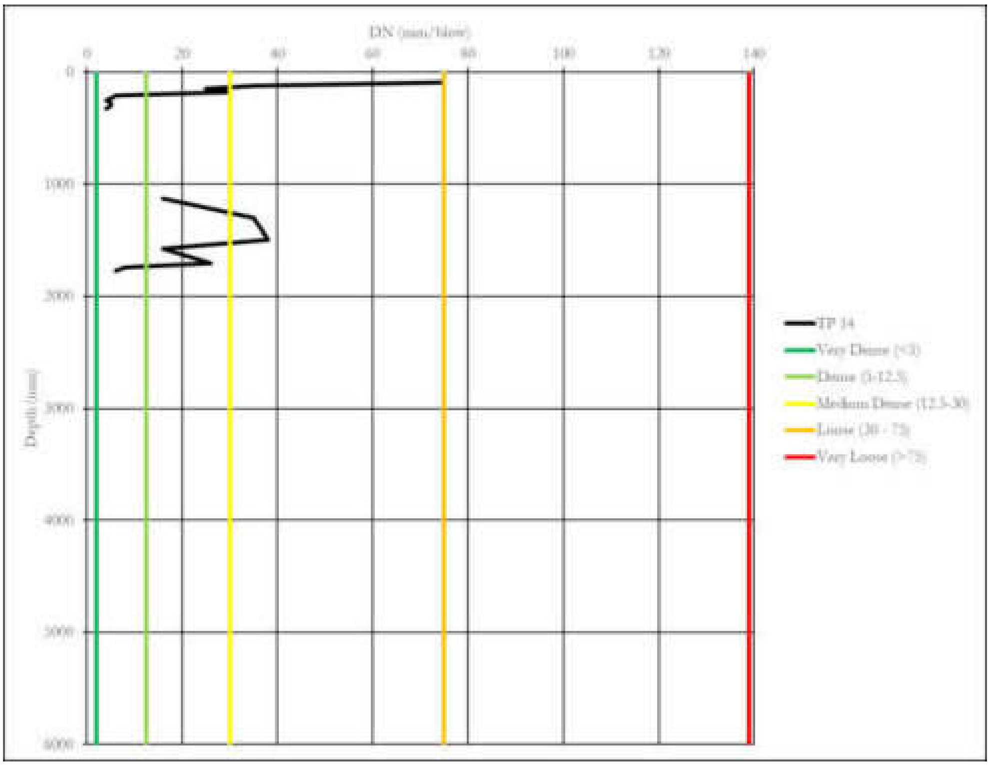


Figure 68: DCP14 Log.

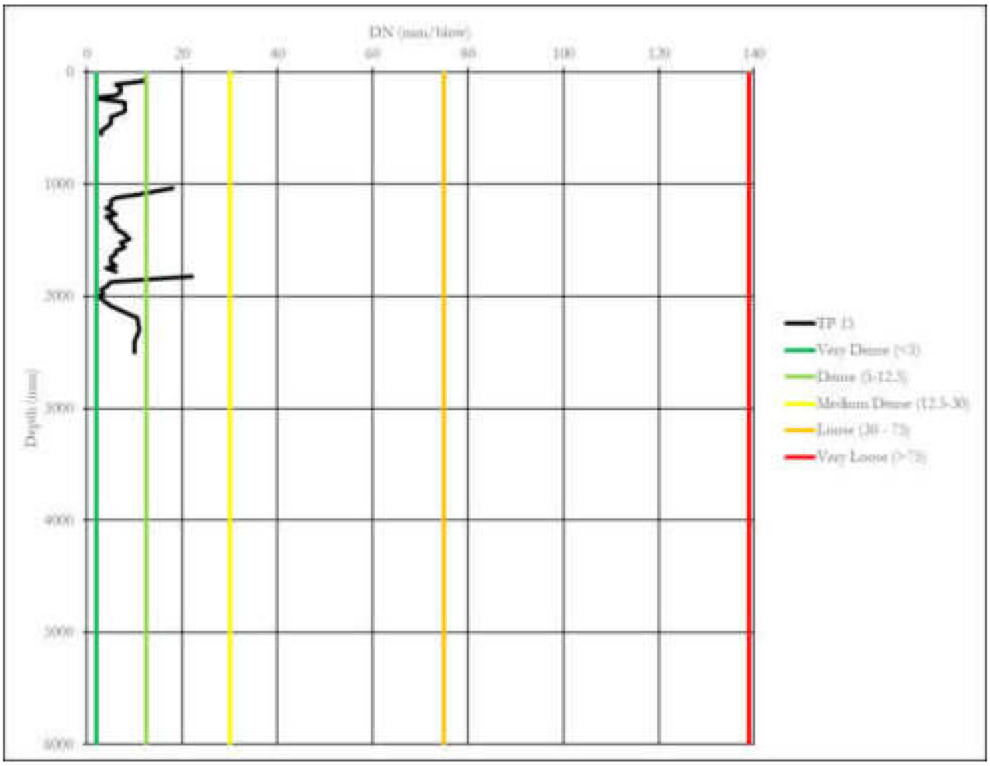


Figure 69: DCP15 Log.

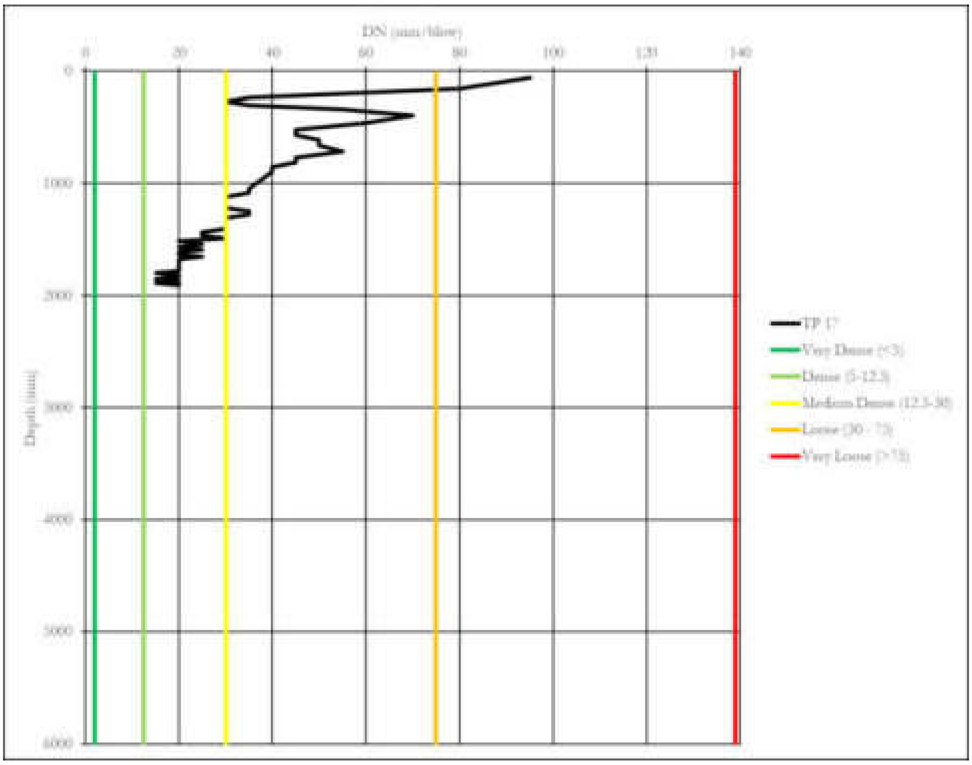


Figure 70: DCP17 Log.

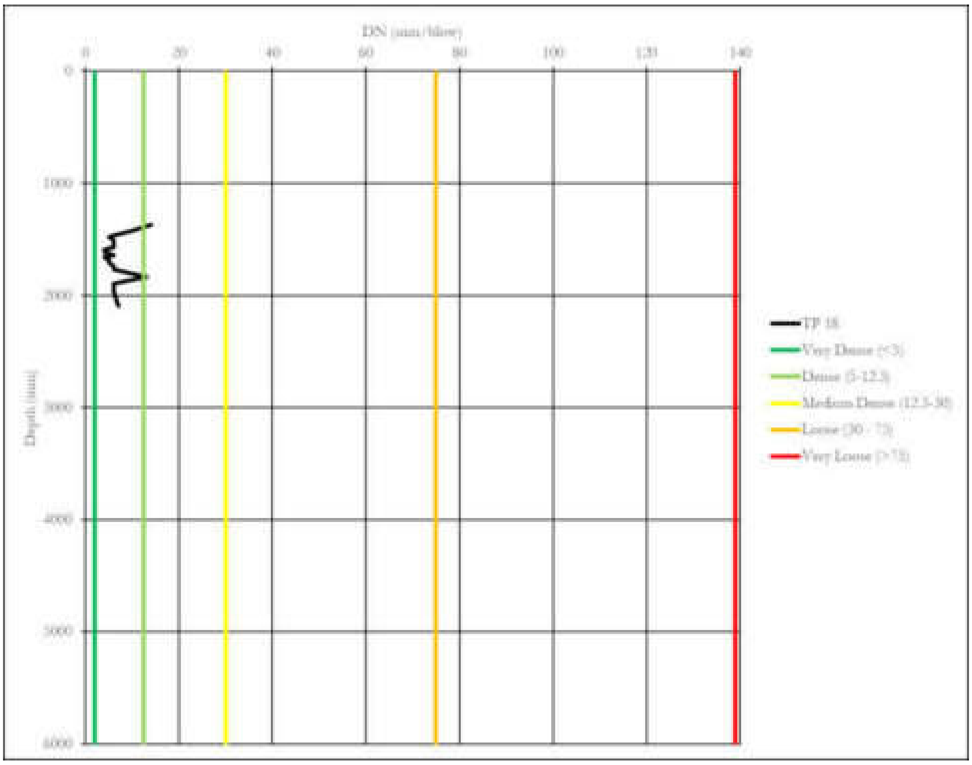


Figure 71: DCP18 Log.

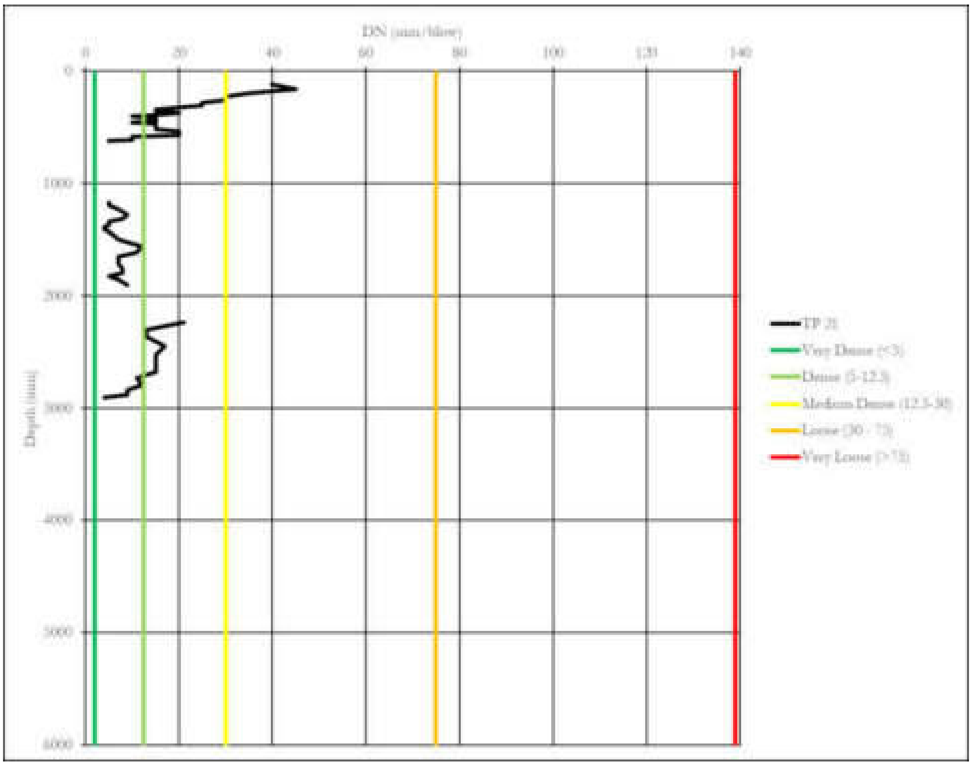


Figure 72: DCP21 Log.

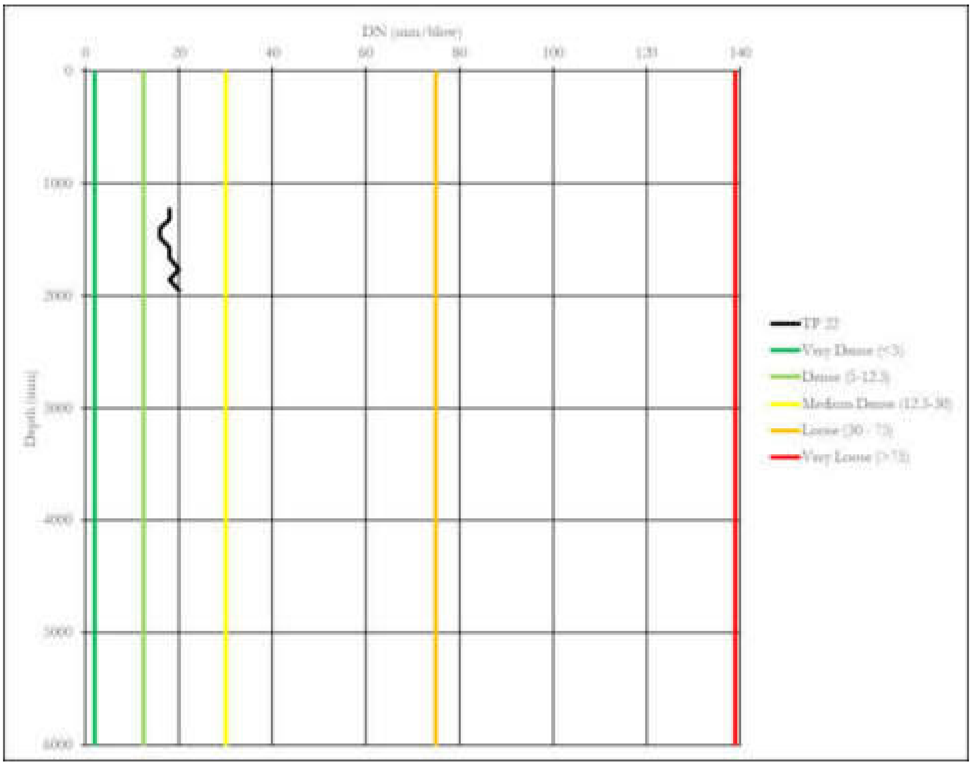


Figure 73: DCP22 Log.

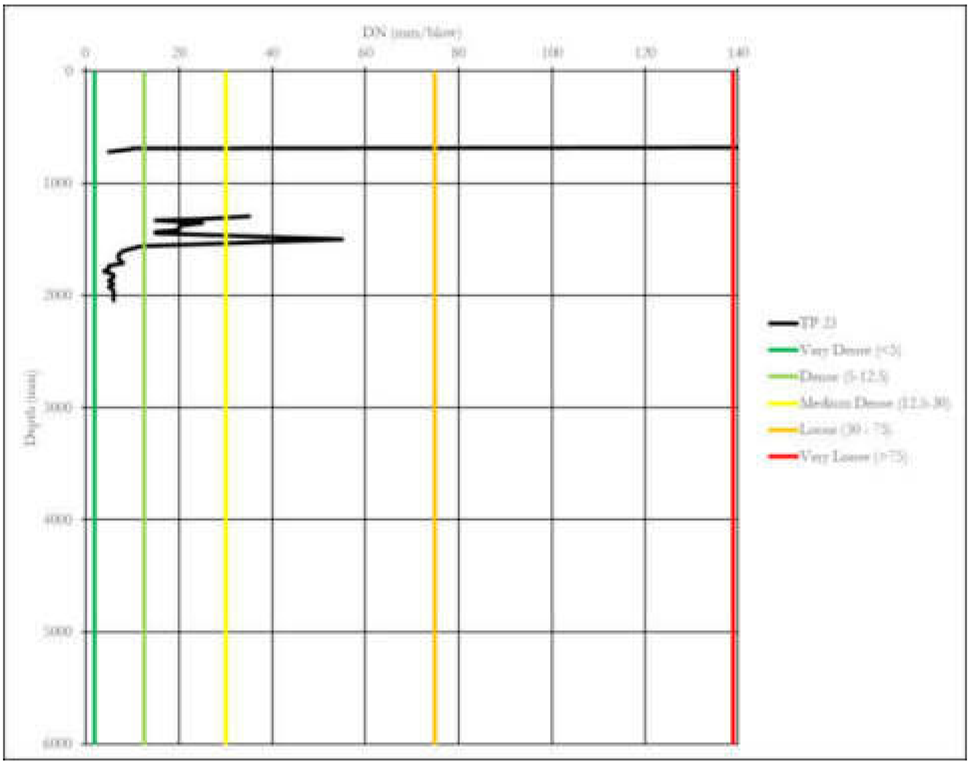


Figure 74: DCP23 Log.

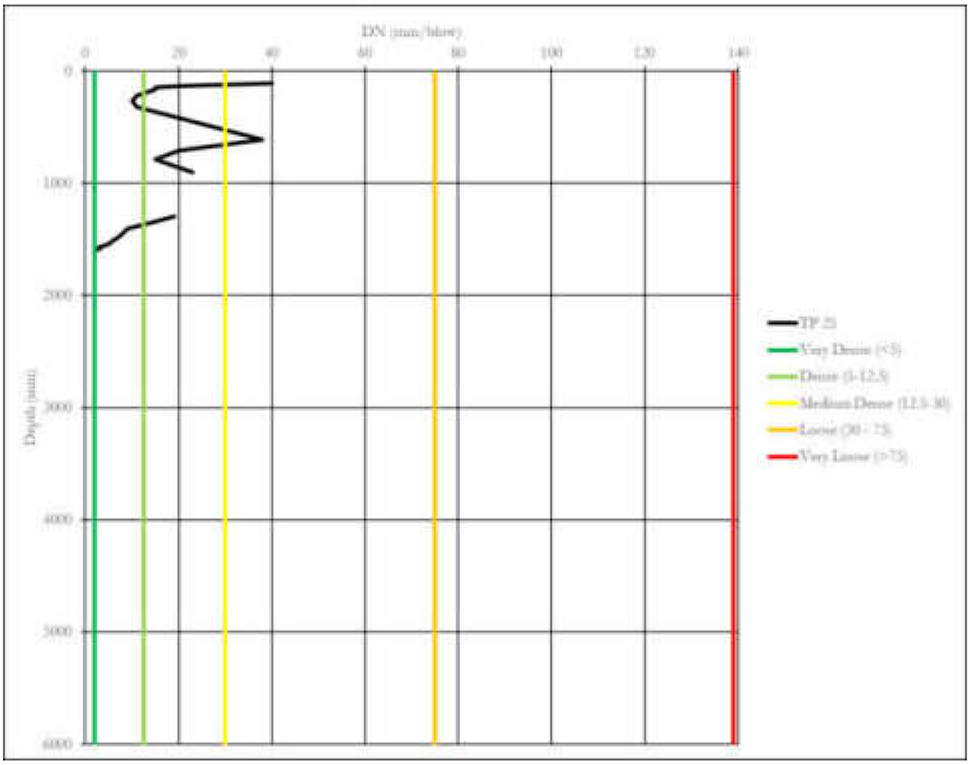


Figure 75: DCP25 Log.

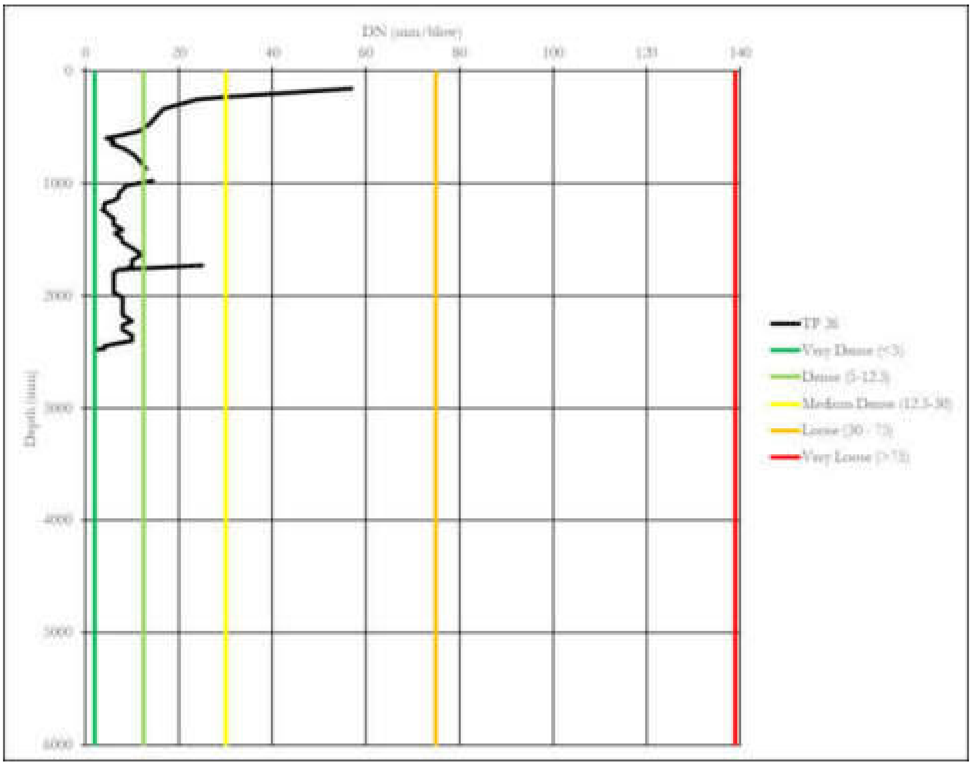


Figure 76: DCP26 Log.

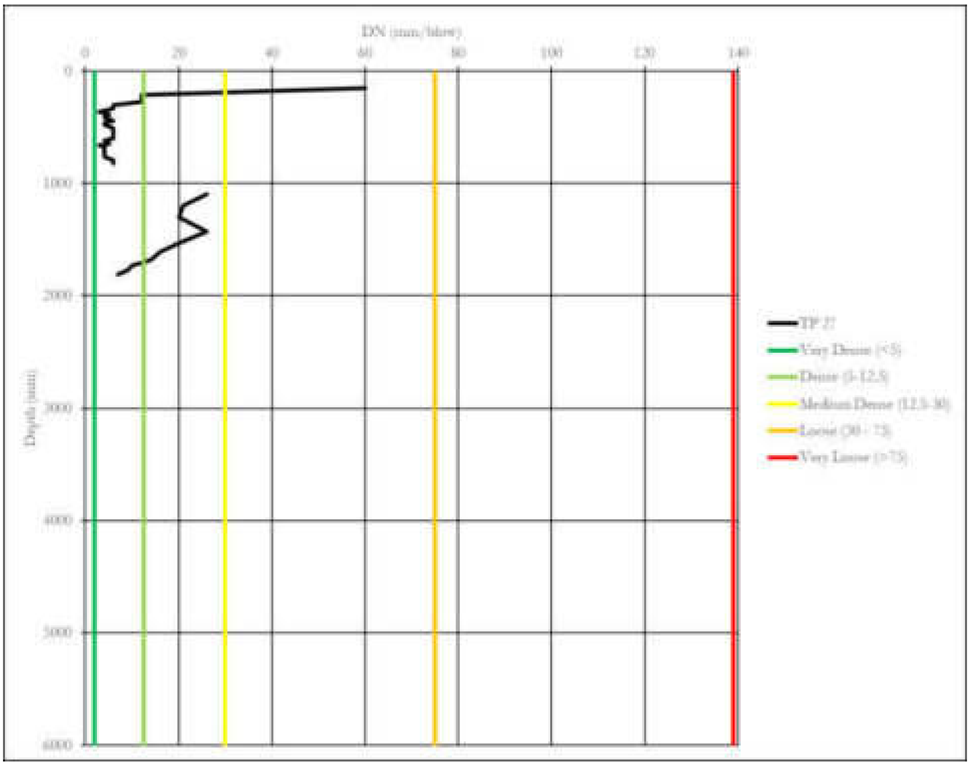


Figure 77: DCP27 Log.

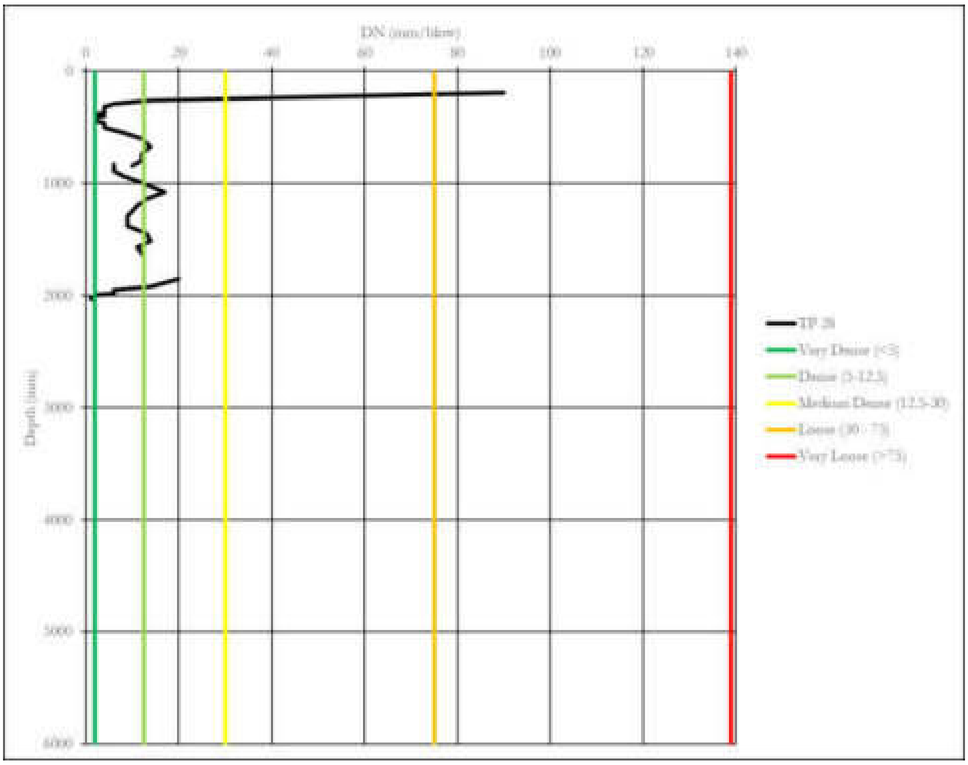


Figure 78: DCP28 Log.

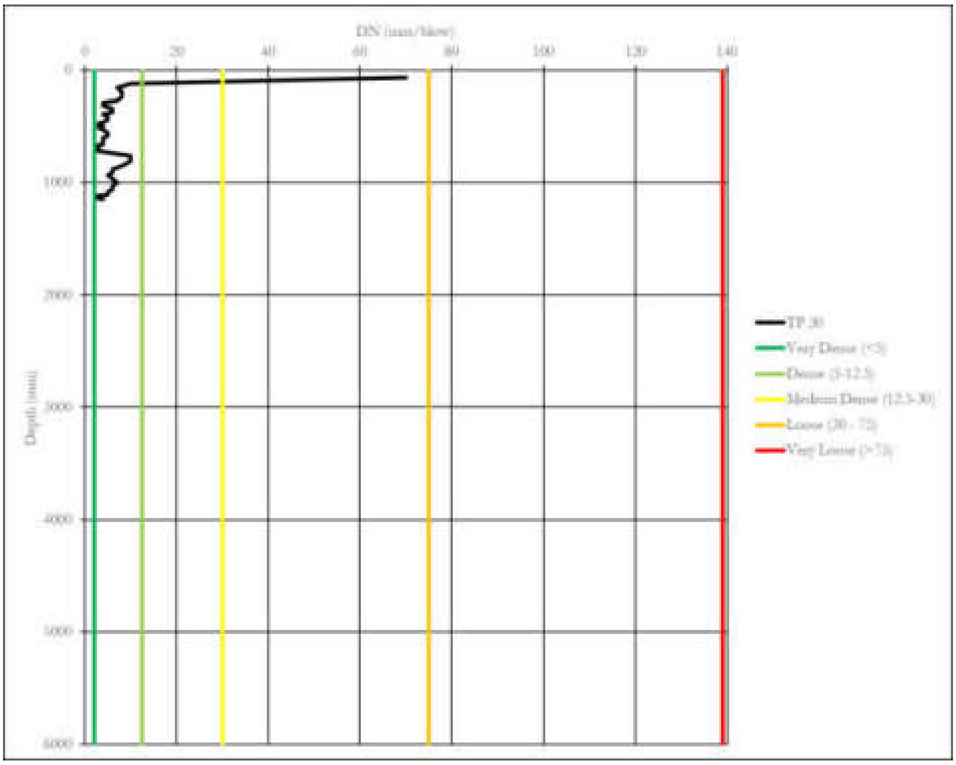


Figure 79: DCP30 Log.

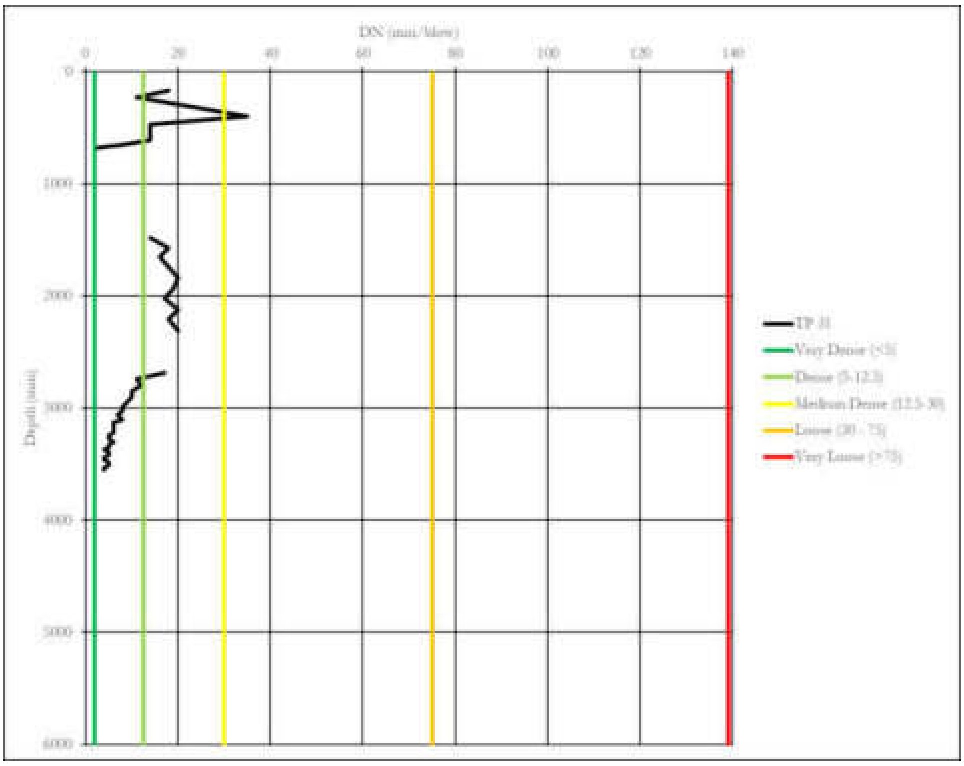


Figure 80: DCP31 Log.

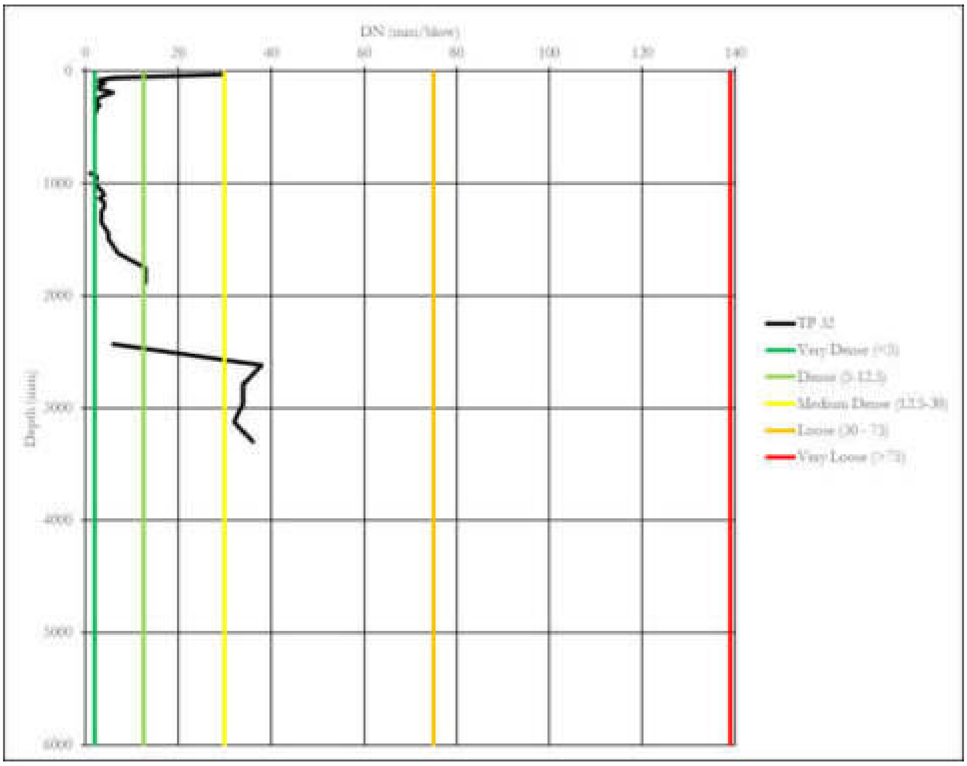


Figure 81: DCP32 Log.

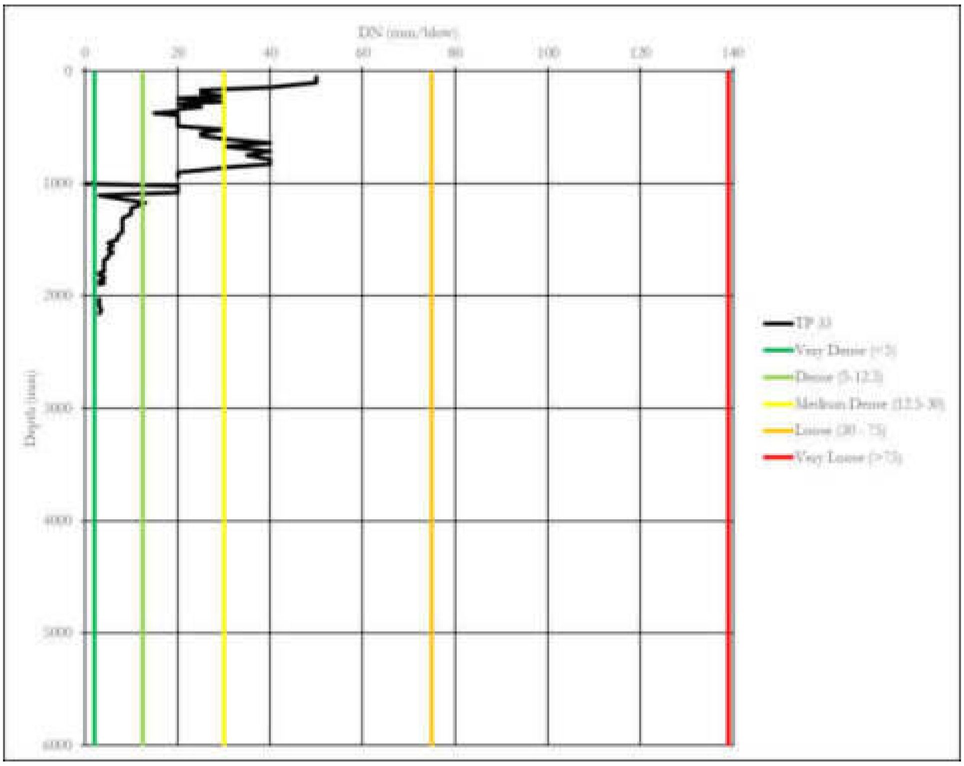


Figure 82: DCP33 Log.

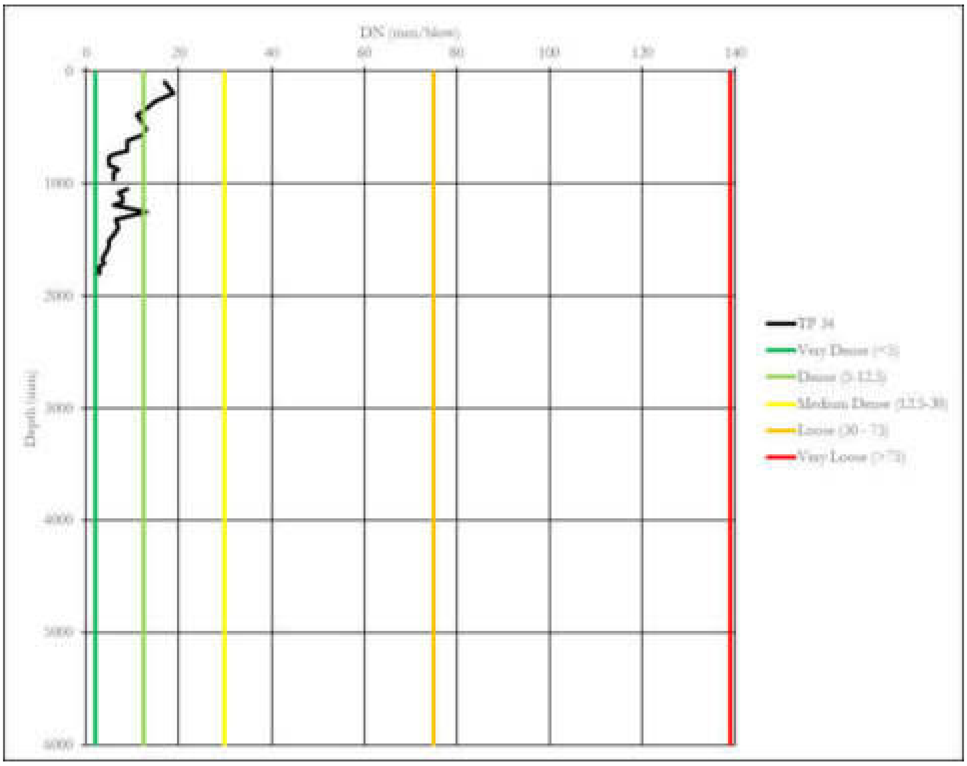


Figure 83: DCP34 Log.

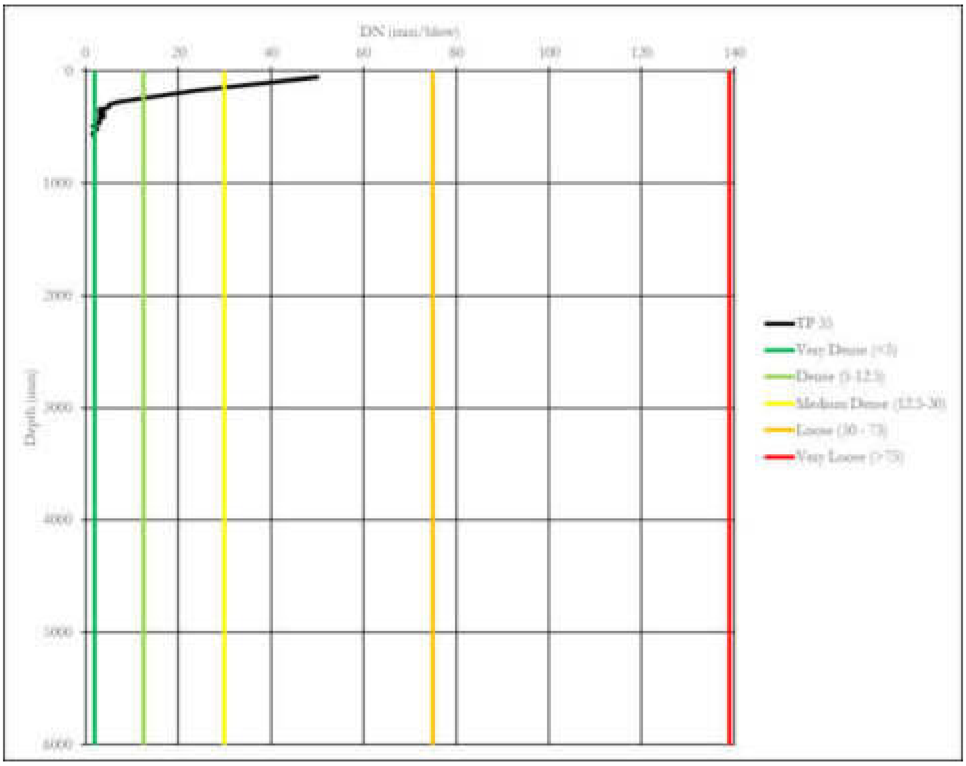


Figure 84: DCP35 Log.

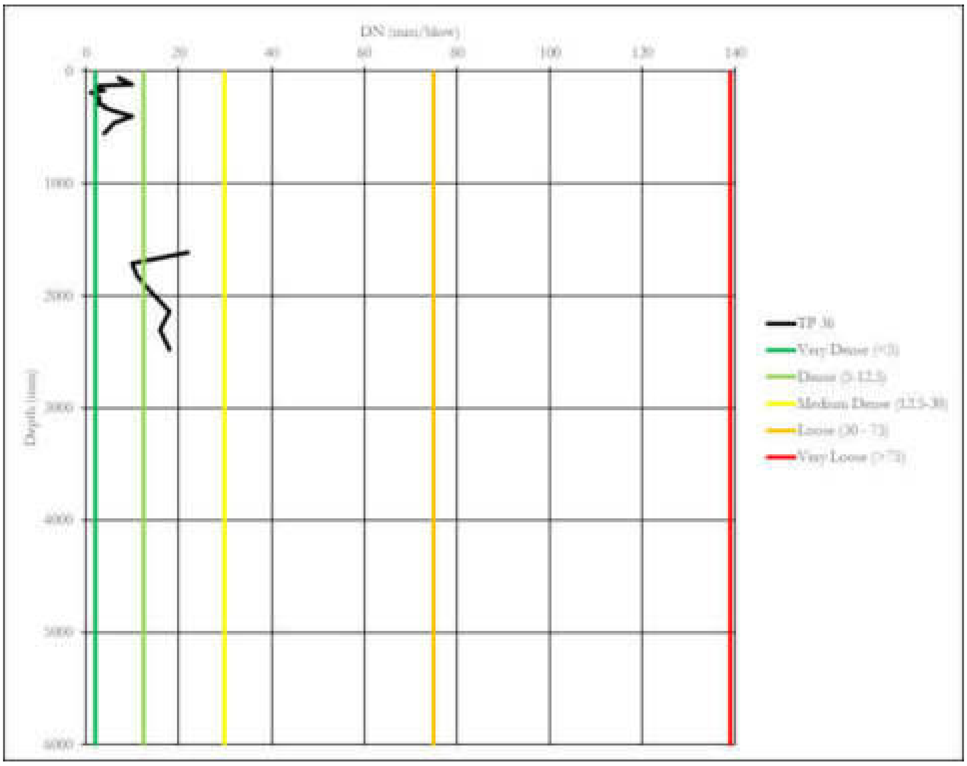


Figure 85: DCP36 Log.

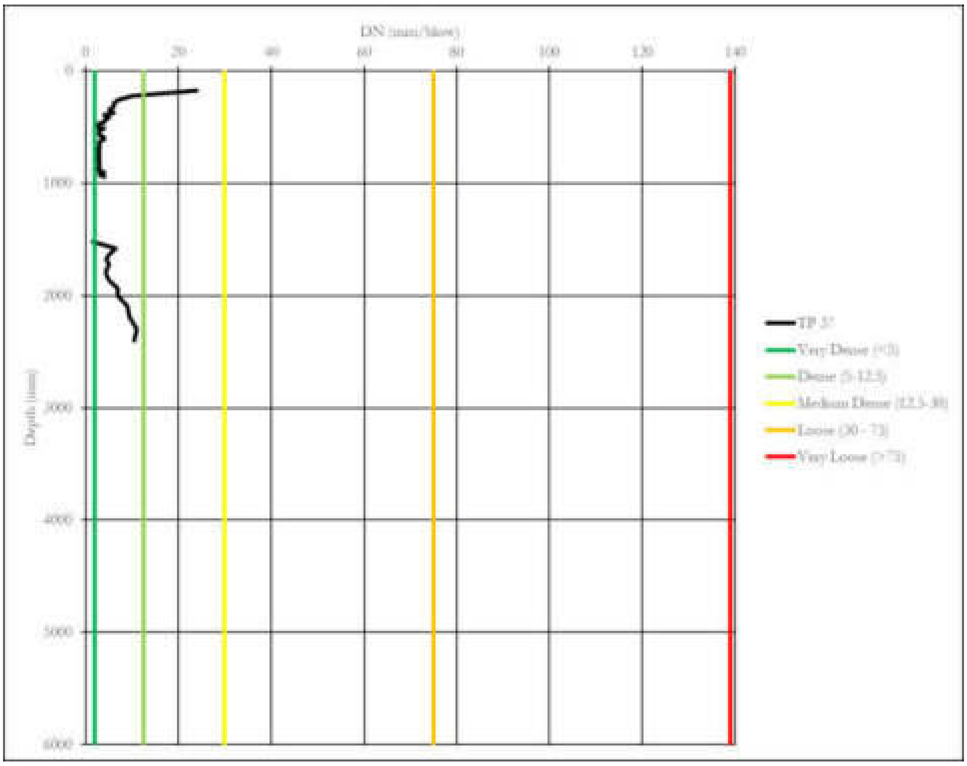


Figure 86: DCP37 Log.

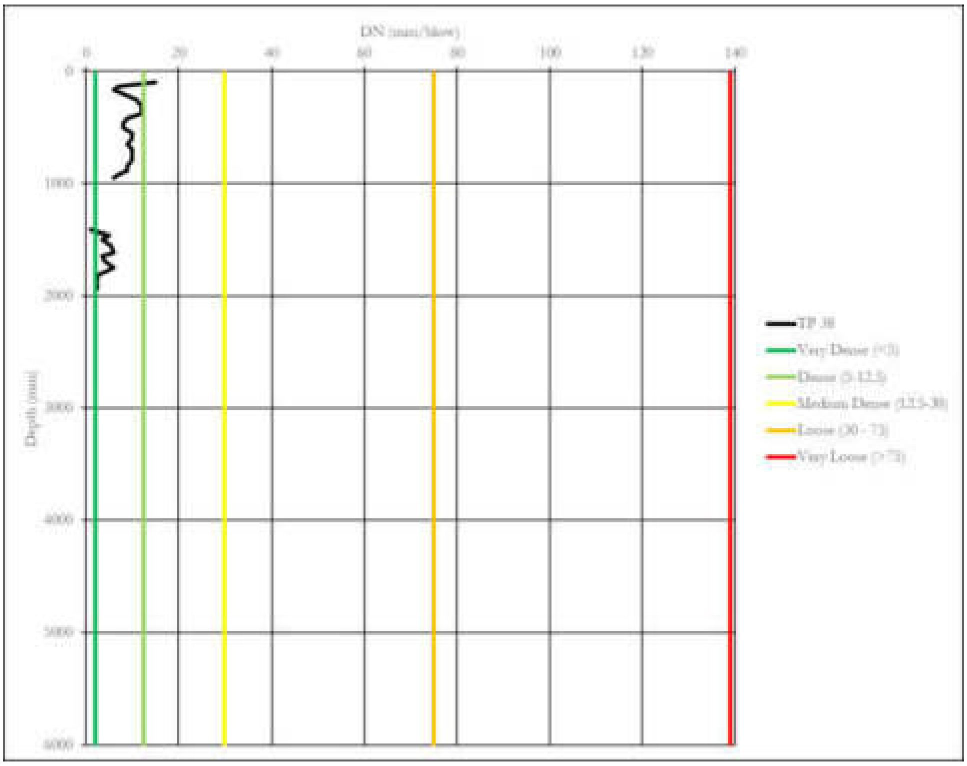


Figure 87: DCP38 Log.

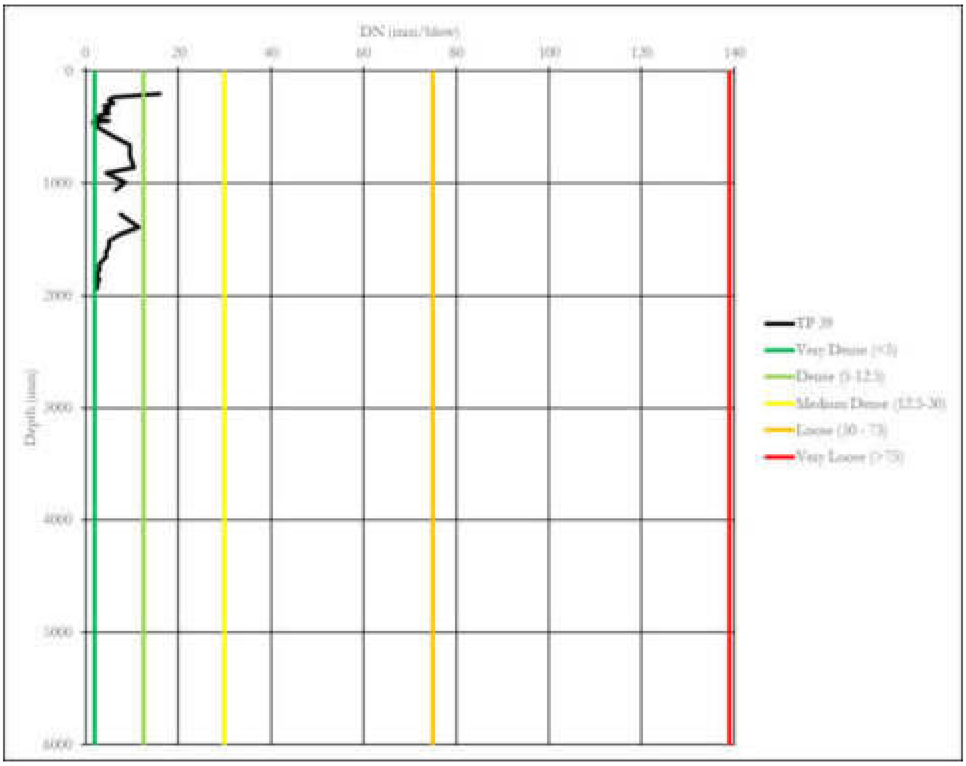


Figure 88: DCP39 Log.

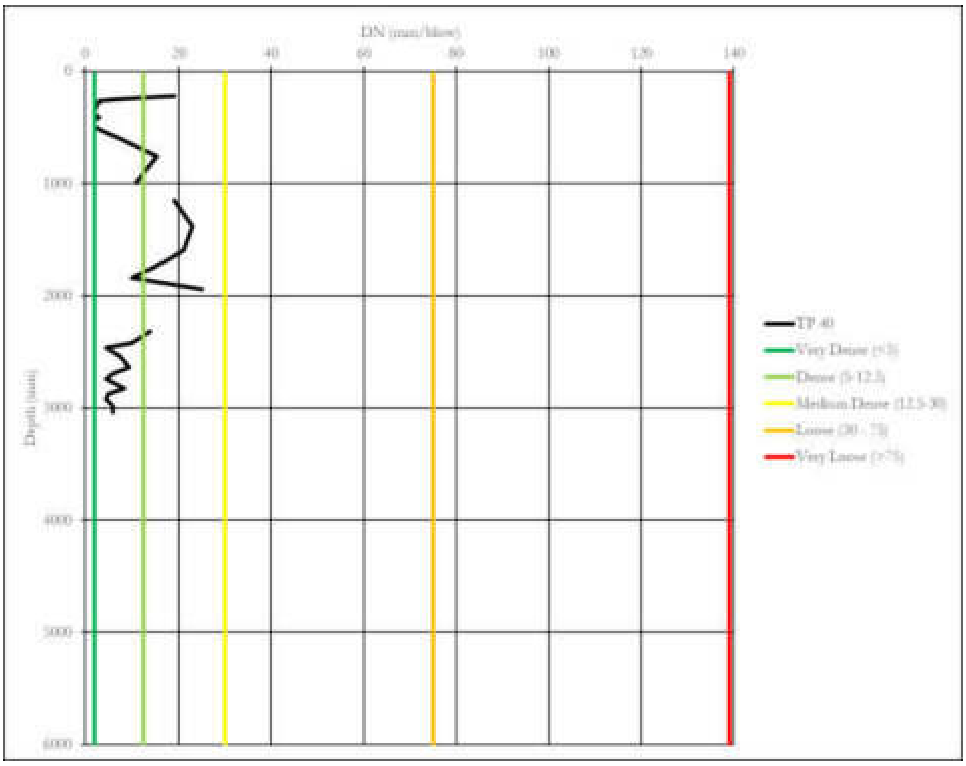


Figure 89: DCP40 Log.

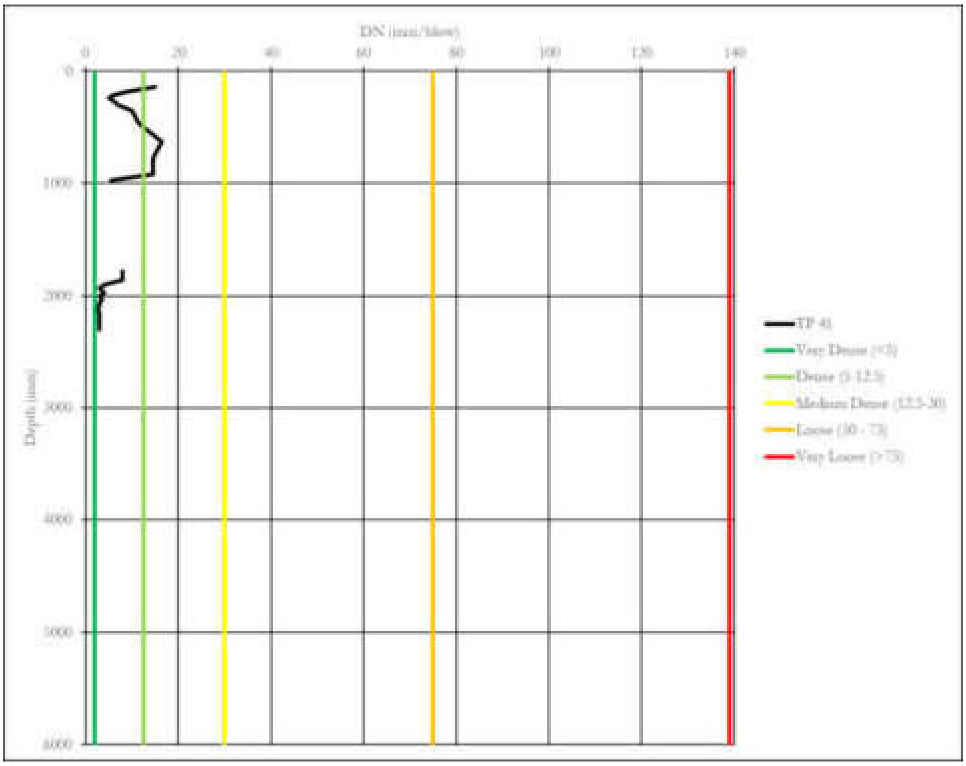


Figure 90: DCP41 Log.

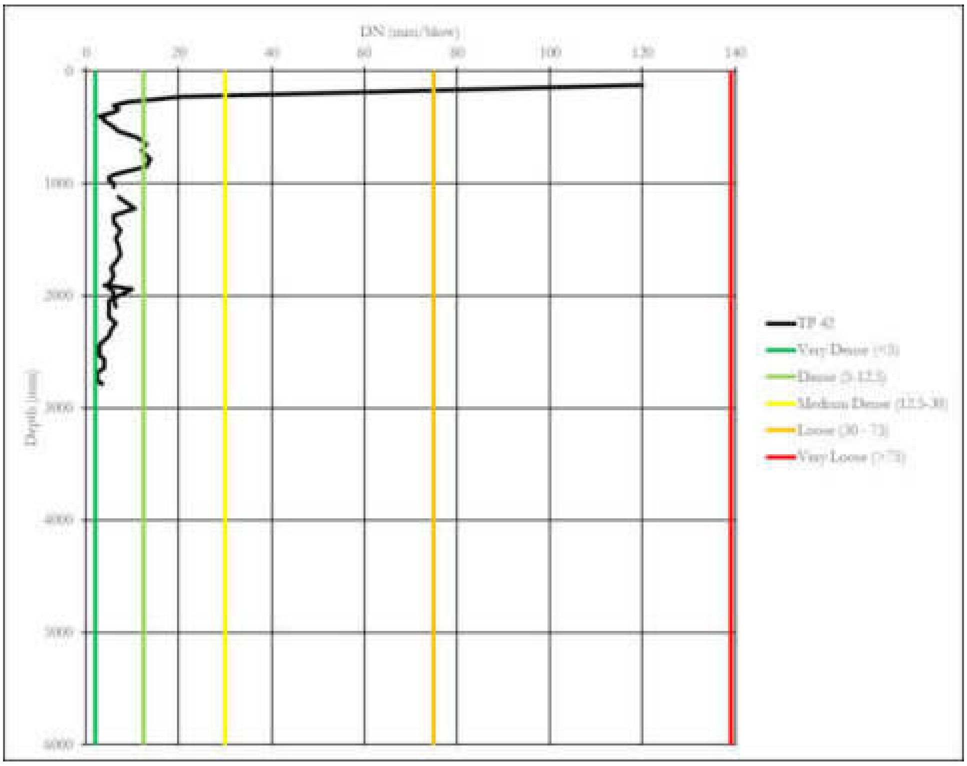


Figure 91: DCP42 Log.

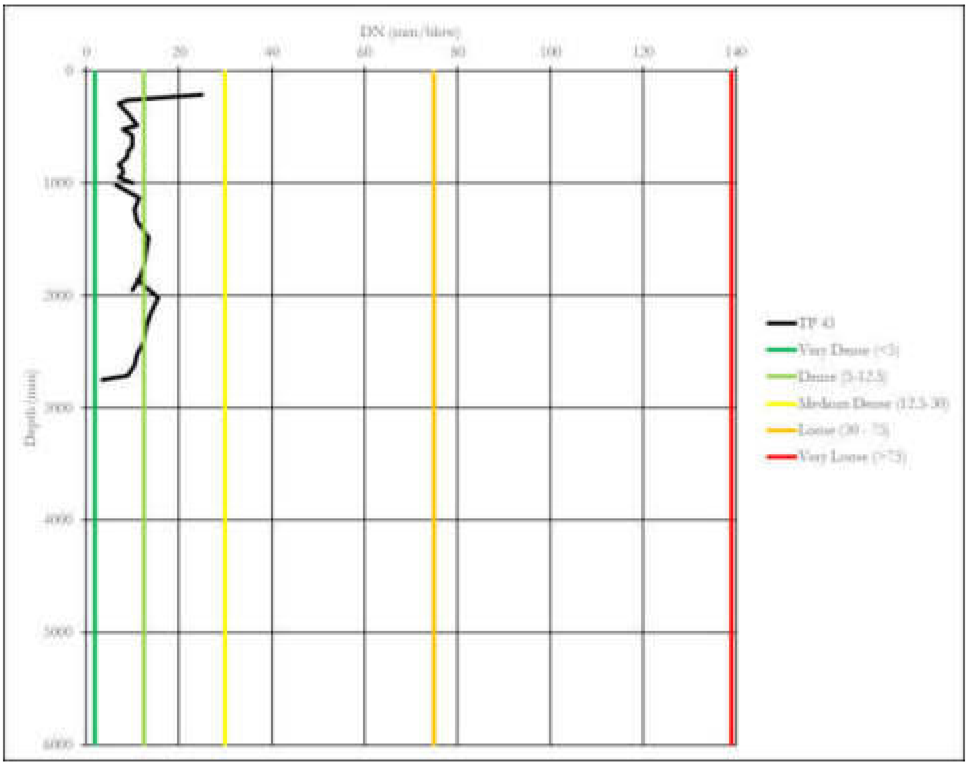


Figure 92: DCP43 Log.

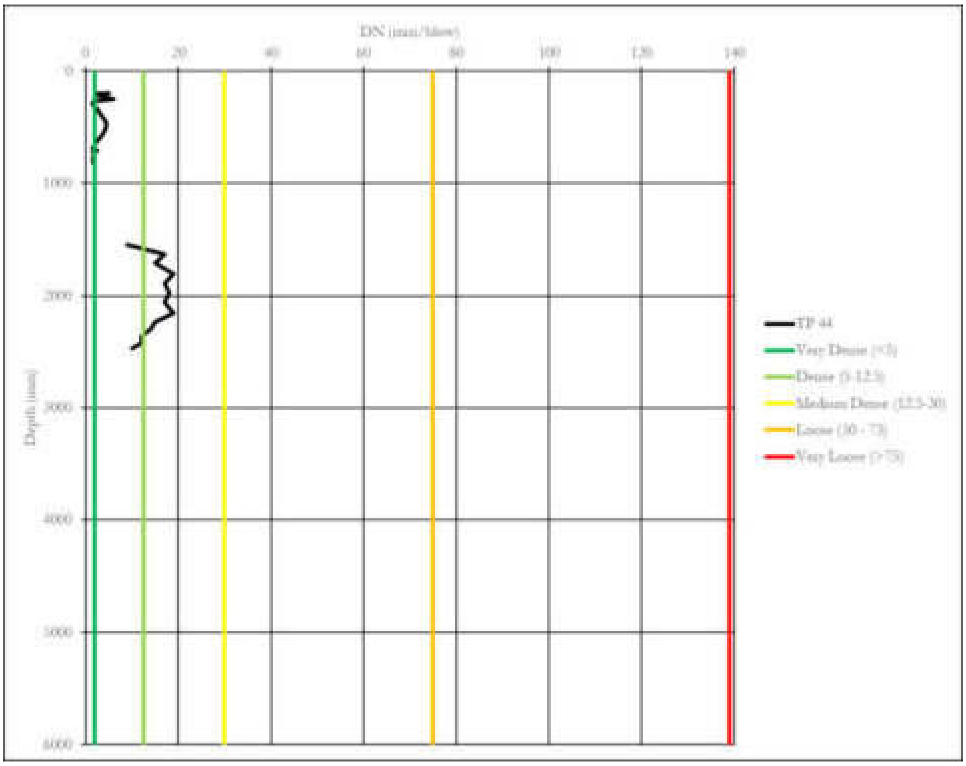


Figure 93: DCP44 Log.

13. APPENDIX E: LABORATORY ANALYSIS RESULTS

STEYN-WILSON LABORATORIES

CIVIL ENGINEERING TESTING LABORATORIES

sanas Testing Laboratory Accreditation No. T0838

11 Gooderson Road Blackheath
PO Box 58 Blackheath 7581
Tel: 021 905 0435
Fax: 086 499 9482
Email: admin@steynwilson.co.za
Web: www.steynwilson.co.za

Client:	**GEOSS South Africa**
Project:	Fisantekraal Airport
Attention:	Mr Shane Teek
Your Ref. No:	4505
Date Reported	16/02/22

TEST REPORT REFERENCE NUMBER / JOB NUMBER : SWL19674

Dear Sir / Madam

Herewith please find the original reports pertaining to the above mentioned project.

Test Requested

4 x MOD / CBR / FOUNDATION INDICATOR

Site Sampling and Materials Information

Sampling Method	*Specimens delivered to Steyn Wilson Laboratory.*
Environmental Condition	*Sunny & Hot*

● **FINAL REPORT**

We would like to take this opportunity to thank you for your valued support.
Should you have any further enquiries please don't hesitate to contact me.

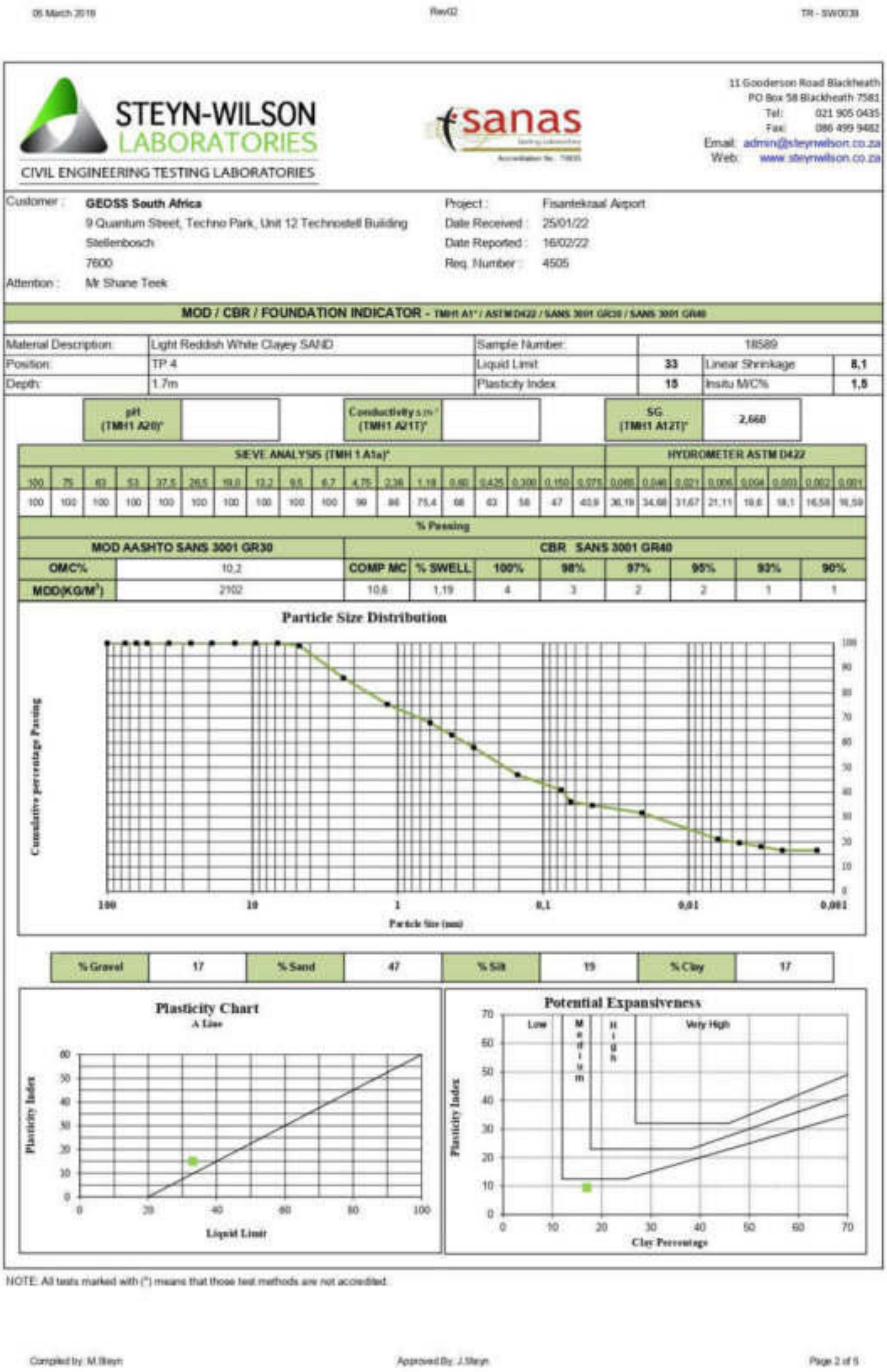
Yours Faithfully
STEYN-WILSON LABORATORIES (PTY) LTD

Mr. R.Wilson
Technical Signatory

Remarks:

1. Information contained herein is confidential to STEYN-WILSON PTY LTD and the addressee
2. Opinions & Interpretations are not included in our schedule of Accreditation.
3. The samples where subjected and analysed according to ASTM.
4. The results reported relate only to the sample tested, Further use of the attached information is not the responsibility or liability of STEYN-WILSON LABORATORIES (PTY) LTD.
5. This document is the correct record of all measurements made, and may not be reproduced other than with full written approval from a director of STEYN-WILSON LABORATORIES (PTY) LTD.
6. Measuring equipment is traceable to national standards (Where applicable).
7. Should there be any deviation from the prescribed test method comments will be made thereof, pertaining to the test on the relevant materials report.

DIRECTORS:	Mr. J. Steyn ND-Civil (Managing) | Mr. R. Wilson B-Tech Civil (Operations)
FINANCIAL MANAGER:	Mr. D. Erasmus (SAICA Reg No: 200522562)
LABORATORY MANAGER:	Mr. K. Booysen



05 March 2019 Rev02 TR - SW0038

STEYN-WILSON LABORATORIES
CIVIL ENGINEERING TESTING LABORATORIES

sanas
Accreditation No. T0035

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Web: www.steynwilson.co.za

Customer :	**GEOSS South Africa**	Project :	Fisantekraal Airport
	9 Quantum Street, Techno Park, Unit 12 Technostell Building	Date Received :	25/01/22
	Stellenbosch	Date Reported :	16/02/22
	7600	Req. Number :	4505
Attention :	Mr Shane Teek		

MOD / CBR / FOUNDATION INDICATOR - TMH1 A1* / ASTM D422 / SANS 3001 GR30 / SANS 3001 GR40

Material Description:	Light Reddish White Clayey SAND	Sample Number:	18589		
Position:	TP 4	Liquid Limit	**33**	Linear Shrinkage	**8,1**
Depth:	1.7m	Plasticity Index	**15**	Insitu M/C%	**1,5**

pH (TMH1 A20)*		**Conductivity s.m⁻¹ (TMH1 A21T)***		**SG (TMH1 A12T)***	**2,660**

SIEVE ANALYSIS (TMH 1 A1a)*																		HYDROMETER ASTM D422							
100	75	63	53	37,5	26,5	19,0	13,2	9,5	6,7	4,75	2,36	1,18	0,60	0,425	0,300	0,150	0,075	0,065	0,046	0,021	0,006	0,004	0,003	0,002	0,001
100	100	100	100	100	100	100	100	100	100	99	86	75,4	68	63	56	47	40,9	36,19	34,68	31,67	21,11	19,6	18,1	16,58	16,59
% Passing																									

MOD AASHTO SANS 3001 GR30		CBR SANS 3001 GR40							
OMC%	10,2	**COMP MC**	**% SWELL**	**100%**	**98%**	**97%**	**95%**	**93%**	**90%**
MDD(KG/M³)	2102	10,6	1,19	4	3	2	2	1	1

Particle Size Distribution

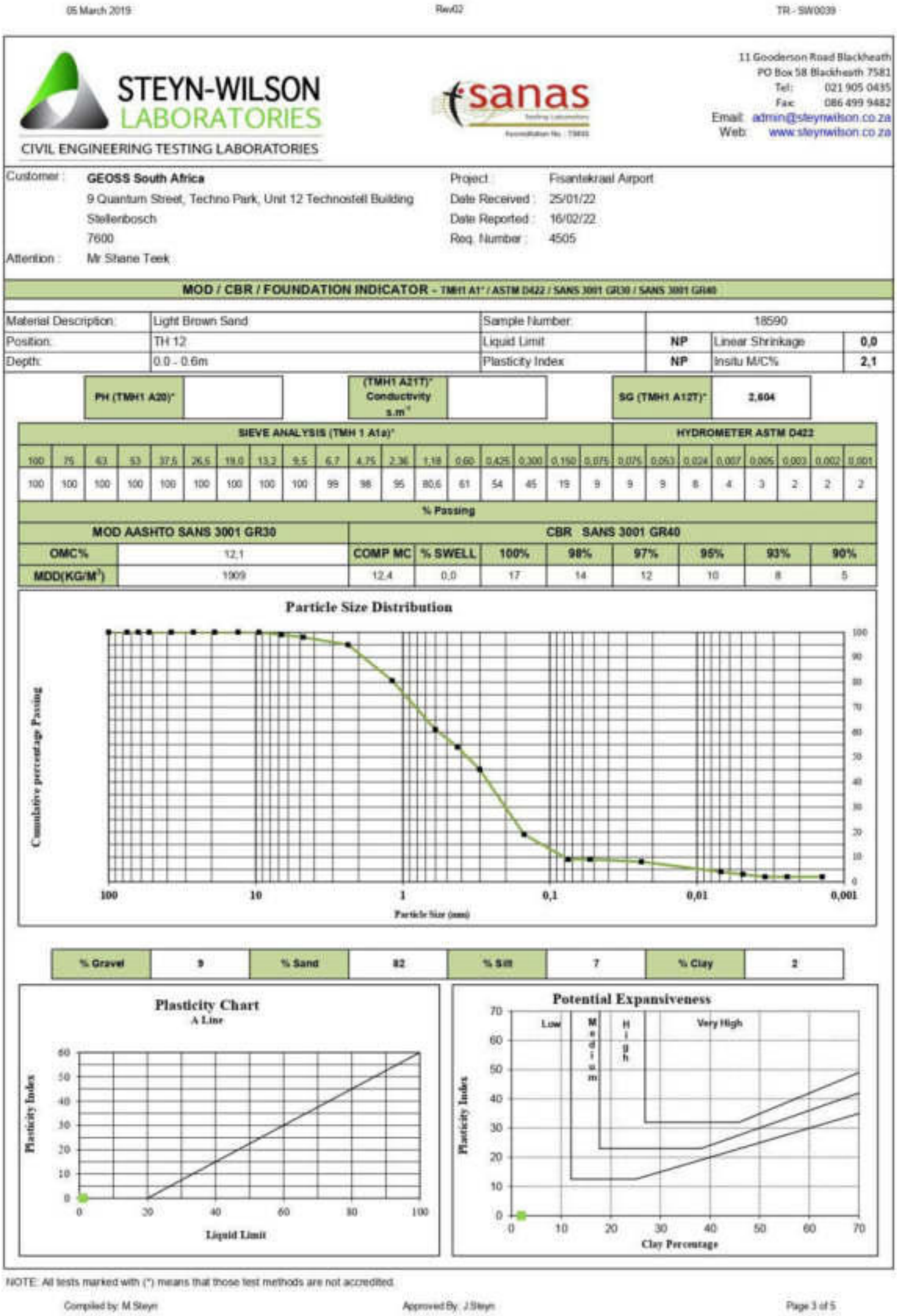
% Gravel	17	**% Sand**	47	**% Silt**	19	**% Clay**	17

Plasticity Chart

Potential Expansiveness

NOTE: All tests marked with (*) means that those test methods are not accredited.

Compiled by: M.Steyn Approved By: J.Steyn Page 2 of 5



05 March 2019 Rev02 TR - SW0039

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	Stellenbosch	Date Reported :	16/02/22
	7600	Req. Number :	4505
Attention :	Mr Shane Teek		

MOD / CBR / FOUNDATION INDICATOR - TMH1 A1* / ASTM D422 / SANS 3001 GR30 / SANS 3001 GR40

Material Description:	Light Brown Sand	Sample Number:	18590		
Position:	TH 12	Liquid Limit	NP	Linear Shrinkage	0,0
Depth:	0.0 - 0.6m	Plasticity Index	NP	Insitu M/C%	2,1

PH (TMH1 A20)*		**(TMH1 A21T)* Conductivity s.m⁻¹**		**SG (TMH1 A12T)***	**2,604**

SIEVE ANALYSIS (TMH 1 A1a)*																		HYDROMETER ASTM D422							
100	75	63	53	37,5	26,5	19,0	13,2	9,5	6,7	4,75	2,36	1,18	0,60	0,425	0,300	0,150	0,075	0,075	0,053	0,024	0,007	0,005	0,003	0,002	0,001
100	100	100	100	100	100	100	100	100	99	98	95	80,6	61	54	45	19	9	9	9	8	4	3	2	2	2
% Passing																									

MOD AASHTO SANS 3001 GR30		CBR SANS 3001 GR40							
OMC%	12,1	**COMP MC**	**% SWELL**	**100%**	**98%**	**97%**	**95%**	**93%**	**90%**
MDD(KG/M³)	1909	12,4	0,0	17	14	12	10	8	5

Particle Size Distribution

% Gravel	9	% Sand	82	% Silt	7	% Clay	2

Plasticity Chart

Potential Expansiveness

NOTE: All tests marked with (*) means that those test methods are not accredited.

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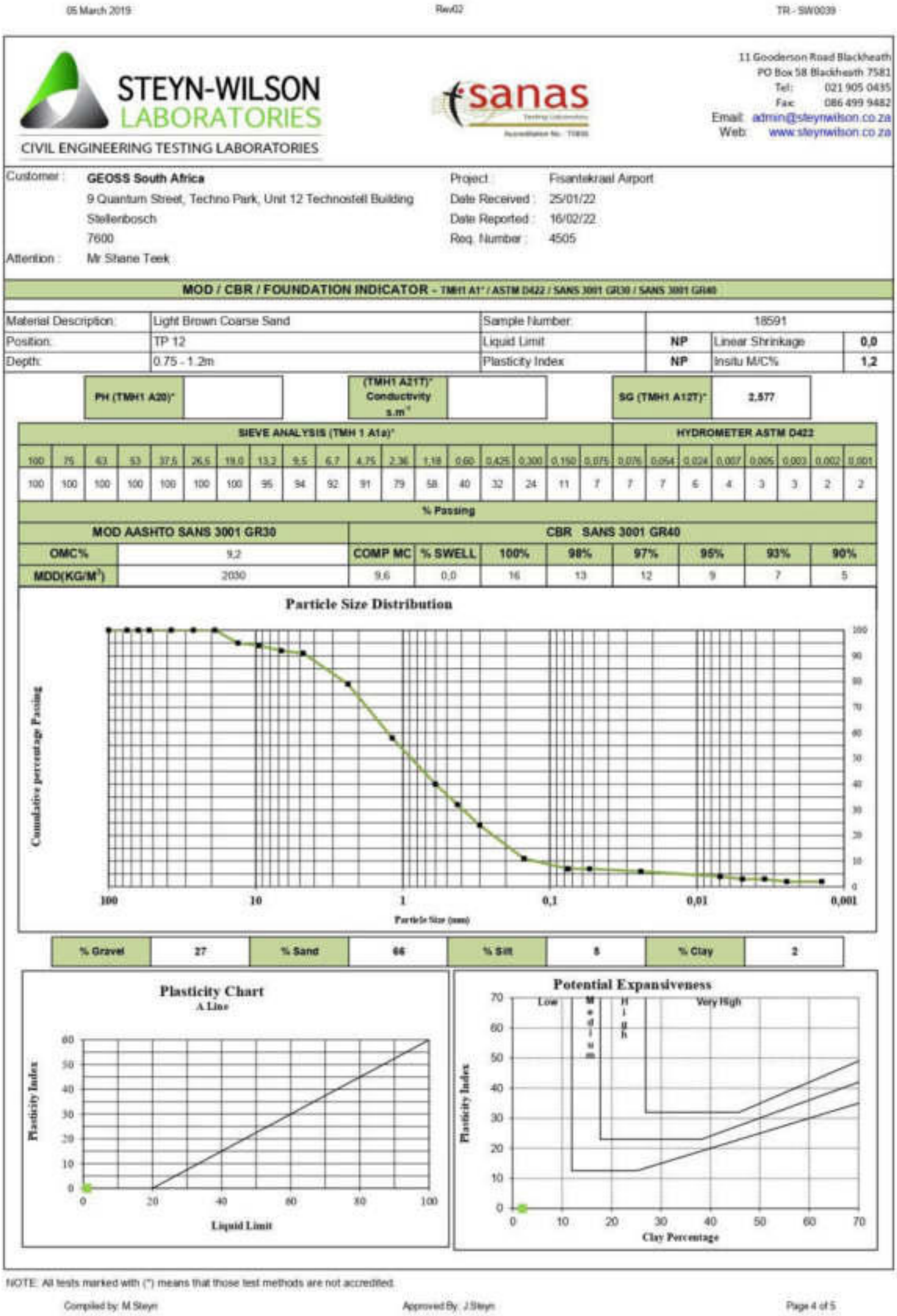

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	Stellenbosch	Date Reported :	16/02/22
	7600	Req. Number :	4505
Attention :	Mr Shane Teek		

MOD / CBR / FOUNDATION INDICATOR - TMH1 A1* / ASTM D422 / SANS 3001 GR30 / SANS 3001 GR40

Material Description:	Light Brown Coarse Sand	Sample Number:	18591		
Position:	TP 12	Liquid Limit	NP	Linear Shrinkage	0,0
Depth:	0.75 - 1.2m	Plasticity Index	NP	Insitu M/C%	1,2

PH (TMH1 A20)*		(TMH1 A21T)* Conductivity s.m⁻¹		SG (TMH1 A12T)*	2,577

SIEVE ANALYSIS (TMH 1 A1a)*																		HYDROMETER ASTM D422							
100	75	63	53	37,5	26,5	19,0	13,2	9,5	6,7	4,75	2,36	1,18	0,60	0,425	0,300	0,150	0,075	0,076	0,054	0,024	0,007	0,005	0,003	0,002	0,001
100	100	100	100	100	100	100	95	94	92	91	79	58	40	32	24	11	7	7	7	6	4	3	3	2	2
% Passing																									

MOD AASHTO SANS 3001 GR30		CBR SANS 3001 GR40							
OMC%	9,2	COMP MC	% SWELL	100%	98%	97%	95%	93%	90%
MDD(KG/M³)	2030	9,6	0,0	16	13	12	9	7	5

Particle Size Distribution

% Gravel	27	% Sand	66	% Silt	5	% Clay	2

Plasticity Chart
A Line

Potential Expansiveness

NOTE: All tests marked with (*) means that those test methods are not accredited.

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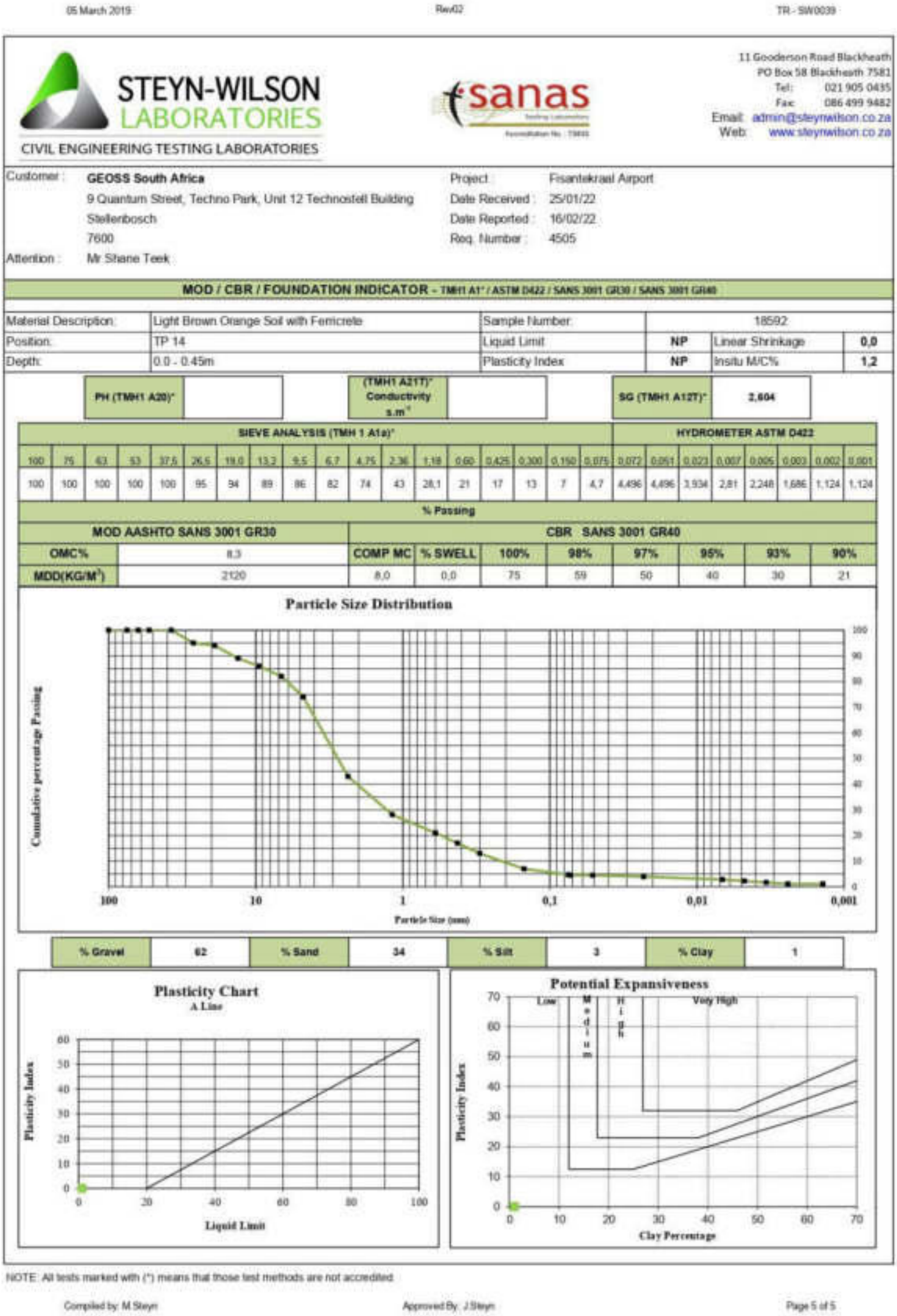

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Date Reported : 16/02/22
Req. Number : 4505

MOD / CBR / FOUNDATION INDICATOR - TMH1 A1* / ASTM D422 / SANS 3001 GR30 / SANS 3001 GR40

Material Description:	Light Brown Orange Soil with Ferricrete	Sample Number:	18592		
Position:	TP 14	Liquid Limit	NP	Linear Shrinkage	0,0
Depth:	0.0 - 0.45m	Plasticity Index	NP	Insitu M/C%	1,2

PH (TMH1 A20)*		(TMH1 A21T)* Conductivity s.m⁻¹		SG (TMH1 A12T)*	2,604

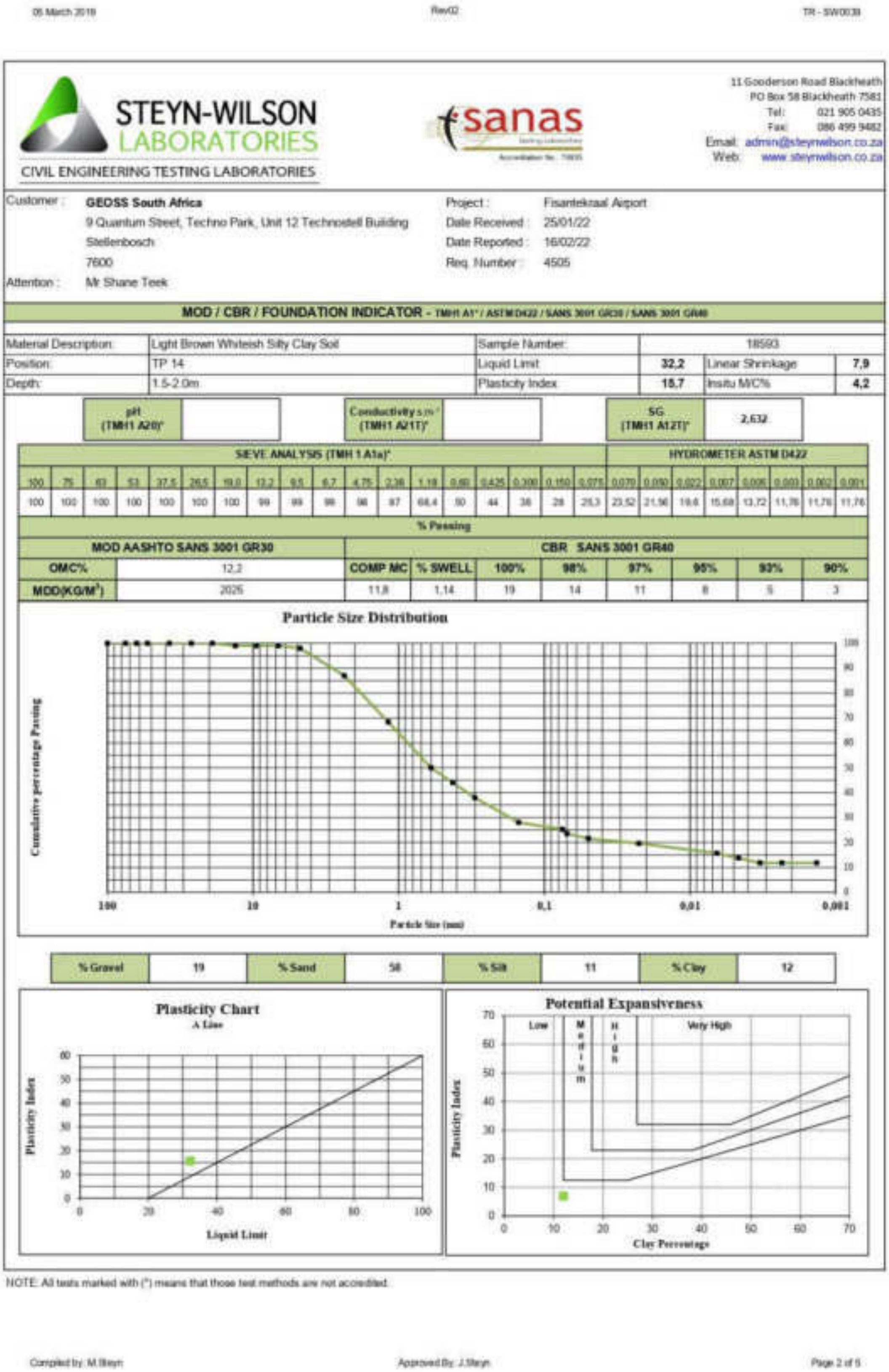
SIEVE ANALYSIS (TMH 1 A1a)*																		HYDROMETER ASTM D422							
100	75	63	53	37.5	26.5	19.0	13.2	9.5	6.7	4.75	2.36	1.18	0.60	0.425	0.300	0.150	0.075	0.072	0.051	0.023	0.007	0.005	0.003	0.002	0.001
100	100	100	100	100	95	94	89	86	82	74	43	28,1	21	17	13	7	4,7	4,496	4,496	3,934	2,81	2,248	1,686	1,124	1,124
% Passing																									

MOD AASHTO SANS 3001 GR30		CBR SANS 3001 GR40							
OMC%	8,3	COMP MC	% SWELL	100%	98%	97%	95%	93%	90%
MDD(KG/M³)	2120	8,0	0,0	75	59	50	40	30	21

% Gravel	62	% Sand	34	% Silt	3	% Clay	1

NOTE: All tests marked with (*) means that those test methods are not accredited

Compiled by: M.Steyn Approved By: J.Steyn Page 5 of 5



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Project : Fisantekraal Airport
Date Received : 25/01/22
Date Reported : 16/02/22
Req. Number : 4505

MOD / CBR / FOUNDATION INDICATOR - TMH1 A1* / ASTM D422 / SANS 3001 GR30 / SANS 3001 GR40

Material Description:	Light Brown Whiteish Silty Clay Soil	Sample Number:	18593		
Position:	TP 14	Liquid Limit	**32,2**	Linear Shrinkage	**7,9**
Depth:	1.5-2.0m	Plasticity Index	**15,7**	Insitu M/C%	**4,2**

pH (TMH1 A20)*		**Conductivity s.m⁻¹ (TMH1 A21T)***		**SG (TMH1 A12T)***	**2,632**

SIEVE ANALYSIS (TMH 1 A1a)*

100	75	63	53	37.5	26.5	19.0	13.2	9.5	6.7	4.75	2.36	1.18	0.60	0.425	0.300	0.150	0.075
100	100	100	100	100	100	100	99	99	99	96	87	68,4	50	44	38	28	25,3

HYDROMETER ASTM D422

0.070	0.050	0.022	0.007	0.005	0.003	0.002	0.001
23,52	21,56	19,6	15,68	13,72	11,76	11,76	11,76

% Passing

MOD AASHTO SANS 3001 GR30		**CBR SANS 3001 GR40**							
OMC%	12,2	**COMP MC**	**% SWELL**	**100%**	**98%**	**97%**	**95%**	**93%**	**90%**
MOD(KG/M³)	2025	11,8	1,14	19	14	11	8	5	3

Particle Size Distribution

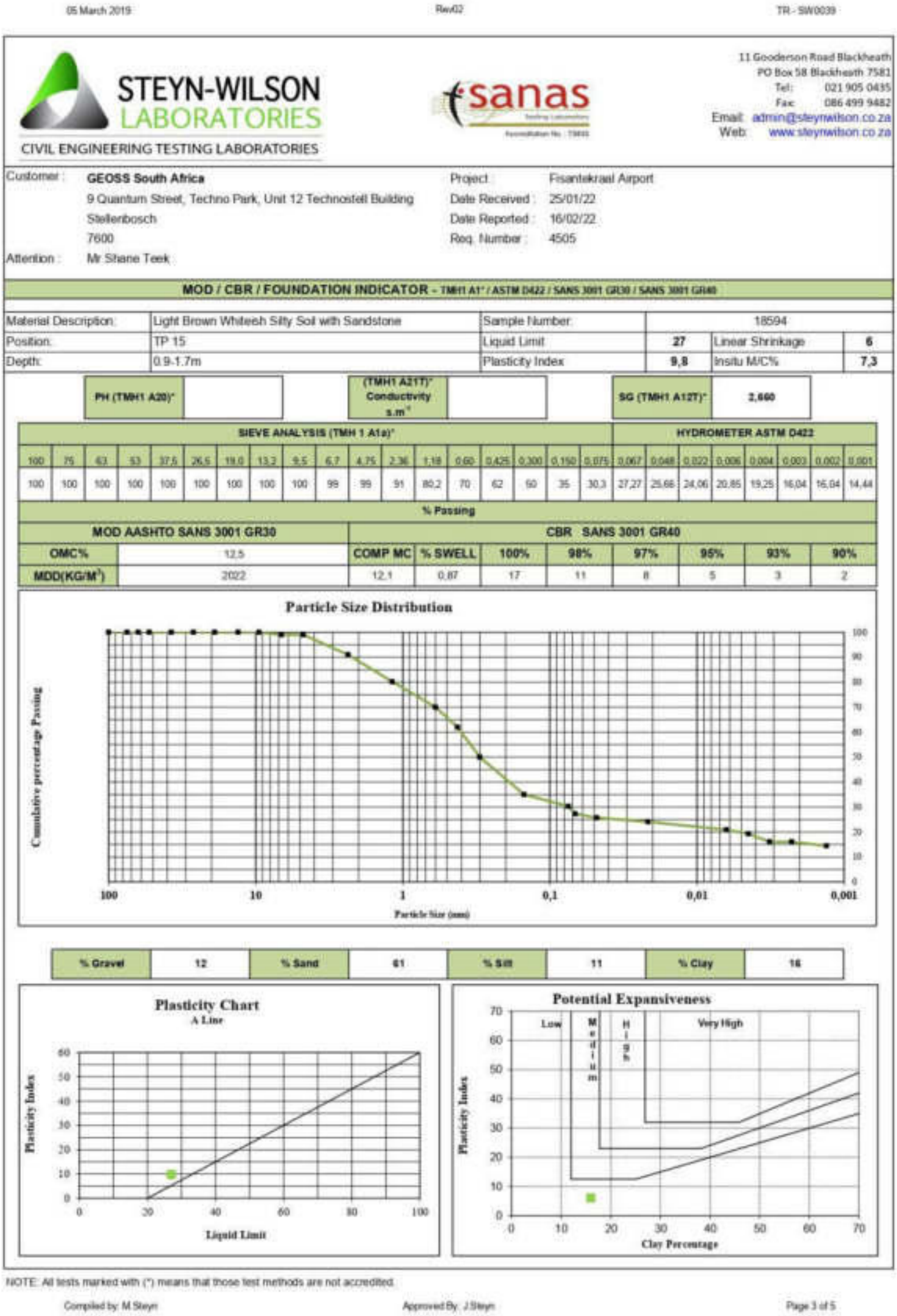
% Gravel	19	**% Sand**	58	**% Silt**	11	**% Clay**	12

Plasticity Chart
A Line

Potential Expansiveness

NOTE: All tests marked with (*) means that those test methods are not accredited.

Compiled by: M.Steyn Approved By: J.Steyn Page 2 of 5



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MOD / CBR / FOUNDATION INDICATOR - TMH1 A1* / ASTM D422 / SANS 3001 GR30 / SANS 3001 GR40

Material Description:	Light Brown Whiteish Silty Soil with Sandstone	Sample Number:	18594		
Position:	TP 15	Liquid Limit	27	Linear Shrinkage	6
Depth:	0.9-1.7m	Plasticity Index	9,8	Insitu M/C%	7,3

PH (TMH1 A20)*		(TMH1 A21T)* Conductivity s.m⁻¹		SG (TMH1 A12T)*	2,660

SIEVE ANALYSIS (TMH 1 A1a)*																		HYDROMETER ASTM D422							
100	75	63	53	37,5	26,5	19,0	13,2	9,5	6,7	4,75	2,36	1,18	0,60	0,425	0,300	0,150	0,075	0,067	0,048	0,022	0,006	0,004	0,003	0,002	0,001
100	100	100	100	100	100	100	100	100	99	99	91	80,2	70	62	50	35	30,3	27,27	25,66	24,06	20,85	19,25	16,04	16,04	14,44
% Passing																									

MOD AASHTO SANS 3001 GR30		CBR SANS 3001 GR40							
OMC%	12,5	COMP MC	% SWELL	100%	98%	97%	95%	93%	90%
MDD(KG/M^3)	2022	12,1	0,87	17	11	8	5	3	2

% Gravel	12	% Sand	61	% Silt	11	% Clay	16

NOTE: All tests marked with (*) means that those test methods are not accredited

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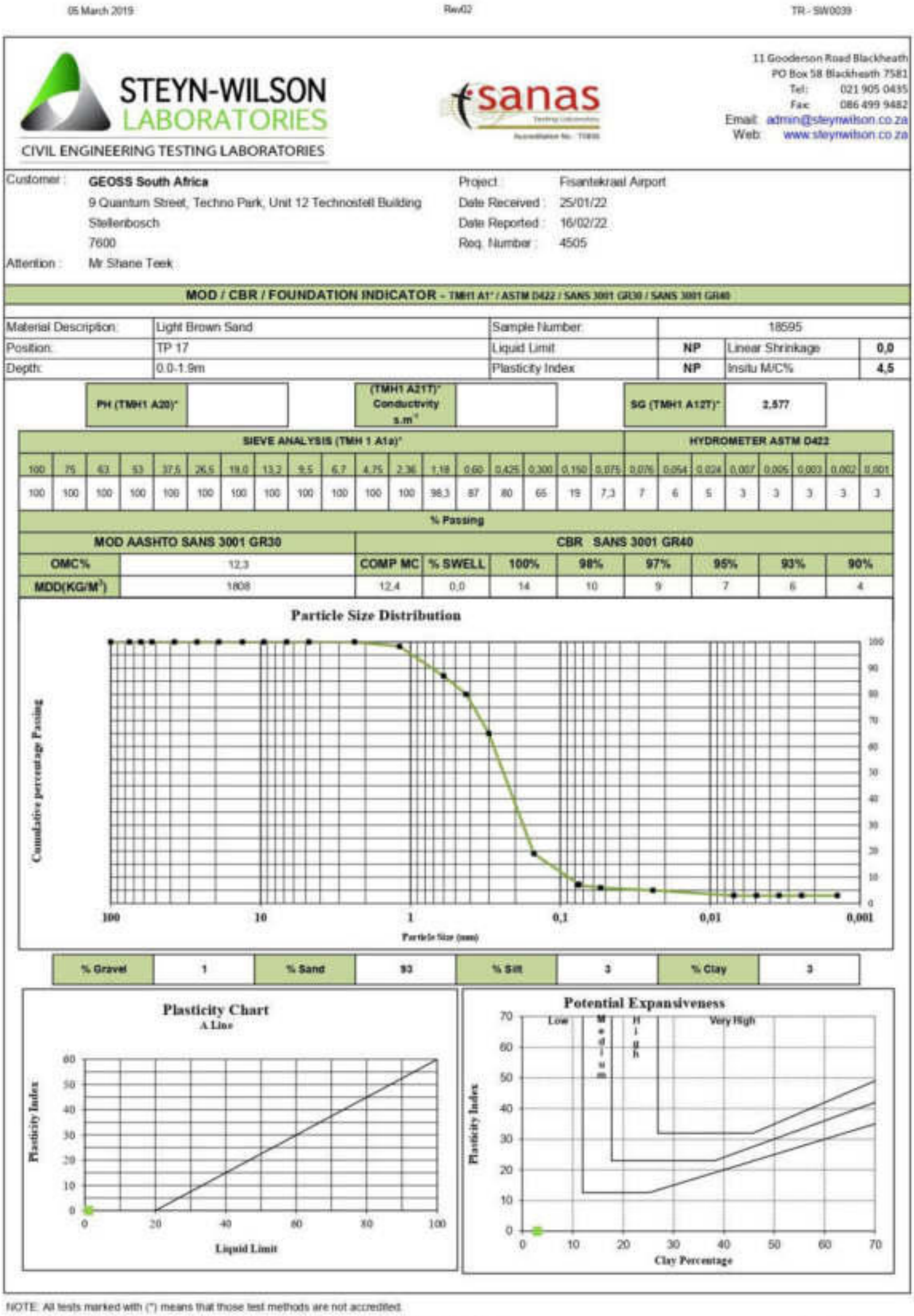

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MOD / CBR / FOUNDATION INDICATOR - TMH1 A1* / ASTM D422 / SANS 3001 GR30 / SANS 3001 GR40

Material Description:	Light Brown Sand	Sample Number:	18595		
Position:	TP 17	Liquid Limit	**NP**	Linear Shrinkage	**0,0**
Depth:	0.0-1.9m	Plasticity Index	**NP**	Insitu M/C%	**4,5**

PH (TMH1 A20)*		**(TMH1 A21T)* Conductivity s.m⁻¹**		**SG (TMH1 A12T)***	**2,577**

SIEVE ANALYSIS (TMH 1 A1a)*																		**HYDROMETER ASTM D422**							
100	75	63	53	37,5	26,5	19,0	13,2	9,5	6,7	4,75	2,36	1,18	0,60	0,425	0,300	0,150	0,075	0,076	0,054	0,024	0,007	0,005	0,003	0,002	0,001
100	100	100	100	100	100	100	100	100	100	100	100	98,3	87	80	65	19	7,3	7	6	5	3	3	3	3	3
% Passing																									

MOD AASHTO SANS 3001 GR30		**CBR SANS 3001 GR40**							
OMC%	12,3	**COMP MC**	**% SWELL**	**100%**	**98%**	**97%**	**95%**	**93%**	**90%**
MDD(KG/M³)	1808	12,4	0,0	14	10	9	7	6	4

Particle Size Distribution

% Gravel	1	**% Sand**	93	**% Silt**	3	**% Clay**	3

Plasticity Chart

A Line

Potential Expansiveness

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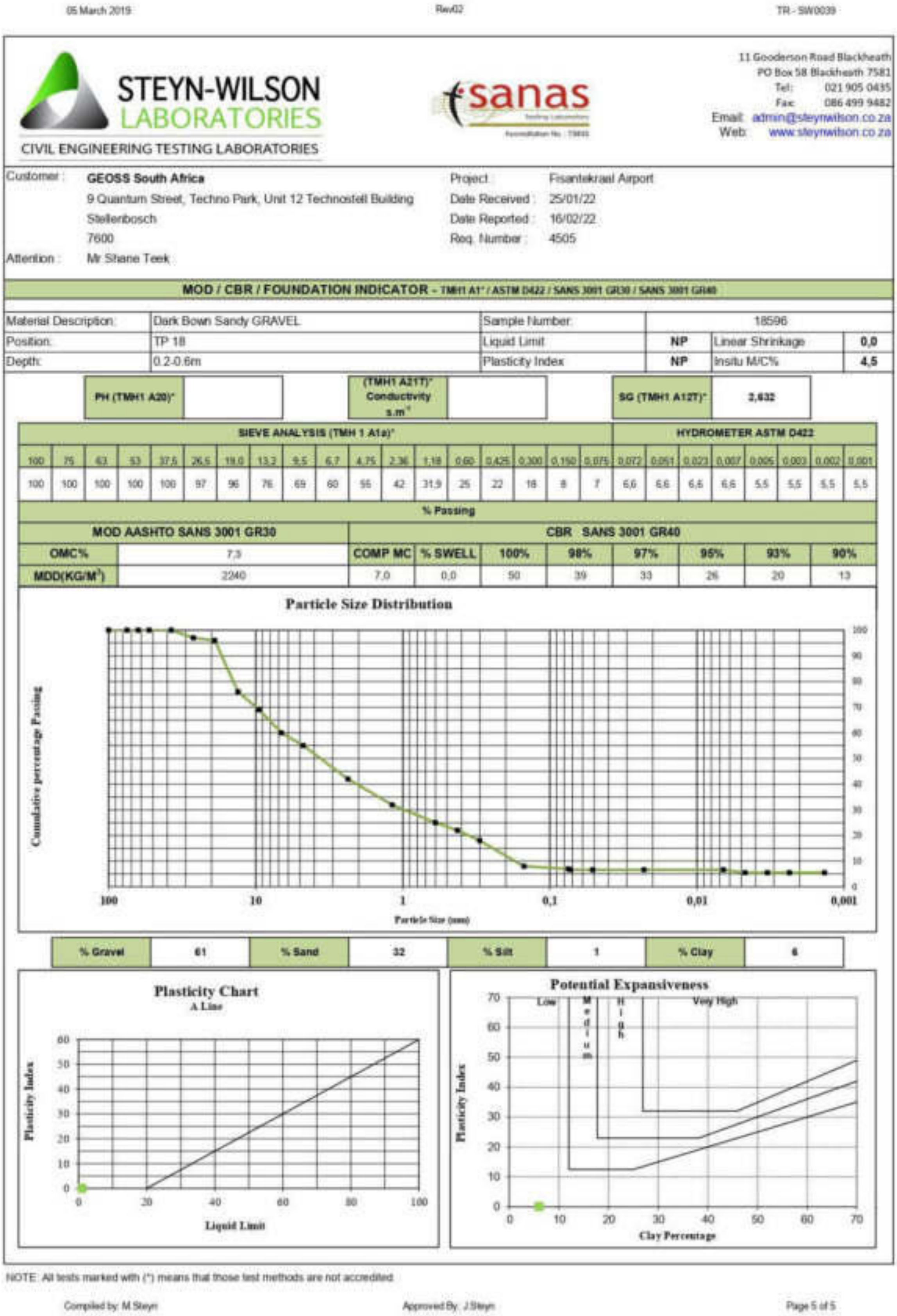

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MOD / CBR / FOUNDATION INDICATOR - TMH1 A1* / ASTM D422 / SANS 3001 GR30 / SANS 3001 GR40

Material Description:	Dark Bown Sandy GRAVEL	Sample Number:	18596		
Position:	TP 18	Liquid Limit	NP	Linear Shrinkage	0,0
Depth:	0.2-0.6m	Plasticity Index	NP	Insitu M/C%	4,5

PH (TMH1 A20)*		(TMH1 A21T)* Conductivity s.m^{-1}		SG (TMH1 A12T)*	2,632

SIEVE ANALYSIS (TMH 1 A1a)*																		HYDROMETER ASTM D422							
100	75	63	53	37.5	26.5	19.0	13.2	9.5	6.7	4.75	2.36	1.18	0.60	0.425	0.300	0.150	0.075	0.072	0.051	0.023	0.007	0.005	0.003	0.002	0.001
100	100	100	100	100	97	96	76	69	60	56	42	31,9	25	22	18	8	7	6,6	6,6	6,6	6,6	5,5	5,5	5,5	5,5
% Passing																									

MOD AASHTO SANS 3001 GR30		CBR SANS 3001 GR40							
OMC%	7,3	COMP MC	% SWELL	100%	98%	97%	95%	93%	90%
MDD(KG/M^3)	2240	7,0	0,0	50	39	33	26	20	13

Particle Size Distribution

% Gravel	61	% Sand	32	% Silt	1	% Clay	6

Plasticity Chart

Potential Expansiveness

NOTE: All tests marked with (*) means that those test methods are not accredited

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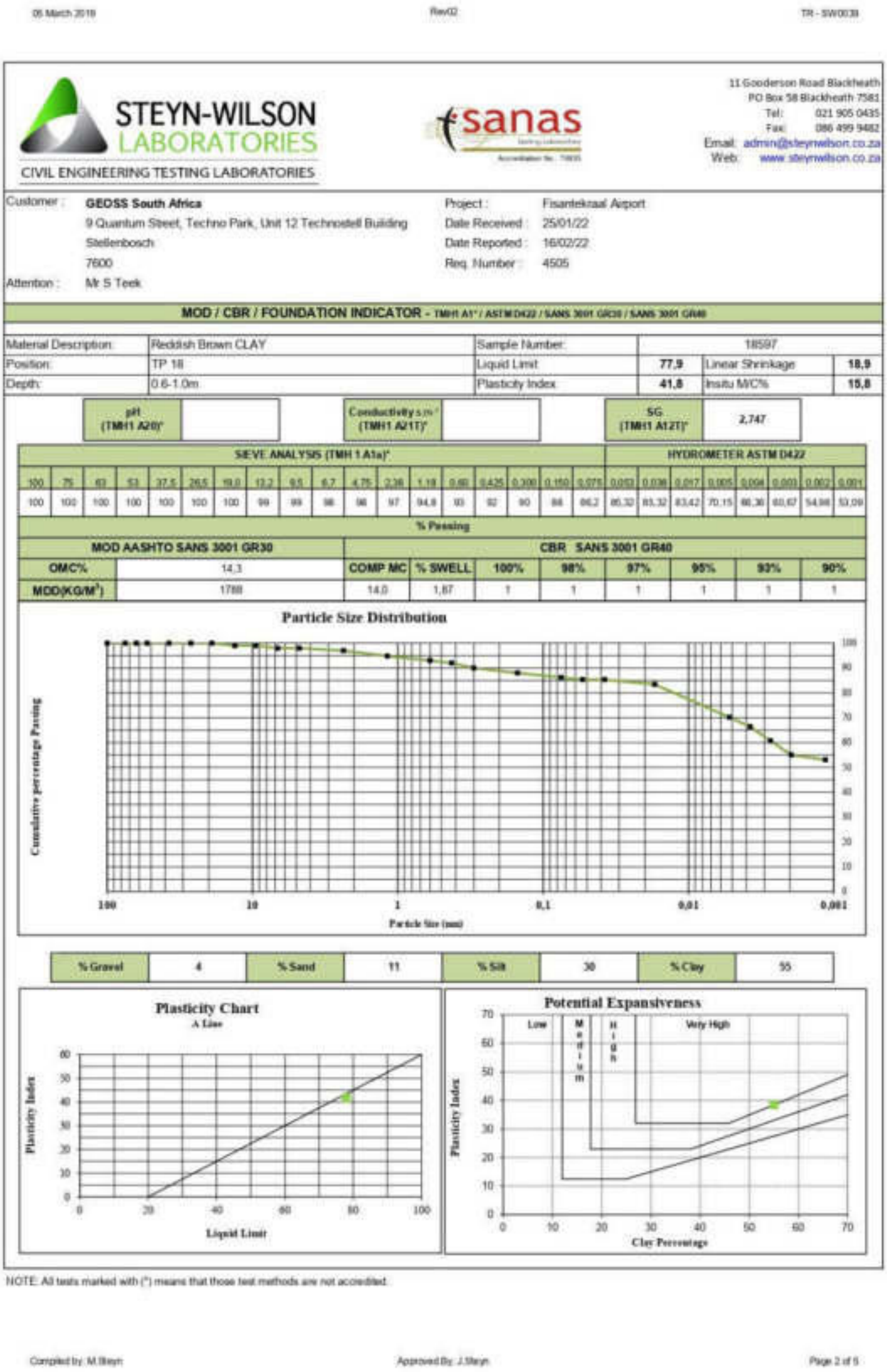

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Req. Number : 4505

MOD / CBR / FOUNDATION INDICATOR - TMH1 A1* / ASTM D422 / SANS 3001 GR30 / SANS 3001 GR40

Material Description:	Reddish Brown CLAY	Sample Number:	18597		
Position:	TP 18	Liquid Limit	77,9	Linear Shrinkage	18,9
Depth:	0.6-1.0m	Plasticity Index	41,8	Insitu M/C%	15,8

pH (TMH1 A20)*		Conductivity s.m⁻¹ (TMH1 A21T)*		SG (TMH1 A12T)*	2,747

SIEVE ANALYSIS (TMH 1 A1a)*																		HYDROMETER ASTM D422							
100	75	63	53	37.5	26.5	19.0	13.2	9.5	6.7	4.75	2.36	1.18	0.60	0.425	0.300	0.150	0.075	0.053	0.038	0.017	0.005	0.004	0.003	0.002	0.001
100	100	100	100	100	100	100	99	99	98	98	97	94,8	93	92	90	88	86,2	85,32	85,32	83,42	70,15	66,36	60,67	54,98	53,09

% Passing

MOD AASHTO SANS 3001 GR30		CBR SANS 3001 GR40							
OMC%	14,3	COMP MC	% SWELL	100%	98%	97%	95%	93%	90%
MDD(KG/M³)	1788	14,0	1,87	1	1	1	1	1	1

Particle Size Distribution

% Gravel	4	% Sand	11	% Silt	30	% Clay	55

Plasticity Chart
A Line

Potential Expansiveness

NOTE: All tests marked with (*) means that those test methods are not accredited.

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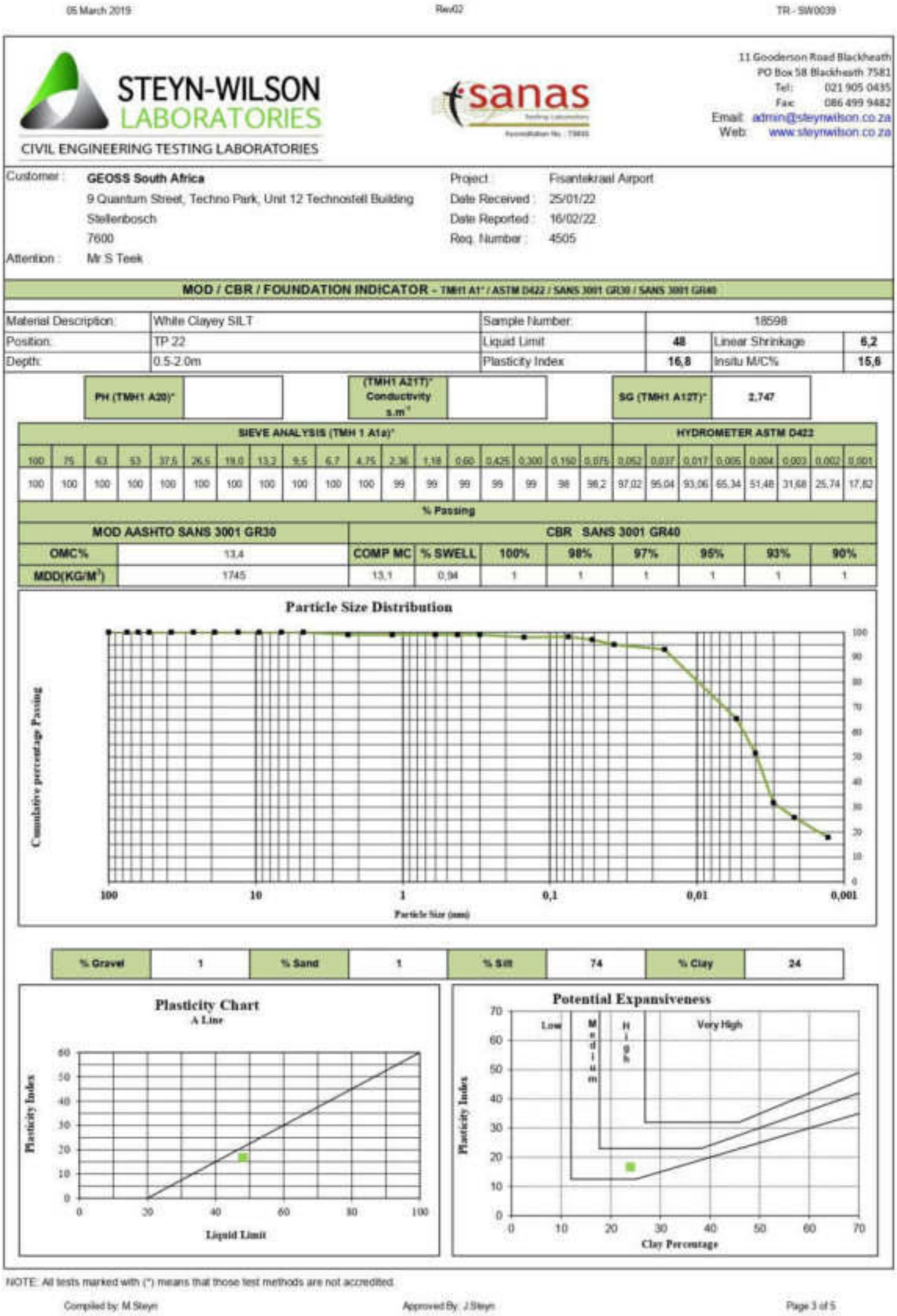

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MOD / CBR / FOUNDATION INDICATOR - TMH1 A1* / ASTM D422 / SANS 3001 GR30 / SANS 3001 GR40

Material Description:	White Clayey SILT	Sample Number:	18598		
Position:	TP 22	Liquid Limit	**48**	Linear Shrinkage	**6,2**
Depth:	0.5-2.0m	Plasticity Index	**16,8**	Insitu M/C%	**15,6**

PH (TMH1 A20)*		**(TMH1 A21T)* Conductivity s.m⁻¹**		**SG (TMH1 A12T)***	**2,747**

SIEVE ANALYSIS (TMH 1 A1a)*																		HYDROMETER ASTM D422							
100	75	63	53	37,5	26,5	19,0	13,2	9,5	6,7	4,75	2,36	1,18	0,60	0,425	0,300	0,150	0,075	0,052	0,037	0,017	0,005	0,004	0,003	0,002	0,001
100	100	100	100	100	100	100	100	100	100	100	99	99	99	99	99	98	98,2	97,02	95,04	93,06	65,34	51,48	31,68	25,74	17,82
% Passing																									

MOD AASHTO SANS 3001 GR30		CBR SANS 3001 GR40							
OMC%	13,4	**COMP MC**	**% SWELL**	**100%**	**98%**	**97%**	**95%**	**93%**	**90%**
MDD(KG/M³)	1745	13,1	0,94	1	1	1	1	1	1

Particle Size Distribution

% Gravel	1	% Sand	1	% Silt	74	% Clay	24

Plasticity Chart

Potential Expansiveness

NOTE: All tests marked with (*) means that those test methods are not accredited.

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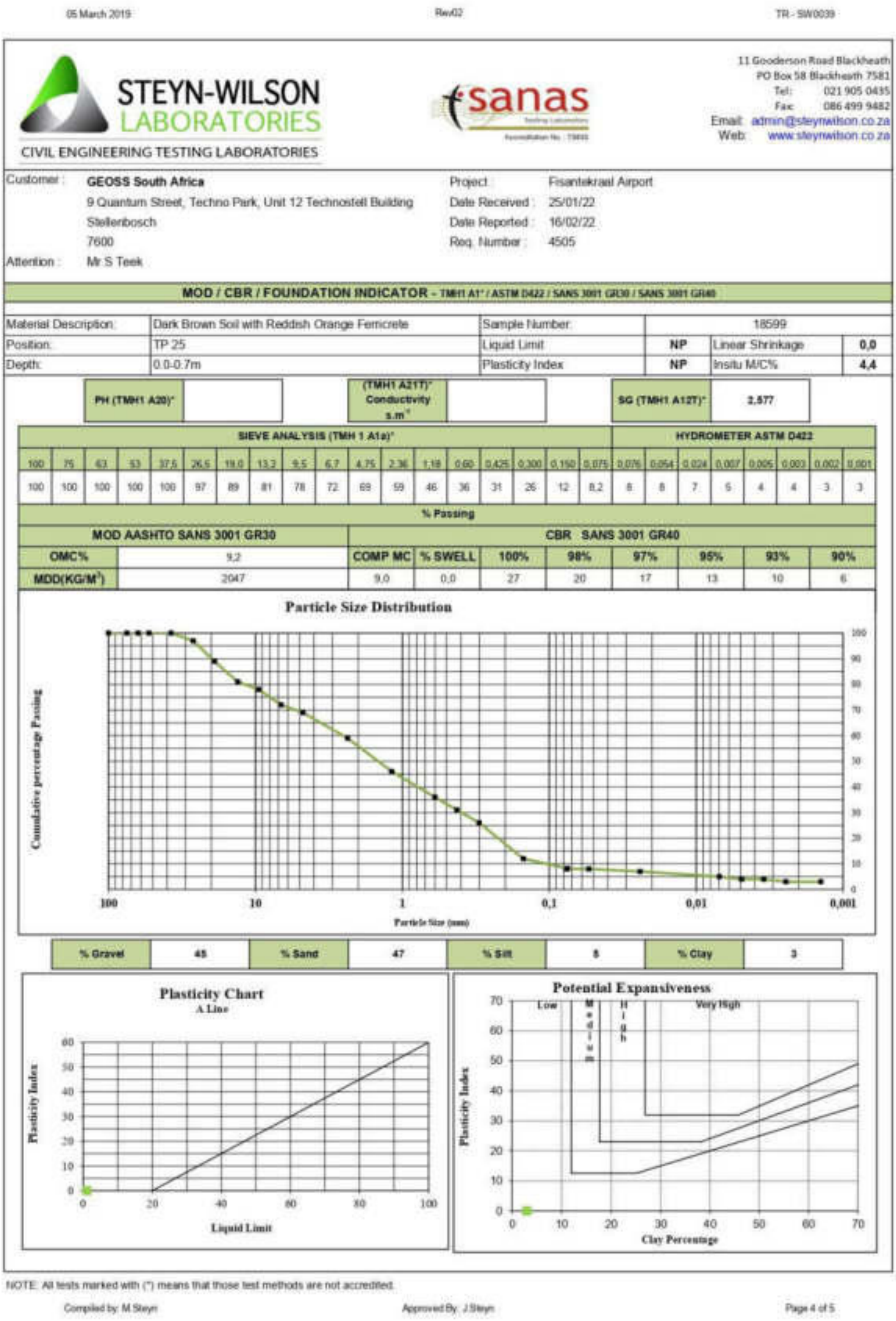

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MOD / CBR / FOUNDATION INDICATOR - TMH1 A1* / ASTM D422 / SANS 3001 GR30 / SANS 3001 GR40

Material Description:	Dark Brown Soil with Reddish Orange Ferricrete	Sample Number:	18599		
Position:	TP 25	Liquid Limit	NP	Linear Shrinkage	0,0
Depth:	0.0-0.7m	Plasticity Index	NP	Insitu M/C%	4,4

PH (TMH1 A20)*		(TMH1 A21T)* Conductivity s.m⁻¹		SG (TMH1 A12T)*	2,577

SIEVE ANALYSIS (TMH 1 A1a)*																		HYDROMETER ASTM D422							
100	75	63	53	37.5	26.5	19.0	13.2	9.5	6.7	4.75	2.36	1.18	0.60	0.425	0.300	0.150	0.075	0.076	0.054	0.024	0.007	0.005	0.003	0.002	0.001
100	100	100	100	100	97	89	81	78	72	69	59	46	36	31	26	12	8,2	8	8	7	5	4	4	3	3
% Passing																									

MOD AASHTO SANS 3001 GR30		CBR SANS 3001 GR40							
OMC%	9,2	COMP MC	% SWELL	100%	98%	97%	95%	93%	90%
MDD(KG/M³)	2047	9,0	0,0	27	20	17	13	10	6

Particle Size Distribution

% Gravel	45	% Sand	47	% Silt	5	% Clay	3

Plasticity Chart
A Line

Potential Expansiveness

NOTE: All tests marked with (*) means that those test methods are not accredited.

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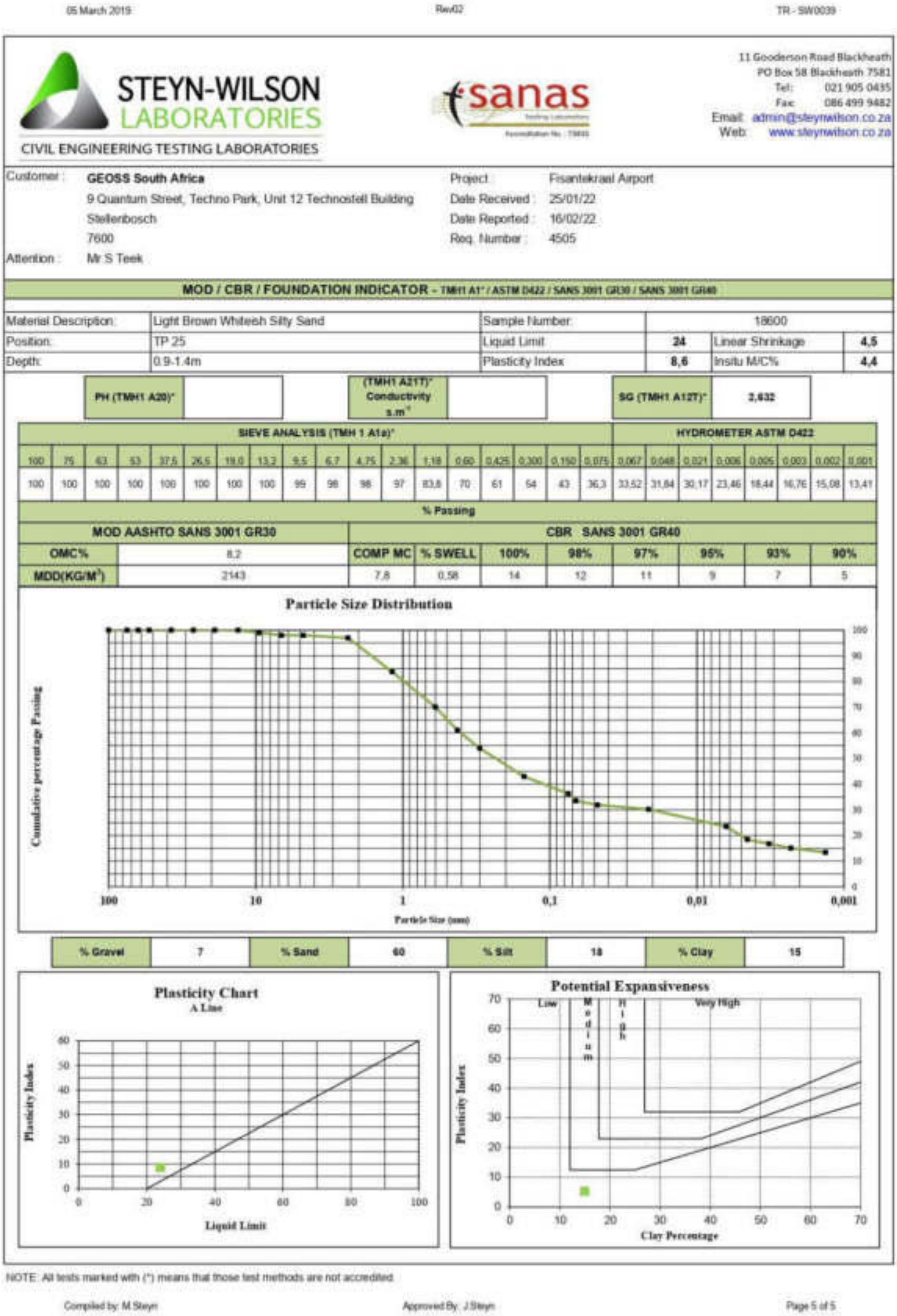

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MOD / CBR / FOUNDATION INDICATOR - TMH1 A1* / ASTM D422 / SANS 3001 GR30 / SANS 3001 GR40

Material Description:	Light Brown Whiteish Silty Sand	Sample Number:	18600		
Position:	TP 25	Liquid Limit	**24**	Linear Shrinkage	**4,5**
Depth:	0.9-1.4m	Plasticity Index	**8,6**	Insitu M/C%	**4,4**

PH (TMH1 A20)*		**(TMH1 A21T)* Conductivity s.m⁻¹**		**SG (TMH1 A12T)***	**2,632**

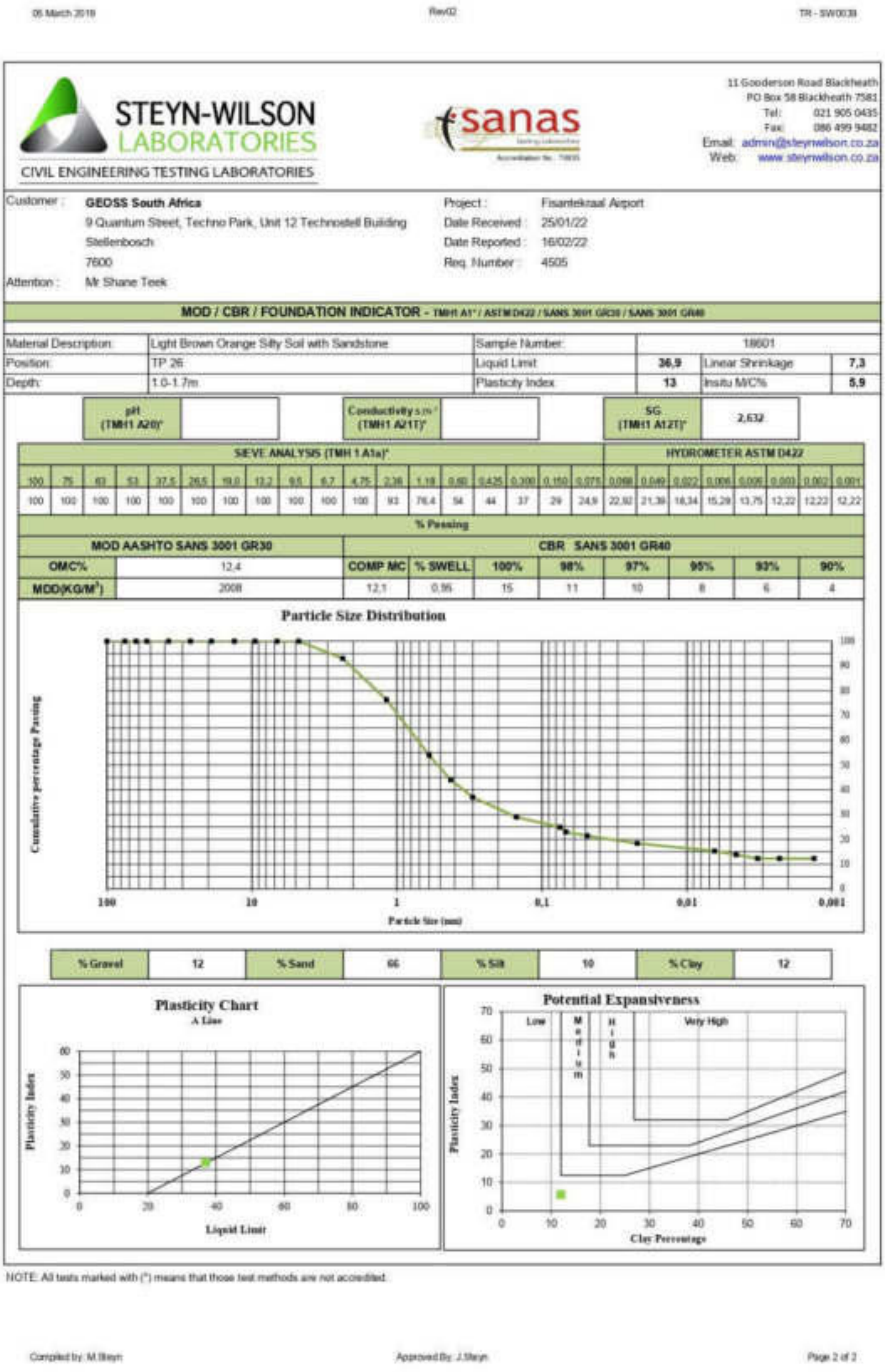
SIEVE ANALYSIS (TMH 1 A1a)*																		**HYDROMETER ASTM D422**							
100	75	63	53	37.5	26.5	19.0	13.2	9.5	6.7	4.75	2.36	1.18	0.60	0.425	0.300	0.150	0.075	0.067	0.048	0.021	0.006	0.005	0.003	0.002	0.001
100	100	100	100	100	100	100	100	99	98	98	97	83,8	70	61	54	43	36,3	33,52	31,84	30,17	23,46	18,44	16,76	15,08	13,41
% Passing																									

MOD AASHTO SANS 3001 GR30		**CBR SANS 3001 GR40**							
OMC%	8,2	**COMP MC**	**% SWELL**	**100%**	**98%**	**97%**	**95%**	**93%**	**90%**
MDD(KG/M³)	2143	7,8	0,58	14	12	11	9	7	5

% Gravel	7	**% Sand**	60	**% Silt**	18	**% Clay**	15

NOTE: All tests marked with (*) means that those test methods are not accredited

Compiled by: M.Steyn Approved By: J.Steyn Page 5 of 5



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MOD / CBR / FOUNDATION INDICATOR - TMH1 A1* / ASTM D422 / SANS 3001 GR30 / SANS 3001 GR40

Material Description:	Light Brown Orange Silty Soil with Sandstone	Sample Number:	18601		
Position:	TP 26	Liquid Limit	**36,9**	Linear Shrinkage	**7,3**
Depth:	1.0-1.7m	Plasticity Index	**13**	Insitu M/C%	**5,9**

pH (TMH1 A20)*		**Conductivity s/m (TMH1 A21T)***		**SG (TMH1 A12T)***	**2,632**

SIEVE ANALYSIS (TMH 1 A1a)*																		**HYDROMETER ASTM D422**							
100	75	63	53	37.5	26.5	19.0	13.2	9.5	6.7	4.75	2.36	1.18	0.60	0.425	0.300	0.150	0.075	0.068	0.049	0.022	0.008	0.006	0.003	0.002	0.001
100	100	100	100	100	100	100	100	100	100	100	93	76,4	54	44	37	29	24,9	22,92	21,38	18,34	15,29	13,75	12,22	12,22	12,22
% Passing																									

MOD AASHTO SANS 3001 GR30		**CBR SANS 3001 GR40**							
OMC%	12,4	**COMP MC**	**% SWELL**	**100%**	**98%**	**97%**	**95%**	**93%**	**90%**
MDD(KG/M³)	2008	12,1	0,95	15	11	10	8	6	4

% Gravel	12	**% Sand**	66	**% Silt**	10	**% Clay**	12

NOTE: All tests marked with (*) means that those test methods are not accredited.

Compiled by: M.Steyn Approved By: J.Steyn Page 2 of 2

STEYN-WILSON LABORATORIES
CIVIL ENGINEERING TESTING LABORATORIES

sanas

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Tel: 021 905 0435
Fax: 086 499 9482
Email: info@steynwilson.co.za
Web: www.steynwilson.co.za

Client:	**GEOSS South Africa**
Project:	4505
Attention:	Mr S Teek
Your Ref. No:	4505
Date Reported	11/05/22

TEST REPORT REFERENCE NUMBER / JOB NUMBER : SWL21614

Dear Sir / Madam

Herewith please find the original reports pertaining to the above mentioned project.

Test Requested

3 x FOUNDATION INDICATOR

Site Sampling and Materials Information

Sampling Method	*Specimens delivered to Steyn Wilson Laboratory*
Environmental Condition	*Sunny*
Deviation from the prescribed test method	
Responsibility of information disclaimer	*The sample information was received from the customer. Results apply to the sample as received from the Customer.*

● **FINAL REPORT**

We would like to take this opportunity to thank you for your valued support.
Should you have any further enquiries please don't hesitate to contact me.

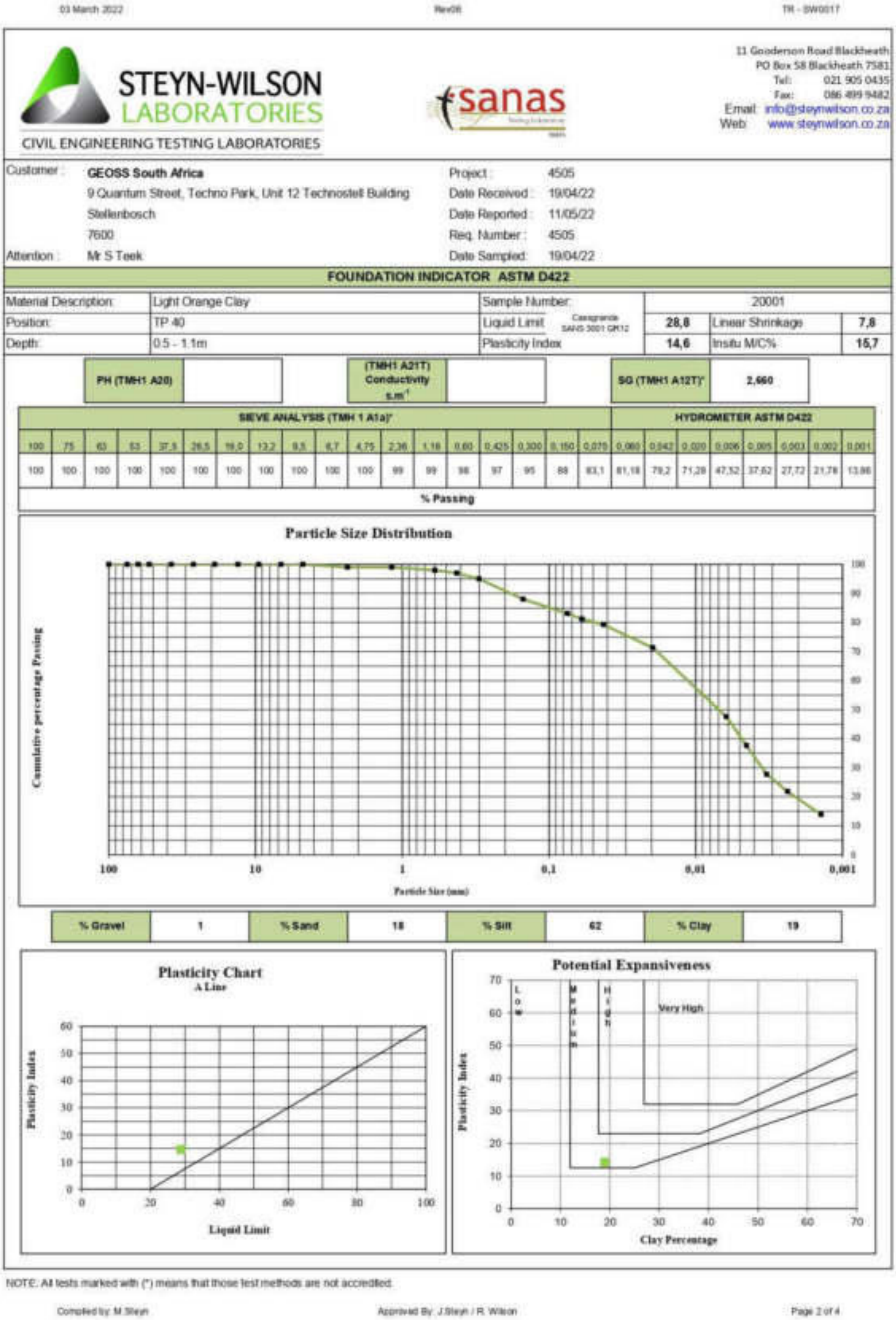
Yours Faithfully
STEYN-WILSON LABORATORIES (PTY) LTD

Mr/J.Steyn
Technical Signatory

Remarks:

1. Information contained herein is confidential to STEYN-WILSON PTY LTD and the addressee
2. Opinions & Interpretations are not included in our schedule of Accreditation.
3. The samples where subjected and analysed according to ASTM.
4. The results reported relate only to the sample tested, Further use of the attached information is not the responsibility or liability of STEYN-WILSON LABORATORIES (PTY) LTD.
5. This document is the correct record of all measurements made, and may not be reproduced other than with full written approval from a director of STEYN-WILSON LABORATORIES (PTY) LTD.
6. Measuring equipment is traceable to national standards (Where applicable).
7. Should there be any deviation from the prescribed test method comments will be made thereof, pertaining to the test on the relevant materials report.
8. Uncertainty of measurement is calculated and corresponds to a coverage probability of approximately 95%. Available on request.
9. The decision rule states that the measurement of uncertainty can be applied by the customer to the test results, on request, It is not the responsibility or liability of STEYN-WILSON LABORATORIES (PTY) LTD.

DIRECTORS: **Mr. J. Steyn ND-Civil (Managing) | Mr. R. Wilson B-Tech Civil (Operations)**



03 March 2022 Rev06 TR - SW0017

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Web: www.steynwilson.co.za

Customer :	**GEOSS South Africa**	Project :	4505
	9 Quantum Street, Techno Park, Unit 12 Technostell Building	Date Received :	19/04/22
	Stellenbosch	Date Reported :	11/05/22
	7600	Req. Number :	4505
Attention :	Mr S Teek	Date Sampled:	19/04/22

FOUNDATION INDICATOR ASTM D422

Material Description:	Light Orange Clay	Sample Number:		20001		
Position:	TP 40	Liquid Limit	Casagrande SANS 3001 GR12	**28,8**	Linear Shrinkage	**7,8**
Depth:	0.5 - 1.1m	Plasticity Index		**14,6**	Insitu M/C%	**15,7**

PH (TMH1 A20)		**(TMH1 A21T) Conductivity s.m^{-1}**		**SG (TMH1 A12T)***	**2,660**

SIEVE ANALYSIS (TMH 1 A1a)*																		**HYDROMETER ASTM D422**							
100	75	63	53	37,5	26,5	19,0	13,2	9,5	6,7	4,75	2,36	1,18	0,60	0,425	0,300	0,150	0,075	0,060	0,042	0,020	0,006	0,005	0,003	0,002	0,001
100	100	100	100	100	100	100	100	100	100	100	99	99	98	97	95	88	83,1	81,18	79,2	71,28	47,52	37,62	27,72	21,78	13,86
% Passing																									

Particle Size Distribution

% Gravel	**1**	**% Sand**	**18**	**% Silt**	**62**	**% Clay**	**19**

Plasticity Chart

Potential Expansiveness

NOTE: All tests marked with (*) means that those test methods are not accredited.

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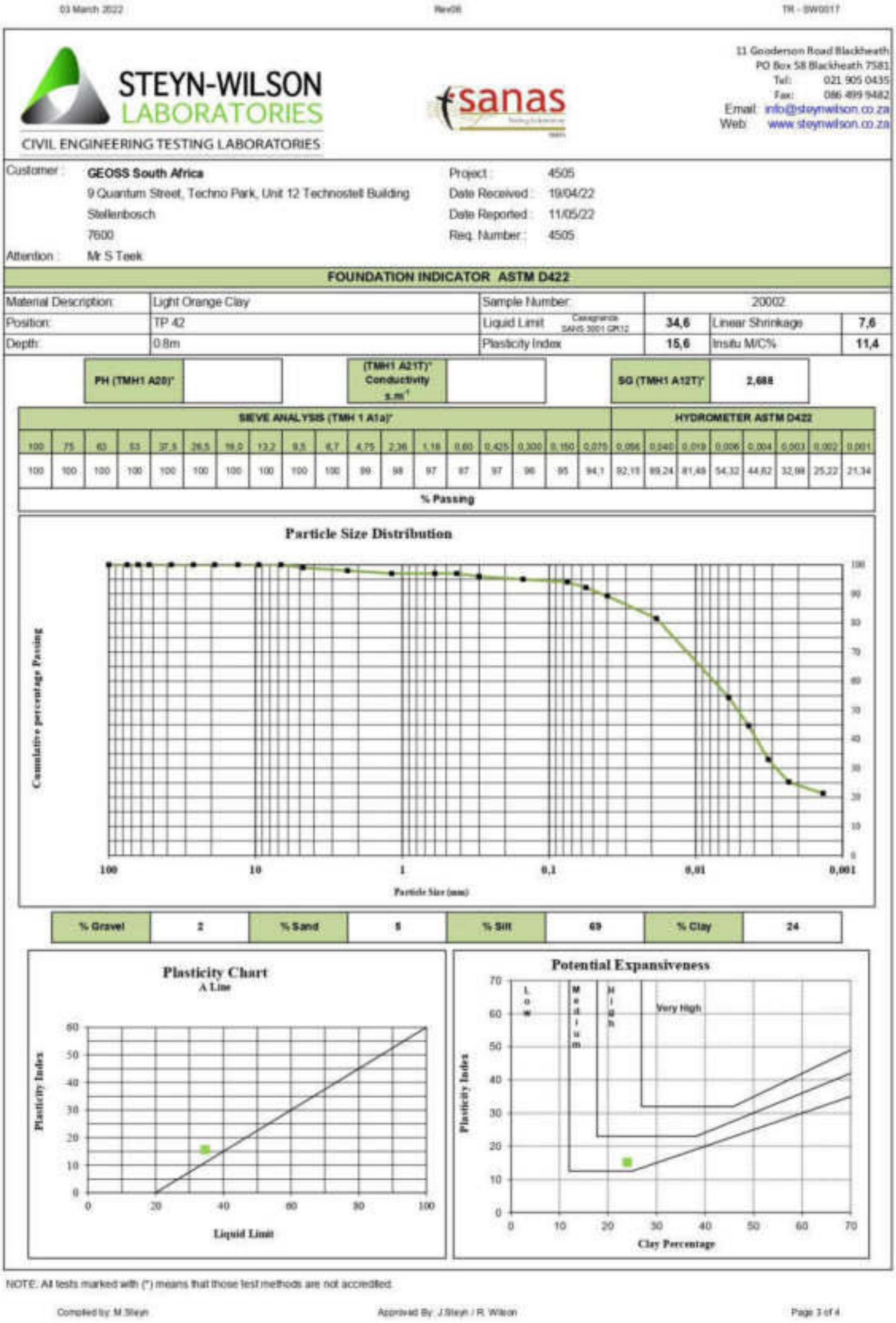

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Customer : **GEOSS South Africa**
9 Quantum Street, Techno Park, Unit 12 Technostell Building
Stellenbosch
7600
Attention : Mr S Teek

Project : 4505
Date Received : 19/04/22
Date Reported : 11/05/22
Req. Number : 4505

FOUNDATION INDICATOR ASTM D422

Material Description:	Light Orange Clay	Sample Number:	20002		
Position:	TP 42	Liquid Limit Casagrande SANS 3001 GR12	**34,6**	Linear Shrinkage	**7,6**
Depth:	0.8m	Plasticity Index	**15,6**	Insitu M/C%	**11,4**

PH (TMH1 A20)*		**(TMH1 A21T)* Conductivity s.m⁻¹**		**SG (TMH1 A12T)***	**2,688**

SIEVE ANALYSIS (TMH 1 A1a)*																		HYDROMETER ASTM D422							
100	75	63	53	37,5	26,5	19,0	13,2	9,5	6,7	4,75	2,36	1,18	0,60	0,425	0,300	0,150	0,075	0,056	0,040	0,019	0,006	0,004	0,003	0,002	0,001
100	100	100	100	100	100	100	100	100	100	99	98	97	97	97	96	95	94,1	92,15	89,24	81,48	54,32	44,82	32,98	25,22	21,34

% Passing

Particle Size Distribution

% Gravel	2	**% Sand**	5	**% Silt**	69	**% Clay**	24

Plasticity Chart
A Line

Potential Expansiveness

NOTE: All tests marked with (*) means that those test methods are not accredited.

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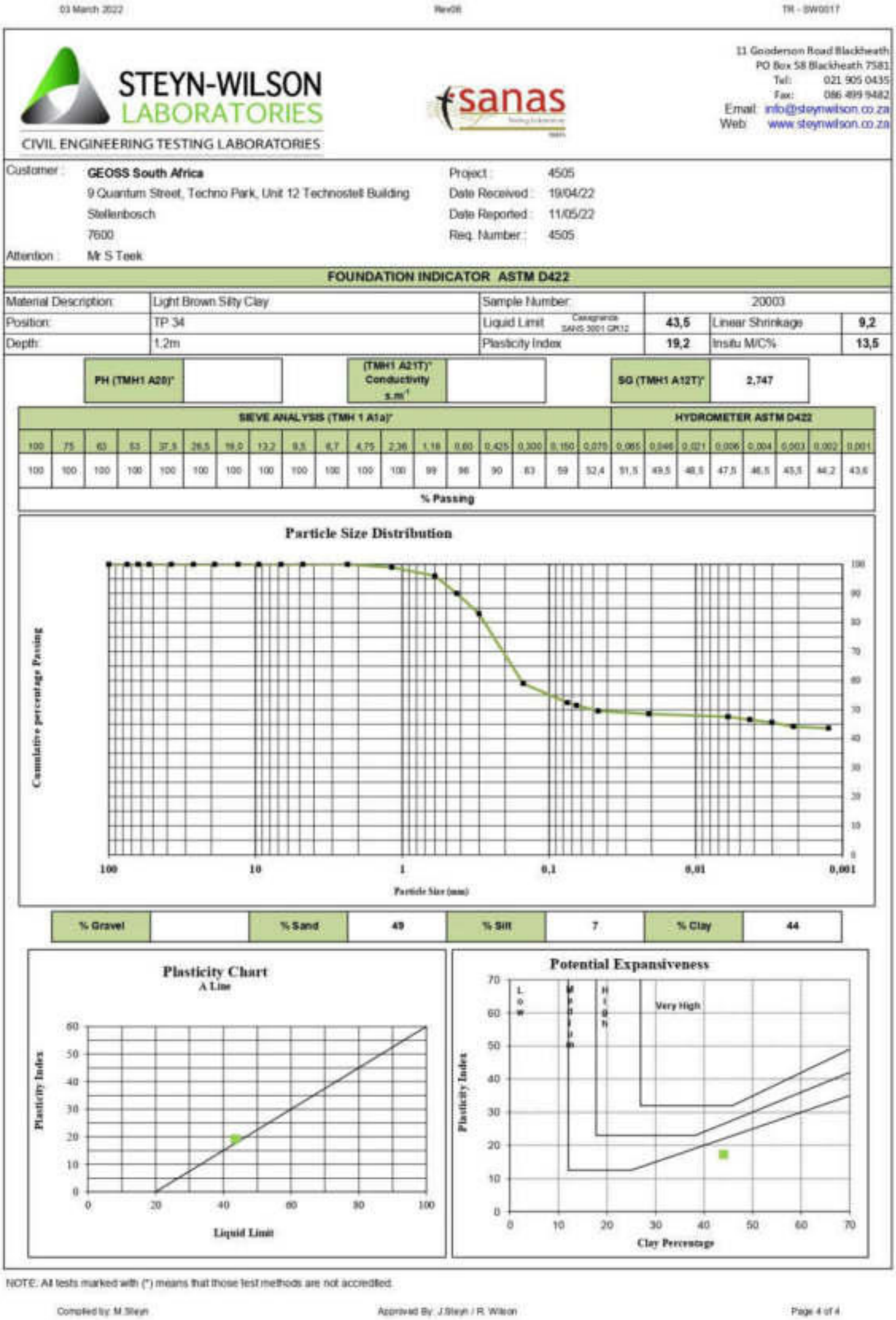
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9 Quantum Street, Techno Park, Unit 12 Technostell Building
Stellenbosch
7600
Attention : Mr S Teek

Project : 4505
Date Received : 19/04/22
Date Reported : 11/05/22
Req. Number : 4505

FOUNDATION INDICATOR ASTM D422

Material Description:	Light Brown Silty Clay	Sample Number:	20003		
Position:	TP 34	Liquid Limit Casagrande SANS 3001 GR12	**43,5**	Linear Shrinkage	**9,2**
Depth:	1,2m	Plasticity Index	**19,2**	Insitu M/C%	**13,5**

PH (TMH1 A20)*		**(TMH1 A21T)* Conductivity s.m⁻¹**		**SG (TMH1 A12T)***	**2,747**

SIEVE ANALYSIS (TMH 1 A1a)*																		**HYDROMETER ASTM D422**							
100	75	63	53	37,5	26,5	19,0	13,2	9,5	6,7	4,75	2,36	1,18	0,60	0,425	0,300	0,150	0,075	0,065	0,046	0,021	0,006	0,004	0,003	0,002	0,001
100	100	100	100	100	100	100	100	100	100	100	100	99	96	90	83	59	52,4	51,5	49,5	48,5	47,5	46,5	45,5	44,2	43,6
% Passing																									

% Gravel		**% Sand**	**49**	**% Silt**	**7**	**% Clay**	**44**

NOTE: All tests marked with (*) means that those test methods are not accredited.

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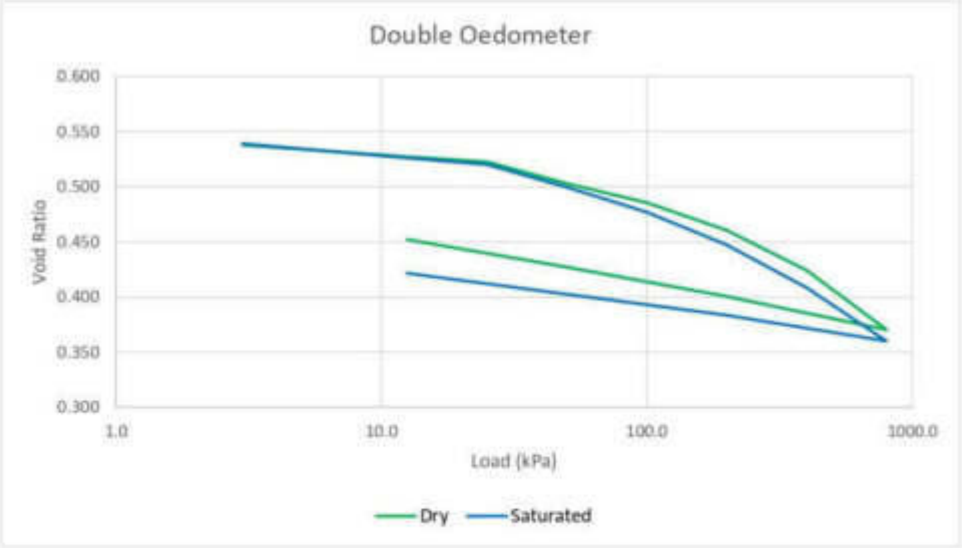
Double Oedometer Test

Dry Sample Detail		Initial	Final
Height	(mm)	20.3	19.2
Diameter	(mm)	63.5	63.5
Weight	(g)	125.7	130.5
Moisture	(%)	13.5	13.9
Dry Density	(Mg/m^3)	1.72	1.89
Bulk Density	(Mg/m^3)	1.96	2.15
Void Ratio		0.538	0.452
Particle Density	(Mg/m^3)	2.65	
Disturbed/Undisturbed		Undisturbed	
Remoulded Density	(Mg/m^3)	-	

Saturated Sample Detail		Initial	Final
Height	(mm)	20.3	18.8
Diameter	(mm)	63.5	63.5
Weight	(g)	125.6	120.2
Moisture	(%)	13.5	28.1
Dry Density	(Mg/m^3)	1.72	1.58
Bulk Density	(Mg/m^3)	1.95	2.02
Void Ratio		0.539	0.421
Particle Density	(Mg/m^3)	2.65	
Disturbed/Undisturbed		Undisturbed	
Remoulded Density	(Mg/m^3)	-	

Dry Sample		
Load (kPa)	Height (mm)	Void Ratio
3.0	20.300	0.538
12.5	20.160	0.527
25.0	20.100	0.523
50.0	19.840	0.503
100.0	19.610	0.486
200.0	19.280	0.461
400.0	18.800	0.424
800.0	18.090	0.370
200.0	18.490	0.401
50.0	18.840	0.427
12.5	19.170	0.452

Saturated Sample		
Load (kPa)	Height (mm)	Void Ratio
3.0	20.300	0.539
12.5	20.130	0.526
25.0	20.050	0.520
50.0	19.780	0.500
100.0	19.480	0.477
200.0	19.090	0.447
400.0	18.580	0.409
800.0	17.940	0.360
200.0	18.250	0.384
50.0	18.500	0.403
12.5	18.750	0.421



STEYN-WILSON GEOTECHNICAL

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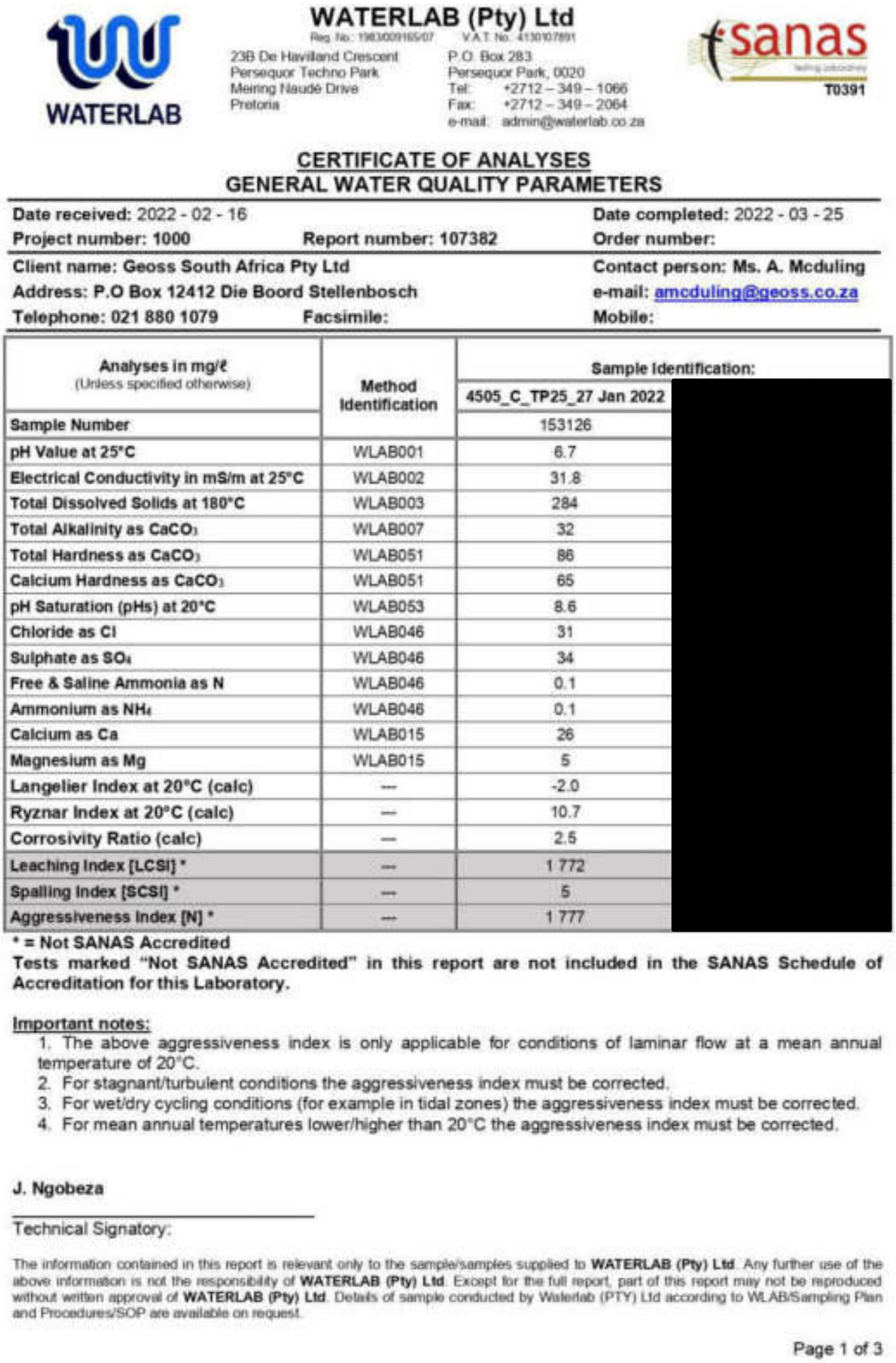
Project	**Fisantekraal**		
Sample	**TP42_0.8m**		
Client	Geoss	Test Method	BS1377 - 5: 1990
Jobfile	SWG0036	Test Date	16/05/2022

01/02/2021 Rev2 TR/GEO-SW0011 Compiled: M. Steyn Approved: R. Wilson



WATERLAB

WATERLAB (Pty) Ltd

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sanas testing laboratory T0391

CERTIFICATE OF ANALYSES
GENERAL WATER QUALITY PARAMETERS

Date received: 2022 - 02 - 16 **Date completed:** 2022 - 03 - 25
Project number: 1000 **Report number:** 107382 **Order number:**

Client name: Geoss South Africa Pty Ltd **Contact person:** Ms. A. Mcduling
Address: P.O Box 12412 Die Boord Stellenbosch **e-mail:** amcduling@geoss.co.za
Telephone: 021 880 1079 **Facsimile:** **Mobile:**

Analyses in mg/ℓ (Unless specified otherwise)	Method Identification	Sample Identification:	
		4505_C_TP25_27 Jan 2022	[redacted]
Sample Number		153126	[redacted]
pH Value at 25°C	WLAB001	6.7	[redacted]
Electrical Conductivity in mS/m at 25°C	WLAB002	31.8	[redacted]
Total Dissolved Solids at 180°C	WLAB003	284	[redacted]
Total Alkalinity as $CaCO_3$	WLAB007	32	[redacted]
Total Hardness as $CaCO_3$	WLAB051	86	[redacted]
Calcium Hardness as $CaCO_3$	WLAB051	65	[redacted]
pH Saturation (pHs) at 20°C	WLAB053	8.6	[redacted]
Chloride as Cl	WLAB046	31	[redacted]
Sulphate as SO_4	WLAB046	34	[redacted]
Free & Saline Ammonia as N	WLAB046	0.1	[redacted]
Ammonium as NH_4	WLAB046	0.1	[redacted]
Calcium as Ca	WLAB015	26	[redacted]
Magnesium as Mg	WLAB015	5	[redacted]
Langelier Index at 20°C (calc)	---	-2.0	[redacted]
Ryznar Index at 20°C (calc)	---	10.7	[redacted]
Corrosivity Ratio (calc)	---	2.5	[redacted]
Leaching Index [LCSI] *	---	1 772	[redacted]
Spalling Index [SCSI] *	---	5	[redacted]
Aggressiveness Index [N] *	---	1 777	[redacted]

*** = Not SANAS Accredited**
Tests marked "Not SANAS Accredited" in this report are not included in the SANAS Schedule of Accreditation for this Laboratory.

Important notes:

1. The above aggressiveness index is only applicable for conditions of laminar flow at a mean annual temperature of 20°C.
2. For stagnant/turbulent conditions the aggressiveness index must be corrected.
3. For wet/dry cycling conditions (for example in tidal zones) the aggressiveness index must be corrected.
4. For mean annual temperatures lower/higher than 20°C the aggressiveness index must be corrected.

J. Ngobeza

Technical Signatory:

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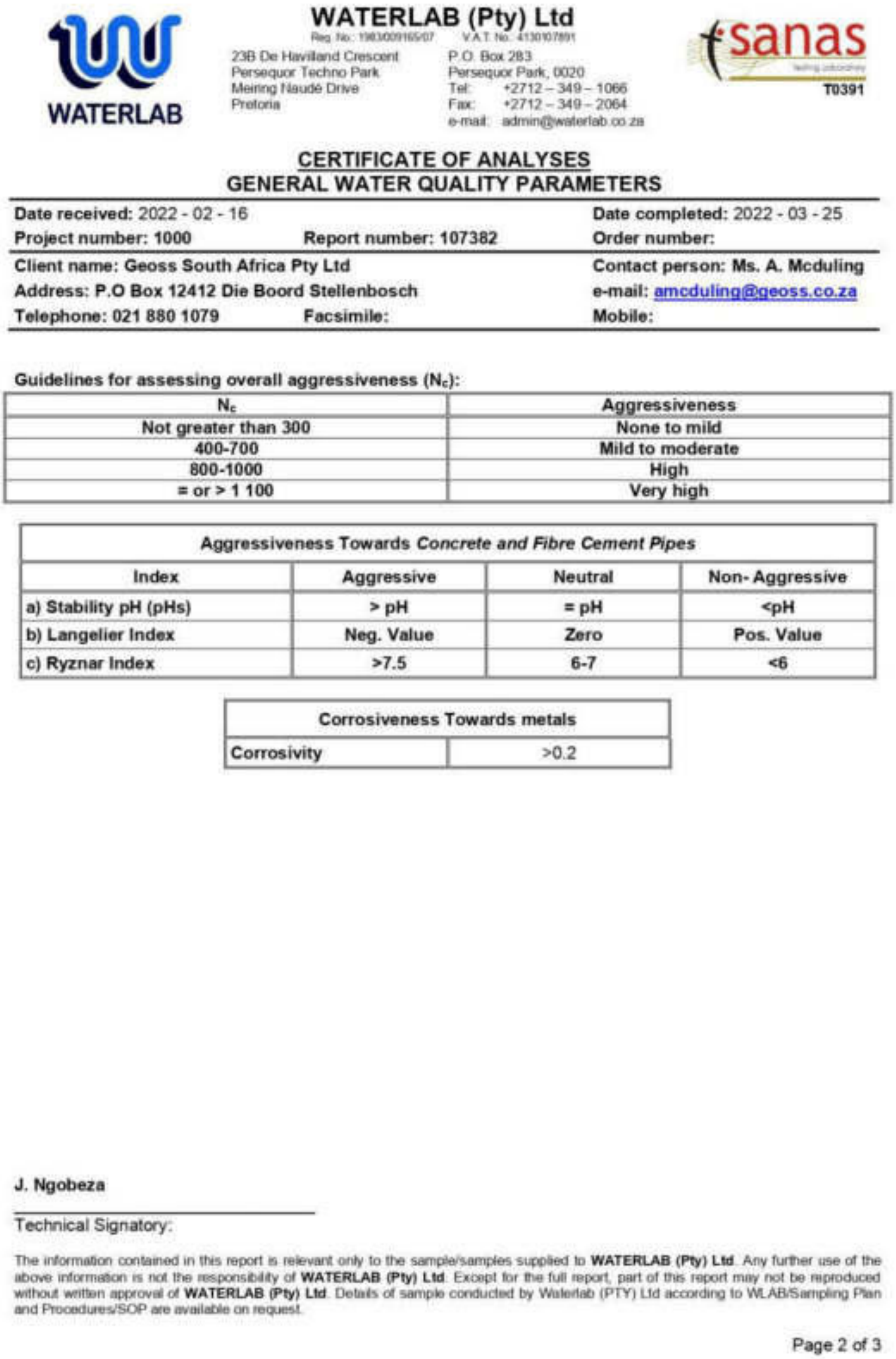
Page 1 of 3



WATERLAB

WATERLAB (Pty) Ltd

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testing laboratory
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CERTIFICATE OF ANALYSES
GENERAL WATER QUALITY PARAMETERS

Date received: 2022 - 02 - 16 **Date completed:** 2022 - 03 - 25
Project number: 1000 **Report number: 107382** **Order number:**

Client name: Geoss South Africa Pty Ltd **Contact person: Ms. A. Mcduling**
Address: P.O Box 12412 Die Boord Stellenbosch **e-mail:** amcduling@geoss.co.za
Telephone: 021 880 1079 **Facsimile:** **Mobile:**

Guidelines for assessing overall aggressiveness (N_c):

N_c	Aggressiveness
Not greater than 300	None to mild
400-700	Mild to moderate
800-1000	High
= or > 1 100	Very high

Aggressiveness Towards *Concrete and Fibre Cement Pipes*			
Index	Aggressive	Neutral	Non- Aggressive
a) Stability pH (pHs)	> pH	= pH	<pH
b) Langelier Index	Neg. Value	Zero	Pos. Value
c) Ryznar Index	>7.5	6-7	<6

Corrosiveness Towards metals	
Corrosivity	>0.2

J. Ngobeza

Technical Signatory:

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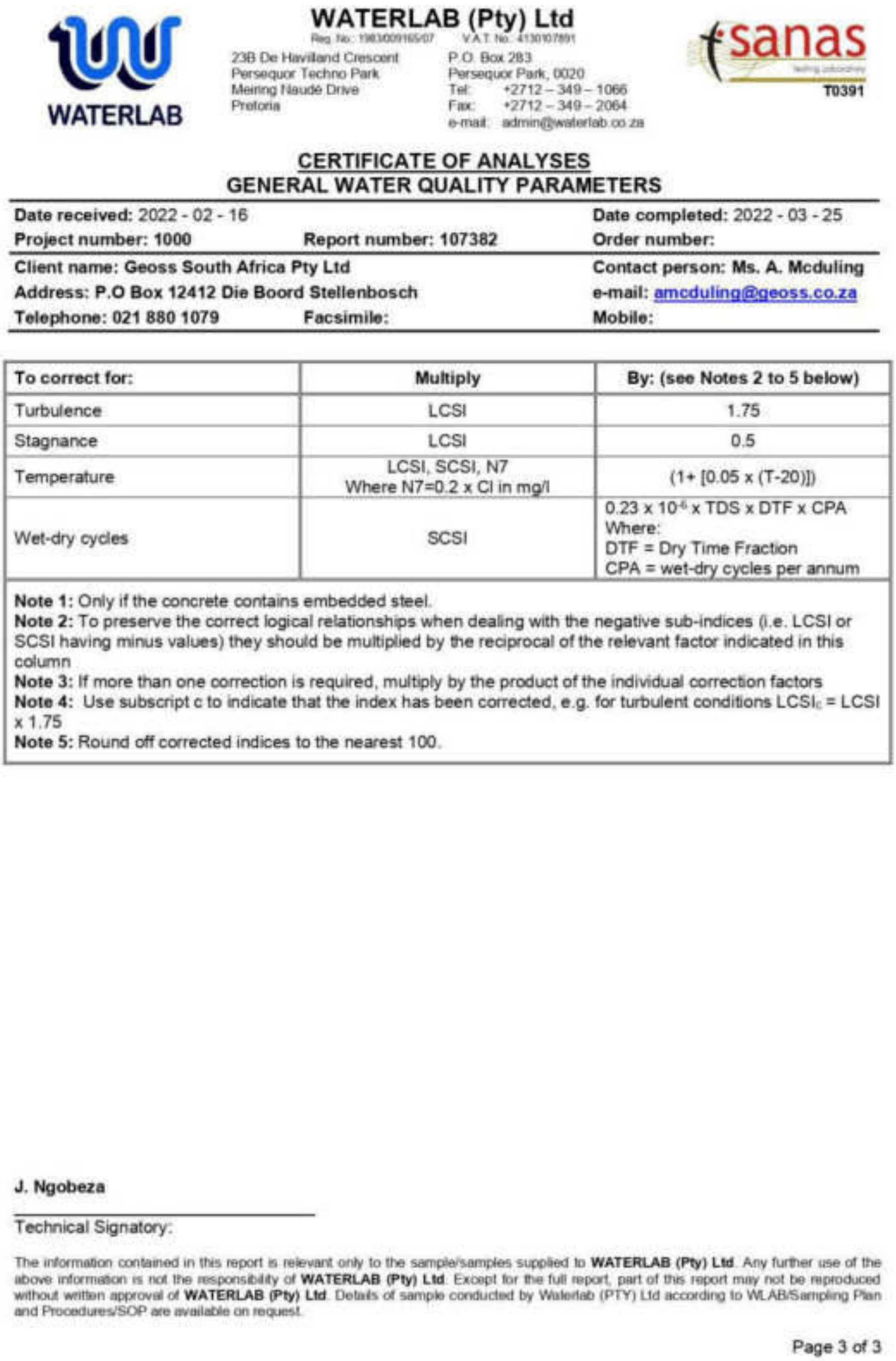

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Client name: Geoss South Africa Pty Ltd
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Address: P.O Box 12412 Die Boord Stellenbosch
e-mail: amcduling@geoss.co.za
Telephone: 021 880 1079
Facsimile:
Mobile:

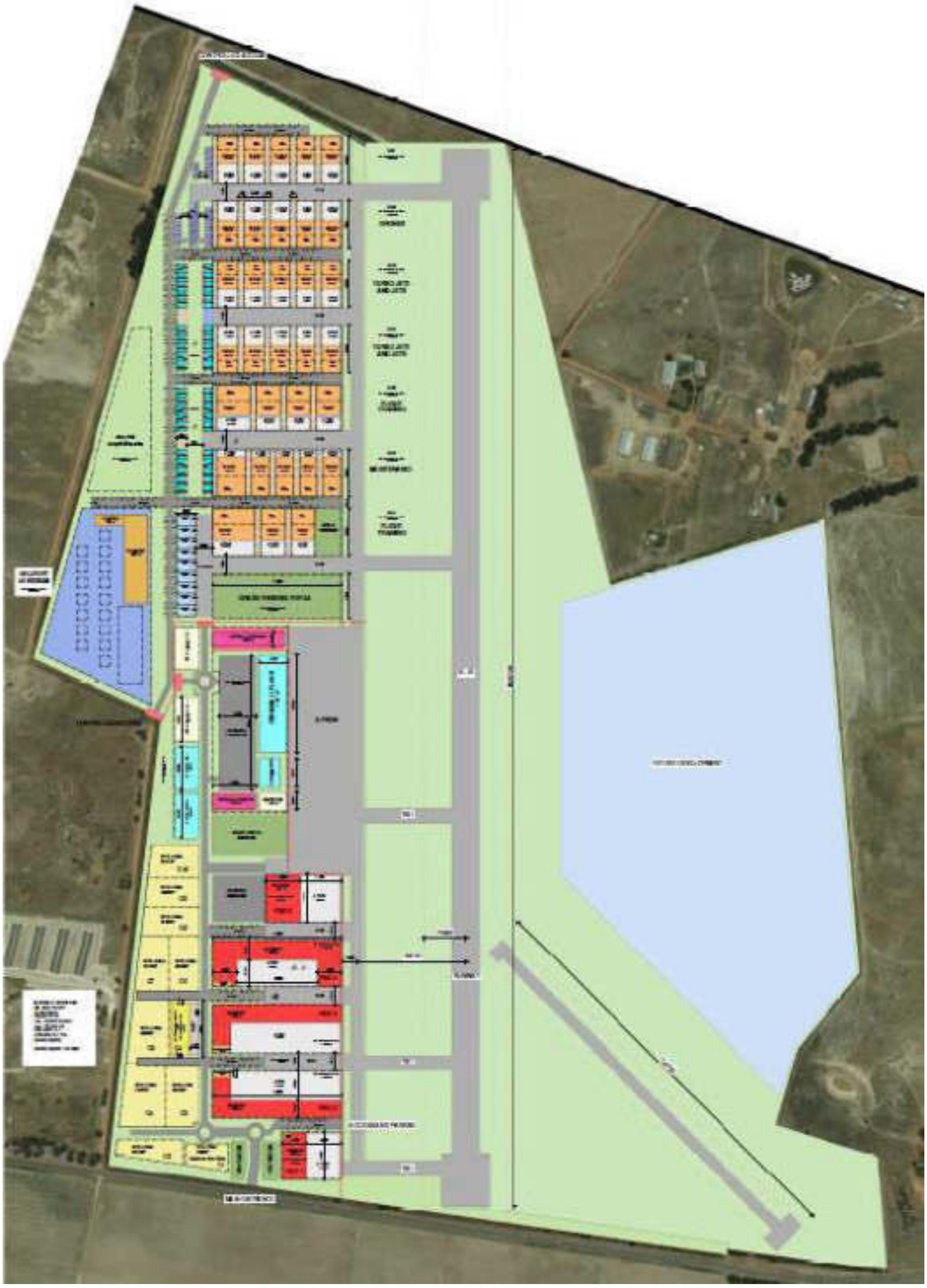
To correct for:	Multiply	By: (see Notes 2 to 5 below)
Turbulence	LCSI	1.75
Stagnance	LCSI	0.5
Temperature	LCSI, SCSI, N7 Where N7=0.2 x Cl in mg/l	(1+ [0.05 x (T-20)])
Wet-dry cycles	SCSI	0.23×10^{-6} x TDS x DTF x CPA Where: DTF = Dry Time Fraction CPA = wet-dry cycles per annum

Note 1: Only if the concrete contains embedded steel.
Note 2: To preserve the correct logical relationships when dealing with the negative sub-indices (i.e. LCSI or SCSI having minus values) they should be multiplied by the reciprocal of the relevant factor indicated in this column
Note 3: If more than one correction is required, multiply by the product of the individual correction factors
Note 4: Use subscript c to indicate that the index has been corrected, e.g. for turbulent conditions $LCSI_c$ = LCSI x 1.75
Note 5: Round off corrected indices to the nearest 100.

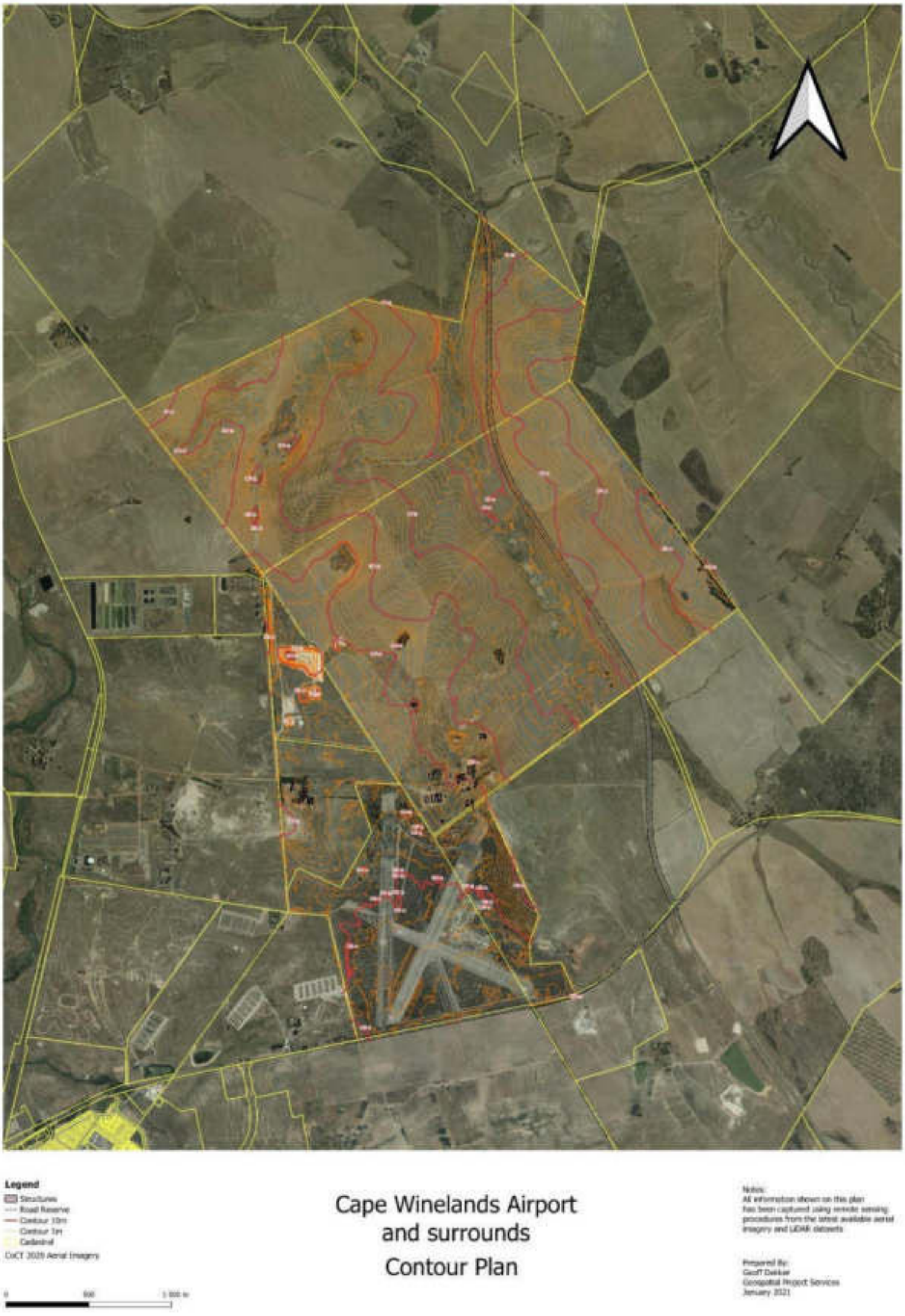
J. Ngobeza

Technical Signatory:

14. APPENDIX F: AVAILABLE PLANS AND SKETCHES



Map 8: Site development plan (Ver. 21D).



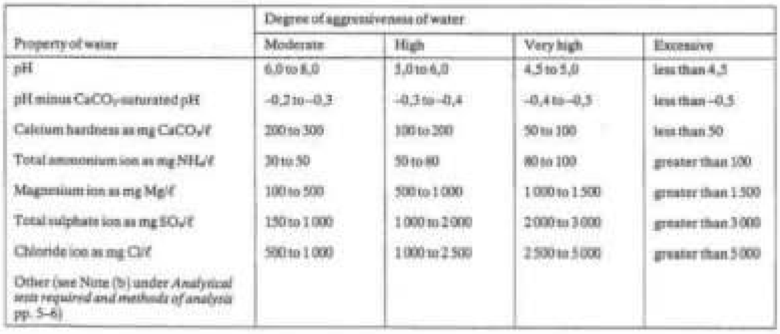
Map 9: LiDAR Data.

15. APPENDIX G: OTHER SUPPORTING INFORMATION

Table 14: Laboratory results for the region surrounding the site (after Stapelberg (2009).

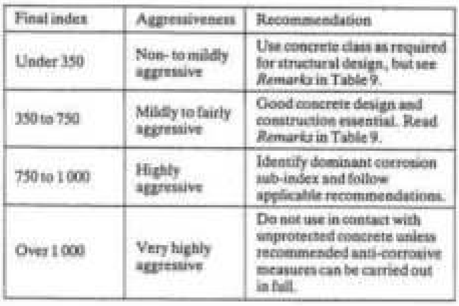
Profile number and depth (m)	Origin	Landform	Indicator tests						Clay minerals (%)	Heave potential	Collapse potential	Dispersiveness	pH/ cond. (mS/m)	Lab.	Permeability (cm/s)	Unified class	PRA Class	Fm	Gm
			LL CC	PI		LS	Clay	Act %											
				<425 µm total	Total														
5/8 (0,4)	Colluvium (granite)	Plain	-	-	-	-	-	-	N.T.	Low	No	-	-	Geos. Lab.	3.6×10^{-3}	SM	A.2.4	2.0	1.49
5/3 (3,0)	Residual shale	Plain	30 0,18	7	6,9	3	2	3.5	Ka/Cl(34) Il/Sm(2)	Low	No	ND3,CT2 SCS 19%	6.79 2232	Geos. Lab.	7.8×10^{-6}	ML	A.2.6 (4)	0.09	0.28
5/10 (0,5)	Residual sh. (slight ferr.)	Convex slope	42 0,29	12	11.9	4	40.5	0.3	N.T.	Low	No	-	-	Geos. Lab.	$<4 \times 10^{-6}$	ML	A.7.5 (9)	0.04	0.05

Table 15: General limits for assessment of aggressiveness (Basson, 1989).



	Degree of aggressiveness of water			
Property of water	Moderate	High	Very high	Excessive
pH	6,0 to 8,0	5,0 to 6,0	4,5 to 5,0	less than 4,5
pH minus $CaCO_3$-saturated pH	-0,2 to -0,3	-0,3 to -0,4	-0,4 to -0,5	less than -0,5
Calcium hardness as mg $CaCO_3$/ℓ	200 to 300	100 to 200	50 to 100	less than 50
Total ammonium ion as mg NH_4/ℓ	30 to 50	50 to 80	80 to 100	greater than 100
Magnesium ion as mg Mg/ℓ	100 to 500	500 to 1 000	1 000 to 1 500	greater than 1 500
Total sulphate ion as mg SO_4/ℓ	150 to 1 000	1 000 to 2 000	2 000 to 3 000	greater than 3 000
Chloride ion as mg Cl/ℓ	500 to 1 000	1 000 to 2 500	2 500 to 5 000	greater than 5 000
Other (see Note (b) under *Analytical tests required and methods of analysis* pp. 5–6)				

Table 16: Guide for assessing Final Basson Index (Basson, 1989).



Final index	Aggressiveness	Recommendation
Under 350	Non- to mildly aggressive	Use concrete class as required for structural design, but see *Remarks* in Table 9.
350 to 750	Mildly to fairly aggressive	Good concrete design and construction essential. Read *Remarks* in Table 9.
750 to 1 000	Highly aggressive	Identify dominant corrosion sub-index and follow applicable recommendations.
Over 1 000	Very highly aggressive	Do not use in contact with unprotected concrete unless recommended anti-corrosive measures can be carried out in full.

Appendix D

Bella Riva Stormwater Management Plan

Concept Stormwater Master Plan

Bella Riva SW Investigation

Sagewise 67 (Pty) Ltd

Submission date: 2024/01/31

Document number: 504584-0000-REP-CC-0001
Revision: B

Appendix E

PCSWMM Simulation Model Output Results

CAPE WINELANDS AIRPORT (CWA) CONCEPT STORMWATER MANAGEMENT PLAN -

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)


*************
  Element Count
  *************
  Number of rain gages ...... 9
  Number of subcatchments ... 559
  Number of nodes ........... 276
  Number of links ........... 287
  Number of pollutants ...... 0
  Number of land uses ....... 0


  ****************
  Raingage Summary
  ****************
                                                    Data       Recording
  Name                  Data Source                 Type       Interval
  ------------------------------------------------------------------------
  (1)_6month_RI_SCS_Type_II_(20.1mm) (1)_6month_RI_SCS_Type_II_(20.1mm) INTENSITY    6 min.
  (2)_1year_RI_SCS_Type_II_(32.9mm) (2)_1year_RI_SCS_Type_II_(32.9mm) INTENSITY    6 min.
  (3)_2year_RI_SCS_Type_II_(44.9mm) (3)_2year_RI_SCS_Type_II_(44.9mm) INTENSITY    6 min.
  (4)_5year_RI_SCS_Type_II_(60.3mm) (4)_5year_RI_SCS_Type_II_(60.3mm) INTENSITY    6 min.
  (5)_10year_RI_SCS_Type_II_(71.4mm) (5)_10year_RI_SCS_Type_II_(71.4mm) INTENSITY    6 min.
  (6)_20year_RI_SCS_Type_II_(83mm) (6)_20year_RI_SCS_Type_II_(83mm) INTENSITY    6 min.
  (7)_50year_RI_SCS_Type_II_(99.4mm) (7)_50year_RI_SCS_Type_II_(99.4mm) INTENSITY    6 min.
  (8)_100year_RI_SCS_Type_II_(112.7mm) (8)_100year_RI_SCS_Type_II_(112.7mm) INTENSITY    6 min.
  (9)_200year_RI_SCS_Type_II_(127mm) (9)_200year_RI_SCS_Type_II_(127mm) INTENSITY    6 min.


  ********************
  Subcatchment Summary
  ********************
  Name                       Area     Width   %Imperv    %Slope Rain Gage            Outlet
  -----------------------------------------------------------------------------------------------------------
  S_Pond1                    0.21     41.96      0.00    0.5000 (4)_5year_RI_SCS_Type_II_(60.3mm) SU1_Pond1
  S_Pond2                    3.29    411.29      0.00    0.5000 (4)_5year_RI_SCS_Type_II_(60.3mm) SU2_Pond2
  S_Pond3                    0.61     76.19      0.00    0.5000 (4)_5year_RI_SCS_Type_II_(60.3mm) SU3_Pond3
  S_Pond4                    0.13     31.32      0.00    0.5000 (4)_5year_RI_SCS_Type_II_(60.3mm) SU4_Pond4
  S_Pond5                    0.45     64.07      0.00    0.5000 (4)_5year_RI_SCS_Type_II_(60.3mm) SU5_Pond5
  S_Pond6                    0.09     45.90      0.00    0.5000 (4)_5year_RI_SCS_Type_II_(60.3mm) SU6_Pond6
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S_Pond7	0.27	90.10	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	SU7_Pond7
S_Pond8	0.20	102.25	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	SU8_Pond8
S1	0.29	29.34	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J327
S1_4	0.33	66.14	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J231
S1_8	1.24	35.42	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	S7_46
S10	0.03	13.70	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	OF_Pond4
S11	0.01	7.20	100.00	1.0000	(4)_5year_RI_SCS_Type_II_(60.3mm)	S45_27
S11_1	0.11	10.71	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J17
S11_10	0.09	8.81	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J179
S11_11	0.07	7.48	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J168
S11_12	0.12	11.93	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J218
S11_2	0.08	8.42	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	S39_2
S11_4	0.17	16.61	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J186
S11_5	0.11	11.33	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J26
S11_6	0.14	13.50	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J174
S11_7	0.12	12.12	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J190
S11_8	0.13	12.91	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J230
S11_9	0.10	9.93	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J168
S12	0.08	8.15	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J35
S12_1	0.46	30.87	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J17
S12_2	0.33	33.07	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	S39_2
S12_3	0.81	36.74	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J186
S12_5	0.49	32.55	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J163
S12_6	0.44	31.64	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J179
S12_7	0.64	32.00	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	OF_Pond7
S12_8	0.38	34.23	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	OF_Pond7
S13	4.46	222.99	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J231
S13_11	3.30	194.01	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J72
S13_12	2.86	143.16	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J267
S13_14	2.18	128.41	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J270
S13_2	3.71	217.98	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J143
S13_8	2.29	134.74	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J72
S136_1	0.87	87.16	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J351
S136_3	0.59	58.61	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J351
S136_4	1.14	114.21	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J244
S136_5	1.77	176.65	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J13
S139_1	0.19	19.00	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J351
S139_2	0.25	17.86	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J13
S14	0.43	43.24	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J351
S140_1	0.25	20.46	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J69

S140_2	0.20	15.14	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J244
S141_1	0.20	19.78	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J145
S141_2	0.16	16.38	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J260
S141_4	0.27	27.05	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J359
S141_5	0.10	10.37	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J145
S143_1	0.12	12.35	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J34
S143_2	0.20	15.03	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J18
S143_3	0.15	15.26	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J242
S144_1	0.18	23.11	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J257
S144_3	0.31	14.16	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J277
S144_4	0.13	13.35	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J141
S144_5	0.15	10.13	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J144
S145_2	0.11	10.74	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J131
S147	0.42	28.26	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J305
S148_1	0.20	10.98	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J140
S15	0.21	10.36	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J150
S15_3	0.61	30.66	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J230
S15_4	0.61	30.36	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J218
S150	0.36	12.75	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J124
S152	0.02	9.90	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J24
S153	1.29	129.38	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J143
S155	0.11	11.33	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J92
S156_1	0.17	17.18	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J43
S157	0.08	8.07	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J96
S158_1	0.09	8.81	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J89
S158_2	0.15	10.09	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J37
S16	0.23	28.50	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J91
S160_2	0.15	10.54	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J98
S161_1	0.04	4.18	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J93
S161_2	0.10	10.13	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J77
S161_3	0.14	9.40	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J77
S161_5	0.09	9.40	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J54
S161_6	0.16	10.48	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J321
S163	0.17	13.23	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J65
S164_1	0.15	9.62	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J160
S164_3	0.11	8.96	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J61
S164_4	0.10	9.38	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J88
S164_5	0.05	6.80	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J103
S165	0.10	10.17	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J70
S166_1	0.11	9.91	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J44

S166_3	0.12	9.62	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J42
S166_4	0.19	9.56	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J111
S167_1	0.13	5.47	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J74
S167_2	0.26	10.89	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J51
S168_1	0.08	8.82	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J116
S168_2	0.12	9.67	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J9
S168_3	0.08	8.71	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J112
S168_4	0.12	9.36	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J49
S17	0.10	10.38	100.00	0.5420	(4)_5year_RI_SCS_Type_II_(60.3mm)	J32
S170_1	0.27	27.26	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J349
S170_2	0.09	9.20	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J302
S170_3	0.27	13.28	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J95
S170_4	0.60	29.79	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J154
S170_5	0.09	9.17	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J154
S170_7	0.17	9.11	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J23
S170_8	0.24	23.87	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J101
S171_1	0.12	12.44	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J79
S171_10	0.12	12.48	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J358
S171_13	0.17	17.41	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J223
S171_14	0.14	13.70	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J230
S171_16	0.20	19.52	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J161
S171_17	0.13	12.92	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J17
S171_18	0.15	14.67	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	S39_2
S171_19	0.13	12.90	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J25
S171_2	0.21	21.01	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J164
S171_3	0.10	10.36	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J73
S171_4	0.11	11.19	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J239
S171_5	0.18	17.79	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J237
S171_7	0.10	9.81	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J223
S171_8	0.14	14.16	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J237
S173_1	0.13	12.63	75.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J74
S173_2	0.28	27.99	75.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J78
S173_3	0.27	27.05	75.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J46
S173_5	0.31	31.34	75.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J156
S173_6	0.39	38.54	75.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J113
S173_7	0.65	65.22	75.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J108
S174_1	0.30	30.36	75.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J44
S174_2	0.12	12.25	75.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J42
S175_1	0.65	64.58	75.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J67
S175_3	0.42	41.75	75.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J83

S175_4	0.55	54.60	75.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J157
S176_1	0.65	65.18	75.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J63
S176_3	0.41	41.28	75.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J86
S176_4	0.55	54.68	75.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J158
S177_1	0.97	96.74	75.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J97
S177_2	1.36	136.16	75.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J98
S178_1	0.97	97.46	75.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J89
S178_2	1.36	135.80	75.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J37
S179_1	0.77	77.30	75.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J60
S179_2	0.32	31.55	75.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J37
S179_3	0.23	22.67	75.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J321
S18	2.14	107.15	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J17
S18_3	0.19	6.18	100.00	1.0000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J76
S18_6	3.24	323.86	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J110
S180	0.14	14.34	75.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J37
S181	0.37	36.93	75.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J77
S182_2	0.27	27.30	75.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J160
S182_3	0.90	89.96	75.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J97
S182_4	0.70	69.64	75.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J98
S183	0.55	55.14	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J265
S184_1	0.08	8.08	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J42
S184_3	0.08	8.04	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J42
S184_4	0.64	63.83	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J107
S185	0.17	16.87	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J25
S186	0.29	28.72	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J70
S187	0.40	39.72	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J76
S188_1	0.12	11.64	75.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J74
S188_2	0.19	19.18	75.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J80
S189	0.09	9.03	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J65
S19	0.05	5.43	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J31
S190	0.79	79.08	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J94
S191	0.38	38.45	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J93
S192	0.01	0.78	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J109
S193_2	0.42	70.50	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J105
S193_3	0.76	75.55	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J106
S193_4	0.70	87.34	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J103
S193_5	0.21	34.60	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J106
S193_6	0.52	74.07	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J112
S193_7	0.74	92.06	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J106
S194_1	0.18	18.45	75.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J61

S194_3	0.11	11.37	75.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J88
S194_4	0.15	14.85	75.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J160
S195_1	0.55	54.57	0.00	0.7500	(4)_5year_RI_SCS_Type_II_(60.3mm)	J112
S195_2	0.91	91.04	0.00	0.7500	(4)_5year_RI_SCS_Type_II_(60.3mm)	J109
S196_1	0.11	9.31	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J99
S196_2	0.07	8.60	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J84
S196_3	0.06	8.11	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J102
S197_1	0.55	55.32	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J31
S197_3	0.36	36.29	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J34
S197_4	0.20	20.28	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J240
S197_5	0.12	11.60	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J68
S197_6	0.31	30.71	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J91
S198_1	0.34	33.80	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J34
S198_10	0.07	7.43	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J33
S198_2	0.36	36.01	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J68
S198_3	0.32	31.97	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J146
S198_4	0.12	12.22	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J119
S198_5	0.15	14.67	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J132
S198_6	0.33	33.09	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J146
S198_7	0.19	19.41	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J242
S198_8	0.13	13.24	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J68
S199	0.31	30.90	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	S198_10
S2	1.27	36.36	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J327
S2_1	1.08	28.50	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J231
S2_11	2.26	59.53	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J334
S2_12	0.54	14.32	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J348
S2_2	0.32	8.31	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	S3_122
S2_21	0.90	23.64	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J351
S2_22	1.09	28.76	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J258
S2_23	0.38	9.89	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J273
S2_24	0.93	24.57	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J317
S2_25	0.57	15.03	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J319
S2_26	1.48	39.03	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	S4
S2_27	0.86	22.75	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J265
S2_28	0.23	6.11	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J359
S2_3	2.66	70.10	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J331
S2_4	0.58	15.13	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	S3_127
S2_5	1.48	38.87	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J348
S2_6	2.61	68.60	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J299
S2_7	0.72	19.06	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	S3_32

S2_8	0.76	20.05	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J338
S20	5.36	536.01	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J59
S200_1	0.35	34.74	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J33
S200_2	0.47	46.85	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J207
S201	0.27	24.55	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J310
S202	0.54	54.47	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J75
S203	0.15	15.18	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J75
S204	0.17	15.20	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J75
S205	0.16	16.20	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J140
S206_1	0.29	23.76	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J306
S206_2	0.41	34.50	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J140
S206_3	0.21	21.17	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J310
S207	0.45	45.30	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J310
S208_1	0.56	70.54	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J95
S208_2	0.13	12.72	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J36
S208_3	0.31	31.20	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J101
S208_4	0.24	23.59	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J57
S209	0.68	67.81	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J56
S21	3.49	348.82	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J13
S210_1	0.22	21.53	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J55
S210_3	0.28	28.28	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J152
S210_4	0.11	10.65	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J95
S210_5	0.23	22.99	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J24
S211_1	0.96	95.71	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J100
S211_2	2.11	210.91	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J99
S212_1	0.24	23.61	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J100
S212_2	1.57	156.63	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J102
S213_1	0.47	47.12	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J48
S213_2	0.14	14.44	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J316
S213_3	1.45	90.76	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J54
S214	0.14	13.55	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J48
S215	0.34	33.75	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J316
S216	1.20	66.57	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J141
S217_1	0.39	39.00	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J41
S217_2	0.53	44.37	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J77
S217_3	0.89	88.50	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J58
S218	0.20	20.00	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J36
S219	0.19	19.02	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J40
S22	4.49	448.70	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J79
S220	0.03	2.74	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J36

S221	0.30	30.31	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J39
S222	0.12	12.32	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J120
S223_1	0.15	18.94	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J134
S223_2	1.27	79.34	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J127
S224	0.05	4.99	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	S223_2
S225	0.03	2.97	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J120
S226	0.40	39.87	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J154
S227	0.48	47.56	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J47
S228	0.05	5.37	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J121
S229_1	0.13	13.44	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J150
S229_2	0.11	10.93	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J123
S229_3	0.27	26.84	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J194
S229_4	0.07	6.90	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J124
S23	0.19	18.72	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J253
S23_2	1.87	58.30	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J243
S23_3	0.35	11.05	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	S29
S23_4	0.09	2.78	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J22
S230_1	0.34	33.60	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J87
S230_2	0.29	29.26	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J121
S231	0.16	15.66	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J302
S232	0.03	2.52	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J302
S233	0.05	4.76	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	S232
S234	0.06	5.72	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J124
S235	0.30	30.20	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J136
S236	0.02	1.57	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J127
S237	0.17	16.74	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J267
S238	0.09	8.74	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	S237
S239	0.47	47.24	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J130
S24	0.17	16.88	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J234
S24_2	0.39	32.58	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J156
S24_3	0.52	34.85	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J113
S24_4	0.45	34.97	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J46
S240_1	0.23	25.36	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J139
S240_2	0.38	42.42	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J134
S241	0.23	29.30	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J280
S242	0.89	52.55	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J130
S25	0.07	6.88	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J81
S26	0.32	31.61	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J133
S27	0.08	8.32	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J137
S28	0.61	61.37	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J230

S29	2.33	116.53	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J243
S3	4.46	446.30	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J73
S3_1	0.63	41.69	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J67
S3_11	0.11	10.77	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J258
S3_119	1.53	85.18	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J281
S3_122	1.92	80.04	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J357
S3_124	3.59	94.58	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J357
S3_126	2.98	149.24	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J327
S3_127	3.10	154.93	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J330
S3_17	2.93	101.08	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J299
S3_18	1.17	65.24	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J273
S3_19	0.92	45.94	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J331
S3_20	2.93	146.39	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J338
S3_21	1.66	83.10	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J348
S3_23	1.65	91.86	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J308
S3_24	1.22	121.64	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J319
S3_27	2.99	90.52	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J281
S3_3	0.18	18.39	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J243
S3_32	1.33	74.02	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J282
S3_4	0.40	39.78	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J86
S3_42	0.44	43.77	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J203
S3_5	0.66	43.79	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J157
S3_69	1.38	138.00	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J359
S3_7	0.26	26.14	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J257
S3_8	1.66	83.09	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J311
S30	0.33	32.77	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J36
S31	0.09	9.34	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J40
S32	0.10	10.18	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J31
S32_1	0.21	21.38	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J164
S32_10	1.02	40.68	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J163
S32_11	0.66	32.94	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J17
S32_12	0.55	39.14	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	S39_2
S32_13	0.08	7.56	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J25
S32_3	0.53	29.28	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J27
S32_4	0.80	106.81	75.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J50
S32_6	0.59	32.54	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	OF_Pond6
S32_8	0.65	32.62	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J358
S33	0.16	16.20	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J48
S34	0.22	22.28	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J56
S35	0.09	9.36	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J97

S36	3.22	161.22	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J223
S37	0.74	30.91	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J162
S38	6.00	300.09	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J162
S39	0.13	43.20	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J10
S39_1	0.10	5.89	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J10
S39_2	3.20	188.19	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J10
S39_4	0.09	5.32	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J10
S4	1.18	65.35	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J275
S40	0.04	18.60	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	S39_2
S43	0.26	25.85	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J325
S45_1	0.26	8.58	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J14
S45_10	0.20	9.24	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J29
S45_11	0.17	16.60	0.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J16
S45_12	0.15	15.15	0.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J16
S45_13	0.21	11.66	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J20
S45_14	0.12	9.62	0.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J207
S45_15	0.16	8.86	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J207
S45_16	0.10	5.71	0.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J15
S45_17	0.10	5.58	0.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J203
S45_18	0.14	7.58	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J15
S45_19	0.10	9.96	0.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J115
S45_2	0.07	8.82	0.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J118
S45_20	0.10	9.68	0.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J115
S45_21	0.13	7.37	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J115
S45_22	0.13	7.83	0.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J85
S45_23	0.06	11.20	0.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J205
S45_24	0.16	8.56	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J85
S45_25	0.12	7.79	0.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J47
S45_26	0.12	7.66	0.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J203
S45_27	0.15	7.90	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J47
S45_28	0.12	8.01	0.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J115
S45_29	0.11	7.36	0.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J115
S45_3	0.07	10.10	0.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J33
S45_30	0.15	8.60	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J115
S45_31	0.16	9.90	0.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J147
S45_32	0.03	6.47	0.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J85
S45_33	0.21	9.42	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J203
S45_34	0.11	8.62	0.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J206
S45_36	0.15	9.93	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J205
S45_37	0.10	10.57	0.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J30

S45_38	0.07	8.24	0.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J30
S45_39	0.12	10.11	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J30
S45_4	0.09	9.26	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J33
S45_40	0.07	8.18	0.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J119
S45_41	0.09	9.74	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J119
S45_42	0.29	16.21	0.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J31
S45_43	0.03	6.70	0.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J194
S45_44	0.37	18.39	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J31
S45_45	0.08	9.62	0.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J47
S45_46	0.03	6.53	0.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J35
S45_47	0.09	9.59	0.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J194
S45_48	0.05	9.56	0.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J7
S45_49	0.09	4.60	0.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J32
S45_5	0.16	10.96	0.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J29
S45_6	0.12	8.59	0.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J208
S45_7	0.07	8.65	0.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J119
S45_8	0.13	10.97	0.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J29
S48_1	0.73	40.64	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J97
S48_2	1.27	48.67	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J98
S49	0.37	11.69	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J338
S5	1.68	167.90	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J243
S50	0.90	89.50	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J325
S51_1	0.31	20.56	0.00	0.8680	(4)_5year_RI_SCS_Type_II_(60.3mm)	J14
S51_2	0.29	19.33	0.00	0.8680	(4)_5year_RI_SCS_Type_II_(60.3mm)	J149
S52	0.27	26.88	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	S18
S52_1	0.98	39.20	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	S7_48
S52_11	1.33	41.48	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J189
S52_12	0.38	11.79	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J209
S52_13	1.54	48.21	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	S7_53
S52_14	0.84	26.35	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	S7_41
S52_15	1.34	41.79	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J282
S52_17	1.46	45.73	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J22
S52_18	0.83	25.91	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	S3_21
S52_19	1.71	53.56	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	S3_20
S52_2	1.72	53.71	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J353
S52_20	0.61	18.98	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J357
S52_21	1.52	47.54	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J333
S52_22	1.09	33.93	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J169
S52_23	1.10	34.50	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	S3_17
S52_3	0.61	18.98	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J176

S52_4	1.51	47.05	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	S7_45
S52_5	1.24	38.69	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J170
S52_8	1.00	39.87	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	S3_127
S52_9	1.24	38.77	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	S3_124
S54	7.40	369.75	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J26
S55	0.70	18.45	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J327
S56	1.05	27.59	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J19
S6	3.82	212.40	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J25
S66_3	7.97	796.83	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J237
S66_4	5.66	566.38	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J79
S66_5	2.44	244.06	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J237
S67	6.20	310.09	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J7
S7	1.37	42.89	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	S38
S7_1	0.54	66.92	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J237
S7_11	1.65	82.71	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J190
S7_12	0.48	23.80	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J223
S7_2	0.21	6.89	100.00	1.0000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J110
S7_3	3.85	192.47	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J173
S7_39	0.45	22.62	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J235
S7_4	1.22	121.87	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J125
S7_41	4.35	217.65	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J218
S7_44	3.27	163.38	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J179
S7_45	8.10	404.81	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J169
S7_46	6.31	315.46	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J17
S7_48	5.24	262.05	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J358
S7_5	1.30	130.15	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J110
S7_50	6.91	345.61	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J185
S7_51	2.02	101.13	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J27
S7_53	7.99	399.62	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J230
S7_6	0.37	45.70	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J239
S7_7	0.58	72.56	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J235
S7_8	8.45	422.47	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J169
S70	1.24	69.05	100.00	1.0000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J13
S70_1	0.06	6.29	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J255
S70_3	0.10	24.95	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J243
S70_4	2.16	179.96	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J360
S71_1	0.17	16.97	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J69
S71_10	0.21	20.56	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J258
S71_11	0.50	50.37	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J359
S71_3	0.23	22.87	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J260

S71_5	0.50	50.07	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J253
S71_6	0.91	90.87	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J361
S71_7	0.46	45.84	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J260
S71_8	2.06	206.17	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J244
S71_9	1.20	120.04	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J31
S72	0.16	32.44	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J317
S8	2.49	177.85	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J164
S8_1	0.34	34.46	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J351
S8_2	0.04	3.85	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J351
S8_4	0.44	44.17	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J142
S8_6	0.06	15.70	100.00	1.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J351
S824_1	0.54	54.28	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J74
S824_2	1.32	132.02	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J156
S825	1.23	123.28	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J54
S826	1.96	122.44	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J92
S827	0.04	4.40	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J141
S828	1.83	131.06	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J137
S829	0.18	30.45	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J134
S830	0.33	46.43	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J136
S831_1	0.97	96.70	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J136
S831_2	0.98	98.44	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J134
S832_1	0.73	72.94	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J310
S832_2	1.52	152.50	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J140
S833	3.32	332.16	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J81
S834	0.05	4.60	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J141
S835_1	0.23	23.46	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J139
S835_2	0.53	53.13	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J137
S836_1	0.54	53.95	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J150
S836_2	0.58	57.75	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J123
S837_1	0.49	49.18	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J87
S837_2	0.42	42.26	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J121
S838_1	0.42	41.54	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J123
S838_2	0.49	49.21	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J121
S839	1.74	174.35	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J306
S840	1.40	140.43	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J133
S841	0.35	35.00	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J144
S842	0.26	43.72	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J302
S843	0.75	94.30	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J302
S844	1.65	165.38	0.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J154
S845	0.20	24.99	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J302

S846	1.17	58.33	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J136
S847	0.17	34.50	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J127
S848	0.18	36.86	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J129
S849	0.45	44.68	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J129
S850	0.76	63.65	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J267
S851	0.41	41.26	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J267
S852_1	1.27	63.56	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J129
S852_2	1.15	57.44	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J316
S853	0.06	30.00	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J130
S854	0.94	94.10	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J39
S855	0.26	43.72	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J120
S856	0.20	24.99	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J120
S857_1	0.59	59.44	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J75
S857_2	0.49	49.31	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J75
S858_1	0.75	74.58	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J131
S858_2	0.71	70.87	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J265
S859	0.84	84.32	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J132
S860_1	2.20	219.68	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J240
S860_2	0.89	89.11	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J146
S861	1.10	109.92	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J242
S862	0.10	10.00	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J33
S863	0.10	10.00	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J33
S864	0.12	12.50	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J68
S865	0.12	12.50	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J34
S866	0.12	12.50	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J34
S867	0.25	25.00	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J34
S868_1	0.48	48.10	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J31
S868_2	0.43	42.84	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J34
S869_1	0.24	23.81	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J253
S869_2	0.24	24.38	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J34
S870_1	0.57	56.59	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J253
S870_3	0.52	52.13	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J69
S870_4	0.59	59.05	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J244
S870_5	0.62	61.83	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J253
S871_1	0.22	21.74	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J260
S871_2	0.50	50.41	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J260
S872	1.00	100.41	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J68
S873	0.64	64.00	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J359
S874	1.00	99.96	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J359
S875	1.36	135.94	100.00	0.5000	(4)_5year_RI_SCS_Type_II_(60.3mm)	J18

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S876_1            0.85    84.86    100.00    0.5000 (4)_5year_RI_SCS_Type_II_(60.3mm) J36
S876_2            0.62    61.90    100.00    0.5000 (4)_5year_RI_SCS_Type_II_(60.3mm) J57
S876_3            0.49    48.86    100.00    0.5000 (4)_5year_RI_SCS_Type_II_(60.3mm) J36
S877_1            0.49    48.82    100.00    0.5000 (4)_5year_RI_SCS_Type_II_(60.3mm) J95
S877_2            0.86    85.87    100.00    0.5000 (4)_5year_RI_SCS_Type_II_(60.3mm) J57
S878            0.59    59.28    100.00    0.5000 (4)_5year_RI_SCS_Type_II_(60.3mm) J40
S879            0.56    69.61    100.00    0.5000 (4)_5year_RI_SCS_Type_II_(60.3mm) J120
S880            0.93    46.45    100.00    0.5000 (4)_5year_RI_SCS_Type_II_(60.3mm) J92
S881            0.63    31.54    100.00    0.5000 (4)_5year_RI_SCS_Type_II_(60.3mm) J316
S882            0.59    29.55    100.00    0.5000 (4)_5year_RI_SCS_Type_II_(60.3mm) J259
S883_1            1.34    133.83    100.00    0.5000 (4)_5year_RI_SCS_Type_II_(60.3mm) J41
S883_2            1.37    136.98    100.00    0.5000 (4)_5year_RI_SCS_Type_II_(60.3mm) J217
S884            0.79    79.19    100.00    0.5000 (4)_5year_RI_SCS_Type_II_(60.3mm) J53
S885            0.62    62.20    100.00    0.5000 (4)_5year_RI_SCS_Type_II_(60.3mm) J77
S886            0.70    70.17    100.00    0.5000 (4)_5year_RI_SCS_Type_II_(60.3mm) J37
S887            0.70    70.17    100.00    0.5000 (4)_5year_RI_SCS_Type_II_(60.3mm) J89
S888            0.62    62.20    100.00    0.5000 (4)_5year_RI_SCS_Type_II_(60.3mm) J160
S889            0.70    70.17    100.00    0.5000 (4)_5year_RI_SCS_Type_II_(60.3mm) J98
S890            0.70    70.17    100.00    0.5000 (4)_5year_RI_SCS_Type_II_(60.3mm) J97
S891_1            1.13    113.07    100.00    0.5000 (4)_5year_RI_SCS_Type_II_(60.3mm) J63
S891_3            0.70    70.50    100.00    0.5000 (4)_5year_RI_SCS_Type_II_(60.3mm) J86
S891_4            0.94    94.08    100.00    0.5000 (4)_5year_RI_SCS_Type_II_(60.3mm) J158
S892_1            1.11    111.03    100.00    0.5000 (4)_5year_RI_SCS_Type_II_(60.3mm) J67
S892_3            0.73    72.57    100.00    0.5000 (4)_5year_RI_SCS_Type_II_(60.3mm) J83
S892_4            0.94    93.89    100.00    0.5000 (4)_5year_RI_SCS_Type_II_(60.3mm) J157
S893            0.63    50.52    100.00    0.5000 (4)_5year_RI_SCS_Type_II_(60.3mm) J49
S894_1            0.75    75.28    100.00    0.5000 (4)_5year_RI_SCS_Type_II_(60.3mm) J78
S894_2            1.11    111.02    100.00    0.5000 (4)_5year_RI_SCS_Type_II_(60.3mm) J156
S895            0.46    46.36    100.00    0.5000 (4)_5year_RI_SCS_Type_II_(60.3mm) J113
S896            0.85    85.12    100.00    0.5000 (4)_5year_RI_SCS_Type_II_(60.3mm) J46
S897            0.52    52.04    100.00    0.5000 (4)_5year_RI_SCS_Type_II_(60.3mm) J25
S898            0.30    24.89    100.00    0.5000 (4)_5year_RI_SCS_Type_II_(60.3mm) J107
S9            0.12    57.50    0.00    0.5000 (4)_5year_RI_SCS_Type_II_(60.3mm) OF_Pond4

*******************
LID Control Summary
*******************
                  No. of    Unit    Unit    % Area    % Imperv    % Perv
Subcatchment    LID Control    Units    Area    Width    Covered    Treated    Treated
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S_Pond1         Pond1            1    2098.00      0.00     100.00      0.00       0.00
S_Pond4         Pond4            1    1253.00      0.00     100.00      0.00       0.00
S_Pond5         Pond5            1    4485.00      0.00     100.00      0.00       0.00
S_Pond6         Pond6            1     918.00      0.00     100.00      0.00       0.00
S_Pond7         Pond7            1    2703.00      0.00     100.00      0.00       0.00
S_Pond8         Pond8            1    2045.00      0.00     100.00      0.00       0.00

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Node Summary
************
                                Invert     Max.    Ponded    External
Name               Type          Elev.    Depth      Area    Inflow
-------------------------------------------------------------------------------
J1               JUNCTION         98.89     2.50       0.0
J10              JUNCTION        122.20     2.77       0.0
J100             JUNCTION        116.42     2.50       0.0
J101             JUNCTION        112.90     2.50       0.0
J102             JUNCTION        117.71     2.50       0.0
J103             JUNCTION        117.52     2.50       0.0
J104             JUNCTION        117.90     2.56       0.0
J105             JUNCTION        117.30     2.46       0.0
J106             JUNCTION        118.40     2.50       0.0
J107             JUNCTION        119.57     2.50       0.0
J108             JUNCTION        120.56     2.14       0.0
J109             JUNCTION        118.54     2.50       0.0
J11              JUNCTION        119.20     3.30       0.0
J110             JUNCTION        119.36     2.50       0.0
J111             JUNCTION        120.20     2.46       0.0
J112             JUNCTION        117.70     2.50       0.0
J113             JUNCTION        120.59     2.41       0.0
J114             JUNCTION        120.66     2.39       0.0
J115             JUNCTION        110.23     3.82       0.0
J116             JUNCTION        118.34     2.50       0.0
J117             JUNCTION        118.19     2.50       0.0
J118             JUNCTION        109.94     2.50       0.0
J119             JUNCTION        109.78     2.24       0.0
J12              JUNCTION        110.41     2.50       0.0
J120             JUNCTION        116.65     2.50       0.0
J121             JUNCTION        114.66     2.50       0.0
J122             JUNCTION        114.64     2.50       0.0
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J123	JUNCTION	113.89	2.74	0.0
J124	JUNCTION	113.28	2.72	0.0
J125	JUNCTION	117.58	2.74	0.0
J127	JUNCTION	115.39	2.50	0.0
J128	JUNCTION	109.18	3.19	0.0
J129	JUNCTION	115.58	2.50	0.0
J13	JUNCTION	96.15	3.97	0.0
J130	JUNCTION	113.51	1.97	0.0
J131	JUNCTION	109.89	2.50	0.0
J132	JUNCTION	109.71	2.63	0.0
J133	JUNCTION	113.23	2.50	0.0
J134	JUNCTION	113.79	1.87	0.0
J136	JUNCTION	113.71	2.65	0.0
J137	JUNCTION	114.05	2.50	0.0
J139	JUNCTION	113.68	2.84	0.0
J14	JUNCTION	115.50	2.54	0.0
J140	JUNCTION	112.85	2.70	0.0
J141	JUNCTION	110.75	2.34	0.0
J142	JUNCTION	101.10	2.50	0.0
J143	JUNCTION	112.21	2.50	0.0
J144	JUNCTION	111.17	2.72	0.0
J145	JUNCTION	105.44	2.50	0.0
J146	JUNCTION	111.09	2.50	0.0
J147	JUNCTION	109.73	3.77	0.0
J148	JUNCTION	116.65	2.50	0.0
J149	JUNCTION	116.22	2.50	0.0
J15	JUNCTION	109.08	3.65	0.0
J150	JUNCTION	111.47	2.48	0.0
J151	JUNCTION	115.81	2.50	0.0
J152	JUNCTION	115.17	2.50	0.0
J153	JUNCTION	114.04	2.50	0.0
J154	JUNCTION	116.13	2.24	0.0
J155	JUNCTION	121.42	2.50	0.0
J156	JUNCTION	120.89	1.96	0.0
J157	JUNCTION	119.71	2.50	0.0
J158	JUNCTION	119.57	2.50	0.0
J159	JUNCTION	120.65	2.50	0.0
J16	JUNCTION	93.44	2.50	0.0
J160	JUNCTION	119.66	2.50	0.0
J161	JUNCTION	109.39	3.86	0.0

J162	JUNCTION	97.86	2.73	0.0
J163	JUNCTION	107.19	2.62	0.0
J164	JUNCTION	122.13	2.80	0.0
J165	JUNCTION	105.81	7.31	0.0
J168	JUNCTION	104.75	2.53	0.0
J169	JUNCTION	111.10	2.50	0.0
J17	JUNCTION	114.34	2.50	0.0
J170	JUNCTION	102.64	8.91	0.0
J171	JUNCTION	101.76	2.42	0.0
J172	JUNCTION	108.92	2.50	0.0
J173	JUNCTION	106.00	4.76	0.0
J174	JUNCTION	105.24	2.50	0.0
J176	JUNCTION	108.15	2.50	0.0
J179	JUNCTION	104.37	2.56	0.0
J18	JUNCTION	110.59	2.50	0.0
J182	JUNCTION	104.25	3.06	0.0
J183	JUNCTION	105.03	3.97	0.0
J185	JUNCTION	98.91	2.29	0.0
J186	JUNCTION	103.50	3.84	0.0
J189	JUNCTION	106.08	2.50	0.0
J19	JUNCTION	119.01	2.79	0.0
J190	JUNCTION	95.51	2.92	0.0
J194	JUNCTION	111.63	2.50	0.0
J2	JUNCTION	92.20	2.80	0.0
J20	JUNCTION	85.14	2.50	0.0
J203	JUNCTION	109.37	3.37	0.0
J205	JUNCTION	109.59	2.74	0.0
J206	JUNCTION	109.33	2.67	0.0
J207	JUNCTION	109.48	2.40	0.0
J208	JUNCTION	109.65	2.00	0.0
J209	JUNCTION	101.20	3.33	0.0
J21	JUNCTION	94.80	2.50	0.0
J212	JUNCTION	119.57	2.33	0.0
J217	JUNCTION	115.32	2.50	0.0
J218	JUNCTION	99.25	3.06	0.0
J22	JUNCTION	99.92	2.70	0.0
J223	JUNCTION	101.98	2.50	0.0
J23	JUNCTION	115.08	2.50	0.0
J230	JUNCTION	96.20	2.30	0.0
J231	JUNCTION	98.31	3.62	0.0

J233	JUNCTION	107.68	2.50	0.0
J234	JUNCTION	101.30	2.50	0.0
J235	JUNCTION	99.66	2.50	0.0
J237	JUNCTION	96.61	2.72	0.0
J239	JUNCTION	93.36	2.50	0.0
J24	JUNCTION	113.90	2.50	0.0
J240	JUNCTION	107.22	2.50	0.0
J242	JUNCTION	105.27	2.50	0.0
J243	JUNCTION	102.01	2.50	0.0
J244	JUNCTION	98.75	3.33	0.0
J25	JUNCTION	122.32	2.28	0.0
J253	JUNCTION	101.61	2.50	0.0
J255	JUNCTION	101.87	2.50	0.0
J256	JUNCTION	101.44	2.50	0.0
J257	JUNCTION	106.75	2.50	0.0
J258	JUNCTION	106.34	2.50	0.0
J259	JUNCTION	115.66	2.50	0.0
J26	JUNCTION	100.82	1.77	0.0
J260	JUNCTION	101.88	2.50	0.0
J263	JUNCTION	108.87	3.78	0.0
J265	JUNCTION	109.49	2.30	0.0
J267	JUNCTION	113.97	2.50	0.0
J27	JUNCTION	100.46	2.84	0.0
J270	JUNCTION	115.40	2.50	0.0
J273	JUNCTION	110.09	2.58	0.0
J274	JUNCTION	111.23	2.50	0.0
J275	JUNCTION	111.54	2.50	0.0
J277	JUNCTION	108.72	2.56	0.0
J279	JUNCTION	108.91	2.28	0.0
J28	JUNCTION	104.67	2.50	0.0
J280	JUNCTION	112.89	2.71	0.0
J281	JUNCTION	105.38	3.24	0.0
J282	JUNCTION	109.07	2.20	0.0
J285	JUNCTION	110.31	2.16	0.0
J289	JUNCTION	114.60	2.50	0.0
J29	JUNCTION	93.75	3.44	0.0
J299	JUNCTION	110.83	2.34	0.0
J30	JUNCTION	94.07	3.50	0.0
J301	JUNCTION	112.68	2.55	0.0
J302	JUNCTION	115.01	2.50	0.0

J305	JUNCTION	111.05	2.21	0.0
J306	JUNCTION	112.03	2.24	0.0
J308	JUNCTION	113.04	2.48	0.0
J309	JUNCTION	111.84	2.50	0.0
J31	JUNCTION	99.77	2.49	0.0
J310	JUNCTION	110.66	2.10	0.0
J311	JUNCTION	112.49	2.76	0.0
J312	JUNCTION	114.21	2.50	0.0
J316	JUNCTION	116.50	2.50	0.0
J317	JUNCTION	114.58	2.49	0.0
J319	JUNCTION	116.19	2.50	0.0
J32	JUNCTION	101.04	4.33	0.0
J321	JUNCTION	117.23	4.02	0.0
J325	JUNCTION	117.25	2.76	0.0
J327	JUNCTION	118.67	2.50	0.0
J33	JUNCTION	108.18	2.50	0.0
J330	JUNCTION	116.64	2.23	0.0
J331	JUNCTION	114.36	2.50	0.0
J333	JUNCTION	113.38	2.50	0.0
J334	JUNCTION	104.28	2.78	0.0
J336	JUNCTION	103.29	2.62	0.0
J338	JUNCTION	102.00	2.88	0.0
J34	JUNCTION	102.82	2.49	0.0
J345	JUNCTION	101.31	3.02	0.0
J348	JUNCTION	100.32	2.48	0.0
J349	JUNCTION	113.69	2.78	0.0
J35	JUNCTION	109.78	3.71	0.0
J350	JUNCTION	99.16	2.87	0.0
J351	JUNCTION	101.61	2.50	0.0
J353	JUNCTION	103.92	2.82	0.0
J357	JUNCTION	109.62	2.09	0.0
J358	JUNCTION	112.52	4.81	0.0
J359	JUNCTION	103.85	2.50	0.0
J36	JUNCTION	115.40	2.18	0.0
J360	JUNCTION	83.89	2.25	0.0
J361	JUNCTION	93.63	3.56	0.0
J37	JUNCTION	118.62	2.50	0.0
J38	JUNCTION	120.01	2.86	0.0
J39	JUNCTION	116.08	2.50	0.0
J4	JUNCTION	88.00	4.00	0.0

J40	JUNCTION	116.27	2.50	0.0
J41	JUNCTION	115.90	3.16	0.0
J42	JUNCTION	122.57	2.50	0.0
J43	JUNCTION	118.55	2.50	0.0
J44	JUNCTION	122.39	2.67	0.0
J45	JUNCTION	119.22	2.50	0.0
J46	JUNCTION	120.98	2.50	0.0
J47	JUNCTION	112.53	2.50	0.0
J48	JUNCTION	118.56	2.50	0.0
J49	JUNCTION	119.08	2.50	0.0
J5	JUNCTION	80.00	6.02	0.0
J50	JUNCTION	118.66	2.50	0.0
J51	JUNCTION	118.90	2.31	0.0
J52	JUNCTION	109.02	3.71	0.0
J53	JUNCTION	116.97	2.50	0.0
J54	JUNCTION	117.45	2.50	0.0
J55	JUNCTION	114.20	2.50	0.0
J56	JUNCTION	115.01	2.44	0.0
J57	JUNCTION	115.30	2.02	0.0
J58	JUNCTION	114.69	2.50	0.0
J59	JUNCTION	117.72	2.20	0.0
J6	JUNCTION	90.11	2.50	0.0
J60	JUNCTION	117.47	2.76	0.0
J61	JUNCTION	122.62	1.56	0.0
J62	JUNCTION	122.56	1.60	0.0
J63	JUNCTION	122.66	1.32	0.0
J64	JUNCTION	110.83	2.50	0.0
J65	JUNCTION	122.53	1.62	0.0
J66	JUNCTION	110.15	2.50	0.0
J67	JUNCTION	122.53	1.47	0.0
J68	JUNCTION	104.52	2.50	0.0
J69	JUNCTION	101.87	2.50	0.0
J7	JUNCTION	107.73	2.50	0.0
J70	JUNCTION	122.47	1.65	0.0
J71	JUNCTION	102.23	2.50	0.0
J72	JUNCTION	113.01	2.50	0.0
J73	JUNCTION	95.71	3.72	0.0
J74	JUNCTION	122.52	1.39	0.0
J75	JUNCTION	109.65	2.72	0.0
J76	JUNCTION	122.42	1.67	0.0

J77	JUNCTION	116.77	3.31	0.0
J78	JUNCTION	121.25	2.23	0.0
J79	JUNCTION	93.49	2.50	0.0
J8	JUNCTION	118.02	2.50	0.0
J80	JUNCTION	121.66	2.50	0.0
J81	JUNCTION	110.20	2.03	0.0
J82	JUNCTION	112.40	2.60	0.0
J83	JUNCTION	120.48	2.50	0.0
J84	JUNCTION	116.14	2.50	0.0
J85	JUNCTION	111.05	2.40	0.0
J86	JUNCTION	120.49	2.50	0.0
J87	JUNCTION	113.74	3.25	0.0
J88	JUNCTION	120.74	2.50	0.0
J89	JUNCTION	118.70	2.50	0.0
J9	JUNCTION	117.27	2.50	0.0
J90	JUNCTION	117.68	2.57	0.0
J91	JUNCTION	111.01	2.50	0.0
J92	JUNCTION	117.36	2.50	0.0
J93	JUNCTION	118.03	2.36	0.0
J94	JUNCTION	118.31	2.76	0.0
J95	JUNCTION	113.36	2.50	0.0
J96	JUNCTION	116.73	3.88	0.0
J97	JUNCTION	118.66	2.50	0.0
J98	JUNCTION	118.38	2.80	0.0
J99	JUNCTION	117.02	2.74	0.0
OF1	JUNCTION	115.95	3.70	0.0
OF_Pond1	OUTFALL	116.05	1.35	0.0
OF_Pond2	OUTFALL	108.25	2.00	0.0
OF_Pond3	OUTFALL	93.00	1.00	0.0
OF_Pond4	OUTFALL	83.50	1.00	0.0
OF_Pond5	OUTFALL	96.00	1.05	0.0
OF_Pond6	OUTFALL	94.00	1.00	0.0
OF_Pond7	OUTFALL	100.50	1.00	0.0
OF_Pond8	OUTFALL	122.00	1.00	0.0
OF2	OUTFALL	106.50	1.00	0.0
OF3	OUTFALL	87.00	1.00	0.0
OF4	OUTFALL	78.00	1.00	0.0
OF5	OUTFALL	87.00	1.00	0.0
OF6	OUTFALL	92.00	1.00	0.0
OF7	OUTFALL	98.00	1.00	0.0

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OF8              OUTFALL          115.00     2.00      0.0

SU1_Pond1          STORAGE          116.00     2.50      0.0

SU2_Pond2          STORAGE          105.00     5.30      0.0

SU3_Pond3          STORAGE           93.00     2.00      0.0

SU4_Pond4          STORAGE           83.50     1.50      0.0

SU5_Pond5          STORAGE           96.00     2.50      0.0

SU6_Pond6          STORAGE           94.00     1.00      0.0

SU7_Pond7          STORAGE          100.50     2.50      0.0

SU8_Pond8          STORAGE          122.00     2.00      0.0



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Link Summary

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Name            From Node        To Node          Type            Length    %Slope Roughness

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C1              J44              J25              CONDUIT          127.2    0.0582    0.0120

C10             J171             OF_Pond7         CONDUIT          107.6    1.1679    0.0120

C100            J51              J50              CONDUIT           25.7    0.9217    0.0120

C101            J139             J140             CONDUIT           91.4    0.9141    0.0120

C102            J101             J47              CONDUIT           38.5    0.9439    0.0120

C103_1          J78              J156             CONDUIT          168.2    0.2194    0.0120

C103_2          J156             J108             CONDUIT          134.2    0.2415    0.0120

C104            J150             J85              CONDUIT           30.4    1.3771    0.0120

C105            J360             OF_Pond4         CONDUIT           23.3    1.6663    0.0120

C106            J140             J306             CONDUIT          166.7    0.4884    0.0120

C107            J130             J133             CONDUIT           70.1    0.4080    0.0120

C108            J263             OF_Pond2         CONDUIT           28.1    2.2257    0.0120

C109            SU5_Pond5        J4               CONDUIT           28.7   38.4931    0.0120

C11             J244             J13              CONDUIT          195.0    1.3337    0.0120

C110            SU6_Pond6        J2               CONDUIT           32.1    7.8058    0.0120

C111            SU8_Pond8        J11              CONDUIT           68.2    6.9081    0.0120

C112            SU7_Pond7        J1               CONDUIT           40.5    6.8374    0.0120

C113            J1               OF7              CONDUIT           21.4    4.1331    0.0120

C114            J2               OF6              CONDUIT           12.4    1.6178    0.0120

C115            J4               OF5              CONDUIT            8.8   11.4774    0.0120

C116            J5               OF4              CONDUIT           35.0    5.7297    0.0120

C117            J6               OF3              CONDUIT           34.4    9.0774    0.0120

C118            J7               OF2              CONDUIT           35.7    3.4323    0.0120

C119_1          J83              J157             CONDUIT          132.7    0.5810    0.0120
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C119_2	J157	J106	CONDUIT	225.7	0.5805	0.0120
C12	J84	OF_Pond1	CONDUIT	8.5	1.1127	0.0120
C12_1	J25	J164	CONDUIT	399.1	0.0476	0.0120
C12_2	J164	J10	CONDUIT	113.0	-0.0611	0.0120
C120	J106	J104	CONDUIT	93.0	0.5353	0.0120
C121	J104	J103	CONDUIT	73.9	0.5158	0.0120
C122	J9	J148	CONDUIT	130.2	0.4739	0.0120
C122_1	J103	J105	CONDUIT	46.7	0.4860	0.0120
C122_2	J105	J9	CONDUIT	5.7	0.5410	0.0120
C123	J116	J117	CONDUIT	36.0	0.4278	0.0120
C124	J117	J8	CONDUIT	35.8	0.4783	0.0120
C125	J8	J112	CONDUIT	64.9	0.4980	0.0120
C126	J112	J9	CONDUIT	89.1	0.4835	0.0120
C127	J102	J99	CONDUIT	80.9	0.8613	0.0120
C128	J97	J94	CONDUIT	117.4	0.3007	0.0120
C129	J98	J99	CONDUIT	313.1	0.4366	0.0120
C13	J68	J34	CONDUIT	147.2	1.1537	0.0120
C130	J99	J100	CONDUIT	154.2	0.3885	0.0120
C131	J100	J84	CONDUIT	102.9	0.2654	0.0120
C132	J37	J100	CONDUIT	314.5	0.6995	0.0120
C133	J89	J93	CONDUIT	127.9	0.5271	0.0120
C134	J94	J93	CONDUIT	155.0	0.1807	0.0120
C135	J93	J90	CONDUIT	100.9	0.3468	0.0120
C136	J90	J60	CONDUIT	58.2	0.3560	0.0120
C137	J23	J58	CONDUIT	79.9	0.4842	0.0120
C138	J58	J55	CONDUIT	101.2	0.4790	0.0120
C139	J57	J56	CONDUIT	38.9	0.7450	0.0120
C14	J34	J32	CONDUIT	169.4	1.0555	0.0120
C140	J56	J58	CONDUIT	59.8	0.5370	0.0120
C141	J95	J47	CONDUIT	173.3	0.4777	0.0120
C142	J40	J41	CONDUIT	97.6	0.3790	0.0120
C143	J41	J56	CONDUIT	167.9	0.5278	0.0120
C144	J302	J87	CONDUIT	68.7	1.8590	0.0120
C145	J43	J96	CONDUIT	50.9	3.5825	0.0120
C146	J96	J41	CONDUIT	168.7	0.4926	0.0120
C147	J82	J150	CONDUIT	75.1	1.2430	0.0120
C148	J47	J194	CONDUIT	191.1	0.4742	0.0120
C149	J194	J85	CONDUIT	139.1	0.4133	0.0120
C15	J33	J32	CONDUIT	173.5	4.1236	0.0120
C150	J92	J96	CONDUIT	146.5	0.4286	0.0120

C151	J48	J316	CONDUIT	212.0	0.9719	0.0120
C152	J147	J203	CONDUIT	212.4	0.1718	0.0120
C153	J203	J15	CONDUIT	164.2	0.1754	0.0120
C154	J205	J15	CONDUIT	103.1	0.4906	0.0120
C155	J15	J52	CONDUIT	44.8	0.1249	0.0120
C156	J316	J259	CONDUIT	83.2	1.0019	0.0120
C157	J53	J259	CONDUIT	237.5	0.5500	0.0120
C158	J39	J36	CONDUIT	77.9	0.8720	0.0120
C159	J36	J349	CONDUIT	194.6	0.8776	0.0120
C16_1	J79	J73	CONDUIT	300.8	-0.7387	0.0120
C160	J289	J349	CONDUIT	55.6	1.6383	0.0120
C161	J133	J280	CONDUIT	63.3	0.5370	0.0120
C162	J129	J133	CONDUIT	325.0	0.7252	0.0120
C163	J127	J136	CONDUIT	163.1	1.0293	0.0120
C164	J136	J280	CONDUIT	82.4	0.9951	0.0120
C165	J137	J82	CONDUIT	99.1	1.6618	0.0120
C166	J122	J123	CONDUIT	87.1	0.8656	0.0120
C167	J123	J124	CONDUIT	79.9	0.7593	0.0120
C168	J124	J82	CONDUIT	132.3	0.6614	0.0120
C169	J134	J136	CONDUIT	139.4	0.0588	0.0120
C17	J71	J13	CONDUIT	245.4	2.4762	0.0120
C170	J120	J154	CONDUIT	66.7	0.7786	0.0120
C171	J154	J87	CONDUIT	297.8	0.8026	0.0120
C172	J87	J124	CONDUIT	52.3	0.8750	0.0120
C173	J121	J349	CONDUIT	87.2	1.1122	0.0120
C174_1	J86	J158	CONDUIT	129.8	0.7101	0.0120
C174_2	J158	J104	CONDUIT	226.7	0.7350	0.0120
C175_1	J88	J160	CONDUIT	117.8	0.9151	0.0120
C175_2	J160	J103	CONDUIT	234.1	0.9152	0.0120
C176_1	J18	J240	CONDUIT	263.1	1.2805	0.0120
C177	J148	J149	CONDUIT	89.8	0.4797	0.0120
C178	J149	J151	CONDUIT	90.0	0.4567	0.0120
C179	J151	J14	CONDUIT	53.5	0.5724	0.0120
C18	J125	J325	CONDUIT	54.0	0.6115	0.0120
C18_2	J243	J22	CONDUIT	234.5	0.8932	0.0200
C182	J118	J119	CONDUIT	76.7	0.2165	0.0120
C183	J119	J208	CONDUIT	72.0	0.1806	0.0120
C184	J208	J207	CONDUIT	90.1	0.1787	0.0120
C185	J207	J206	CONDUIT	90.0	0.1744	0.0120
C186	J206	J205	CONDUIT	89.9	-0.2871	0.0120

C19	J327	J330	CONDUIT	237.8	0.8554	0.0200
C2	SU1_Pond1	OF1	CONDUIT	8.5	24.9917	0.0120
C20	J240	J242	CONDUIT	153.2	1.2693	0.0120
C21	J14	J217	CONDUIT	46.6	0.3781	0.0120
C21_1	J12	J66	CONDUIT	28.4	0.9267	0.0120
C21_2	J66	J263	CONDUIT	116.3	1.0928	0.0120
C217	J349	J101	CONDUIT	98.7	0.8044	0.0120
C22	J310	J35	CONDUIT	120.0	0.7360	0.0120
C227	J17	J358	CONDUIT	220.0	0.8254	0.0120
C23	J79	J360	CONDUIT	204.3	4.7017	0.0120
C235	J330	J331	CONDUIT	291.7	0.7817	0.0200
C236	J331	J333	CONDUIT	140.7	0.6945	0.0120
C237	J333	J311	CONDUIT	121.0	0.7423	0.0200
C238	J311	J309	CONDUIT	101.1	0.6412	0.0120
C239	J309	J299	CONDUIT	170.3	0.5890	0.0200
C24	J64	J12	CONDUIT	59.0	0.7064	0.0120
C240	J299	J285	CONDUIT	148.4	0.3524	0.0120
C241	J285	J357	CONDUIT	295.2	0.2327	0.0200
C242	J357	J282	CONDUIT	282.1	0.1953	0.0200
C243	J282	J279	CONDUIT	95.4	0.1730	0.0120
C244	J279	J277	CONDUIT	127.9	0.1501	0.0120
C245	J277	J263	CONDUIT	142.0	-0.1112	0.0120
C246	J281	J334	CONDUIT	192.9	0.5706	0.0200
C247	J334	J336	CONDUIT	145.7	0.6793	0.0120
C248	J336	J338	CONDUIT	180.8	0.7150	0.0200
C249	J338	J345	CONDUIT	88.9	0.7740	0.0120
C25	J35	J147	CONDUIT	4.8	0.9099	0.0120
C250	J345	J348	CONDUIT	124.1	0.7987	0.0200
C251	J348	J350	CONDUIT	148.9	0.7759	0.0120
C252	J350	J231	CONDUIT	96.3	0.8859	0.0200
C256	J231	J230	CONDUIT	364.8	0.5790	0.0120
C257	J255	J351	CONDUIT	197.8	0.1294	0.0120
C258	J351	J256	CONDUIT	132.4	0.1284	0.0120
C259	J256	J234	CONDUIT	123.4	0.1183	0.0120
C26	J61	J62	CONDUIT	115.0	0.0591	0.0120
C260_1	J234	J142	CONDUIT	13.1	1.4619	0.0120
C260_2	J142	J231	CONDUIT	113.6	2.4575	0.0120
C261	J325	J319	CONDUIT	168.9	0.6224	0.0200
C262	J319	J317	CONDUIT	253.3	0.6389	0.0200
C263	J317	J312	CONDUIT	64.2	0.5729	0.0120

C264	J312	J308	CONDUIT	238.9	0.4910	0.0200
C265	J308	J301	CONDUIT	68.4	0.5223	0.0120
C266	J301	J275	CONDUIT	239.5	0.4752	0.0200
C267	J275	J274	CONDUIT	61.4	0.5114	0.0120
C268	J274	J273	CONDUIT	245.0	0.4632	0.0120
C269	J273	J265	CONDUIT	137.6	0.4396	0.0120
C27	J259	J270	CONDUIT	47.3	0.5514	0.0120
C270	J265	J277	CONDUIT	184.5	0.4173	0.0120
C271	J233	J257	CONDUIT	110.2	0.8461	0.0120
C272	J257	J258	CONDUIT	56.8	0.7178	0.0120
C273_1	J258	J145	CONDUIT	102.1	0.8826	0.0120
C273_2	J145	J359	CONDUIT	204.7	0.7800	0.0120
C274	J359	J260	CONDUIT	278.6	0.7067	0.0120
C275	J260	J234	CONDUIT	169.4	0.3435	0.0120
C276	J163	J165	CONDUIT	152.9	0.9001	0.0120
C277	J165	J168	CONDUIT	115.6	0.9224	0.0120
C278	J168	J171	CONDUIT	261.6	1.1439	0.0120
C28	J62	J65	CONDUIT	75.0	0.0333	0.0120
C283	J169	J170	CONDUIT	390.9	2.1635	0.0120
C284	J170	J171	CONDUIT	40.1	2.2101	0.0120
C285	J172	J173	CONDUIT	165.7	1.7667	0.0120
C286	J173	J174	CONDUIT	40.6	1.8669	0.0120
C287	J174	J171	CONDUIT	193.3	1.8013	0.0120
C288	J176	J183	CONDUIT	337.2	0.9232	0.0120
C29	J270	J267	CONDUIT	256.2	0.5569	0.0120
C293	J183	J185	CONDUIT	142.5	4.3002	0.0120
C294	J186	J185	CONDUIT	89.0	5.1656	0.0120
C295	J185	J190	CONDUIT	187.5	1.8163	0.0120
C296	J189	J353	CONDUIT	228.7	0.9426	0.0120
C297	J353	J209	CONDUIT	265.3	1.0266	0.0120
C3	J11	OF8	CONDUIT	60.5	6.9635	0.0120
C30	J267	J72	CONDUIT	177.8	0.5432	0.0120
C302	J218	J230	CONDUIT	414.4	0.7354	0.0120
C306	J13	J361	CONDUIT	52.2	4.8262	0.0120
C31	J32	J31	CONDUIT	104.1	1.2162	0.0120
C310	J235	J237	CONDUIT	240.2	1.2672	0.0120
C311	J237	J239	CONDUIT	279.4	1.1644	0.0120
C32	J253	J31	CONDUIT	270.0	0.6810	0.0120
C33	J69	J244	CONDUIT	245.2	1.2713	0.0120
C34	J29	J361	CONDUIT	20.0	0.6000	0.0120

C35	J65	J70	CONDUIT	93.0	0.0645	0.0120
C36	J242	J68	CONDUIT	60.8	1.2334	0.0120
C37	J72	J143	CONDUIT	180.3	0.4410	0.0120
C38	J143	J144	CONDUIT	203.6	0.5142	0.0120
C39	J31	J30	CONDUIT	286.5	1.9882	0.0120
C4	OF1	J14	CONDUIT	6.7	0.7481	0.0120
C41	J21	J29	CONDUIT	203.5	0.5151	0.0120
C42	J46	J114	CONDUIT	152.5	0.2098	0.0120
C43	J114	J113	CONDUIT	14.0	0.4650	0.0120
C44	J113	J111	CONDUIT	150.0	0.2587	0.0120
C45	J107	J108	CONDUIT	38.0	-2.6140	0.0120
C46	J108	J111	CONDUIT	48.3	0.7390	0.0120
C47	J111	J38	CONDUIT	29.6	0.6689	0.0120
C48	J54	J321	CONDUIT	137.8	0.1604	0.0120
C49	J59	J60	CONDUIT	147.4	0.1675	0.0120
C5	SU2_Pond2	J7	CONDUIT	108.8	2.0910	0.0120
C50_1	J42	J155	CONDUIT	155.7	0.7378	0.0120
C50_2	J155	J38	CONDUIT	142.5	0.9903	0.0120
C51	J60	J321	CONDUIT	109.8	0.2205	0.0120
C52	J38	J212	CONDUIT	43.1	1.0065	0.0120
C53_1	J321	J77	CONDUIT	161.9	0.2817	0.0120
C53_2	J77	J84	CONDUIT	200.4	0.3144	0.0120
C54	J212	J45	CONDUIT	24.9	1.4053	0.0120
C55	J70	J76	CONDUIT	78.4	0.0638	0.0120
C56	J76	J25	CONDUIT	214.7	0.0461	0.0120
C57	J110	J19	CONDUIT	50.7	0.6879	0.0120
C58	J19	J125	CONDUIT	237.1	0.6036	0.0120
C6	SU3_Pond3	J6	CONDUIT	34.8	13.2939	0.0120
C62	J358	J161	CONDUIT	382.7	0.8180	0.0120
C63	J239	J360	CONDUIT	383.1	2.4736	0.0120
C64	J28	J179	CONDUIT	117.0	0.2598	0.0120
C65	J131	J75	CONDUIT	78.5	0.2981	0.0120
C66	J146	J132	CONDUIT	191.7	0.7206	0.0120
C67	J132	J205	CONDUIT	20.2	0.6296	0.0120
C68	J22	J231	CONDUIT	185.9	0.8632	0.0200
C69	J30	J361	CONDUIT	20.0	2.2005	0.0120
C69_1	J217	J152	CONDUIT	20.1	0.7569	0.0120
C69_2	J152	J23	CONDUIT	20.0	0.4810	0.0120
C7	SU4_Pond4	J5	CONDUIT	61.8	7.2195	0.0120
C70	J74	J76	CONDUIT	110.7	0.0940	0.0120

C71	J20	J360	CONDUIT	30.0	4.1803	0.0120
C71_1	J55	J153	CONDUIT	34.7	0.4646	0.0120
C71_2	J153	J24	CONDUIT	34.6	0.4072	0.0120
C72	J24	J95	CONDUIT	129.0	0.4193	0.0120
C73	J161	J163	CONDUIT	253.5	0.8681	0.0120
C74_1	J223	J162	CONDUIT	362.7	1.1360	0.0120
C74_2	J162	J230	CONDUIT	248.8	0.6672	0.0120
C75	J26	J27	CONDUIT	192.3	0.1862	0.0120
C76	J182	J186	CONDUIT	209.3	0.3550	0.0120
C77	J45	J49	CONDUIT	27.2	0.5363	0.0120
C78	J67	J70	CONDUIT	113.1	0.0540	0.0120
C79	J209	J27	CONDUIT	62.6	1.1871	0.0120
C8	J230	OF_Pond5	CONDUIT	16.1	1.2393	0.0120
C80	J27	J218	CONDUIT	115.6	1.0477	0.0120
C81	J179	J182	CONDUIT	35.8	0.3465	0.0120
C82	J16	J20	CONDUIT	179.9	4.6174	0.0120
C83	J91	J64	CONDUIT	69.7	0.2697	0.0120
C83_1	J75	J128	CONDUIT	61.7	0.7586	0.0120
C83_2	J128	J263	CONDUIT	113.5	0.2721	0.0120
C84	J52	J263	CONDUIT	251.3	0.0593	0.0120
C85	J10	OF_Pond8	CONDUIT	36.5	0.5479	0.0120
C86	J63	J65	CONDUIT	112.4	0.1157	0.0120
C87	J361	OF_Pond3	CONDUIT	24.1	2.6279	0.0120
C88	J85	J115	CONDUIT	258.2	0.3164	0.0120
C89	J115	J147	CONDUIT	198.8	0.2526	0.0120
C9	J190	OF_Pond6	CONDUIT	94.8	1.5882	0.0120
C90	J305	J141	CONDUIT	79.2	0.3786	0.0120
C91	J141	J81	CONDUIT	107.2	0.5141	0.0120
C92	J49	J50	CONDUIT	92.3	0.4516	0.0120
C93	J50	J109	CONDUIT	30.2	0.4110	0.0120
C94	J280	J306	CONDUIT	143.5	0.5958	0.0120
C95	J306	J305	CONDUIT	216.8	0.4510	0.0120
C96	J144	J141	CONDUIT	74.3	0.5542	0.0120
C97	J81	J75	CONDUIT	85.0	0.6474	0.0120
C98	J109	J116	CONDUIT	39.2	0.4900	0.0120
C99_1	J80	J159	CONDUIT	119.5	0.8484	0.0120
C99_2	J159	J51	CONDUIT	229.4	0.7643	0.0120
OR1	SU1_Pond1	OF1	ORIFICE			
OR10	SU6_Pond6	J2	ORIFICE			
OR11	SU2_Pond2	J7	ORIFICE			

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OR12           SU6_Pond6      J2             ORIFICE
OR13           SU5_Pond5      J4             ORIFICE
OR14           SU5_Pond5      J4             ORIFICE
OR15           SU5_Pond5      J4             ORIFICE
OR16           SU4_Pond4      J5             ORIFICE
OR17           SU4_Pond4      J5             ORIFICE
OR18           SU4_Pond4      J5             ORIFICE
OR19           SU3_Pond3      J6             ORIFICE
OR2            SU1_Pond1      OF1            ORIFICE
OR20           SU3_Pond3      J6             ORIFICE
OR21           SU3_Pond3      J6             ORIFICE
OR22           SU2_Pond2      J7             ORIFICE
OR23           SU2_Pond2      J7             ORIFICE
OR24           SU2_Pond2      J7             ORIFICE
OR25           SU1_Pond1      OF1            ORIFICE
OR26           SU8_Pond8      J11            ORIFICE
OR3            SU1_Pond1      OF1            ORIFICE
OR4            SU8_Pond8      J11            ORIFICE
OR5            SU3_Pond3      J6             ORIFICE
OR6            SU8_Pond8      J11            ORIFICE
OR7            SU7_Pond7      J1             ORIFICE
OR8            SU7_Pond7      J1             ORIFICE
OR9            SU7_Pond7      J1             ORIFICE


*********************
Cross Section Summary
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                         Full     Full     Hyd.     Max.   No. of     Full
Conduit        Shape     Depth     Area     Rad.    Width  Barrels     Flow
---------------------------------------------------------------------------
C1             CIRCULAR           1.00     0.79     0.25     1.00        1     0.63
C10            TRAPEZOIDAL        1.00     8.00     0.71    11.00        1    57.16
C100           CIRCULAR           1.05     0.87     0.26     1.05        1     2.84
C101           CIRCULAR           1.00     0.79     0.25     1.00        1     2.48
C102           CIRCULAR           1.65     2.14     0.41     1.65        1     9.59
C103_1         CIRCULAR           1.05     0.87     0.26     1.05        1     1.39
C103_2         CIRCULAR           1.05     0.87     0.26     1.05        1     1.45
C104           CIRCULAR           2.00     3.14     0.50     2.00        1    19.36
C105           TRAPEZOIDAL        1.00     6.00     0.64     9.00        1    48.11
C106           CIRCULAR           1.35     1.43     0.34     1.35        1     4.04
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C107	CIRCULAR	1.05	0.87	0.26	1.05	1	1.89
C108	TRAPEZOIDAL	2.00	18.00	1.15	15.00	1	245.71
C109	TRAPEZOIDAL	1.00	6.00	0.64	9.00	1	231.25
C11	CIRCULAR	1.05	0.87	0.26	1.05	1	3.42
C110	TRAPEZOIDAL	1.00	6.00	0.64	9.00	1	104.14
C111	TRAPEZOIDAL	1.00	6.00	0.64	9.00	1	97.96
C112	TRAPEZOIDAL	1.00	6.00	0.64	9.00	1	97.46
C113	TRAPEZOIDAL	1.00	6.00	0.64	9.00	1	75.78
C114	TRAPEZOIDAL	1.00	6.00	0.64	9.00	1	47.41
C115	TRAPEZOIDAL	1.00	6.00	0.64	9.00	1	126.27
C116	TRAPEZOIDAL	1.00	6.00	0.64	9.00	1	89.22
C117	TRAPEZOIDAL	1.00	6.00	0.64	9.00	1	112.30
C118	TRAPEZOIDAL	1.00	6.00	0.64	9.00	1	69.05
C119_1	CIRCULAR	1.05	0.87	0.26	1.05	1	2.26
C119_2	CIRCULAR	1.05	0.87	0.26	1.05	1	2.25
C12	CIRCULAR	1.35	1.43	0.34	1.35	1	6.10
C12_1	TRAPEZOIDAL	1.35	5.87	0.86	5.70	1	9.67
C12_2	TRAPEZOIDAL	1.35	5.87	0.86	5.70	1	10.95
C120	CIRCULAR	1.05	0.87	0.26	1.05	1	2.16
C121	CIRCULAR	1.05	0.87	0.26	1.05	1	2.13
C122	CIRCULAR	1.65	2.14	0.41	1.65	1	6.80
C122_1	CIRCULAR	1.65	2.14	0.41	1.65	1	6.88
C122_2	CIRCULAR	1.65	2.14	0.41	1.65	1	7.26
C123	CIRCULAR	1.20	1.13	0.30	1.20	1	2.76
C124	CIRCULAR	1.20	1.13	0.30	1.20	1	2.92
C125	CIRCULAR	1.20	1.13	0.30	1.20	1	2.98
C126	CIRCULAR	1.20	1.13	0.30	1.20	1	2.94
C127	CIRCULAR	1.05	0.87	0.26	1.05	1	2.75
C128	CIRCULAR	1.05	0.87	0.26	1.05	1	1.62
C129	CIRCULAR	1.05	0.87	0.26	1.05	1	1.96
C13	CIRCULAR	1.05	0.87	0.26	1.05	1	3.18
C130	CIRCULAR	1.20	1.13	0.30	1.20	1	2.63
C131	CIRCULAR	1.20	1.13	0.30	1.20	1	2.18
C132	CIRCULAR	1.05	0.87	0.26	1.05	1	2.47
C133	CIRCULAR	1.05	0.87	0.26	1.05	1	2.15
C134	CIRCULAR	1.05	0.87	0.26	1.05	1	1.26
C135	CIRCULAR	1.20	1.13	0.30	1.20	1	2.49
C136	CIRCULAR	1.20	1.13	0.30	1.20	1	2.52
C137	CIRCULAR	1.65	2.14	0.41	1.65	1	6.87
C138	CIRCULAR	1.85	2.69	0.46	1.85	1	9.27

C139	CIRCULAR	1.05	0.87	0.26	1.05	1	2.55
C14	CIRCULAR	1.05	0.87	0.26	1.05	1	3.04
C140	CIRCULAR	1.05	0.87	0.26	1.05	1	2.17
C141	CIRCULAR	1.85	2.69	0.46	1.85	1	9.26
C142	CIRCULAR	1.05	0.87	0.26	1.05	1	1.82
C143	CIRCULAR	1.05	0.87	0.26	1.05	1	2.15
C144	CIRCULAR	1.05	0.87	0.26	1.05	1	4.03
C145	CIRCULAR	1.05	0.87	0.26	1.05	1	5.60
C146	CIRCULAR	1.05	0.87	0.26	1.05	1	2.08
C147	CIRCULAR	1.35	1.43	0.34	1.35	1	6.45
C148	CIRCULAR	2.05	3.30	0.51	2.05	1	12.13
C149	CIRCULAR	2.05	3.30	0.51	2.05	1	11.33
C15	CIRCULAR	1.05	0.87	0.26	1.05	1	6.01
C150	CIRCULAR	1.05	0.87	0.26	1.05	1	1.94
C151	CIRCULAR	1.05	0.87	0.26	1.05	1	2.92
C152	CIRCULAR	2.40	4.52	0.60	2.40	1	11.12
C153	CIRCULAR	2.40	4.52	0.60	2.40	1	11.23
C154	CIRCULAR	1.85	2.69	0.46	1.85	1	9.38
C155	CIRCULAR	2.40	4.52	0.60	2.40	1	9.48
C156	CIRCULAR	1.05	0.87	0.26	1.05	1	2.96
C157	CIRCULAR	1.05	0.87	0.26	1.05	1	2.19
C158	CIRCULAR	1.05	0.87	0.26	1.05	1	2.76
C159	CIRCULAR	1.50	1.77	0.38	1.50	1	7.18
C16_1	CIRCULAR	1.05	0.87	0.26	1.05	1	2.54
C160	CIRCULAR	1.05	0.87	0.26	1.05	1	3.79
C161	CIRCULAR	1.05	0.87	0.26	1.05	1	2.17
C162	CIRCULAR	1.05	0.87	0.26	1.05	1	2.52
C163	CIRCULAR	1.05	0.87	0.26	1.05	1	3.00
C164	CIRCULAR	1.05	0.87	0.26	1.05	1	2.95
C165	CIRCULAR	1.35	1.43	0.34	1.35	1	7.46
C166	CIRCULAR	1.05	0.87	0.26	1.05	1	2.75
C167	CIRCULAR	1.05	0.87	0.26	1.05	1	2.58
C168	CIRCULAR	1.05	0.87	0.26	1.05	1	2.41
C169	CIRCULAR	1.05	0.87	0.26	1.05	1	0.72
C17	CIRCULAR	1.05	0.87	0.26	1.05	1	4.66
C170	CIRCULAR	1.05	0.87	0.26	1.05	1	2.61
C171	CIRCULAR	1.05	0.87	0.26	1.05	1	2.65
C172	CIRCULAR	1.05	0.87	0.26	1.05	1	2.77
C173	CIRCULAR	1.05	0.87	0.26	1.05	1	3.12
C174_1	CIRCULAR	1.05	0.87	0.26	1.05	1	2.49

C174_2	CIRCULAR	1.05	0.87	0.26	1.05	1	2.54
C175_1	CIRCULAR	1.05	0.87	0.26	1.05	1	2.83
C175_2	CIRCULAR	1.05	0.87	0.26	1.05	1	2.83
C176_1	CIRCULAR	1.05	0.87	0.26	1.05	1	3.35
C177	CIRCULAR	1.65	2.14	0.41	1.65	1	6.84
C178	CIRCULAR	1.65	2.14	0.41	1.65	1	6.67
C179	CIRCULAR	1.65	2.14	0.41	1.65	1	7.47
C18	CIRCULAR	1.05	0.87	0.26	1.05	1	2.31
C18_2	TRAPEZOIDAL	2.00	28.00	1.48	18.00	1	171.70
C182	CIRCULAR	1.05	0.87	0.26	1.05	1	1.38
C183	CIRCULAR	1.05	0.87	0.26	1.05	1	1.26
C184	CIRCULAR	1.20	1.13	0.30	1.20	1	1.79
C185	CIRCULAR	1.50	1.77	0.38	1.50	1	3.20
C186	CIRCULAR	1.85	2.69	0.46	1.85	1	7.18
C19	TRAPEZOIDAL	1.00	12.00	0.83	14.00	1	48.99
C2	TRAPEZOIDAL	1.00	6.00	0.64	9.00	1	186.33
C20	CIRCULAR	1.05	0.87	0.26	1.05	1	3.33
C21	CIRCULAR	1.20	1.13	0.30	1.20	1	2.60
C21_1	CIRCULAR	1.05	0.87	0.26	1.05	1	2.85
C21_2	CIRCULAR	1.05	0.87	0.26	1.05	1	3.09
C217	CIRCULAR	1.50	1.77	0.38	1.50	1	6.87
C22	CIRCULAR	1.05	0.87	0.26	1.05	1	2.54
C227	TRIANGULAR	1.00	2.50	0.46	5.00	1	11.35
C23	CIRCULAR	0.37	0.11	0.09	0.37	1	0.39
C235	TRAPEZOIDAL	1.00	12.00	0.83	14.00	1	46.83
C236	CIRCULAR	1.05	0.87	0.26	1.05	1	2.47
C237	TRAPEZOIDAL	1.00	12.00	0.83	14.00	1	45.63
C238	CIRCULAR	1.05	0.87	0.26	1.05	1	2.37
C239	TRAPEZOIDAL	1.00	12.00	0.83	14.00	1	40.65
C24	CIRCULAR	1.05	0.87	0.26	1.05	1	2.49
C240	CIRCULAR	1.05	0.87	0.26	1.05	1	1.76
C241	TRAPEZOIDAL	1.00	12.00	0.83	14.00	1	25.55
C242	TRAPEZOIDAL	1.00	12.00	0.83	14.00	1	23.41
C243	TRAPEZOIDAL	1.00	8.00	0.71	11.00	1	22.00
C244	CIRCULAR	1.05	0.87	0.26	1.05	1	1.15
C245	CIRCULAR	1.05	0.87	0.26	1.05	1	0.99
C246	TRAPEZOIDAL	2.00	28.00	1.48	18.00	1	137.25
C247	CIRCULAR	1.20	1.13	0.30	1.20	1	3.48
C248	TRAPEZOIDAL	2.00	28.00	1.48	18.00	1	153.63
C249	CIRCULAR	1.05	0.87	0.26	1.05	1	2.60

C25	CIRCULAR	1.05	0.87	0.26	1.05	1	2.82
C250	TRAPEZOIDAL	2.00	28.00	1.48	18.00	1	162.37
C251	CIRCULAR	1.05	0.87	0.26	1.05	1	2.61
C252	TRAPEZOIDAL	2.00	28.00	1.48	18.00	1	171.01
C256	CIRCULAR	1.05	0.87	0.26	1.05	1	2.25
C257	CIRCULAR	1.05	0.87	0.26	1.05	1	1.06
C258	CIRCULAR	1.05	0.87	0.26	1.05	1	1.06
C259	CIRCULAR	1.05	0.87	0.26	1.05	1	1.02
C26	CIRCULAR	1.20	1.13	0.30	1.20	1	1.03
C260_1	CIRCULAR	1.05	0.87	0.26	1.05	1	3.58
C260_2	CIRCULAR	1.05	0.87	0.26	1.05	1	4.64
C261	TRAPEZOIDAL	1.00	12.00	0.83	14.00	1	41.79
C262	TRAPEZOIDAL	1.00	12.00	0.83	14.00	1	42.34
C263	CIRCULAR	1.05	0.87	0.26	1.05	1	2.24
C264	CIRCULAR	1.05	0.87	0.26	1.05	1	1.24
C265	CIRCULAR	1.05	0.87	0.26	1.05	1	2.14
C266	CIRCULAR	1.05	0.87	0.26	1.05	1	1.22
C267	CIRCULAR	1.05	0.87	0.26	1.05	1	2.12
C268	CIRCULAR	1.05	0.87	0.26	1.05	1	2.01
C269	CIRCULAR	1.05	0.87	0.26	1.05	1	1.96
C27	CIRCULAR	1.20	1.13	0.30	1.20	1	3.14
C270	CIRCULAR	1.05	0.87	0.26	1.05	1	1.91
C271	CIRCULAR	1.05	0.87	0.26	1.05	1	2.72
C272	CIRCULAR	1.05	0.87	0.26	1.05	1	2.51
C273_1	CIRCULAR	1.05	0.87	0.26	1.05	1	2.78
C273_2	CIRCULAR	1.05	0.87	0.26	1.05	1	2.61
C274	CIRCULAR	1.05	0.87	0.26	1.05	1	2.49
C275	CIRCULAR	1.05	0.87	0.26	1.05	1	1.73
C276	TRIANGULAR	1.00	2.50	0.46	5.00	1	11.85
C277	TRAPEZOIDAL	1.00	8.00	0.71	11.00	1	50.80
C278	TRAPEZOIDAL	1.00	8.00	0.71	11.00	1	56.57
C28	CIRCULAR	1.20	1.13	0.30	1.20	1	0.77
C283	TRAPEZOIDAL	1.00	8.00	0.71	11.00	1	77.79
C284	TRAPEZOIDAL	1.00	8.00	0.71	11.00	1	78.63
C285	TRAPEZOIDAL	1.00	8.00	0.71	11.00	1	70.30
C286	TRAPEZOIDAL	1.00	8.00	0.71	11.00	1	72.26
C287	TRAPEZOIDAL	1.00	8.00	0.71	11.00	1	70.98
C288	TRAPEZOIDAL	1.00	8.00	0.71	11.00	1	50.82
C29	CIRCULAR	1.35	1.43	0.34	1.35	1	4.32
C293	TRAPEZOIDAL	1.00	8.00	0.71	11.00	1	109.67

C294	TRIANGULAR	1.00	2.50	0.46	5.00	1	28.39
C295	TRAPEZOIDAL	1.00	8.00	0.71	11.00	1	71.28
C296	TRAPEZOIDAL	1.00	8.00	0.71	11.00	1	51.35
C297	TRAPEZOIDAL	1.00	8.00	0.71	11.00	1	53.59
C3	TRAPEZOIDAL	2.00	22.00	1.25	17.00	1	560.44
C30	CIRCULAR	1.35	1.43	0.34	1.35	1	4.26
C302	TRIANGULAR	1.00	2.50	0.46	5.00	1	10.71
C306	CIRCULAR	1.05	0.87	0.26	1.05	1	6.50
C31	CIRCULAR	1.05	0.87	0.26	1.05	1	3.26
C310	TRIANGULAR	1.00	2.50	0.46	5.00	1	14.06
C311	TRIANGULAR	1.00	2.50	0.46	5.00	1	13.48
C32	CIRCULAR	1.05	0.87	0.26	1.05	1	2.44
C33	CIRCULAR	1.05	0.87	0.26	1.05	1	3.34
C34	CIRCULAR	1.05	0.87	0.26	1.05	1	2.29
C35	CIRCULAR	1.20	1.13	0.30	1.20	1	1.07
C36	CIRCULAR	1.05	0.87	0.26	1.05	1	3.29
C37	CIRCULAR	1.50	1.77	0.38	1.50	1	5.09
C38	CIRCULAR	1.50	1.77	0.38	1.50	1	5.49
C39	CIRCULAR	1.05	0.87	0.26	1.05	1	4.17
C4	TRAPEZOIDAL	1.05	8.56	0.74	11.30	1	50.25
C41	CIRCULAR	1.05	0.87	0.26	1.05	1	2.12
C42	CIRCULAR	1.05	0.87	0.26	1.05	1	1.36
C43	CIRCULAR	1.20	1.13	0.30	1.20	1	2.88
C44	CIRCULAR	1.20	1.13	0.30	1.20	1	2.15
C45	CIRCULAR	1.05	0.87	0.26	1.05	1	4.78
C46	CIRCULAR	1.05	0.87	0.26	1.05	1	2.54
C47	CIRCULAR	1.20	1.13	0.30	1.20	1	3.45
C48	CIRCULAR	1.05	0.87	0.26	1.05	1	1.18
C49	CIRCULAR	1.20	1.13	0.30	1.20	1	1.73
C5	TRAPEZOIDAL	1.00	6.00	0.64	9.00	1	53.90
C50_1	CIRCULAR	1.05	0.87	0.26	1.05	1	2.54
C50_2	CIRCULAR	1.05	0.87	0.26	1.05	1	2.94
C51	CIRCULAR	1.35	1.43	0.34	1.35	1	2.72
C52	CIRCULAR	1.20	1.13	0.30	1.20	1	4.24
C53_1	CIRCULAR	1.35	1.43	0.34	1.35	1	3.07
C53_2	CIRCULAR	1.35	1.43	0.34	1.35	1	3.24
C54	CIRCULAR	1.20	1.13	0.30	1.20	1	5.01
C55	CIRCULAR	1.20	1.13	0.30	1.20	1	1.07
C56	CIRCULAR	1.20	1.13	0.30	1.20	1	0.91
C57	CIRCULAR	1.05	0.87	0.26	1.05	1	2.45

C58	CIRCULAR	1.05	0.87	0.26	1.05	1	2.30
C6	TRAPEZOIDAL	1.00	6.00	0.64	9.00	1	135.90
C62	TRIANGULAR	1.00	2.50	0.46	5.00	1	11.30
C63	TRIANGULAR	1.00	2.50	0.46	5.00	1	19.65
C64	TRIANGULAR	1.00	2.50	0.46	5.00	1	6.37
C65	CIRCULAR	1.05	0.87	0.26	1.05	1	1.62
C66	CIRCULAR	1.05	0.87	0.26	1.05	1	2.51
C67	CIRCULAR	1.05	0.87	0.26	1.05	1	2.35
C68	TRAPEZOIDAL	2.00	28.00	1.48	18.00	1	168.80
C69	CIRCULAR	1.05	0.87	0.26	1.05	1	4.39
C69_1	CIRCULAR	1.20	1.13	0.30	1.20	1	3.68
C69_2	CIRCULAR	1.65	2.14	0.41	1.65	1	6.85
C7	TRAPEZOIDAL	1.00	6.00	0.64	9.00	1	100.15
C70	CIRCULAR	1.05	0.87	0.26	1.05	1	0.91
C71	CIRCULAR	1.05	0.87	0.26	1.05	1	6.05
C71_1	CIRCULAR	1.85	2.69	0.46	1.85	1	9.13
C71_2	CIRCULAR	1.85	2.69	0.46	1.85	1	8.55
C72	CIRCULAR	1.85	2.69	0.46	1.85	1	8.68
C73	TRIANGULAR	1.00	2.50	0.46	5.00	1	11.64
C74_1	TRIANGULAR	1.00	2.50	0.46	5.00	1	13.32
C74_2	TRIANGULAR	1.00	2.50	0.46	5.00	1	10.20
C75	TRAPEZOIDAL	1.00	8.00	0.71	11.00	1	22.82
C76	TRIANGULAR	1.00	2.50	0.46	5.00	1	7.44
C77	CIRCULAR	1.20	1.13	0.30	1.20	1	3.09
C78	CIRCULAR	1.05	0.87	0.26	1.05	1	0.69
C79	TRAPEZOIDAL	1.00	8.00	0.71	11.00	1	57.62
C8	TRAPEZOIDAL	1.05	6.46	0.67	9.30	1	45.87
C80	TRAPEZOIDAL	1.00	8.00	0.71	11.00	1	54.14
C81	CIRCULAR	1.05	0.87	0.26	1.05	1	1.74
C82	CIRCULAR	1.05	0.87	0.26	1.05	1	6.36
C83	CIRCULAR	1.05	0.87	0.26	1.05	1	1.54
C83_1	TRAPEZOIDAL	2.00	18.00	1.15	15.00	1	143.45
C83_2	TRAPEZOIDAL	2.00	18.00	1.15	15.00	1	85.92
C84	TRAPEZOIDAL	2.00	18.00	1.15	15.00	1	40.11
C85	TRAPEZOIDAL	1.00	6.00	0.64	9.00	1	27.59
C86	CIRCULAR	1.05	0.87	0.26	1.05	1	1.01
C87	TRAPEZOIDAL	1.00	6.00	0.64	9.00	1	60.42
C88	CIRCULAR	2.05	3.30	0.51	2.05	1	9.91
C89	CIRCULAR	2.40	4.52	0.60	2.40	1	13.48
C9	TRAPEZOIDAL	1.00	6.00	0.64	9.00	1	46.97

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C90          CIRCULAR         1.80    2.54    0.45    1.80       1    7.66
C91          CIRCULAR         1.80    2.54    0.45    1.80       1    8.93
C92          CIRCULAR         1.20    1.13    0.30    1.20       1    2.84
C93          CIRCULAR         1.20    1.13    0.30    1.20       1    2.71
C94          CIRCULAR         1.05    0.87    0.26    1.05       1    2.28
C95          CIRCULAR         1.35    1.43    0.34    1.35       1    3.88
C96          CIRCULAR         1.80    2.54    0.45    1.80       1    9.27
C97          CIRCULAR         1.80    2.54    0.45    1.80       1   10.02
C98          CIRCULAR         1.20    1.13    0.30    1.20       1    2.96
C99_1          CIRCULAR         1.05    0.87    0.26    1.05       1    2.73
C99_2          CIRCULAR         1.05    0.87    0.26    1.05       1    2.59

****************
Analysis Options
****************
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... MODIFIED_GREEN_AMPT
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 08/08/2024 00:00:00
Ending Date .............. 08/10/2024 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:00:05
Wet Time Step ............ 00:00:05
Dry Time Step ............ 00:00:05
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 8
Head Tolerance ........... 0.001500 m
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**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Initial LID Storage ......        0.046         0.107
Total Precipitation ......       25.904        60.300
Outfall Runon ............       10.899        25.370
Evaporation Loss .........        0.000         0.000
Infiltration Loss ........       20.697        48.177
Surface Runoff ...........       15.432        35.923
LID Drainage .............        0.176         0.410
Final Storage ............        0.544         1.267
Continuity Error (%) .....       -0.000

**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......        0.000         0.000
Wet Weather Inflow .......       15.612       156.121
Groundwater Inflow .......        0.000         0.000
RDII Inflow ..............        0.000         0.000
External Inflow ..........        0.000         0.000
External Outflow .........       14.224       142.238
Flooding Loss ............        0.000         0.000
Evaporation Loss .........        0.000         0.000
Exfiltration Loss ........        0.000         0.000
Initial Stored Volume ....        3.875        38.748
Final Stored Volume ......        5.264        52.641
Continuity Error (%) .....       -0.005

*************************
Highest Continuity Errors
*************************
Node J107 (8.26%)
Node J206 (3.18%)
Node J164 (1.44%)
Node J207 (1.24%)
```

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***************************
Time-Step Critical Elements
***************************
Link C115 (59.21%)
Link C12 (26.11%)
Link C25 (2.60%)

********************************
Highest Flow Instability Indexes
********************************
Link C155 (3)
Link C25 (3)

*********************************
Most Frequent Nonconverging Nodes
*********************************
Node J35 (0.02%)
Node OF_Pond1 (0.02%)
Node OF_Pond2 (0.02%)
Node OF_Pond3 (0.02%)
Node OF_Pond4 (0.02%)

*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     0.50 sec
Average Time Step           :     3.13 sec
Maximum Time Step           :     5.00 sec
% of Time in Steady State   :     0.00
Average Iterations per Step :     2.00
% of Steps Not Converging   :     0.02
Time Step Frequencies       :
   5.000 -  3.155 sec       :    43.65 %
   3.155 -  1.991 sec       :    46.22 %
   1.991 -  1.256 sec       :     6.69 %
   1.256 -  0.792 sec       :     3.04 %
   0.792 -  0.500 sec       :     0.39 %
```

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***************************
Subcatchment Runoff Summary
***************************

  --------------------------------------------------------------------------------------------------------------------------
                          Total     Total     Total     Total    Imperv      Perv     Total      Total    Peak  Runoff
                         Precip     Runon      Evap     Infil    Runoff    Runoff    Runoff     Runoff  Runoff   Coeff
Subcatchment                 mm        mm        mm        mm        mm        mm        mm   10^6 ltr     CMS
--------------------------------------------------------------------------------------------------------------------------
S_Pond1               60.30   5432.59      0.00     20.15      0.00      0.00   5273.61      11.06    3.86   0.960
S_Pond2               60.30   2080.78      0.00   1401.61      0.00    739.48    739.48      24.33   10.16   0.345
S_Pond3               60.30   1608.34      0.00   1027.51      0.00    641.14    641.14       3.91    2.72   0.384
S_Pond4               60.30    407.81      0.00     17.24      0.00      0.00    266.69       0.33    0.18   0.570
S_Pond5               60.30   2920.88      0.00     18.90      0.00      0.00   2752.63      12.35    2.71   0.923
S_Pond6               60.30      0.00      0.00      0.62      0.00      0.00      6.50       0.01    0.01   0.108
S_Pond7               60.30    693.53      0.00     17.87      0.00      0.00    541.72       1.46    0.53   0.719
S_Pond8               60.30   1876.20      0.00     18.65      0.00      0.00   1719.28       3.52    0.97   0.888
S1                    60.30      0.00      0.00      0.00     58.80      0.00     58.80       0.17    0.06   0.975
S1_4                  60.30      0.00      0.00     60.30      0.00      0.00      0.00       0.00    0.00   0.000
S1_8                  60.30      0.00      0.00      0.00     58.78      0.00     58.78       0.73    0.19   0.975
S10                   60.30      0.00      0.00     60.30      0.00      0.00      0.00       0.00    0.00   0.000
S11                   60.30      0.00      0.00      0.00     58.80      0.00     58.80       0.01    0.00   0.975
S11_1                 60.30      0.00      0.00      0.00     58.79      0.00     58.79       0.06    0.02   0.975
S11_10                60.30      0.00      0.00      0.00     58.79      0.00     58.79       0.05    0.02   0.975
S11_11                60.30      0.00      0.00      0.00     58.79      0.00     58.79       0.04    0.01   0.975
S11_12                60.30      0.00      0.00      0.00     58.79      0.00     58.79       0.07    0.02   0.975
S11_2                 60.30      0.00      0.00      0.00     58.79      0.00     58.79       0.05    0.02   0.975
S11_4                 60.30      0.00      0.00      0.00     58.79      0.00     58.79       0.10    0.03   0.975
S11_5                 60.30      0.00      0.00      0.00     58.79      0.00     58.79       0.07    0.02   0.975
S11_6                 60.30      0.00      0.00      0.00     58.79      0.00     58.79       0.08    0.03   0.975
S11_7                 60.30      0.00      0.00      0.00     58.79      0.00     58.79       0.07    0.02   0.975
S11_8                 60.30      0.00      0.00      0.00     58.79      0.00     58.79       0.08    0.02   0.975
S11_9                 60.30      0.00      0.00      0.00     58.79      0.00     58.79       0.06    0.02   0.975
S12                   60.30      0.00      0.00      0.00     58.45      0.00     58.45       0.05    0.02   0.969
S12_1                 60.30      0.00      0.00     60.30      0.00      0.00      0.00       0.00    0.00   0.000
S12_2                 60.30      0.00      0.00     60.30      0.00      0.00      0.00       0.00    0.00   0.000
S12_3                 60.30      0.00      0.00     60.30      0.00      0.00      0.00       0.00    0.00   0.000
S12_5                 60.30      0.00      0.00     60.30      0.00      0.00      0.00       0.00    0.00   0.000
S12_6                 60.30      0.00      0.00     60.30      0.00      0.00      0.00       0.00    0.00   0.000
S12_7                 60.30      0.00      0.00     60.30      0.00      0.00      0.00       0.00    0.00   0.000
S12_8                 60.30      0.00      0.00     60.30      0.00      0.00      0.00       0.00    0.00   0.000
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S13	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S13_11	60.30	0.00	0.00	0.00	58.79	0.00	58.79	1.94	0.63	0.975
S13_12	60.30	0.00	0.00	0.00	58.79	0.00	58.79	1.68	0.52	0.975
S13_14	60.30	0.00	0.00	0.00	58.79	0.00	58.79	1.28	0.41	0.975
S13_2	60.30	0.00	0.00	0.00	58.79	0.00	58.79	2.18	0.70	0.975
S13_8	60.30	0.00	0.00	0.00	58.79	0.00	58.79	1.35	0.43	0.975
S136_1	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.52	0.16	0.983
S136_3	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.35	0.11	0.983
S136_4	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.68	0.22	0.983
S136_5	60.30	0.00	0.00	0.00	59.29	0.00	59.29	1.05	0.33	0.983
S139_1	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.11	0.04	0.975
S139_2	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.15	0.04	0.975
S14	60.30	0.00	0.00	0.00	58.80	0.00	58.80	0.25	0.09	0.975
S140_1	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.14	0.04	0.975
S140_2	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.12	0.03	0.975
S141_1	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.12	0.04	0.975
S141_2	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.10	0.03	0.975
S141_4	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.16	0.05	0.975
S141_5	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.06	0.02	0.975
S143_1	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.07	0.02	0.975
S143_2	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.11	0.03	0.975
S143_3	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.09	0.03	0.975
S144_1	60.30	0.00	0.00	0.00	58.80	0.00	58.80	0.11	0.04	0.975
S144_3	60.30	0.00	0.00	0.00	58.78	0.00	58.78	0.18	0.05	0.975
S144_4	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.08	0.03	0.975
S144_5	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.09	0.03	0.975
S145_2	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.06	0.02	0.975
S147	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.25	0.07	0.975
S148_1	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.12	0.03	0.975
S15	60.30	0.00	0.00	0.00	58.78	0.00	58.78	0.12	0.03	0.975
S15_3	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S15_4	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S150	60.30	0.00	0.00	0.00	58.77	0.00	58.77	0.21	0.05	0.975
S152	60.30	0.00	0.00	0.00	58.80	0.00	58.80	0.01	0.00	0.975
S153	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.76	0.24	0.975
S155	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.07	0.02	0.975
S156_1	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.10	0.03	0.975
S157	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.05	0.02	0.975
S158_1	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.05	0.02	0.975
S158_2	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.09	0.03	0.975

S16	60.30	0.00	0.00	0.00	58.80	0.00	58.80	0.13	0.05	0.975
S160_2	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.09	0.03	0.975
S161_1	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.02	0.01	0.975
S161_2	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.06	0.02	0.975
S161_3	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.08	0.02	0.975
S161_5	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.06	0.02	0.975
S161_6	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.09	0.03	0.975
S163	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.10	0.03	0.975
S164_1	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.09	0.03	0.975
S164_3	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.06	0.02	0.975
S164_4	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.06	0.02	0.975
S164_5	60.30	0.00	0.00	0.00	58.80	0.00	58.80	0.03	0.01	0.975
S165	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.06	0.02	0.975
S166_1	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.06	0.02	0.975
S166_3	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.07	0.02	0.975
S166_4	60.30	0.00	0.00	0.00	58.78	0.00	58.78	0.11	0.03	0.975
S167_1	60.30	0.00	0.00	0.00	58.78	0.00	58.78	0.07	0.02	0.975
S167_2	60.30	0.00	0.00	0.00	58.78	0.00	58.78	0.15	0.04	0.975
S168_1	60.30	0.00	0.00	0.00	58.80	0.00	58.80	0.05	0.02	0.975
S168_2	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.07	0.02	0.975
S168_3	60.30	0.00	0.00	0.00	58.80	0.00	58.80	0.05	0.02	0.975
S168_4	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.07	0.02	0.975
S17	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.06	0.02	0.975
S170_1	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.16	0.05	0.975
S170_2	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.05	0.02	0.975
S170_3	60.30	0.00	0.00	0.00	58.78	0.00	58.78	0.16	0.04	0.975
S170_4	60.30	0.00	0.00	0.00	58.78	0.00	58.78	0.35	0.09	0.975
S170_5	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.05	0.02	0.975
S170_7	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.10	0.03	0.975
S170_8	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.14	0.05	0.975
S171_1	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.07	0.02	0.975
S171_10	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.07	0.02	0.975
S171_13	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.10	0.03	0.975
S171_14	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.08	0.03	0.975
S171_16	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.11	0.04	0.975
S171_17	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.08	0.02	0.975
S171_18	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.09	0.03	0.975
S171_19	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.08	0.02	0.975
S171_2	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.12	0.04	0.975
S171_3	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.06	0.02	0.975

S171_4	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.07	0.02	0.975
S171_5	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.10	0.03	0.975
S171_7	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.06	0.02	0.975
S171_8	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.08	0.03	0.975
S173_1	60.30	0.00	0.00	15.07	44.10	0.00	44.10	0.06	0.02	0.731
S173_2	60.30	0.00	0.00	15.08	44.10	0.00	44.10	0.12	0.04	0.731
S173_3	60.30	0.00	0.00	15.08	44.10	0.00	44.10	0.12	0.04	0.731
S173_5	60.30	0.00	0.00	15.07	44.10	0.00	44.10	0.14	0.05	0.731
S173_6	60.30	0.00	0.00	15.07	44.10	0.00	44.10	0.17	0.06	0.731
S173_7	60.30	0.00	0.00	15.08	44.10	0.00	44.10	0.29	0.10	0.731
S174_1	60.30	0.00	0.00	15.07	44.10	0.00	44.10	0.13	0.05	0.731
S174_2	60.30	0.00	0.00	15.07	44.10	0.00	44.10	0.05	0.02	0.731
S175_1	60.30	0.00	0.00	15.08	44.10	0.00	44.10	0.28	0.10	0.731
S175_3	60.30	0.00	0.00	15.07	44.10	0.00	44.10	0.18	0.06	0.731
S175_4	60.30	0.00	0.00	15.08	44.10	0.00	44.10	0.24	0.08	0.731
S176_1	60.30	0.00	0.00	15.07	44.10	0.00	44.10	0.29	0.10	0.731
S176_3	60.30	0.00	0.00	15.07	44.10	0.00	44.10	0.18	0.06	0.731
S176_4	60.30	0.00	0.00	15.07	44.10	0.00	44.10	0.24	0.08	0.731
S177_1	60.30	0.00	0.00	15.07	44.10	0.00	44.10	0.43	0.15	0.731
S177_2	60.30	0.00	0.00	15.08	44.10	0.00	44.10	0.60	0.20	0.731
S178_1	60.30	0.00	0.00	15.08	44.10	0.00	44.10	0.43	0.15	0.731
S178_2	60.30	0.00	0.00	15.07	44.10	0.00	44.10	0.60	0.20	0.731
S179_1	60.30	0.00	0.00	15.08	44.10	0.00	44.10	0.34	0.12	0.731
S179_2	60.30	0.00	0.00	15.07	44.10	0.00	44.10	0.14	0.05	0.731
S179_3	60.30	0.00	0.00	15.07	44.10	0.00	44.10	0.10	0.03	0.731
S18	60.30	7.38	0.00	67.68	0.00	0.00	0.00	0.00	0.00	0.000
S18_3	60.30	0.00	0.00	0.00	58.78	0.00	58.78	0.11	0.03	0.975
S18_6	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S180	60.30	0.00	0.00	15.08	44.10	0.00	44.10	0.06	0.02	0.731
S181	60.30	0.00	0.00	15.08	44.10	0.00	44.10	0.16	0.06	0.731
S182_2	60.30	0.00	0.00	15.08	44.10	0.00	44.10	0.12	0.04	0.731
S182_3	60.30	0.00	0.00	15.07	44.10	0.00	44.10	0.40	0.13	0.731
S182_4	60.30	0.00	0.00	15.08	44.10	0.00	44.10	0.31	0.10	0.731
S183	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S184_1	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S184_3	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S184_4	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S185	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S186	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S187	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000

S188_1	60.30	0.00	0.00	15.07	44.10	0.00	44.10	0.05	0.02	0.731
S188_2	60.30	0.00	0.00	15.08	44.10	0.00	44.10	0.08	0.03	0.731
S189	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S19	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S190	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S191	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S192	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.00	0.00	0.975
S193_2	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S193_3	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S193_4	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S193_5	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S193_6	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S193_7	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S194_1	60.30	0.00	0.00	15.08	44.10	0.00	44.10	0.08	0.03	0.731
S194_3	60.30	0.00	0.00	15.08	44.10	0.00	44.10	0.05	0.02	0.731
S194_4	60.30	0.00	0.00	15.07	44.10	0.00	44.10	0.07	0.02	0.731
S195_1	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S195_2	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S196_1	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.07	0.02	0.975
S196_2	60.30	0.00	0.00	0.00	58.80	0.00	58.80	0.04	0.01	0.975
S196_3	60.30	0.00	0.00	0.00	58.80	0.00	58.80	0.04	0.01	0.975
S197_1	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S197_3	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S197_4	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S197_5	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S197_6	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S198_1	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S198_10	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S198_2	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S198_3	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S198_4	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S198_5	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S198_6	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S198_7	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S198_8	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S199	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S2	60.30	0.00	0.00	0.00	58.78	0.00	58.78	0.75	0.20	0.975
S2_1	60.30	0.00	0.00	0.00	58.78	0.00	58.78	0.64	0.17	0.975
S2_11	60.30	0.00	0.00	0.00	58.78	0.00	58.78	1.33	0.35	0.975
S2_12	60.30	0.00	0.00	0.00	58.78	0.00	58.78	0.32	0.08	0.975

S2_2	60.30	0.00	0.00	0.00	58.78	0.00	58.78	0.19	0.05	0.975
S2_21	60.30	0.00	0.00	0.00	58.78	0.00	58.78	0.53	0.14	0.975
S2_22	60.30	0.00	0.00	0.00	58.78	0.00	58.78	0.64	0.17	0.975
S2_23	60.30	0.00	0.00	0.00	58.78	0.00	58.78	0.22	0.06	0.975
S2_24	60.30	0.00	0.00	0.00	58.78	0.00	58.78	0.55	0.14	0.975
S2_25	60.30	0.00	0.00	0.00	58.78	0.00	58.78	0.34	0.09	0.975
S2_26	60.30	0.00	0.00	0.00	58.78	0.00	58.78	0.87	0.23	0.975
S2_27	60.30	0.00	0.00	0.00	58.78	0.00	58.78	0.51	0.13	0.975
S2_28	60.30	0.00	0.00	0.00	58.78	0.00	58.78	0.14	0.04	0.975
S2_3	60.30	0.00	0.00	0.00	58.78	0.00	58.78	1.57	0.41	0.975
S2_4	60.30	0.00	0.00	0.00	58.78	0.00	58.78	0.34	0.09	0.975
S2_5	60.30	0.00	0.00	0.00	58.78	0.00	58.78	0.87	0.23	0.975
S2_6	60.30	0.00	0.00	0.00	58.78	0.00	58.78	1.53	0.40	0.975
S2_7	60.30	0.00	0.00	0.00	58.78	0.00	58.78	0.43	0.11	0.975
S2_8	60.30	0.00	0.00	0.00	58.78	0.00	58.78	0.45	0.12	0.975
S20	60.30	0.00	0.00	0.00	58.79	0.00	58.79	3.15	1.01	0.975
S200_1	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S200_2	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S201	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S202	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S203	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S204	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S205	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S206_1	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S206_2	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S206_3	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S207	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S208_1	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S208_2	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S208_3	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S208_4	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S209	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S21	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S210_1	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S210_3	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S210_4	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S210_5	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S211_1	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S211_2	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S212_1	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000

S212_2	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S213_1	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S213_2	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S213_3	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S214	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S215	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S216	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S217_1	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S217_2	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S217_3	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S218	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S219	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S22	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S220	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S221	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S222	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S223_1	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S223_2	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S224	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S225	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S226	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S227	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S228	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S229_1	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S229_2	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S229_3	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S229_4	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S23	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.11	0.04	0.975
S23_2	60.30	0.00	0.00	0.00	58.79	0.00	58.79	1.10	0.30	0.975
S23_3	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.21	0.06	0.975
S23_4	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.05	0.01	0.975
S230_1	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S230_2	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S231	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S232	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S233	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S234	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S235	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S236	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S237	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000

S238	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S239	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S24	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.10	0.03	0.975
S24_2	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.23	0.07	0.975
S24_3	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.31	0.09	0.975
S24_4	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.27	0.08	0.975
S240_1	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S240_2	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S241	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S242	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S25	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.04	0.01	0.975
S26	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.19	0.06	0.975
S27	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.05	0.02	0.975
S28	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S29	60.30	8.92	0.00	69.22	0.00	0.00	0.00	0.00	0.00	0.000
S3	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S3_1	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.37	0.11	0.975
S3_11	60.30	0.00	0.00	0.00	58.80	0.00	58.80	0.06	0.02	0.975
S3_119	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S3_122	60.30	9.66	0.00	69.96	0.00	0.00	0.00	0.00	0.00	0.000
S3_124	60.30	20.29	0.00	80.59	0.00	0.00	0.00	0.00	0.00	0.000
S3_126	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S3_127	60.30	29.82	0.00	90.12	0.00	0.00	0.00	0.00	0.00	0.000
S3_17	60.30	22.14	0.00	82.44	0.00	0.00	0.00	0.00	0.00	0.000
S3_18	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S3_19	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S3_20	60.30	34.41	0.00	94.71	0.00	0.00	0.00	0.00	0.00	0.000
S3_21	60.30	29.33	0.00	89.63	0.00	0.00	0.00	0.00	0.00	0.000
S3_23	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S3_24	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S3_27	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S3_3	60.30	0.00	0.00	0.00	58.80	0.00	58.80	0.11	0.04	0.975
S3_32	60.30	31.95	0.00	92.25	0.00	0.00	0.00	0.00	0.00	0.000
S3_4	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.23	0.08	0.975
S3_42	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S3_5	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.39	0.11	0.975
S3_69	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S3_7	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S3_8	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S30	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.19	0.06	0.975

S31	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.05	0.02	0.975
S32	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S32_1	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S32_10	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S32_11	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S32_12	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S32_13	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S32_3	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S32_4	60.30	0.00	0.00	15.07	44.10	0.00	44.10	0.35	0.13	0.731
S32_6	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S32_8	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S33	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.10	0.03	0.975
S34	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.13	0.04	0.975
S35	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.06	0.02	0.975
S36	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S37	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S38	60.30	13.44	0.00	73.74	0.00	0.00	0.00	0.00	0.00	0.000
S39	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S39_1	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S39_2	60.30	4.24	0.00	64.54	0.00	0.00	0.00	0.00	0.00	0.000
S39_4	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S4	60.30	74.12	0.00	134.42	0.00	0.00	0.00	0.00	0.00	0.000
S40	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S43	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.15	0.05	0.975
S45_1	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.15	0.04	0.975
S45_10	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.12	0.04	0.975
S45_11	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S45_12	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S45_13	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.12	0.04	0.975
S45_14	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S45_15	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.09	0.03	0.975
S45_16	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S45_17	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S45_18	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.08	0.03	0.975
S45_19	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S45_2	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S45_20	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S45_21	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.08	0.02	0.975
S45_22	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S45_23	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000

S45_24	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.10	0.03	0.975
S45_25	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S45_26	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S45_27	60.30	5.64	0.00	0.00	64.43	0.00	64.43	0.10	0.03	0.977
S45_28	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S45_29	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S45_3	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S45_30	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.09	0.03	0.975
S45_31	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S45_32	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S45_33	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.12	0.04	0.975
S45_34	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S45_36	60.30	0.00	0.00	0.00	58.80	0.00	58.80	0.09	0.03	0.975
S45_37	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S45_38	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S45_39	60.30	0.00	0.00	0.00	58.80	0.00	58.80	0.07	0.02	0.975
S45_4	60.30	0.00	0.00	0.00	58.80	0.00	58.80	0.05	0.02	0.975
S45_40	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S45_41	60.30	0.00	0.00	0.00	58.80	0.00	58.80	0.05	0.02	0.975
S45_42	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S45_43	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S45_44	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.22	0.07	0.975
S45_45	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S45_46	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S45_47	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S45_48	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S45_49	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S45_5	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S45_6	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S45_7	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S45_8	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S48_1	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.43	0.12	0.975
S48_2	60.30	0.00	0.00	0.00	58.78	0.00	58.78	0.74	0.19	0.975
S49	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.22	0.06	0.975
S5	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S50	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.53	0.17	0.975
S51_1	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S51_2	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S52	60.30	0.00	0.00	0.00	58.80	0.00	58.80	0.16	0.06	0.975
S52_1	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.58	0.17	0.975

S52_11	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.78	0.21	0.975
S52_12	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.22	0.06	0.975
S52_13	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.91	0.25	0.975
S52_14	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.50	0.13	0.975
S52_15	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.79	0.21	0.975
S52_17	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.86	0.23	0.975
S52_18	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.49	0.13	0.975
S52_19	60.30	0.00	0.00	0.00	58.79	0.00	58.79	1.01	0.27	0.975
S52_2	60.30	0.00	0.00	0.00	58.79	0.00	58.79	1.01	0.27	0.975
S52_20	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.36	0.10	0.975
S52_21	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.89	0.24	0.975
S52_22	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.64	0.17	0.975
S52_23	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.65	0.18	0.975
S52_3	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.36	0.10	0.975
S52_4	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.89	0.24	0.975
S52_5	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.73	0.20	0.975
S52_8	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.59	0.17	0.975
S52_9	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.73	0.20	0.975
S54	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S55	60.30	0.00	0.00	0.00	58.78	0.00	58.78	0.41	0.11	0.975
S56	60.30	0.00	0.00	0.00	58.78	0.00	58.78	0.62	0.16	0.975
S6	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S66_3	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S66_4	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S66_5	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S67	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S7	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.81	0.22	0.975
S7_1	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S7_11	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S7_12	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S7_2	60.30	0.00	0.00	0.00	58.78	0.00	58.78	0.12	0.03	0.975
S7_3	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S7_39	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S7_4	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S7_41	60.30	11.39	0.00	71.69	0.00	0.00	0.00	0.00	0.00	0.000
S7_44	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S7_45	60.30	10.93	0.00	71.23	0.00	0.00	0.00	0.00	0.00	0.000
S7_46	60.30	11.55	0.00	71.85	0.00	0.00	0.00	0.00	0.00	0.000
S7_48	60.30	10.99	0.00	71.29	0.00	0.00	0.00	0.00	0.00	0.000
S7_5	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000

S7_50	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S7_51	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S7_53	60.30	11.35	0.00	71.65	0.00	0.00	0.00	0.00	0.00	0.000
S7_6	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S7_7	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S7_8	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S70	60.30	0.00	0.00	0.00	58.79	0.00	58.79	0.73	0.22	0.975
S70_1	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S70_3	60.30	0.00	0.00	0.00	58.80	0.00	58.80	0.06	0.02	0.975
S70_4	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S71_1	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S71_10	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S71_11	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S71_3	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S71_5	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S71_6	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S71_7	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S71_8	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S71_9	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S72	60.30	0.00	0.00	0.00	58.80	0.00	58.80	0.10	0.03	0.975
S8	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S8_1	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S8_2	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S8_4	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S8_6	60.30	0.00	0.00	0.00	58.80	0.00	58.80	0.04	0.01	0.975
S824_1	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.32	0.10	0.983
S824_2	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.78	0.25	0.983
S825	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.73	0.23	0.983
S826	60.30	0.00	0.00	0.00	59.29	0.00	59.29	1.16	0.33	0.983
S827	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.03	0.01	0.983
S828	60.30	0.00	0.00	0.00	59.29	0.00	59.29	1.09	0.32	0.983
S829	60.30	0.00	0.00	0.00	59.30	0.00	59.30	0.11	0.04	0.983
S830	60.30	0.00	0.00	0.00	59.30	0.00	59.30	0.19	0.07	0.983
S831_1	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.57	0.18	0.983
S831_2	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.58	0.19	0.983
S832_1	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.43	0.14	0.983
S832_2	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.90	0.29	0.983
S833	60.30	0.00	0.00	0.00	59.29	0.00	59.29	1.97	0.63	0.983
S834	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.03	0.01	0.983
S835_1	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.14	0.04	0.983

S835_2	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.32	0.10	0.983
S836_1	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.32	0.10	0.983
S836_2	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.34	0.11	0.983
S837_1	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.29	0.09	0.983
S837_2	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.25	0.08	0.983
S838_1	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.25	0.08	0.983
S838_2	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.29	0.09	0.983
S839	60.30	0.00	0.00	0.00	59.29	0.00	59.29	1.03	0.33	0.983
S840	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.83	0.27	0.983
S841	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.21	0.07	0.983
S842	60.30	0.00	0.00	0.00	59.30	0.00	59.30	0.16	0.05	0.983
S843	60.30	0.00	0.00	0.00	59.30	0.00	59.30	0.45	0.15	0.983
S844	60.30	0.00	0.00	60.30	0.00	0.00	0.00	0.00	0.00	0.000
S845	60.30	0.00	0.00	0.00	59.30	0.00	59.30	0.12	0.04	0.983
S846	60.30	0.00	0.00	0.00	59.28	0.00	59.28	0.69	0.18	0.983
S847	60.30	0.00	0.00	0.00	59.30	0.00	59.30	0.10	0.04	0.983
S848	60.30	0.00	0.00	0.00	59.30	0.00	59.30	0.11	0.04	0.983
S849	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.26	0.08	0.983
S850	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.45	0.14	0.983
S851	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.24	0.08	0.983
S852_1	60.30	0.00	0.00	0.00	59.28	0.00	59.28	0.75	0.20	0.983
S852_2	60.30	0.00	0.00	0.00	59.28	0.00	59.28	0.68	0.18	0.983
S853	60.30	0.00	0.00	0.00	59.30	0.00	59.30	0.04	0.01	0.983
S854	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.56	0.18	0.983
S855	60.30	0.00	0.00	0.00	59.30	0.00	59.30	0.16	0.05	0.983
S856	60.30	0.00	0.00	0.00	59.30	0.00	59.30	0.12	0.04	0.983
S857_1	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.35	0.11	0.983
S857_2	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.29	0.09	0.983
S858_1	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.44	0.14	0.983
S858_2	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.42	0.13	0.983
S859	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.50	0.16	0.983
S860_1	60.30	0.00	0.00	0.00	59.29	0.00	59.29	1.30	0.41	0.983
S860_2	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.53	0.17	0.983
S861	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.65	0.21	0.983
S862	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.06	0.02	0.983
S863	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.06	0.02	0.983
S864	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.07	0.02	0.983
S865	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.07	0.02	0.983
S866	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.07	0.02	0.983
S867	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.15	0.05	0.983

S868_1	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.29	0.09	0.983
S868_2	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.25	0.08	0.983
S869_1	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.14	0.04	0.983
S869_2	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.14	0.05	0.983
S870_1	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.34	0.11	0.983
S870_3	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.31	0.10	0.983
S870_4	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.35	0.11	0.983
S870_5	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.37	0.12	0.983
S871_1	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.13	0.04	0.983
S871_2	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.30	0.10	0.983
S872	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.60	0.19	0.983
S873	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.38	0.12	0.983
S874	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.59	0.19	0.983
S875	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.81	0.26	0.983
S876_1	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.50	0.16	0.983
S876_2	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.37	0.12	0.983
S876_3	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.29	0.09	0.983
S877_1	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.29	0.09	0.983
S877_2	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.51	0.16	0.983
S878	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.35	0.11	0.983
S879	60.30	0.00	0.00	0.00	59.30	0.00	59.30	0.33	0.11	0.983
S880	60.30	0.00	0.00	0.00	59.28	0.00	59.28	0.55	0.15	0.983
S881	60.30	0.00	0.00	0.00	59.28	0.00	59.28	0.37	0.10	0.983
S882	60.30	0.00	0.00	0.00	59.28	0.00	59.28	0.35	0.09	0.983
S883_1	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.79	0.25	0.983
S883_2	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.81	0.26	0.983
S884	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.47	0.15	0.983
S885	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.37	0.12	0.983
S886	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.42	0.13	0.983
S887	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.42	0.13	0.983
S888	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.37	0.12	0.983
S889	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.42	0.13	0.983
S890	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.42	0.13	0.983
S891_1	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.67	0.21	0.983
S891_3	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.42	0.13	0.983
S891_4	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.56	0.18	0.983
S892_1	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.66	0.21	0.983
S892_3	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.43	0.14	0.983
S892_4	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.56	0.18	0.983
S893	60.30	0.00	0.00	0.00	59.29	0.00	59.29	0.37	0.11	0.983

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S894_1           60.30     0.00     0.00     0.00    59.29     0.00    59.29     0.45    0.14   0.983
S894_2           60.30     0.00     0.00     0.00    59.29     0.00    59.29     0.66    0.21   0.983
S895             60.30     0.00     0.00     0.00    59.29     0.00    59.29     0.27    0.09   0.983
S896             60.30     0.00     0.00     0.00    59.29     0.00    59.29     0.50    0.16   0.983
S897             60.30     0.00     0.00     0.00    59.29     0.00    59.29     0.31    0.10   0.983
S898             60.30     0.00     0.00     0.00    59.29     0.00    59.29     0.18    0.05   0.983
S9             60.30     0.00     0.00    60.30     0.00     0.00     0.00     0.00    0.00   0.000


***********************
LID Performance Summary
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--------------------------------------------------------------------------------------------------------------
                             Total    Evap    Infil  Surface   Drain   Initial    Final  Continuity
                            Inflow    Loss     Loss  Outflow  Outflow  Storage  Storage      Error
Subcatchment     LID Control          mm       mm       mm       mm       mm       mm       mm         %
--------------------------------------------------------------------------------------------------------------
S_Pond1          Pond1         5492.89     0.00    20.15   5096.03   177.58    34.00   233.13      -0.00
S_Pond4          Pond4          468.11     0.00    17.24   232.92    33.78    34.00   218.18      -0.00
S_Pond5          Pond5         2981.18     0.00    18.90   2572.14   180.50    34.00   243.65      -0.00
S_Pond6          Pond6           60.30     0.00     0.62     6.50     0.00    34.00    87.18      -0.00
S_Pond7          Pond7          753.83     0.00    17.87   452.37    89.35    34.00   228.24      -0.00
S_Pond8          Pond8         1936.50     0.00    18.65   1575.63   143.65    34.00   232.57      -0.00


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Node Depth Summary
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  ---------------------------------------------------------------------------------
                                 Average  Maximum  Maximum  Time of Max    Reported
                                   Depth    Depth      HGL   Occurrence   Max Depth
Node                 Type         Meters   Meters   Meters  days hr:min      Meters
---------------------------------------------------------------------------------
J1                 JUNCTION     0.01     0.03    98.91     0  12:31       0.03
J10                JUNCTION     0.02     0.16   122.36     0  12:06       0.16
J100               JUNCTION     0.07     0.60   117.02     0  11:59       0.60
J101               JUNCTION     0.05     0.73   113.63     0  12:03       0.73
J102               JUNCTION     0.01     0.05   117.76     0  11:54       0.05
J103               JUNCTION     0.06     0.54   118.07     0  11:58       0.54
J104               JUNCTION     0.06     0.52   118.43     0  11:56       0.52
J105               JUNCTION     0.08     0.74   118.04     0  11:59       0.74
J106               JUNCTION     0.05     0.36   118.76     0  11:56       0.36
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J107	JUNCTION	1.03	1.44	121.01	0	11:55	1.44
J108	JUNCTION	0.05	0.45	121.01	0	11:55	0.45
J109	JUNCTION	0.08	0.68	119.21	0	11:58	0.68
J11	JUNCTION	0.01	0.02	119.22	0	13:10	0.02
J110	JUNCTION	0.01	0.08	119.44	0	12:00	0.08
J111	JUNCTION	0.07	0.53	120.74	0	11:56	0.53
J112	JUNCTION	0.08	0.70	118.39	0	11:58	0.70
J113	JUNCTION	0.05	0.39	120.99	0	11:55	0.39
J114	JUNCTION	0.03	0.32	120.98	0	11:55	0.32
J115	JUNCTION	0.21	1.21	111.44	0	12:03	1.21
J116	JUNCTION	0.08	0.69	119.04	0	11:58	0.69
J117	JUNCTION	0.08	0.67	118.86	0	11:58	0.67
J118	JUNCTION	0.01	0.45	110.40	0	12:08	0.45
J119	JUNCTION	0.02	0.61	110.39	0	12:08	0.61
J12	JUNCTION	0.01	0.09	110.50	0	11:55	0.09
J120	JUNCTION	0.02	0.20	116.84	0	11:54	0.20
J121	JUNCTION	0.02	0.17	114.83	0	11:54	0.17
J122	JUNCTION	0.00	0.00	114.64	0	00:00	0.00
J123	JUNCTION	0.02	0.19	114.08	0	11:54	0.19
J124	JUNCTION	0.05	0.44	113.72	0	11:55	0.44
J125	JUNCTION	0.03	0.22	117.79	0	12:00	0.22
J127	JUNCTION	0.01	0.08	115.46	0	11:54	0.08
J128	JUNCTION	0.06	0.58	109.76	0	11:59	0.58
J129	JUNCTION	0.03	0.25	115.83	0	11:55	0.25
J13	JUNCTION	0.04	0.31	96.46	0	11:54	0.31
J130	JUNCTION	0.01	0.11	113.63	0	11:55	0.11
J131	JUNCTION	0.03	0.23	110.11	0	11:59	0.23
J132	JUNCTION	0.04	0.68	110.39	0	12:06	0.68
J133	JUNCTION	0.05	0.39	113.62	0	11:56	0.39
J134	JUNCTION	0.05	0.38	114.17	0	11:54	0.38
J136	JUNCTION	0.04	0.34	114.05	0	11:55	0.34
J137	JUNCTION	0.03	0.22	114.27	0	11:54	0.22
J139	JUNCTION	0.01	0.09	113.77	0	11:54	0.09
J14	JUNCTION	0.19	1.01	116.51	0	12:00	1.01
J140	JUNCTION	0.04	0.27	113.12	0	11:55	0.27
J141	JUNCTION	0.13	1.04	111.79	0	11:58	1.04
J142	JUNCTION	0.05	0.38	101.49	0	12:00	0.38
J143	JUNCTION	0.11	0.87	113.08	0	11:56	0.87
J144	JUNCTION	0.10	0.86	112.03	0	11:57	0.86
J145	JUNCTION	0.03	0.23	105.67	0	11:56	0.23

J146	JUNCTION	0.02	0.18	111.28	0	11:54	0.18
J147	JUNCTION	0.23	1.30	111.04	0	12:05	1.30
J148	JUNCTION	0.10	0.78	117.43	0	11:59	0.78
J149	JUNCTION	0.10	0.80	117.02	0	12:00	0.80
J15	JUNCTION	0.22	1.27	110.35	0	12:08	1.27
J150	JUNCTION	0.06	1.14	112.61	0	12:03	1.14
J151	JUNCTION	0.09	0.84	116.64	0	12:00	0.84
J152	JUNCTION	0.16	0.85	116.02	0	12:00	0.85
J153	JUNCTION	0.18	0.96	115.01	0	12:01	0.96
J154	JUNCTION	0.03	0.24	116.37	0	11:55	0.24
J155	JUNCTION	0.01	0.08	121.50	0	11:57	0.08
J156	JUNCTION	0.07	0.52	121.40	0	11:54	0.52
J157	JUNCTION	0.04	0.36	120.07	0	11:54	0.36
J158	JUNCTION	0.04	0.32	119.89	0	11:55	0.32
J159	JUNCTION	0.01	0.07	120.72	0	11:57	0.07
J16	JUNCTION	0.00	0.00	93.44	0	00:00	0.00
J160	JUNCTION	0.03	0.20	119.87	0	11:55	0.20
J161	JUNCTION	0.03	0.16	109.55	0	12:00	0.16
J162	JUNCTION	0.03	0.13	97.99	0	12:01	0.13
J163	JUNCTION	0.04	0.19	107.38	0	12:02	0.19
J164	JUNCTION	0.10	0.40	122.53	0	12:05	0.40
J165	JUNCTION	0.00	0.02	105.84	0	12:03	0.02
J168	JUNCTION	0.00	0.03	104.77	0	12:04	0.03
J169	JUNCTION	0.00	0.03	111.13	0	12:00	0.03
J17	JUNCTION	0.02	0.12	114.46	0	11:55	0.12
J170	JUNCTION	0.00	0.05	102.69	0	12:00	0.05
J171	JUNCTION	0.01	0.06	101.82	0	12:02	0.06
J172	JUNCTION	0.00	0.00	108.92	0	00:00	0.00
J173	JUNCTION	0.00	0.00	106.00	0	00:00	0.00
J174	JUNCTION	0.00	0.01	105.25	0	11:57	0.01
J176	JUNCTION	0.00	0.03	108.17	0	12:00	0.03
J179	JUNCTION	0.01	0.07	104.44	0	11:54	0.07
J18	JUNCTION	0.03	0.21	110.79	0	11:54	0.21
J182	JUNCTION	0.02	0.10	104.34	0	11:59	0.10
J183	JUNCTION	0.00	0.02	105.05	0	12:01	0.02
J185	JUNCTION	0.00	0.03	98.94	0	12:02	0.03
J186	JUNCTION	0.02	0.11	103.61	0	11:56	0.11
J189	JUNCTION	0.00	0.04	106.12	0	12:00	0.04
J19	JUNCTION	0.03	0.21	119.21	0	12:00	0.21
J190	JUNCTION	0.00	0.04	95.54	0	12:03	0.04

J194	JUNCTION	0.18	1.07	112.69	0	12:03	1.06
J2	JUNCTION	0.00	0.00	92.20	0	12:03	0.00
J20	JUNCTION	0.01	0.07	85.21	0	11:54	0.07
J203	JUNCTION	0.23	1.28	110.65	0	12:06	1.28
J205	JUNCTION	0.05	0.79	110.38	0	12:07	0.79
J206	JUNCTION	0.29	1.06	110.39	0	12:08	1.06
J207	JUNCTION	0.14	0.91	110.39	0	12:07	0.91
J208	JUNCTION	0.03	0.75	110.39	0	12:06	0.75
J209	JUNCTION	0.01	0.07	101.27	0	12:00	0.07
J21	JUNCTION	0.00	0.00	94.80	0	00:00	0.00
J212	JUNCTION	0.06	0.48	120.05	0	11:56	0.48
J217	JUNCTION	0.16	0.91	116.23	0	12:01	0.91
J218	JUNCTION	0.08	0.35	99.60	0	12:03	0.35
J22	JUNCTION	0.01	0.07	99.99	0	12:00	0.07
J223	JUNCTION	0.02	0.12	102.10	0	11:55	0.12
J23	JUNCTION	0.16	0.86	115.94	0	12:00	0.86
J230	JUNCTION	0.03	0.22	96.42	0	12:06	0.22
J231	JUNCTION	0.13	0.81	99.12	0	12:07	0.81
J233	JUNCTION	0.00	0.00	107.68	0	00:00	0.00
J234	JUNCTION	0.06	0.44	101.74	0	12:00	0.44
J235	JUNCTION	0.00	0.00	99.66	0	00:00	0.00
J237	JUNCTION	0.02	0.13	96.74	0	11:56	0.13
J239	JUNCTION	0.03	0.14	93.51	0	12:00	0.14
J24	JUNCTION	0.17	0.95	114.86	0	12:01	0.95
J240	JUNCTION	0.04	0.32	107.54	0	11:55	0.32
J242	JUNCTION	0.05	0.38	105.65	0	11:55	0.38
J243	JUNCTION	0.01	0.05	102.06	0	11:59	0.05
J244	JUNCTION	0.03	0.27	99.02	0	11:55	0.27
J25	JUNCTION	0.04	0.34	122.66	0	12:02	0.34
J253	JUNCTION	0.03	0.25	101.86	0	11:54	0.25
J255	JUNCTION	0.01	0.27	102.14	0	11:56	0.27
J256	JUNCTION	0.07	0.51	101.95	0	12:00	0.51
J257	JUNCTION	0.01	0.09	106.84	0	11:54	0.09
J258	JUNCTION	0.03	0.20	106.54	0	11:55	0.20
J259	JUNCTION	0.05	0.35	116.01	0	11:57	0.35
J26	JUNCTION	0.00	0.02	100.83	0	12:00	0.02
J260	JUNCTION	0.06	0.50	102.37	0	11:58	0.50
J263	JUNCTION	0.07	0.45	109.32	0	12:03	0.45
J265	JUNCTION	0.07	0.38	109.87	0	12:15	0.38
J267	JUNCTION	0.07	0.58	114.55	0	11:57	0.58

J27	JUNCTION	0.01	0.07	100.53	0	12:01	0.07
J270	JUNCTION	0.06	0.42	115.82	0	11:57	0.42
J273	JUNCTION	0.06	0.34	110.43	0	12:15	0.34
J274	JUNCTION	0.06	0.33	111.56	0	12:14	0.33
J275	JUNCTION	0.05	0.32	111.86	0	12:13	0.32
J277	JUNCTION	0.33	0.95	109.67	0	12:30	0.95
J279	JUNCTION	0.16	0.82	109.72	0	12:34	0.82
J28	JUNCTION	0.00	0.00	104.67	0	00:00	0.00
J280	JUNCTION	0.07	0.57	113.46	0	11:56	0.57
J281	JUNCTION	0.00	0.00	105.38	0	00:00	0.00
J282	JUNCTION	0.07	0.65	109.72	0	12:34	0.65
J285	JUNCTION	0.02	0.13	110.44	0	12:12	0.13
J289	JUNCTION	0.00	0.00	114.60	0	00:00	0.00
J29	JUNCTION	0.01	0.09	93.84	0	11:55	0.09
J299	JUNCTION	0.10	0.50	111.33	0	12:12	0.50
J30	JUNCTION	0.07	0.48	94.55	0	11:57	0.48
J301	JUNCTION	0.08	0.46	113.14	0	12:12	0.46
J302	JUNCTION	0.02	0.18	115.19	0	11:54	0.18
J305	JUNCTION	0.08	0.74	111.80	0	11:57	0.74
J306	JUNCTION	0.08	0.68	112.71	0	11:57	0.68
J308	JUNCTION	0.05	0.32	113.36	0	12:10	0.32
J309	JUNCTION	0.01	0.08	111.92	0	12:11	0.08
J31	JUNCTION	0.06	0.49	100.26	0	11:57	0.49
J310	JUNCTION	0.02	0.39	111.05	0	12:04	0.39
J311	JUNCTION	0.08	0.39	112.88	0	12:09	0.39
J312	JUNCTION	0.08	0.45	114.66	0	12:09	0.45
J316	JUNCTION	0.03	0.23	116.72	0	12:00	0.23
J317	JUNCTION	0.05	0.32	114.89	0	12:07	0.32
J319	JUNCTION	0.01	0.07	116.26	0	12:01	0.07
J32	JUNCTION	0.06	0.48	101.52	0	11:56	0.48
J321	JUNCTION	0.10	0.83	118.06	0	11:58	0.83
J325	JUNCTION	0.01	0.06	117.31	0	11:57	0.06
J327	JUNCTION	0.01	0.06	118.73	0	11:57	0.06
J33	JUNCTION	0.01	0.07	108.26	0	11:54	0.07
J330	JUNCTION	0.01	0.05	116.69	0	12:02	0.05
J331	JUNCTION	0.07	0.36	114.72	0	12:08	0.36
J333	JUNCTION	0.01	0.08	113.46	0	12:05	0.08
J334	JUNCTION	0.05	0.25	104.54	0	12:03	0.25
J336	JUNCTION	0.01	0.05	103.34	0	12:06	0.05
J338	JUNCTION	0.05	0.28	102.28	0	12:10	0.28

J34	JUNCTION	0.06	0.49	103.32	0	11:55	0.49
J345	JUNCTION	0.01	0.05	101.36	0	12:11	0.05
J348	JUNCTION	0.07	0.34	100.66	0	12:09	0.34
J349	JUNCTION	0.04	0.32	114.01	0	11:55	0.32
J35	JUNCTION	0.18	1.26	111.04	0	12:05	1.26
J350	JUNCTION	0.01	0.06	99.23	0	12:10	0.06
J351	JUNCTION	0.07	0.52	102.13	0	11:59	0.52
J353	JUNCTION	0.01	0.07	103.99	0	12:00	0.07
J357	JUNCTION	0.02	0.13	109.76	0	12:21	0.13
J358	JUNCTION	0.03	0.14	112.66	0	12:00	0.14
J359	JUNCTION	0.05	0.36	104.21	0	11:57	0.36
J36	JUNCTION	0.03	0.26	115.66	0	11:54	0.26
J360	JUNCTION	0.00	0.04	83.93	0	11:59	0.04
J361	JUNCTION	0.02	0.20	93.83	0	11:57	0.20
J37	JUNCTION	0.04	0.29	118.91	0	11:54	0.29
J38	JUNCTION	0.06	0.48	120.49	0	11:56	0.48
J39	JUNCTION	0.02	0.18	116.26	0	11:54	0.18
J4	JUNCTION	0.01	0.03	88.03	0	13:45	0.03
J40	JUNCTION	0.02	0.19	116.45	0	11:54	0.19
J41	JUNCTION	0.06	0.47	116.37	0	11:57	0.47
J42	JUNCTION	0.01	0.09	122.66	0	11:54	0.09
J43	JUNCTION	0.01	0.06	118.61	0	11:54	0.06
J44	JUNCTION	0.03	0.27	122.67	0	12:01	0.27
J45	JUNCTION	0.07	0.62	119.84	0	11:56	0.62
J46	JUNCTION	0.04	0.33	121.30	0	11:54	0.33
J47	JUNCTION	0.17	1.01	113.55	0	12:02	1.01
J48	JUNCTION	0.01	0.07	118.63	0	11:55	0.07
J49	JUNCTION	0.08	0.65	119.73	0	11:57	0.65
J5	JUNCTION	0.00	0.01	80.01	0	12:31	0.01
J50	JUNCTION	0.08	0.70	119.36	0	11:58	0.70
J51	JUNCTION	0.02	0.46	119.36	0	11:58	0.46
J52	JUNCTION	0.15	0.71	109.73	0	12:07	0.71
J53	JUNCTION	0.02	0.18	117.15	0	11:55	0.18
J54	JUNCTION	0.05	0.62	118.07	0	11:58	0.62
J55	JUNCTION	0.17	0.95	115.15	0	12:01	0.95
J56	JUNCTION	0.07	0.64	115.65	0	12:00	0.64
J57	JUNCTION	0.03	0.33	115.63	0	12:01	0.33
J58	JUNCTION	0.17	0.93	115.62	0	12:00	0.93
J59	JUNCTION	0.08	0.68	118.40	0	11:54	0.68
J6	JUNCTION	0.01	0.02	90.14	0	12:45	0.02

J60	JUNCTION	0.10	0.82	118.29	0	11:56	0.82
J61	JUNCTION	0.04	0.52	123.14	0	12:01	0.52
J62	JUNCTION	0.06	0.59	123.14	0	12:01	0.59
J63	JUNCTION	0.05	0.50	123.16	0	12:00	0.50
J64	JUNCTION	0.01	0.10	110.92	0	11:55	0.10
J65	JUNCTION	0.07	0.61	123.14	0	12:00	0.61
J66	JUNCTION	0.01	0.09	110.23	0	11:56	0.09
J67	JUNCTION	0.08	0.62	123.15	0	12:00	0.62
J68	JUNCTION	0.05	0.43	104.95	0	11:55	0.43
J69	JUNCTION	0.02	0.15	102.01	0	11:54	0.15
J7	JUNCTION	0.02	0.04	107.76	0	14:05	0.04
J70	JUNCTION	0.10	0.65	123.12	0	12:00	0.65
J71	JUNCTION	0.00	0.00	102.23	0	00:00	0.00
J72	JUNCTION	0.09	0.78	113.78	0	11:55	0.78
J73	JUNCTION	0.01	0.06	95.77	0	11:57	0.06
J74	JUNCTION	0.06	0.53	123.06	0	12:00	0.53
J75	JUNCTION	0.05	0.45	110.11	0	11:58	0.45
J76	JUNCTION	0.13	0.64	123.06	0	12:01	0.64
J77	JUNCTION	0.10	0.83	117.60	0	11:58	0.83
J78	JUNCTION	0.03	0.25	121.51	0	11:54	0.25
J79	JUNCTION	0.01	0.09	93.57	0	11:58	0.09
J8	JUNCTION	0.08	0.67	118.69	0	11:58	0.67
J80	JUNCTION	0.01	0.08	121.74	0	11:54	0.08
J81	JUNCTION	0.13	1.02	111.23	0	11:58	1.02
J82	JUNCTION	0.05	0.41	112.81	0	11:56	0.41
J83	JUNCTION	0.03	0.21	120.69	0	11:54	0.21
J84	JUNCTION	0.09	0.72	116.86	0	11:59	0.72
J85	JUNCTION	0.20	1.30	112.36	0	12:03	1.30
J86	JUNCTION	0.03	0.23	120.72	0	11:54	0.23
J87	JUNCTION	0.04	0.35	114.08	0	11:55	0.35
J88	JUNCTION	0.01	0.08	120.83	0	11:54	0.08
J89	JUNCTION	0.03	0.26	118.97	0	11:54	0.26
J9	JUNCTION	0.10	0.78	118.04	0	11:59	0.78
J90	JUNCTION	0.06	0.62	118.30	0	11:57	0.62
J91	JUNCTION	0.02	0.12	111.14	0	11:54	0.12
J92	JUNCTION	0.05	0.36	117.72	0	11:54	0.36
J93	JUNCTION	0.06	0.48	118.51	0	11:56	0.48
J94	JUNCTION	0.06	0.48	118.79	0	11:55	0.48
J95	JUNCTION	0.17	0.94	114.30	0	12:00	0.94
J96	JUNCTION	0.05	0.36	117.09	0	11:57	0.36

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J97             JUNCTION    0.05    0.42   119.08    0  11:54       0.42
J98             JUNCTION    0.05    0.42   118.80    0  11:54       0.42
J99             JUNCTION    0.05    0.40   117.42    0  11:57       0.40
OF1              JUNCTION    0.03    0.56   116.51    0  12:01       0.56
OF_Pond1            OUTFALL     0.09    0.72   116.77    0  11:59       0.72
OF_Pond2            OUTFALL     0.07    0.45   108.70    0  12:03       0.45
OF_Pond3            OUTFALL     0.02    0.20    93.20    0  11:57       0.20
OF_Pond4            OUTFALL     0.00    0.04    83.54    0  11:59       0.04
OF_Pond5            OUTFALL     0.03    0.22    96.22    0  12:06       0.22
OF_Pond6            OUTFALL     0.00    0.04    94.04    0  12:03       0.04
OF_Pond7            OUTFALL     0.01    0.06   100.56    0  12:02       0.06
OF_Pond8            OUTFALL     0.02    0.16   122.16    0  12:06       0.16
OF2              OUTFALL     0.02    0.04   106.54    0  14:05       0.04
OF3              OUTFALL     0.01    0.02    87.02    0  12:45       0.02
OF4              OUTFALL     0.00    0.01    78.01    0  12:31       0.01
OF5              OUTFALL     0.01    0.03    87.03    0  13:45       0.03
OF6              OUTFALL     0.00    0.00    92.00    0  12:03       0.00
OF7              OUTFALL     0.01    0.03    98.03    0  12:31       0.03
OF8              OUTFALL     0.01    0.02   115.02    0  13:10       0.02
SU1_Pond1           STORAGE     0.50    1.26   117.26    0  13:00       1.26
SU2_Pond2           STORAGE     3.22    3.80   108.80    0  14:04       3.80
SU3_Pond3           STORAGE     0.23    0.80    93.80    0  12:45       0.80
SU4_Pond4           STORAGE     0.04    0.20    83.70    0  12:30       0.20
SU5_Pond5           STORAGE     0.51    1.34    97.34    0  13:45       1.34
SU6_Pond6           STORAGE     0.00    0.03    94.03    0  12:00       0.03
SU7_Pond7           STORAGE     0.13    0.94   101.44    0  12:31       0.94
SU8_Pond8           STORAGE     0.27    0.95   122.95    0  13:09       0.95


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Node Inflow Summary
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  -------------------------------------------------------------------------------------------------
                              Maximum  Maximum                 Lateral       Total       Flow
                              Lateral    Total  Time of Max      Inflow      Inflow     Balance
                               Inflow   Inflow   Occurrence      Volume       Volume       Error
Node                 Type          CMS      CMS  days hr:min    10^6 ltr    10^6 ltr     Percent
-------------------------------------------------------------------------------------------------
J1               JUNCTION    0.000   0.120     0  12:31          0        1.46       0.007
J10              JUNCTION    0.000   0.885     0  12:06          0        3.84       0.006
J100              JUNCTION    0.000   1.046     0  11:56          0        3.57       0.037
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J101	JUNCTION	0.045	1.007	0	12:05	0.14	2.45	0.034
J102	JUNCTION	0.013	0.013	0	11:54	0.0382	0.0382	-0.151
J103	JUNCTION	0.010	1.285	0	11:56	0.028	4.21	0.005
J104	JUNCTION	0.000	1.056	0	11:55	0	3.43	0.017
J105	JUNCTION	0.000	1.272	0	11:57	0	4.21	0.003
J106	JUNCTION	0.000	0.560	0	11:55	0	1.8	0.010
J107	JUNCTION	0.054	0.054	0	11:54	0.177	0.192	9.002
J108	JUNCTION	0.098	0.887	0	11:55	0.288	2.84	0.001
J109	JUNCTION	0.001	1.730	0	11:58	0.00459	5.75	-0.003
J11	JUNCTION	0.000	0.115	0	13:09	0	3.47	0.007
J110	JUNCTION	0.032	0.032	0	12:00	0.122	0.122	-0.010
J111	JUNCTION	0.030	1.412	0	11:55	0.112	4.58	0.004
J112	JUNCTION	0.015	1.760	0	11:58	0.0461	5.84	-0.002
J113	JUNCTION	0.234	0.502	0	11:55	0.752	1.64	-0.007
J114	JUNCTION	0.000	0.280	0	11:54	0	0.891	0.020
J115	JUNCTION	0.054	6.792	0	12:03	0.169	34	0.007
J116	JUNCTION	0.015	1.744	0	11:58	0.0467	5.79	0.004
J117	JUNCTION	0.000	1.743	0	11:58	0	5.79	0.001
J118	JUNCTION	0.000	0.104	0	12:02	0	0.0172	2.558
J119	JUNCTION	0.019	0.177	0	12:00	0.0516	0.115	-0.263
J12	JUNCTION	0.000	0.044	0	11:55	0	0.134	0.002
J120	JUNCTION	0.204	0.204	0	11:54	0.604	0.604	-0.015
J121	JUNCTION	0.173	0.173	0	11:54	0.542	0.542	-0.015
J122	JUNCTION	0.000	0.000	0	00:00	0	0	0.000 ltr
J123	JUNCTION	0.187	0.187	0	11:54	0.589	0.589	-0.017
J124	JUNCTION	0.052	0.869	0	11:55	0.21	2.87	0.006
J125	JUNCTION	0.000	0.194	0	12:00	0	0.738	0.019
J127	JUNCTION	0.037	0.037	0	11:54	0.102	0.102	-0.128
J128	JUNCTION	0.000	6.535	0	11:58	0	22.3	-0.018
J129	JUNCTION	0.320	0.320	0	11:54	1.13	1.13	-0.004
J13	JUNCTION	0.598	1.072	0	11:54	1.93	3.52	-0.003
J130	JUNCTION	0.014	0.014	0	11:54	0.0356	0.0356	-0.219
J131	JUNCTION	0.161	0.161	0	11:54	0.505	0.505	-0.048
J132	JUNCTION	0.159	0.321	0	11:54	0.5	1.03	0.095
J133	JUNCTION	0.325	0.638	0	11:55	1.02	2.18	0.005
J134	JUNCTION	0.224	0.224	0	11:54	0.692	0.692	-0.023
J136	JUNCTION	0.429	0.676	0	11:54	1.46	2.25	0.008
J137	JUNCTION	0.434	0.434	0	11:54	1.45	1.45	-0.010
J139	JUNCTION	0.044	0.044	0	11:54	0.139	0.139	-0.016
J14	JUNCTION	0.042	3.212	0	12:01	0.151	21	0.009

J140	JUNCTION	0.320	0.363	0	11:54	1.02	1.16	-0.038	
J141	JUNCTION	0.042	5.630	0	11:58	0.132	19.2	0.005	
J142	JUNCTION	0.000	1.330	0	12:00	0	4.68	-0.023	
J143	JUNCTION	0.947	3.496	0	11:56	2.94	11.9	-0.002	
J144	JUNCTION	0.092	3.593	0	11:56	0.297	12.2	-0.002	
J145	JUNCTION	0.057	0.276	0	11:55	0.177	0.992	0.009	
J146	JUNCTION	0.168	0.168	0	11:54	0.528	0.528	-0.207	
J147	JUNCTION	0.000	6.505	0	12:04	0	34.6	0.011	
J148	JUNCTION	0.000	3.050	0	11:59	0	10.1	0.000	
J149	JUNCTION	0.000	3.055	0	11:59	0	10.1	-0.001	
J15	JUNCTION	0.026	6.483	0	12:06	0.0802	36.1	0.046	
J150	JUNCTION	0.134	2.491	0	12:03	0.442	4.97	0.059	
J151	JUNCTION	0.000	3.056	0	12:00	0	10.1	-0.008	
J152	JUNCTION	0.000	3.396	0	12:01	0	21.8	0.001	
J153	JUNCTION	0.000	4.575	0	12:01	0	26	0.004	
J154	JUNCTION	0.109	0.312	0	11:54	0.404	1.01	0.009	
J155	JUNCTION	0.000	0.039	0	11:54	0	0.122	0.062	
J156	JUNCTION	0.577	0.751	0	11:54	1.81	2.38	-0.005	
J157	JUNCTION	0.371	0.565	0	11:54	1.18	1.8	-0.008	
J158	JUNCTION	0.260	0.524	0	11:54	0.799	1.63	-0.022	
J159	JUNCTION	0.000	0.028	0	11:54	0	0.0846	-0.077	
J16	JUNCTION	0.000	0.000	0	00:00	0	0	0.000	ltr
J160	JUNCTION	0.206	0.241	0	11:54	0.645	0.756	-0.054	
J161	JUNCTION	0.037	0.094	0	11:59	0.115	0.327	-0.031	
J162	JUNCTION	0.000	0.050	0	11:56	0	0.16	-0.392	
J163	JUNCTION	0.000	0.090	0	12:00	0	0.327	0.099	
J164	JUNCTION	0.040	0.938	0	12:02	0.124	3.89	1.459	
J165	JUNCTION	0.000	0.086	0	12:02	0	0.327	0.008	
J168	JUNCTION	0.033	0.105	0	12:00	0.102	0.429	0.005	
J169	JUNCTION	0.173	0.173	0	12:00	0.638	0.638	-0.000	
J17	JUNCTION	0.045	0.045	0	11:54	0.139	0.139	-0.145	
J170	JUNCTION	0.197	0.369	0	12:00	0.728	1.37	0.003	
J171	JUNCTION	0.000	0.481	0	12:00	0	1.87	0.013	
J172	JUNCTION	0.000	0.000	0	00:00	0	0	0.000	ltr
J173	JUNCTION	0.000	0.000	0	00:00	0	0	0.000	ltr
J174	JUNCTION	0.025	0.025	0	11:54	0.0794	0.0794	-0.030	
J176	JUNCTION	0.097	0.097	0	12:00	0.357	0.357	0.004	
J179	JUNCTION	0.017	0.017	0	11:54	0.0518	0.0518	-0.025	
J18	JUNCTION	0.291	0.291	0	11:54	0.921	0.921	-0.010	
J182	JUNCTION	0.000	0.016	0	11:54	0	0.0518	0.176	

J183	JUNCTION	0.000	0.095	0	12:00	0	0.357	0.003
J185	JUNCTION	0.000	0.134	0	12:00	0	0.506	0.014
J186	JUNCTION	0.031	0.044	0	11:55	0.0976	0.149	-0.073
J189	JUNCTION	0.211	0.211	0	12:00	0.78	0.78	-0.003
J19	JUNCTION	0.162	0.194	0	12:00	0.616	0.738	-0.016
J190	JUNCTION	0.023	0.146	0	12:01	0.0713	0.578	0.010
J194	JUNCTION	0.000	5.595	0	12:02	0	29	0.008
J2	JUNCTION	0.000	0.001	0	12:00	0	0.0059	-0.304
J20	JUNCTION	0.039	0.039	0	11:54	0.123	0.123	-0.009
J203	JUNCTION	0.037	6.500	0	12:05	0.122	34.6	0.011
J205	JUNCTION	0.029	0.711	0	12:01	0.0875	1.67	-0.062
J206	JUNCTION	0.000	0.506	0	12:01	0	0.538	3.280
J207	JUNCTION	0.030	0.388	0	12:02	0.0938	0.378	1.259
J208	JUNCTION	0.000	0.256	0	12:00	0	0.189	-0.006
J209	JUNCTION	0.060	0.540	0	12:00	0.222	2.01	0.004
J21	JUNCTION	0.000	0.000	0	00:00	0	0	0.000 ltr
J212	JUNCTION	0.000	1.445	0	11:56	0	4.71	-0.002
J217	JUNCTION	0.259	3.397	0	12:00	0.812	21.8	0.002
J218	JUNCTION	0.023	0.563	0	12:01	0.0701	2.15	0.086
J22	JUNCTION	0.247	0.592	0	11:59	0.913	2.18	-0.060
J223	JUNCTION	0.051	0.051	0	11:54	0.16	0.16	-0.262
J23	JUNCTION	0.027	3.425	0	12:01	0.102	21.9	0.003
J230	JUNCTION	0.050	2.400	0	12:06	0.156	13.1	0.025
J231	JUNCTION	0.168	2.432	0	12:00	0.637	10.7	0.221
J233	JUNCTION	0.000	0.000	0	00:00	0	0	0.000 ltr
J234	JUNCTION	0.032	1.331	0	11:59	0.0992	4.68	0.005
J235	JUNCTION	0.000	0.000	0	00:00	0	0	0.000 ltr
J237	JUNCTION	0.060	0.060	0	11:54	0.188	0.188	-0.114
J239	JUNCTION	0.021	0.076	0	11:56	0.0658	0.254	0.108
J24	JUNCTION	0.004	4.575	0	12:01	0.0116	26	0.003
J240	JUNCTION	0.415	0.695	0	11:54	1.3	2.22	0.002
J242	JUNCTION	0.236	0.912	0	11:54	0.741	2.96	0.003
J243	JUNCTION	0.357	0.357	0	11:54	1.26	1.26	0.000
J244	JUNCTION	0.362	0.498	0	11:54	1.14	1.6	0.003
J25	JUNCTION	0.123	0.977	0	12:00	0.384	3.77	-0.019
J253	JUNCTION	0.304	0.304	0	11:54	0.953	0.953	-0.058
J255	JUNCTION	0.000	0.050	0	11:53	0	0.0212	2.071
J256	JUNCTION	0.000	0.518	0	11:59	0	1.8	0.008
J257	JUNCTION	0.037	0.037	0	11:54	0.109	0.109	-0.028
J258	JUNCTION	0.187	0.221	0	11:54	0.706	0.814	-0.000

J259	JUNCTION	0.093	0.540	0	11:56	0.35	1.97	0.021
J26	JUNCTION	0.021	0.021	0	11:54	0.0666	0.0666	-0.031
J260	JUNCTION	0.167	0.798	0	11:56	0.524	2.78	0.005
J263	JUNCTION	0.000	11.642	0	12:02	0	68.5	0.009
J265	JUNCTION	0.263	0.533	0	12:13	0.928	3.54	-0.037
J267	JUNCTION	0.739	1.618	0	11:56	2.38	5.63	0.004
J27	JUNCTION	0.000	0.554	0	12:00	0	2.08	-0.006
J270	JUNCTION	0.414	0.923	0	11:56	1.28	3.25	-0.001
J273	JUNCTION	0.058	0.454	0	12:14	0.221	2.61	0.013
J274	JUNCTION	0.000	0.434	0	12:13	0	2.39	0.009
J275	JUNCTION	0.000	0.435	0	12:12	0	2.39	0.010
J277	JUNCTION	0.048	1.070	0	12:38	0.183	10.3	0.180
J279	JUNCTION	0.000	0.753	0	12:39	0	6.56	0.073
J28	JUNCTION	0.000	0.000	0	00:00	0	0	0.000 ltr
J280	JUNCTION	0.000	1.291	0	11:56	0	4.43	0.005
J281	JUNCTION	0.000	0.000	0	00:00	0	0	0.000 ltr
J282	JUNCTION	0.213	0.815	0	12:19	0.786	6.45	0.088
J285	JUNCTION	0.000	0.761	0	12:13	0	5.3	0.036
J289	JUNCTION	0.000	0.000	0	00:00	0	0	0.000 ltr
J29	JUNCTION	0.036	0.036	0	11:54	0.12	0.12	-0.004
J299	JUNCTION	0.403	0.803	0	12:06	1.53	5.31	0.233
J30	JUNCTION	0.025	1.873	0	11:57	0.0713	6.16	0.000
J301	JUNCTION	0.000	0.437	0	12:10	0	2.39	-0.003
J302	JUNCTION	0.260	0.260	0	11:54	0.775	0.775	-0.015
J305	JUNCTION	0.072	2.015	0	11:57	0.249	6.88	0.003
J306	JUNCTION	0.329	1.946	0	11:56	1.03	6.63	0.003
J308	JUNCTION	0.000	0.438	0	12:10	0	2.39	0.009
J309	JUNCTION	0.000	0.602	0	12:09	0	3.78	0.020
J31	JUNCTION	0.158	1.859	0	11:56	0.501	6.09	0.008
J310	JUNCTION	0.138	0.138	0	11:54	0.432	0.432	-0.149
J311	JUNCTION	0.000	0.623	0	12:05	0	3.78	0.154
J312	JUNCTION	0.000	0.440	0	12:08	0	2.39	-0.004
J316	JUNCTION	0.280	0.308	0	12:00	1.05	1.15	0.003
J317	JUNCTION	0.174	0.605	0	12:00	0.644	2.4	0.257
J319	JUNCTION	0.088	0.481	0	11:58	0.336	1.75	-0.018
J32	JUNCTION	0.020	1.423	0	11:55	0.061	4.64	0.006
J321	JUNCTION	0.061	2.129	0	11:58	0.192	7.12	0.005
J325	JUNCTION	0.218	0.388	0	11:57	0.678	1.42	-0.002
J327	JUNCTION	0.362	0.362	0	11:54	1.33	1.33	0.002
J33	JUNCTION	0.057	0.057	0	11:54	0.173	0.173	-0.082

J330	JUNCTION	0.000	0.361	0	12:00	0	1.33	-0.023
J331	JUNCTION	0.412	0.711	0	12:00	1.57	2.9	0.378
J333	JUNCTION	0.242	0.624	0	12:04	0.894	3.78	-0.000
J334	JUNCTION	0.350	0.350	0	12:00	1.33	1.33	0.235
J336	JUNCTION	0.000	0.256	0	12:03	0	1.33	0.020
J338	JUNCTION	0.177	0.376	0	12:00	0.668	1.99	0.306
J34	JUNCTION	0.245	1.347	0	11:55	0.768	4.4	0.000
J345	JUNCTION	0.000	0.318	0	12:10	0	1.99	0.023
J348	JUNCTION	0.313	0.500	0	12:00	1.19	3.18	0.167
J349	JUNCTION	0.051	0.702	0	11:54	0.16	2.25	-0.019
J35	JUNCTION	0.015	0.307	0	11:55	0.0476	0.633	0.072
J350	JUNCTION	0.000	0.466	0	12:09	0	3.17	0.016
J351	JUNCTION	0.550	0.550	0	11:54	1.8	1.82	-0.037
J353	JUNCTION	0.274	0.485	0	12:00	1.01	1.79	0.008
J357	JUNCTION	0.097	0.818	0	12:15	0.357	5.65	0.044
J358	JUNCTION	0.024	0.066	0	11:54	0.0734	0.212	-0.010
J359	JUNCTION	0.395	0.651	0	11:55	1.27	2.26	-0.013
J36	JUNCTION	0.314	0.490	0	11:54	0.985	1.54	-0.010
J360	JUNCTION	0.000	0.147	0	11:59	0	0.511	-0.005
J361	JUNCTION	0.000	2.945	0	11:57	0	9.8	0.004
J37	JUNCTION	0.431	0.431	0	11:54	1.31	1.31	-0.093
J38	JUNCTION	0.000	1.443	0	11:56	0	4.71	0.002
J39	JUNCTION	0.178	0.178	0	11:54	0.558	0.558	-0.006
J4	JUNCTION	0.000	0.270	0	13:45	0	11.9	0.002
J40	JUNCTION	0.130	0.130	0	11:54	0.406	0.406	-0.048
J41	JUNCTION	0.253	0.891	0	11:55	0.793	3.13	0.008
J42	JUNCTION	0.039	0.039	0	11:54	0.122	0.122	-0.050
J43	JUNCTION	0.032	0.032	0	11:54	0.101	0.101	-0.034
J44	JUNCTION	0.066	0.066	0	11:54	0.198	0.198	-0.195
J45	JUNCTION	0.000	1.446	0	11:56	0	4.71	-0.000
J46	JUNCTION	0.282	0.282	0	11:54	0.891	0.891	-0.021
J47	JUNCTION	0.031	5.999	0	12:02	0.0967	29	0.007
J48	JUNCTION	0.031	0.031	0	11:54	0.0952	0.0952	-0.070
J49	JUNCTION	0.134	1.575	0	11:56	0.446	5.15	0.001
J5	JUNCTION	0.000	0.020	0	12:30	0	0.325	0.025
J50	JUNCTION	0.133	1.731	0	11:57	0.353	5.75	0.001
J51	JUNCTION	0.040	0.085	0	11:53	0.154	0.246	0.059
J52	JUNCTION	0.000	7.523	0	12:08	0	35.9	0.008
J53	JUNCTION	0.150	0.150	0	11:54	0.47	0.47	-0.074
J54	JUNCTION	0.251	0.251	0	11:54	0.786	0.786	-0.028

J55	JUNCTION	0.000	4.573	0	12:01	0	26	0.001
J56	JUNCTION	0.042	1.194	0	11:56	0.131	4.13	-0.006
J57	JUNCTION	0.279	0.279	0	11:54	0.876	0.876	-0.013
J58	JUNCTION	0.000	4.566	0	12:00	0	26	0.007
J59	JUNCTION	1.012	1.012	0	11:54	3.15	3.15	-0.014
J6	JUNCTION	0.000	0.138	0	12:45	0	3.72	0.006
J60	JUNCTION	0.116	1.871	0	11:55	0.341	6.14	0.005
J61	JUNCTION	0.047	0.051	0	11:53	0.145	0.145	-0.007
J62	JUNCTION	0.000	0.067	0	11:54	0	0.177	0.037
J63	JUNCTION	0.311	0.311	0	11:54	0.958	0.958	-0.045
J64	JUNCTION	0.000	0.045	0	11:54	0	0.134	0.008
J65	JUNCTION	0.030	0.332	0	11:58	0.101	1.24	0.029
J66	JUNCTION	0.000	0.044	0	11:55	0	0.134	-0.240
J67	JUNCTION	0.413	0.413	0	11:54	1.31	1.31	-0.022
J68	JUNCTION	0.213	1.115	0	11:55	0.669	3.63	-0.002
J69	JUNCTION	0.143	0.143	0	11:54	0.453	0.453	-0.009
J7	JUNCTION	0.000	0.208	0	14:04	0	11.8	0.023
J70	JUNCTION	0.019	0.698	0	11:59	0.0598	2.57	0.005
J71	JUNCTION	0.000	0.000	0	00:00	0	0	0.000 ltr
J72	JUNCTION	1.060	2.596	0	11:56	3.29	8.92	-0.000
J73	JUNCTION	0.020	0.020	0	11:54	0.0609	0.0609	0.000
J74	JUNCTION	0.157	0.157	0	11:54	0.503	0.503	-0.031
J75	JUNCTION	0.205	6.530	0	11:58	0.645	22.3	0.000
J76	JUNCTION	0.029	0.846	0	12:00	0.109	3.19	-0.004
J77	JUNCTION	0.216	2.326	0	11:58	0.674	7.79	0.000
J78	JUNCTION	0.184	0.184	0	11:54	0.57	0.57	-0.005
J79	JUNCTION	0.023	0.040	0	11:55	0.0731	0.134	0.025
J8	JUNCTION	0.000	1.745	0	11:58	0	5.79	-0.001
J80	JUNCTION	0.029	0.029	0	11:54	0.0846	0.0846	-0.053
J81	JUNCTION	0.640	6.206	0	11:58	2.01	21.2	-0.003
J82	JUNCTION	0.000	1.291	0	11:56	0	4.33	-0.009
J83	JUNCTION	0.200	0.200	0	11:54	0.614	0.614	-0.016
J84	JUNCTION	0.014	3.362	0	11:59	0.043	11.4	0.004
J85	JUNCTION	0.030	8.524	0	12:04	0.0956	34	0.002
J86	JUNCTION	0.270	0.270	0	11:54	0.834	0.834	-0.011
J87	JUNCTION	0.093	0.646	0	11:54	0.292	2.08	0.006
J88	JUNCTION	0.036	0.036	0	11:54	0.111	0.111	-0.020
J89	JUNCTION	0.295	0.295	0	11:54	0.898	0.898	-0.033
J9	JUNCTION	0.021	3.044	0	11:59	0.0682	10.1	0.002
J90	JUNCTION	0.000	0.817	0	11:56	0	2.65	0.003

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J91              JUNCTION    0.045    0.045     0  11:54      0.134      0.134     -0.012

J92              JUNCTION    0.491    0.491     0  11:54       1.78       1.78    -0.007

J93              JUNCTION    0.008    0.825     0  11:55     0.0246       2.65      0.014

J94              JUNCTION    0.000    0.546     0  11:54          0       1.72     0.003

J95              JUNCTION    0.133    4.671     0  12:01      0.446       26.5      0.008

J96              JUNCTION    0.015    0.540     0  11:54     0.0474       1.93      0.009

J97              JUNCTION    0.548    0.548     0  11:54       1.72       1.72    -0.010

J98              JUNCTION    0.644    0.644     0  11:54       2.15       2.15    -0.029

J99              JUNCTION    0.020    0.670     0  11:55     0.0657       2.26      0.022

OF1               JUNCTION    0.000    0.275     0  13:00          0       10.7    -0.001

OF_Pond1          OUTFALL     0.000    3.360     0  11:59          0       11.4      0.000

OF_Pond2          OUTFALL     0.000   11.637     0  12:03          0       68.5      0.000

OF_Pond3          OUTFALL     0.000    2.945     0  11:57          0        9.8      0.000

OF_Pond4          OUTFALL     0.000    0.147     0  11:59          0      0.511      0.000

OF_Pond5          OUTFALL     0.000    2.399     0  12:06          0       13.1      0.000

OF_Pond6          OUTFALL     0.000    0.142     0  12:03          0      0.578      0.000

OF_Pond7          OUTFALL     0.000    0.464     0  12:02          0       1.87      0.000

OF_Pond8          OUTFALL     0.000    0.885     0  12:06          0       3.84      0.000

OF2               OUTFALL     0.000    0.208     0  14:05          0       11.8      0.000

OF3               OUTFALL     0.000    0.138     0  12:45          0       3.72      0.000

OF4               OUTFALL     0.000    0.020     0  12:31          0      0.325      0.000

OF5               OUTFALL     0.000    0.270     0  13:45          0       11.9      0.000

OF6               OUTFALL     0.000    0.001     0  12:03          0    0.00592      0.000

OF7               OUTFALL     0.000    0.120     0  12:31          0       1.46      0.000

OF8               OUTFALL     0.000    0.114     0  13:10          0       3.47      0.000

SU1_Pond1         STORAGE     3.860    3.860     0  11:59       11.1       11.1      0.001

SU2_Pond2         STORAGE    10.156   10.156     0  12:05       24.3       63.1      0.002

SU3_Pond3         STORAGE     2.720    2.720     0  11:59       3.91       3.91      0.001

SU4_Pond4         STORAGE     0.181    0.181     0  11:59      0.335      0.335      0.001

SU5_Pond5         STORAGE     2.711    2.711     0  12:03       12.4       12.4      0.001

SU6_Pond6         STORAGE     0.011    0.011     0  11:54    0.00596    0.00596      0.001

SU7_Pond7         STORAGE     0.533    0.533     0  11:59       1.47       1.47      0.001

SU8_Pond8         STORAGE     0.965    0.965     0  12:03       3.52       3.52      0.001


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Node Surcharge Summary

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No nodes were surcharged.
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Node Flooding Summary

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No nodes were flooded.


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Storage Volume Summary

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                   Average    Avg   Evap  Exfil     Maximum    Max    Time of Max    Maximum

                    Volume    Pcnt   Pcnt   Pcnt      Volume   Pcnt     Occurrence     Outflow

Storage Unit          1000 m³   Full   Loss   Loss     1000 m³   Full    days hr:min       CMS

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SU1_Pond1             2.461   17.1    0.0    0.0      6.478   45.1       0  13:00      0.275

SU2_Pond2            51.468   56.5    0.0    0.0     61.797   67.9       0  14:04      0.208

SU3_Pond3             0.967   10.0    0.0    0.0      3.469   35.8       0  12:45      0.138

SU4_Pond4             0.041    1.9    0.0    0.0     0.213   10.1      0  12:30     0.020

SU5_Pond5             2.506   17.8    0.0    0.0      6.856   48.8       0  13:45      0.270

SU6_Pond6             0.001    0.2    0.0    0.0     0.006    1.6      0  12:00     0.001

SU7_Pond7             0.074    2.9    0.0    0.0     0.624   24.5      0  12:31     0.120

SU8_Pond8             0.488   10.6    0.0    0.0      1.831   39.8       0  13:09      0.115


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Outfall Loading Summary

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                   Flow      Avg       Max       Total

                   Freq     Flow      Flow      Volume

Outfall Node          Pcnt      CMS       CMS    10^6 ltr

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OF_Pond1            96.74     0.142     3.360      11.398

OF_Pond2            99.32     0.749    11.637      68.466

OF_Pond3            93.99     0.125     2.945       9.803

OF_Pond4            72.11     0.009     0.147       0.511

OF_Pond5            99.43     0.149     2.399      13.101

OF_Pond6            79.59     0.009     0.142       0.578

OF_Pond7            88.71     0.025     0.464       1.875

OF_Pond8            87.34     0.051     0.885       3.837

OF2               73.15     0.109     0.208      11.772
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OF3             75.98    0.040    0.138     3.719
OF4             77.96    0.004    0.020     0.325
OF5             90.49    0.100    0.270    11.916
OF6             28.86    0.000    0.001     0.006
OF7             81.95    0.017    0.120     1.458
OF8             89.14    0.032    0.114     3.475
-----------------------------------------------------------
System            82.32    1.561   21.240    142.237


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Link Flow Summary
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  -----------------------------------------------------------------------------
                           Maximum  Time of Max   Maximum    Max/    Max/
                           |Flow|   Occurrence   |Veloc|    Full    Full
Link               Type         CMS  days hr:min     m/sec    Flow   Depth
-----------------------------------------------------------------------------
C1                 CONDUIT     0.060     0  11:54      0.46    0.10    0.31
C10                CONDUIT     0.464     0  12:02      1.40    0.01    0.06
C100               CONDUIT     0.122     0  12:04      0.32    0.04    0.55
C101               CONDUIT     0.044     0  11:54      0.45    0.02    0.18
C102               CONDUIT     1.408     0  12:04      1.57    0.15    0.50
C103_1             CONDUIT     0.178     0  11:54      0.62    0.13    0.37
C103_2             CONDUIT     0.742     0  11:55      1.92    0.51    0.46
C104               CONDUIT     3.325     0  12:04      2.16    0.17    0.58
C105               CONDUIT     0.147     0  11:59      1.21    0.00    0.04
C106               CONDUIT     0.354     0  11:55      0.83    0.09    0.35
C107               CONDUIT     0.018     0  12:02      0.14    0.01    0.24
C108               CONDUIT    11.637     0  12:03      5.98    0.05    0.22
C109               CONDUIT     0.000     0  00:00      0.00    0.00    0.02
C11                CONDUIT     0.487     0  11:55      2.54    0.14    0.27
C110               CONDUIT     0.000     0  00:00      0.00    0.00    0.00
C111               CONDUIT     0.000     0  00:00      0.00    0.00    0.01
C112               CONDUIT     0.000     0  00:00      0.00    0.00    0.01
C113               CONDUIT     0.120     0  12:31      1.48    0.00    0.03
C114               CONDUIT     0.001     0  12:03      0.00    0.00    0.00
C115               CONDUIT     0.270     0  13:45      2.76    0.00    0.03
C116               CONDUIT     0.020     0  12:31      0.81    0.00    0.01
C117               CONDUIT     0.138     0  12:45      1.98    0.00    0.02
C118               CONDUIT     0.208     0  14:05      1.72    0.00    0.04
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C119_1	CONDUIT	0.196	0	11:54	1.05	0.09	0.27
C119_2	CONDUIT	0.560	0	11:55	2.16	0.25	0.34
C12	CONDUIT	3.360	0	11:59	4.36	0.55	0.53
C12_1	CONDUIT	0.915	0	12:02	0.75	0.09	0.27
C12_2	CONDUIT	0.885	0	12:06	0.97	0.08	0.21
C120	CONDUIT	0.549	0	11:56	1.59	0.25	0.42
C121	CONDUIT	1.048	0	11:57	2.39	0.49	0.51
C122	CONDUIT	3.050	0	11:59	3.08	0.45	0.47
C122_1	CONDUIT	1.272	0	11:57	1.69	0.18	0.39
C122_2	CONDUIT	1.267	0	11:58	1.35	0.17	0.46
C123	CONDUIT	1.743	0	11:58	2.63	0.63	0.57
C124	CONDUIT	1.745	0	11:58	2.68	0.60	0.56
C125	CONDUIT	1.747	0	11:58	2.62	0.59	0.57
C126	CONDUIT	1.764	0	11:59	2.43	0.60	0.61
C127	CONDUIT	0.012	0	11:54	0.10	0.00	0.22
C128	CONDUIT	0.546	0	11:54	1.55	0.34	0.43
C129	CONDUIT	0.638	0	11:55	2.08	0.33	0.39
C13	CONDUIT	1.113	0	11:55	3.05	0.35	0.44
C130	CONDUIT	0.645	0	11:57	1.47	0.24	0.42
C131	CONDUIT	1.019	0	11:59	1.62	0.47	0.55
C132	CONDUIT	0.417	0	11:54	1.34	0.17	0.42
C133	CONDUIT	0.291	0	11:54	1.12	0.14	0.35
C134	CONDUIT	0.535	0	11:55	1.40	0.43	0.45
C135	CONDUIT	0.817	0	11:56	1.63	0.33	0.46
C136	CONDUIT	0.821	0	11:57	1.20	0.33	0.60
C137	CONDUIT	3.427	0	12:01	2.96	0.50	0.54
C138	CONDUIT	4.573	0	12:01	3.35	0.49	0.51
C139	CONDUIT	0.278	0	11:54	0.97	0.11	0.46
C14	CONDUIT	1.351	0	11:56	3.43	0.44	0.46
C140	CONDUIT	1.164	0	11:57	1.89	0.54	0.74
C141	CONDUIT	4.689	0	12:01	3.48	0.51	0.53
C142	CONDUIT	0.127	0	11:54	0.58	0.07	0.31
C143	CONDUIT	0.884	0	11:57	2.01	0.41	0.52
C144	CONDUIT	0.259	0	11:54	1.56	0.06	0.25
C145	CONDUIT	0.032	0	11:54	0.28	0.01	0.20
C146	CONDUIT	0.530	0	11:57	1.67	0.26	0.40
C147	CONDUIT	1.290	0	11:56	3.60	0.20	0.55
C148	CONDUIT	5.595	0	12:02	3.42	0.46	0.50
C149	CONDUIT	5.390	0	12:03	2.96	0.48	0.58
C15	CONDUIT	0.056	0	11:54	0.34	0.01	0.26

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C150          CONDUIT   0.494   0  11:55    1.89   0.25   0.34
C151          CONDUIT   0.029   0  11:55    0.38   0.01   0.14
C152          CONDUIT   6.482   0  12:05    2.62   0.58   0.54
C153          CONDUIT   6.452   0  12:06    2.70   0.57   0.53
C154          CONDUIT   0.537   0  12:17    0.62   0.06   0.56
C155          CONDUIT   7.523   0  12:08    4.33   0.79   0.41
C156          CONDUIT   0.307   0  12:00    1.58   0.10   0.28
C157          CONDUIT   0.144   0  11:55    0.85   0.07   0.25
C158          CONDUIT   0.176   0  11:54    1.33   0.06   0.21
C159          CONDUIT   0.481   0  11:54    1.99   0.07   0.20
C16_1          CONDUIT   0.018   0  11:57    0.66   0.01   0.07
C160          CONDUIT   0.000   0  00:00    0.00   0.00   0.15
C161          CONDUIT   0.628   0  11:56    1.62   0.29   0.46
C162          CONDUIT   0.312   0  11:55    1.40   0.12   0.31
C163          CONDUIT   0.035   0  11:54    0.29   0.01   0.20
C164          CONDUIT   0.668   0  11:55    1.88   0.23   0.43
C165          CONDUIT   0.432   0  11:54    1.74   0.06   0.23
C166          CONDUIT   0.000   0  00:00    0.00   0.00   0.09
C167          CONDUIT   0.184   0  11:54    0.87   0.07   0.30
C168          CONDUIT   0.870   0  11:56    2.66   0.36   0.40
C169          CONDUIT   0.218   0  11:55    0.82   0.30   0.34
C17          CONDUIT   0.000   0  00:00    0.00   0.00   0.15
C170          CONDUIT   0.203   0  11:54    1.57   0.08   0.21
C171          CONDUIT   0.302   0  11:55    1.53   0.11   0.28
C172          CONDUIT   0.638   0  11:55    2.16   0.23   0.37
C173          CONDUIT   0.171   0  11:54    1.13   0.05   0.23
C174_1          CONDUIT   0.267   0  11:54    1.48   0.11   0.26
C174_2          CONDUIT   0.512   0  11:55    1.63   0.20   0.40
C175_1          CONDUIT   0.035   0  11:54    0.50   0.01   0.14
C175_2          CONDUIT   0.233   0  11:55    0.93   0.08   0.35
C176_1          CONDUIT   0.285   0  11:54    1.67   0.09   0.25
C177          CONDUIT   3.055   0  11:59    3.02   0.45   0.48
C178          CONDUIT   3.056   0  12:00    2.89   0.46   0.50
C179          CONDUIT   3.053   0  12:00    2.51   0.41   0.56
C18          CONDUIT   0.193   0  12:00    2.81   0.08   0.13
C18_2          CONDUIT   0.344   0  11:59    0.58   0.00   0.03
C182          CONDUIT   0.104   0  12:02    0.52   0.08   0.51
C183          CONDUIT   0.165   0  12:00    0.59   0.13   0.64
C184          CONDUIT   0.256   0  12:00    0.53   0.14   0.69
C185          CONDUIT   0.369   0  12:02    0.43   0.12   0.65
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C186            CONDUIT    0.506    0  12:01     0.62    0.07    0.50
C19             CONDUIT    0.361    0  12:00     0.71    0.01    0.05
C2              CONDUIT    0.000    0  00:00     0.00    0.00    0.28
C20             CONDUIT    0.683    0  11:55     2.70    0.21    0.33
C21             CONDUIT    3.206    0  12:01     3.35    1.23    0.80
C21_1           CONDUIT    0.044    0  11:55     1.25    0.02    0.08
C21_2           CONDUIT    0.044    0  11:56     0.31    0.01    0.25
C217            CONDUIT    0.699    0  11:55     2.55    0.10    0.33
C22             CONDUIT    0.135    0  11:54     0.37    0.05    0.69
C227            CONDUIT    0.043    0  11:55     1.04    0.00    0.13
C23             CONDUIT    0.039    0  11:58     3.18    0.10    0.17
C235            CONDUIT    0.319    0  12:02     0.16    0.01    0.20
C236            CONDUIT    0.488    0  12:08     3.79    0.20    0.21
C237            CONDUIT    0.623    0  12:05     0.27    0.01    0.23
C238            CONDUIT    0.602    0  12:09     4.11    0.25    0.23
C239            CONDUIT    0.600    0  12:11     0.20    0.01    0.29
C24             CONDUIT    0.044    0  11:55     1.14    0.02    0.09
C240            CONDUIT    0.761    0  12:13     3.52    0.43    0.30
C241            CONDUIT    0.787    0  12:15     0.60    0.03    0.13
C242            CONDUIT    0.759    0  12:21     0.21    0.03    0.39
C243            CONDUIT    0.753    0  12:39     0.15    0.03    0.73
C244            CONDUIT    0.771    0  12:39     1.01    0.67    0.84
C245            CONDUIT    1.080    0  12:37     2.18    1.09    0.59
C246            CONDUIT    0.000    0  00:00     0.00    0.00    0.06
C247            CONDUIT    0.256    0  12:03     3.15    0.07    0.12
C248            CONDUIT    0.251    0  12:06     0.15    0.00    0.08
C249            CONDUIT    0.318    0  12:10     3.65    0.12    0.16
C25             CONDUIT    0.346    0  11:57     0.45    0.12    1.00
C250            CONDUIT    0.317    0  12:11     0.15    0.00    0.10
C251            CONDUIT    0.466    0  12:09     3.96    0.18    0.19
C252            CONDUIT    0.465    0  12:10     0.10    0.00    0.22
C256            CONDUIT    1.831    0  12:07     4.37    0.81    0.49
C257            CONDUIT    0.050    0  11:53     0.22    0.05    0.37
C258            CONDUIT    0.518    0  11:59     1.23    0.49    0.49
C259            CONDUIT    0.517    0  12:00     1.35    0.51    0.46
C26             CONDUIT    0.055    0  12:04     0.12    0.05    0.46
C260_1          CONDUIT    1.330    0  12:00     4.19    0.37    0.39
C260_2          CONDUIT    1.329    0  12:00     3.32    0.29    0.54
C261            CONDUIT    0.393    0  11:58     0.62    0.01    0.06
C262            CONDUIT    0.444    0  12:01     0.25    0.01    0.19
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C263	CONDUIT	0.440	0	12:08	1.54	0.20	0.37
C264	CONDUIT	0.438	0	12:10	1.51	0.35	0.37
C265	CONDUIT	0.437	0	12:10	1.51	0.20	0.37
C266	CONDUIT	0.435	0	12:12	1.49	0.36	0.37
C267	CONDUIT	0.434	0	12:13	1.89	0.21	0.31
C268	CONDUIT	0.432	0	12:14	1.81	0.21	0.32
C269	CONDUIT	0.452	0	12:15	1.72	0.23	0.34
C27	CONDUIT	0.540	0	11:57	1.73	0.17	0.32
C270	CONDUIT	0.530	0	12:15	1.03	0.28	0.61
C271	CONDUIT	0.000	0	00:00	0.00	0.00	0.04
C272	CONDUIT	0.035	0	11:54	0.50	0.01	0.14
C273_1	CONDUIT	0.221	0	11:55	1.76	0.08	0.20
C273_2	CONDUIT	0.273	0	11:56	1.36	0.10	0.28
C274	CONDUIT	0.642	0	11:57	1.93	0.26	0.41
C275	CONDUIT	0.791	0	11:58	2.13	0.46	0.45
C276	CONDUIT	0.086	0	12:02	2.95	0.01	0.11
C277	CONDUIT	0.086	0	12:03	0.66	0.00	0.03
C278	CONDUIT	0.101	0	12:04	0.46	0.00	0.04
C28	CONDUIT	0.090	0	12:03	0.17	0.12	0.50
C283	CONDUIT	0.172	0	12:00	0.89	0.00	0.04
C284	CONDUIT	0.367	0	12:00	1.36	0.00	0.05
C285	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
C286	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
C287	CONDUIT	0.023	0	11:57	0.15	0.00	0.04
C288	CONDUIT	0.095	0	12:00	0.84	0.00	0.02
C29	CONDUIT	0.920	0	11:57	1.91	0.21	0.37
C293	CONDUIT	0.092	0	12:01	0.85	0.00	0.02
C294	CONDUIT	0.044	0	11:57	4.31	0.00	0.07
C295	CONDUIT	0.130	0	12:02	0.79	0.00	0.03
C296	CONDUIT	0.211	0	12:00	0.75	0.00	0.06
C297	CONDUIT	0.480	0	12:00	1.35	0.01	0.07
C3	CONDUIT	0.114	0	13:10	1.40	0.00	0.01
C30	CONDUIT	1.611	0	11:57	2.27	0.38	0.50
C302	CONDUIT	0.537	0	12:04	2.69	0.05	0.28
C306	CONDUIT	1.072	0	11:55	6.79	0.16	0.24
C31	CONDUIT	1.421	0	11:56	3.61	0.44	0.46
C310	CONDUIT	0.000	0	00:00	0.00	0.00	0.06
C311	CONDUIT	0.056	0	11:56	1.26	0.00	0.14
C32	CONDUIT	0.295	0	11:54	1.16	0.12	0.35
C33	CONDUIT	0.139	0	11:54	1.16	0.04	0.20

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C34              CONDUIT    0.035    0  11:55     0.50    0.02    0.14
C35              CONDUIT    0.317    0  12:03     0.57    0.30    0.53
C36              CONDUIT    0.910    0  11:55     2.97    0.28    0.38
C37              CONDUIT    2.609    0  11:56     2.64    0.51    0.55
C38              CONDUIT    3.506    0  11:56     3.32    0.64    0.58
C39              CONDUIT    1.851    0  11:57     4.73    0.44    0.46
C4              CONDUIT    0.434    0  12:07     1.00    0.01    0.55
C41              CONDUIT    0.000    0  00:00     0.00    0.00    0.04
C42              CONDUIT    0.280    0  11:54     1.24    0.21    0.31
C43              CONDUIT    0.276    0  11:55     0.98    0.10    0.30
C44              CONDUIT    0.497    0  11:55     1.24    0.23    0.39
C45              CONDUIT    0.054    0  11:54     0.08    0.01    0.71
C46              CONDUIT    0.885    0  11:55     2.24    0.35    0.47
C47              CONDUIT    1.406    0  11:56     3.08    0.41    0.42
C48              CONDUIT    0.234    0  11:58     0.42    0.20    0.69
C49              CONDUIT    0.990    0  11:54     1.40    0.57    0.62
C5              CONDUIT    0.000    0  00:00     0.00    0.00    0.02
C50_1              CONDUIT    0.039    0  11:54     1.15    0.02    0.08
C50_2              CONDUIT    0.037    0  11:57     0.20    0.01    0.27
C51              CONDUIT    1.856    0  11:56     2.04    0.68    0.61
C52              CONDUIT    1.445    0  11:56     3.40    0.34    0.40
C53_1              CONDUIT    2.132    0  11:58     2.32    0.69    0.61
C53_2              CONDUIT    2.331    0  11:59     2.76    0.72    0.57
C54              CONDUIT    1.446    0  11:56     2.86    0.29    0.46
C55              CONDUIT    0.686    0  12:00     1.11    0.64    0.54
C56              CONDUIT    0.838    0  12:01     1.94    0.92    0.41
C57              CONDUIT    0.032    0  12:00     0.45    0.01    0.14
C58              CONDUIT    0.194    0  12:00     1.56    0.08    0.20
C6              CONDUIT    0.000    0  00:00     0.00    0.00    0.01
C62              CONDUIT    0.061    0  12:00     1.09    0.01    0.15
C63              CONDUIT    0.073    0  12:00     3.44    0.00    0.09
C64              CONDUIT    0.000    0  00:00     0.00    0.00    0.04
C65              CONDUIT    0.159    0  11:54     0.75    0.10    0.32
C66              CONDUIT    0.164    0  11:54     1.24    0.07    0.38
C67              CONDUIT    0.318    0  11:55     2.06    0.14    0.69
C68              CONDUIT    0.569    0  12:00     0.15    0.00    0.22
C69              CONDUIT    1.869    0  11:57     7.74    0.43    0.32
C69_1              CONDUIT    3.396    0  12:01     3.82    0.92    0.73
C69_2              CONDUIT    3.400    0  12:01     3.18    0.50    0.52
C7              CONDUIT    0.000    0  00:00     0.00    0.00    0.00
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C70	CONDUIT	0.139	0	11:54	0.35	0.15	0.56
C71	CONDUIT	0.039	0	11:54	2.50	0.01	0.05
C71_1	CONDUIT	4.575	0	12:01	3.26	0.50	0.52
C71_2	CONDUIT	4.573	0	12:01	3.25	0.53	0.52
C72	CONDUIT	4.574	0	12:01	3.31	0.53	0.51
C73	CONDUIT	0.090	0	12:00	1.19	0.01	0.18
C74_1	CONDUIT	0.050	0	11:56	1.34	0.00	0.13
C74_2	CONDUIT	0.045	0	12:01	0.82	0.00	0.17
C75	CONDUIT	0.018	0	12:00	0.08	0.00	0.04
C76	CONDUIT	0.015	0	11:59	0.60	0.00	0.10
C77	CONDUIT	1.447	0	11:57	2.38	0.47	0.53
C78	CONDUIT	0.398	0	11:54	0.82	0.58	0.61
C79	CONDUIT	0.536	0	12:00	1.46	0.01	0.07
C8	CONDUIT	2.399	0	12:06	2.99	0.05	0.21
C80	CONDUIT	0.547	0	12:01	0.47	0.01	0.21
C81	CONDUIT	0.016	0	11:54	0.52	0.01	0.08
C82	CONDUIT	0.000	0	00:00	0.00	0.00	0.03
C83	CONDUIT	0.045	0	11:54	0.91	0.03	0.11
C83_1	CONDUIT	6.535	0	11:58	2.79	0.05	0.26
C83_2	CONDUIT	6.526	0	11:59	2.94	0.08	0.25
C84	CONDUIT	6.443	0	12:08	2.47	0.16	0.29
C85	CONDUIT	0.885	0	12:06	1.63	0.03	0.16
C86	CONDUIT	0.295	0	11:54	0.80	0.29	0.53
C87	CONDUIT	2.945	0	11:57	4.11	0.05	0.20
C88	CONDUIT	6.762	0	12:03	3.29	0.68	0.61
C89	CONDUIT	6.426	0	12:04	2.71	0.48	0.52
C9	CONDUIT	0.142	0	12:03	1.17	0.00	0.04
C90	CONDUIT	2.027	0	11:58	1.62	0.26	0.49
C91	CONDUIT	5.626	0	11:58	3.74	0.63	0.57
C92	CONDUIT	1.577	0	11:57	2.43	0.56	0.56
C93	CONDUIT	1.729	0	11:58	2.59	0.64	0.57
C94	CONDUIT	1.293	0	11:57	2.41	0.57	0.59
C95	CONDUIT	1.945	0	11:57	2.55	0.50	0.53
C96	CONDUIT	3.590	0	11:57	2.65	0.39	0.53
C97	CONDUIT	6.203	0	11:58	6.29	0.62	0.41
C98	CONDUIT	1.730	0	11:58	2.60	0.59	0.57
C99_1	CONDUIT	0.028	0	11:54	1.06	0.01	0.07
C99_2	CONDUIT	0.026	0	11:57	0.45	0.01	0.25
OR1	ORIFICE	0.113	0	13:00			1.00
OR10	ORIFICE	0.001	0	12:00			0.28

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OR11              ORIFICE    0.076    0  14:04                  1.00
OR12              ORIFICE    0.000    0  00:00
OR13              ORIFICE    0.101    0  13:45                  1.00
OR14              ORIFICE    0.169    0  13:45                  1.00
OR15              ORIFICE    0.000    0  00:00
OR16              ORIFICE    0.020    0  12:30                  1.00
OR17              ORIFICE    0.000    0  00:00                  0.00
OR18              ORIFICE    0.000    0  00:00
OR19              ORIFICE    0.049    0  12:45                  1.00
OR2               ORIFICE    0.098    0  13:00                  1.00
OR20              ORIFICE    0.061    0  12:45                  1.00
OR21              ORIFICE    0.000    0  00:00
OR22              ORIFICE    0.128    0  14:04                  1.00
OR23              ORIFICE    0.005    0  14:04                  0.15
OR24              ORIFICE    0.000    0  00:00
OR25              ORIFICE    0.065    0  13:00                  0.87
OR26              ORIFICE    0.061    0  13:09                  1.00
OR3               ORIFICE    0.000    0  00:00
OR4               ORIFICE    0.054    0  13:09                  1.00
OR5               ORIFICE    0.028    0  12:45                  1.00
OR6               ORIFICE    0.000    0  00:00
OR7               ORIFICE    0.054    0  12:31                  1.00
OR8               ORIFICE    0.066    0  12:31                  1.00
OR9               ORIFICE    0.000    0  00:00


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Flow Classification Summary
***************************
  -------------------------------------------------------------------------------------
                Adjusted    ---------- Fraction of Time in Flow Class ----------
                 /Actual        Up    Down  Sub   Sup   Up    Down  Norm  Inlet
Conduit            Length    Dry  Dry   Dry   Crit  Crit  Crit  Crit  Ltd   Ctrl
-------------------------------------------------------------------------------------
C1                   1.00   0.00  0.00  0.00  1.00  0.00  0.00  0.00  0.90  0.00
C10                  1.00   0.01  0.00  0.00  0.02  0.97  0.00  0.00  0.21  0.00
C100                 1.00   0.00  0.00  0.00  1.00  0.00  0.00  0.00  0.99  0.00
C101                 1.00   0.00  0.03  0.00  0.97  0.00  0.00  0.00  1.00  0.00
C102                 1.00   0.00  0.00  0.00  1.00  0.00  0.00  0.00  0.99  0.00
C103_1               1.00   0.00  0.00  0.00  1.00  0.00  0.00  0.00  1.00  0.00
C103_2               1.00   0.00  0.00  0.00  0.94  0.06  0.00  0.00  0.00  0.00
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C104	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.99	0.00
C105	1.00	0.00	0.00	0.00	0.23	0.77	0.00	0.00	0.15	0.00
C106	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
C107	1.00	0.00	0.31	0.00	0.69	0.00	0.00	0.00	1.00	0.00
C108	1.00	0.01	0.00	0.00	0.00	0.99	0.00	0.00	0.31	0.00
C109	1.00	0.12	0.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C11	1.00	0.00	0.00	0.00	0.47	0.53	0.00	0.00	1.00	0.00
C110	1.00	0.27	0.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C111	1.00	0.13	0.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C112	1.00	0.19	0.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C113	1.00	0.19	0.00	0.00	0.00	0.80	0.00	0.00	0.16	0.00
C114	1.00	0.27	0.00	0.00	0.30	0.43	0.00	0.00	0.07	0.00
C115	1.00	0.12	0.00	0.00	0.00	0.88	0.00	0.00	0.00	0.00
C116	1.00	0.22	0.00	0.00	0.00	0.78	0.00	0.00	0.12	0.00
C117	1.00	0.24	0.00	0.00	0.00	0.76	0.00	0.00	0.00	0.00
C118	1.00	0.25	0.00	0.00	0.00	0.75	0.00	0.00	0.00	0.00
C119_1	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
C119_2	1.00	0.00	0.00	0.00	0.53	0.47	0.00	0.00	0.93	0.00
C12	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.11	0.00
C12_1	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.94	0.00
C12_2	1.00	0.01	0.08	0.00	0.91	0.00	0.00	0.00	0.00	0.00
C120	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
C121	1.00	0.00	0.00	0.00	0.52	0.47	0.00	0.00	0.22	0.00
C122	1.00	0.00	0.00	0.00	0.50	0.50	0.00	0.00	0.40	0.00
C122_1	1.00	0.00	0.00	0.00	0.75	0.25	0.00	0.00	0.40	0.00
C122_2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.57	0.00
C123	1.00	0.00	0.00	0.00	0.56	0.44	0.00	0.00	0.08	0.00
C124	1.00	0.00	0.00	0.00	0.54	0.46	0.00	0.00	0.12	0.00
C125	1.00	0.00	0.00	0.00	0.54	0.46	0.00	0.00	0.90	0.00
C126	1.00	0.00	0.00	0.00	0.96	0.03	0.00	0.00	0.99	0.00
C127	1.00	0.00	0.18	0.00	0.82	0.00	0.00	0.00	1.00	0.00
C128	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.98	0.00
C129	1.00	0.00	0.00	0.00	0.85	0.15	0.00	0.00	0.51	0.00
C13	1.00	0.00	0.00	0.00	0.43	0.57	0.00	0.00	1.00	0.00
C130	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
C131	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.98	0.00
C132	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.99	0.00
C133	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.99	0.00
C134	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.53	0.00
C135	1.00	0.00	0.00	0.00	0.97	0.02	0.00	0.00	0.20	0.00

C136	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.99	0.00
C137	1.00	0.00	0.00	0.00	0.09	0.91	0.00	0.00	0.48	0.00
C138	1.00	0.00	0.00	0.00	0.05	0.95	0.00	0.00	0.87	0.00
C139	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
C14	1.00	0.00	0.00	0.00	0.40	0.60	0.00	0.00	0.18	0.00
C140	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.98	0.00
C141	1.00	0.00	0.00	0.00	0.05	0.95	0.00	0.00	0.48	0.00
C142	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
C143	1.00	0.00	0.00	0.00	0.85	0.15	0.00	0.00	0.99	0.00
C144	1.00	0.00	0.00	0.00	0.98	0.02	0.00	0.00	1.00	0.00
C145	1.00	0.00	0.13	0.00	0.87	0.00	0.00	0.00	1.00	0.00
C146	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
C147	1.00	0.00	0.00	0.00	0.30	0.69	0.00	0.00	0.01	0.00
C148	1.00	0.00	0.00	0.00	0.14	0.86	0.00	0.00	0.95	0.00
C149	1.00	0.00	0.00	0.00	0.68	0.32	0.00	0.00	0.98	0.00
C15	1.00	0.00	0.11	0.00	0.89	0.00	0.00	0.00	1.00	0.00
C150	1.00	0.00	0.00	0.00	0.87	0.13	0.00	0.00	0.51	0.00
C151	1.00	0.00	0.08	0.00	0.92	0.00	0.00	0.00	1.00	0.00
C152	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.46	0.00
C153	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.63	0.00
C154	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.99	0.00
C155	1.00	0.00	0.00	0.00	0.50	0.50	0.00	0.00	0.00	0.00
C156	1.00	0.00	0.00	0.00	0.91	0.09	0.00	0.00	1.00	0.00
C157	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
C158	1.00	0.00	0.00	0.00	0.99	0.01	0.00	0.00	1.00	0.00
C159	1.00	0.00	0.00	0.00	0.56	0.44	0.00	0.00	1.00	0.00
C16_1	1.00	0.00	0.10	0.00	0.89	0.00	0.00	0.00	1.00	0.00
C160	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C161	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.99	0.00
C162	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
C163	1.00	0.00	0.15	0.00	0.84	0.00	0.00	0.00	1.00	0.00
C164	1.00	0.00	0.00	0.00	0.99	0.01	0.00	0.00	1.00	0.00
C165	1.00	0.00	0.00	0.00	0.96	0.04	0.00	0.00	1.00	0.00
C166	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C167	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
C168	1.00	0.00	0.00	0.00	0.47	0.53	0.00	0.00	0.20	0.00
C169	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.45	0.00
C17	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C170	1.00	0.00	0.00	0.00	0.94	0.06	0.00	0.00	0.98	0.00
C171	1.00	0.00	0.00	0.00	0.97	0.03	0.00	0.00	1.00	0.00

C172	1.00	0.00	0.00	0.00	0.51	0.49	0.00	0.00	0.99	0.00
C173	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
C174_1	1.00	0.00	0.00	0.00	0.99	0.01	0.00	0.00	1.00	0.00
C174_2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.99	0.00
C175_1	1.00	0.00	0.02	0.00	0.98	0.00	0.00	0.00	1.00	0.00
C175_2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
C176_1	1.00	0.00	0.00	0.00	0.80	0.20	0.00	0.00	1.00	0.00
C177	1.00	0.00	0.00	0.00	0.53	0.47	0.00	0.00	0.94	0.00
C178	1.00	0.00	0.00	0.00	0.49	0.51	0.00	0.00	0.02	0.00
C179	1.00	0.00	0.00	0.00	0.99	0.01	0.00	0.00	0.97	0.00
C18	1.00	0.00	0.00	0.00	0.39	0.61	0.00	0.00	0.00	0.00
C18_2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.96	0.00
C182	1.00	0.00	0.97	0.00	0.03	0.00	0.00	0.00	0.74	0.00
C183	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.09	0.00
C184	1.00	0.00	0.20	0.00	0.80	0.00	0.00	0.00	0.97	0.00
C185	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.07	0.00
C186	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.11	0.00
C19	1.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.78	0.00
C2	1.00	0.07	0.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C20	1.00	0.00	0.00	0.00	0.45	0.55	0.00	0.00	1.00	0.00
C21	1.00	0.00	0.00	0.00	0.06	0.94	0.00	0.00	0.38	0.00
C21_1	1.00	0.00	0.00	0.00	0.57	0.43	0.00	0.00	0.13	0.00
C21_2	1.00	0.00	0.11	0.00	0.88	0.01	0.00	0.00	0.98	0.00
C217	1.00	0.00	0.00	0.00	0.48	0.52	0.00	0.00	0.01	0.00
C22	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.97	0.00
C227	1.00	0.00	0.00	0.00	0.96	0.04	0.00	0.00	0.93	0.00
C23	1.00	0.00	0.00	0.00	0.28	0.72	0.00	0.00	0.26	0.00
C235	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.99	0.00
C236	1.00	0.00	0.00	0.00	0.06	0.94	0.00	0.00	0.02	0.00
C237	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.97	0.00
C238	1.00	0.00	0.00	0.00	0.05	0.95	0.00	0.00	0.00	0.00
C239	1.00	0.00	0.04	0.00	0.96	0.00	0.00	0.00	0.96	0.00
C24	1.00	0.00	0.01	0.00	0.71	0.28	0.00	0.00	0.30	0.00
C240	1.00	0.00	0.00	0.00	0.06	0.94	0.00	0.00	0.00	0.00
C241	1.00	0.01	0.03	0.00	0.96	0.00	0.00	0.00	0.89	0.00
C242	1.00	0.00	0.01	0.00	0.99	0.00	0.00	0.00	0.99	0.00
C243	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.78	0.00
C244	1.00	0.00	0.02	0.00	0.98	0.00	0.00	0.00	0.59	0.00
C245	1.00	0.00	0.01	0.00	0.98	0.01	0.00	0.00	0.07	0.00
C246	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

C247	1.00	0.00	0.00	0.00	0.10	0.90	0.00	0.00	0.00	0.00
C248	1.00	0.00	0.03	0.00	0.97	0.00	0.00	0.00	0.97	0.00
C249	1.00	0.00	0.00	0.00	0.05	0.95	0.00	0.00	0.00	0.00
C25	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.03	0.00
C250	1.00	0.00	0.03	0.00	0.97	0.00	0.00	0.00	0.97	0.00
C251	1.00	0.00	0.00	0.00	0.03	0.97	0.00	0.00	0.00	0.00
C252	1.00	0.00	0.02	0.00	0.98	0.00	0.00	0.00	0.98	0.00
C256	1.00	0.00	0.00	0.00	0.03	0.97	0.00	0.00	0.01	0.00
C257	1.00	0.00	0.88	0.00	0.12	0.00	0.00	0.00	0.75	0.00
C258	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.97	0.00
C259	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C26	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.87	0.00
C260_1	1.00	0.00	0.00	0.00	0.26	0.74	0.00	0.00	0.05	0.00
C260_2	1.00	0.00	0.00	0.00	0.84	0.16	0.00	0.00	0.94	0.00
C261	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.90	0.00
C262	1.00	0.00	0.01	0.00	0.99	0.00	0.00	0.00	0.99	0.00
C263	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.98	0.00
C264	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.00	0.00
C265	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.98	0.00
C266	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.00	0.00
C267	1.00	0.02	0.00	0.00	0.58	0.41	0.00	0.00	0.85	0.00
C268	1.00	0.00	0.02	0.00	0.86	0.13	0.00	0.00	0.98	0.00
C269	1.00	0.00	0.00	0.00	0.97	0.03	0.00	0.00	1.00	0.00
C27	1.00	0.00	0.00	0.00	0.97	0.02	0.00	0.00	0.99	0.00
C270	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
C271	1.00	0.08	0.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C272	1.00	0.00	0.08	0.00	0.92	0.00	0.00	0.00	1.00	0.00
C273_1	1.00	0.00	0.00	0.00	0.55	0.45	0.00	0.00	1.00	0.00
C273_2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
C274	1.00	0.00	0.00	0.00	0.95	0.05	0.00	0.00	1.00	0.00
C275	1.00	0.00	0.00	0.00	0.87	0.13	0.00	0.00	0.01	0.00
C276	1.00	0.01	0.00	0.00	0.16	0.83	0.00	0.00	0.01	0.00
C277	1.00	0.00	0.06	0.00	0.91	0.03	0.00	0.00	0.94	0.00
C278	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.98	0.00
C28	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.54	0.00
C283	1.00	0.00	0.00	0.00	0.73	0.26	0.00	0.00	1.00	0.00
C284	1.00	0.00	0.00	0.00	0.50	0.50	0.00	0.00	0.95	0.00
C285	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C286	1.00	0.18	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C287	1.00	0.00	0.17	0.00	0.82	0.00	0.00	0.00	0.98	0.00

C288	1.00	0.00	0.01	0.00	0.49	0.50	0.00	0.00	0.00	0.00
C29	1.00	0.00	0.00	0.00	0.99	0.01	0.00	0.00	1.00	0.00
C293	1.00	0.00	0.00	0.00	0.47	0.53	0.00	0.00	0.99	0.00
C294	1.00	0.00	0.00	0.00	0.35	0.65	0.00	0.00	0.32	0.00
C295	1.00	0.00	0.01	0.00	0.90	0.09	0.00	0.00	0.99	0.00
C296	1.00	0.00	0.00	0.00	0.99	0.01	0.00	0.00	0.98	0.00
C297	1.00	0.00	0.00	0.00	0.54	0.45	0.00	0.00	0.91	0.00
C3	1.00	0.13	0.00	0.00	0.00	0.87	0.00	0.00	0.09	0.00
C30	1.00	0.00	0.00	0.00	0.97	0.03	0.00	0.00	0.99	0.00
C302	1.00	0.00	0.00	0.00	0.04	0.96	0.00	0.00	0.00	0.00
C306	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
C31	1.00	0.00	0.00	0.00	0.39	0.61	0.00	0.00	0.93	0.00
C310	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C311	1.00	0.00	0.00	0.00	0.54	0.46	0.00	0.00	0.98	0.00
C32	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.99	0.00
C33	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
C34	1.00	0.00	0.02	0.00	0.98	0.00	0.00	0.00	1.00	0.00
C35	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.71	0.00
C36	1.00	0.00	0.00	0.00	0.43	0.57	0.00	0.00	0.99	0.00
C37	1.00	0.00	0.00	0.00	0.84	0.16	0.00	0.00	0.99	0.00
C38	1.00	0.00	0.00	0.00	0.45	0.54	0.00	0.00	0.01	0.00
C39	1.00	0.00	0.00	0.00	0.31	0.69	0.00	0.00	0.98	0.00
C4	1.00	0.07	0.00	0.00	0.01	0.00	0.00	0.91	0.00	0.00
C41	1.00	0.02	0.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C42	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C43	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.98	0.00
C44	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.98	0.00
C45	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.05	0.00
C46	1.00	0.00	0.00	0.00	0.67	0.33	0.00	0.00	0.99	0.00
C47	1.00	0.00	0.00	0.00	0.45	0.55	0.00	0.00	0.03	0.00
C48	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.97	0.00
C49	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.98	0.00
C5	1.00	0.25	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C50_1	1.00	0.00	0.00	0.00	0.70	0.30	0.00	0.00	0.03	0.00
C50_2	1.00	0.00	0.09	0.00	0.91	0.00	0.00	0.00	1.00	0.00
C51	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.92	0.00
C52	1.00	0.00	0.00	0.00	0.40	0.60	0.00	0.00	0.01	0.00
C53_1	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.97	0.00
C53_2	1.00	0.00	0.00	0.00	0.67	0.33	0.00	0.00	0.43	0.00
C54	1.00	0.00	0.00	0.00	0.44	0.56	0.00	0.00	0.98	0.00

C55	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.52	0.00
C56	1.00	0.00	0.00	0.00	0.99	0.01	0.00	0.00	0.00	0.00
C57	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
C58	1.00	0.00	0.00	0.00	0.94	0.05	0.00	0.00	0.99	0.00
C6	1.00	0.24	0.76	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C62	1.00	0.00	0.00	0.00	0.93	0.07	0.00	0.00	0.97	0.00
C63	1.00	0.00	0.00	0.00	0.27	0.73	0.00	0.00	0.23	0.00
C64	1.00	0.09	0.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C65	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.94	0.00
C66	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
C67	1.00	0.00	0.00	0.00	0.52	0.48	0.00	0.00	0.47	0.00
C68	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.99	0.00
C69	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
C69_1	1.00	0.00	0.00	0.00	0.01	0.99	0.00	0.00	0.58	0.00
C69_2	1.00	0.00	0.00	0.00	0.03	0.96	0.00	0.00	0.58	0.00
C7	1.00	0.22	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C70	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.65	0.00
C71	1.00	0.00	0.00	0.00	0.38	0.62	0.00	0.00	0.44	0.00
C71_1	1.00	0.00	0.00	0.00	0.17	0.83	0.00	0.00	0.56	0.00
C71_2	1.00	0.00	0.00	0.00	0.25	0.75	0.00	0.00	0.60	0.00
C72	1.00	0.00	0.00	0.00	0.16	0.84	0.00	0.00	0.04	0.00
C73	1.00	0.00	0.00	0.00	0.95	0.05	0.00	0.00	0.97	0.00
C74_1	1.00	0.00	0.00	0.00	0.57	0.43	0.00	0.00	0.95	0.00
C74_2	1.00	0.00	0.00	0.00	0.61	0.39	0.00	0.00	0.56	0.00
C75	1.00	0.00	0.06	0.00	0.94	0.00	0.00	0.00	0.97	0.00
C76	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.99	0.00
C77	1.00	0.00	0.00	0.00	0.57	0.43	0.00	0.00	0.90	0.00
C78	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.73	0.00
C79	1.00	0.00	0.00	0.00	0.49	0.51	0.00	0.00	0.91	0.00
C8	1.00	0.00	0.00	0.00	0.01	0.99	0.00	0.00	0.45	0.00
C80	1.00	0.00	0.02	0.00	0.98	0.00	0.00	0.00	0.98	0.00
C81	1.00	0.00	0.09	0.00	0.91	0.00	0.00	0.00	1.00	0.00
C82	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C83	1.00	0.00	0.00	0.00	0.99	0.01	0.00	0.00	0.00	0.00
C83_1	1.00	0.00	0.00	0.00	0.59	0.41	0.00	0.00	0.98	0.00
C83_2	1.00	0.00	0.00	0.00	0.96	0.03	0.00	0.00	0.75	0.00
C84	1.00	0.00	0.00	0.00	0.99	0.01	0.00	0.00	0.02	0.00
C85	1.00	0.09	0.00	0.00	0.67	0.24	0.00	0.00	0.11	0.00
C86	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.96	0.00
C87	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.11	0.00

```
C88                    1.00   0.00  0.00  0.00  0.71  0.29  0.00  0.00  0.87  0.00
C89                    1.00   0.00  0.00  0.00  1.00  0.00  0.00  0.00  0.98  0.00
C9                    1.00   0.00  0.00  0.00  0.01  0.98  0.00  0.00  0.14  0.00
C90                    1.00   0.00  0.00  0.00  1.00  0.00  0.00  0.00  0.99  0.00
C91                    1.00   0.00  0.00  0.00  0.56  0.44  0.00  0.00  0.99  0.00
C92                    1.00   0.00  0.00  0.00  0.81  0.19  0.00  0.00  0.99  0.00
C93                    1.00   0.00  0.00  0.00  0.56  0.44  0.00  0.00  0.21  0.00
C94                    1.00   0.00  0.00  0.00  0.84  0.16  0.00  0.00  0.99  0.00
C95                    1.00   0.00  0.00  0.00  0.51  0.49  0.00  0.00  0.06  0.00
C96                    1.00   0.00  0.00  0.00  0.85  0.15  0.00  0.00  0.98  0.00
C97                    1.00   0.00  0.00  0.00  0.26  0.74  0.00  0.00  0.01  0.00
C98                    1.00   0.00  0.00  0.00  0.56  0.44  0.00  0.00  0.93  0.00
C99_1                   1.00   0.00  0.00  0.00  0.84  0.16  0.00  0.00  0.68  0.00
C99_2                   1.00   0.00  0.05  0.00  0.95  0.00  0.00  0.00  0.97  0.00

Analysis begun on:  Mon Aug 12 08:46:15 2024
Analysis ended on:  Mon Aug 12 08:46:39 2024
Total elapsed time: 00:00:24
```