

Greater Kokstad Municipality
Identification of a New Regional Landfill Site
Application for a Waste Management Licence
Draft Scoping Report

Undertaken by:

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environmental management/training since 1985

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Greater Kokstad Municipality

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1 Introduction

The Greater Kokstad Municipality (GKM) is in urgent need of a new landfill site. The current landfill, although being used, should in fact be prepared for closure as it has reached capacity. Due to the distance between Kokstad and the closest neighbouring town with a landfill, the cost of transporting waste to another town is unfeasible. GKM therefore initiated the investigation into possible new sites by appointing a team to identify possible locations for a new long-term general waste disposal site. Thekwini Geocivils and Scientific Roets Engineering Consulting Services appointed Icando to carry out the required environmental investigations. This scoping report describes the investigation process taken thus far. Although the process applied is a Waste Management Licence Application, the National Environmental Management: Waste Act (Act 59 of 2008) in Government Notice 718 published on 03 July 2009 states that any person who wishes to undertake the disposal of general waste to land covering an area in excess of 200m² is obligated to carry out an environmental impact assessment as stipulated in the National Environmental Management Act (Act 107 of 1998).

1.1 Details of EAP

This scoping report was compiled by June Lombard (MSc, Certified Environmental Assessment Practitioner, EAPSA, Registered Professional Natural Scientist) and Verusha Nadar (BSc Geography and Environmental Management). June Lombard has 24 years of experience in conducting EIAs and specialises in public participation processes, especially around waste treatment and disposal facilities. Verusha has 5 years of experience in the waste management field.

2 Description of Proposed Activity

2.1 Description of Area

GKM is a local municipality located in the southern tip of the KwaZulu-Natal province. It forms part of the Sisonke District Municipality and is also considered to be the district node and dominant commercial centre of the area. The administrative centre of GKM is Kokstad Town with other areas like Franklin, Bhongweni and Swartberg forming the other urbanised regions of the local municipality. The dominant economic activity in the municipality is agriculture



Figure 1: Locality of the Greater Kokstad Local Municipality

2.2 Project Description and Background

The Greater Kokstad Municipality is responsible for providing adequate waste disposal facilities for the area. Although GKM identified that the existing landfill near Shayamoya needed to be closed, the establishment of a new landfill to replace the Shayamoya site was a challenge. Capital expenses for the rehabilitation of the old site and identification of a new one is costly and both are processes that are governed by national legislation which means they require adequate time to undergo the obligatory phases.

In accordance with the National Environmental Management: Waste Act, 2008 (No. 59 of 2008), a Waste Management Licence (WML) Application must be carried out for each site. The construction of landfill sites which will cover an areas greater than 200m² falls under Category B of the listed waste management activities that have or are likely to have a detrimental effect on the environment, published in Government Notice No. 718 of July 2009. This process requires a full Scoping and EIA Process. The closure of an existing landfill falls under a Category A activity which requires a Basic Assessment Process. The Project Team decided to run both processes concurrently and combine certain steps, for example a Public Participation meeting to inform people of the closure of the old site and identification of a new one was held at the same time to save on both time and cost.

2.3 Need and Desirability

Current disposal systems and facilities in the Greater Kokstad Region urgently need to be upgraded. The current waste disposal site located near Shayamoya has to be rehabilitated and closed as it has reached full capacity, having been used since the mid 1980's. The site itself was not run at the level of a sanitary landfill as it was not permitted and had issues with leachate, odour and wind scattered waste. The closest neighbouring landfill is located in Harding in uMuziwabantu Local Municipality which is approximately 60km away. Due to costs associated with hauling waste over these types of distances GKM Council decided to identify and develop a new general waste disposal site that would cater for the waste management needs of the area.

2.4 Dimensions and Capacity of site

The Local Municipalities have not kept records of waste quantities so accurate figures are not available. However, Thekwini GeoCivils and Scientific Roets, in their closure design for the Shayamoya site, estimated that the current rate of deposition at the Shayamoya site was around 30 tonnes/day in 2011. This amounts to approximately 900 tonnes/month.

To ensure that the site has a long-term purpose, a medium-sized landfill is proposed for the region. According to the Minimum Requirements for Waste Disposal by Landfill, Second Edition, 1998, a medium sized landfill site would have the capacity to accept up to 500 tonnes of waste per day. However the expected rate of deposition should be far below this figure. The landfill, if correctly managed should have a lifespan of fifty years, assuming an approximate airspace capacity of approximately 3,4 million m³.

2.5 Role Players and Roles

The regulating authority is the KZN Department of Agriculture and Environmental Affairs (DAEA) who will ultimately make the decision on whether the activity should proceed. They will also decide on whether the proposed mitigation measures will be adequate and effective to ensure minimal impact on the environment and surrounding communities. In the case of an approval, the department will issue a Waste Licence which will detail requirements and conditions which the Licence Holder must abide by.

There will be other parties that will be involved during the process. The Department of Water Affairs (DWA) will provide potential requirements with regard to protecting water resources. DWA is also required to issue a Record of Decision approving the licence. KZN Ezemvelo

Wildlife will be consulted on the potential sites that are in areas where biodiversity must be protected. Likewise, Amafa will advise on areas of historical or cultural significance. Any issues relating to these issues will be raised by these organisations.

Other registered I&APs include Farmer's Associations, Environmental NGOs and Local Residents. These I&APs will be kept informed and of the process and be provided with opportunities to view and comment on all documentation regarding the project.

3 Alternative Sites

3.1 Preliminary Locality Screening and Ranking

The initial investigations for potential sites were carried out by Thekwini GeoCivils and Scientific Roets. There were a limited number of places that the team could investigate as the areas have to be suitable in terms of geology, available airspace, topography and distance to the greatest generator of waste – in this case the town of Kokstad.

Another major factor that was considered was land ownership. The potential candidate sites needed to be located on municipal owned land or by an owner who would be willing to enter into negotiations for the sale of their land. The land must also be clear of land claims as any land claim would make land owner negotiations next to impossible. It was during this exercise that the team identified seven potential candidate sites. (See Appendix 1 for locality map). Three of the potential candidate sites were located on municipal-owned land which would offer a distinct advantage in for GKM since buying or leasing land would increase development costs.

In order to assess site suitability and narrow the options down for further investigation, a desktop site ranking exercise was carried out. The objective of site ranking is to list the sites according to their suitability in terms of economic, social and biophysical aspects. Out of the preliminary ranking exercise, three alternatives came out as the most suitable. These were Sites 1, 2 and 5 – all located on municipal-owned land. See table 1.

Table 1: Ranking of potential sites for GKM.

Screening Criteria	1 Kranzfontein Farm 1	2 Kranzfontein Farm 2	3 Kommetjes Fontein	4 Glenthorn	5 Kranzfontein Farm 3	6 Koppieskraal	7 Pieterse Farm
Geology	0	0	-1	-1	1	0	0
Access	0	-1	-1	1	-1	0	1
Airspace	0	0	0	-1	0	0	0
Distance from Generating Area	1	1	-1	0	1	1	0
Stormwater	0	0	-1	0	1	1	-1
Land Ownership	1	1	-1	0	1	-1	0
Groundwater Impact	0	0	-1	1	-1	1	0
Buffer Area	1	1	0	-1	-1	0	0
Visual Impact	0	0	0	-1	-1	-1	-1
TOTAL	+3	+2	-6	-2	0	-1	-1
Prelim Ranking	Suitable	Suitable			Acceptable		

3.2 Identification of preferred option and preliminary investigations

The preferred sites that came out of the site ranking exercise were located on Kranzfontein Farm, owned by the Municipality. Site visits were carried out for each of the sites identified as potentially suitable during the desktop ranking exercise and public participation was also initiated. Preliminary investigations which consisted of surveys, assessments and site visits were conducted after the desktop ranking exercise. The purpose of these preliminary studies were to test the suitability of the preferred candidate site before the more costly detailed investigations could be carried out.

3.2.1 Preferred candidate site

The desktop ranking exercise came out strongly with Site 1 located on Kranzfontein Farm as the preferred candidate site. The engineering team therefore initiated further preliminary investigations and stakeholder engagement around Site 1.

3.2.1.1 Site visits

Several site visits were held during the Scoping Phase in order to familiarise I&APs with the potential candidate sites. I&APs were invited to visit the preferred candidate site on the day of the public meeting held on 29 August 2011. The attendance register of those who attended has been included as Appendix 2. The project team proceeded with preliminary investigations and it during the course of the studies that the authorities were further invited to another site visit to the preferred candidate site which was held on 28 August 2012. The preliminary investigations will be discussed in below.



Figure 2. View upslope of proposed Site 1



Figure 3. Site 1 looking towards Bhongweni Township

3.2.1.2 Geotechnical investigations

The site desktop ranking exercise rated Site 1 as the strongest candidate in terms of environmental and socio-economic factors. The engineering team commissioned a preliminary geotechnical survey by Drennan Maud & Partners to determine the site suitability and to also confirm the viability of the proposed footprint for the landfill site itself. Although the results of the geotechnical survey were generally favourable, the survey identified a permanent subsoil seepage area within the initial proposed landfill footprint area. Drennan Maud & Partners suggest that this area could “*represent a spring utilising a fracture zone along the dolerite / shale contact zone in this area as a preferential flow path*”. As such, no development would be allowed in that area and the proposed landfill footprint was adjusted accordingly. The full geotechnical report has been attached as Appendix 3.

3.2.1.3 Heritage survey

The geotechnical survey as discussed earlier identified a permanent subsoil seepage area within the proposed landfill footprint. This led the engineering team to adjust the proposed footprint of the landfill north-west of the originally preferred alignment. However, this adjustment now meant that a derelict kraal structure located on the farm that would have previously not been impacted now fell within the new proposed landfill footprint. The structure looked to be more than thirty years old and could be of historical importance which led to the commissioning of a heritage survey. The survey found two kraal structures. The first, KTF01, may be part of the original farm buildings located on Kranzfontein Farm. As such, a deeds search and historical architectural assessment, together with a permit would be required to destroy the kraal. The heritage

specialist recommended that an architect historian be appointed to conduct the deeds search as well as provide an assessment of the ruins. Accordingly, the GKM has approved the appointment of the historian to carry out the necessary work which will be done within the next few weeks.



Figure . Main view of Kraal KTF01 (Photo: G. Anderson)

The second structure, KTF02, was located approximately 60m north of the existing dirt road and was rated as low in significance by the heritage specialist. However, it was flagged with the intention of identifying that although low in significance, it should not be destroyed unnecessarily and its location should be noted for future road widening.



Figure . Kraal KTF02 (Photo: G. Anderson)

In addition to the stone kraal structures, the heritage specialist also noted that the geology of the area, the Adelaide Subgroup, is “highly productive” in terms of paleontological fossil finds. The specialist therefore recommended that a qualified Palaeontologist be on site to complete further assessments when all areas underlain by rocks of the Adelaide Subgroup are excavated.

3.3 No Development Option

The 'No Development' option implies that the proposed development will not be undertaken. This would mean that Greater Kokstad Municipality would have to build a transfer station and haul waste to another region for disposal as the current Shayamoya landfill is due for imminent closure. The 'No Development' option is not a realistic or viable option as the region urgently requires a local disposal facility.

4 Legal Framework

The project will follow the process prescribed by the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) and regulations.

Other relevant pieces of legislation related to the proposed landfill site include the following:

- The SA Constitution
- National Environmental Management Act (Act 107 of 1998)
- National Water Act (Act 36 of 1998.)
- National Road Traffic Act (Act 29 of 1989)
- Occupational Health and Safety Act (Act 85 of 1993)

4.1 The Constitution

The Constitution (Act 108 of 1996) makes provision for the protection of the environment and the right of people to an environment that is not harmful to human health and well being. A number of sections in the Constitution also deal with public participation, which is an essential component of the Waste Management Licence process, while others deal with issues that either directly or indirectly support public interaction with government. The Constitution also stresses the principles of accountability, transparency and openness, which have relevance for public participation.

4.2 NEM Waste Act (NEMWA)

Since the 1st July 2009, the NEM Waste Act (Act 59 of 2008) has become effective. This essentially means that a new licensing procedure must be followed. The proposed project is a Category B Activity listed in Government Notice No. 718 of 03 July 2009, in terms of the NEM: Waste Act. The activities are described as follows:-

4 (10). "The disposal of general waste to land covering an area in excess of 200m²."

and

4 (11). "The construction of facilities for activities listed in Category B of this Schedule (not in isolation for associated activity)"

A materials recovery facility may also be established on site so that recyclable material coming into the landfill could be recovered from the general waste stream. The project then triggers a Category A Activity in terms of Government Notice No. 718 of 03 July 2009, in terms of the NEM: Waste Act.

3 (5) "The sorting, shredding, grinding or bailing of general waste at a facility that has the capacity to process in excess of one ton of general waste per day."

A Category B of GN No. 718 of 03 July 2009 of the NEM: Waste Act states that:-

"Any person who wishes to commence, undertake or conduct an activity listed under this Category, must conduct an environmental impact assessment process, as stipulated in the environmental impact assessment regulations made under section 24(5) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) as part a waste management licence application."

The licensing of a waste management activity requires the applicant to follow a similar process to that stipulated under the EIA regulations.

4.3 The National Environmental Management Act (NEMA)

The NEMA (Act 107 of 1998), which is the overarching framework for environmental management in South Africa, requires that development be environmentally sustainable. It requires that EIAs be undertaken to ensure that:

- Ecosystem disturbance and pollution are minimised or remedied;
- Waste is avoided or minimised and disposed of responsibly;
- Negative impacts on people and their environmental rights be prevented, minimised or mitigated;
- The precautionary principle is adopted.
- The provision for sufficient and transparent information on an ongoing basis to stakeholders to enable them to comment on the process.

Essentially the EIA process seeks to assess both positive and negative impacts of alternatives for a proposed activity on the social, economic and biophysical components of the receiving environment. It serves to inform authorities and proponents of the best practicable environmental alternative.

This application will follow the Scoping and Environmental Impact Assessment process as laid out in the NEMA Regulations promulgated in 2006.

4.4 The Scoping Phase

The scoping phase serves to introduce the proposed project to the relevant authorities and the general public through the public participation process, during which both the authorities and Interested and Affected Parties (I&APs) raise any issues and concerns they may have about the proposed activity. The scoping phase further identifies alternatives to the proposed development, which can be weighed against each other in order to determine the best practicable environmental option. The objectives of the scoping phase in this study are to:

- Identify and investigate alternative sites for the location of the landfill site.
- Investigate and formulate, where necessary, applicable mechanisms and processes to mitigate and or eliminate anticipated biophysical and social impacts arising from the establishment and operation of the landfill site.
- Identify, inform and empower a broad range of stakeholders of the proposed activity to ensure active participation of all key stakeholders in the decision-making process.
- Develop a plan of study for environmental impact assessment which sets out the tasks that will be undertaken as part of the environmental impact assessment process, the stages at which the competent authority will be consulted, a description of the

proposed method of assessing the environmental issues and alternatives, and particular of the public participation process that will be conducted.

A scoping report compiled in terms of GNR 385 of April 2006 28(f) is submitted to the competent authority at the end of the scoping phase.

4.5 The EIA phase

Once the scoping report has been accepted, the competent authority advises the environmental practitioner to proceed with the tasks contemplated in the plan of study for environmental impact assessment.

These tasks are then carried out and an environmental impact assessment report is prepared for submission to the competent authority.

The EIA report would include the following information:

- Detailed descriptions of the proposed activity
- A description of the environment that may be affected by the activity, including physical, biological, social, economic and cultural aspects
- Details of the public participation process undertaken
- A description of the need and desirability of the proposed activity, including alternatives
- A description of the methodology used in determining the significance of potential impacts and an assessment of the potential impacts identified
- A summary of findings and recommendations of any specialist reports
- A draft environmental management plan.

4.6 Waste Management Licence Application

The EIA process forms the basis of the application for a Waste Management Licence (WML). However, as stated earlier, this category of activity requires that the EIA is carried out as part of the WML process. Information that is required as part of the WML includes additional details of expected waste stream and quantities, information on the competence of an applicant to operate a site, financial plans for environmental monitoring, provision and replacement of infrastructure and restoration and aftercare of the site, landfill design details and parameters and site operational plan, amongst others. The application for a WML will be completed and submitted with the final EIA report.

5 Discussion of Environmental Issues and Potential Impacts

5.1 Biophysical impacts

5.1.1 Destruction of flora and fauna

The areas concerned are all disturbed by human use most notably, agricultural activity but vegetation would need to be cleared to make way for the landfill site. A biodiversity study would have to be undertaken to determine if the ecological sensitivity of the area and expected effect on flora and fauna.

5.1.2 Contamination of surface and groundwater

Protection of surface and groundwater sources is a high priority in cases of landfill site development. The impact of leachate generation is mitigated through proper landfill siting, design and operation. Even in an area where leachate is generated sporadically, the potential to contaminate water sources is reduced if these factors are properly addressed.

5.1.3 Generation of landfill gas

Landfill sites produce landfill gas which is a mixture of methane (CH₄) and carbon dioxide (CO₂). The generation of these gases depends on climatic conditions and the amount and type of waste that is deposited on the landfill site. Generally, the higher the organic content in waste the higher landfill gas yield. In this case, the majority of the waste will be general municipal waste with a relatively high proportion of organic wastes.

5.1.4 Invasion of alien species

Clearing of vegetation, excavation and stockpiling during construction presents an opportunity for alien species invasion into disturbed areas.

5.1.5 Soil erosion

Soil erosion is always a potential impact in most construction operations where there is vegetation clearing and exposed, bare soils

5.1.6 Illegal Dumping

A landfill site is intended to be a controlled operation for the safe disposal of waste, however, there are cases where illegal dumping on sites have become a problem. This is usually a result of inadequate security measures and it could lead to dumping of hazardous wastes that are not allowed in a general waste site.

5.1.7 Vermin and disease vectors

Landfill sites are known to attract vermin like flies and rodents which increase risk to the health and well-being of people living in the vicinity.

5.1.8 Burning of waste

Fires on landfill sites are still common on many waste disposal sites and often used to decrease the volume of waste. Burning of waste has potentially negative effects on human health and causes air pollution and odours.

5.2 Socio-economic impacts

5.2.1 Odour and wind scatter

Landfill gas is known to be malodorous and potentially explosive. Odour is one of the impacts that most people find to be objectionable. Wind scatter, usually from unmanaged sites, also causes negative visual impacts.

5.2.2 Loss of “sense of place”

The change in landuse will alter the present landscape with possible negative visual impacts and a decrease in the aesthetic value of the area.

5.2.3 Decrease in land value

The potential of decreasing land value is often raised as a concern by neighbouring residents.

5.3 Specialist involvement

5.4 Summary of Impacts

The key issues and impacts associated with the proposed landfill site are described and assessed in Table 2. The nature of the anticipated impacts was assessed in terms of their respective intensity, extent, duration, probability and significance.

- Extent of Impacts can be classified as:
 - Local, extending only as far as the activity itself.
 - Limited to the site and the immediate surrounding areas.
 - Having an impact on a regional, national and international scale.
- Duration of Impacts are divided into:

- Short to medium term effects (i.e. only during the active phase).
- Long term effects (extending to closure of the activity and beyond).
- Impacts can have varying intensities:
 - Low (natural/cultural/social functions are not affected).
 - Medium (natural/cultural/social function or processes continue but are modified).
 - High (functions and processes are temporarily or permanently altered).
- The likelihood/probability of impacts are classified as:
 - Improbable
 - Probable
 - Highly probable
 - Definite
- The significance of impacts can be classified as:
 - Low (no influence on the decision to authorise the site).
 - Medium (unless mitigated against, it will affect the decision).
 - High (the impact will affect the decision regardless of any mitigation measures).

Table 2: Summary of intensity and duration of potential impacts.

POTENTIAL IMPACTS	NATURE OF IMPACT	PHASE WHEN RELEVANT	EXTENT OF IMPACTS	DURATION OF IMPACTS	INTENSITY OF IMPACTS	PROBABILITY OF IMPACTS	SIGNIFICANCE OF IMPACTS
Destruction of fauna and flora	Destruction of flora and fauna may <ul style="list-style-type: none"> • Decrease habitat and species diversity • Limit species migration 	Construction Post-construction	Local	Short-medium	Low	Probable	Low (negative)
Alien species invasion	Alien species invasion in areas where there is stockpiling or clearing of vegetation.	Construction	Local	Short-medium	Low	Probable	Low (negative)
Soil erosion	Potential soil erosion from areas where vegetation has been cleared.	Construction	Local	Short term	Low	Probable	Low (negative)
Soil and water contamination	<ul style="list-style-type: none"> • Oil spills and other leakages could result in contamination of the soil and water during construction. 	Construction Post-construction	Local	Medium term	High	Low	High (negative)
	<ul style="list-style-type: none"> • Contamination of soil and water sources from leachate. 	Operational	Regional	Long term	High	Probable	High (negative)
Air pollution	Dust from stock piles or vehicle movement and emissions from machinery and vehicles used during construction	Construction	Limited	Short term	Low	Probable	Low (negative)
	Emissions in the form of methane (CH ₄) and carbon dioxide (CO ₂)	Operational	Limited	Long term	Medium	Probable	Medium (negative)

POTENTIAL IMPACTS	NATURE OF IMPACT	PHASE WHEN RELEVANT	EXTENT OF IMPACTS	DURATION OF IMPACTS	INTENSITY OF IMPACTS	PROBABILITY OF IMPACTS	SIGNIFICANCE OF IMPACTS
Noise, dust and visual impacts	Dust from stock piles or vehicle movement and the attendant noise impacts.	Construction	Local	Short term	Low	Probable	Low (negative)
Litter and wind scatter	Unmanaged waste produced during the construction phase could result in wind scatter which has visual impacts.	Construction	Local	Short term	Low	Probable	Low (negative)
	If the landfill is not managed properly i.e. daily covering and compacting of waste, wind scatter would be a problem.	Operational	Limited	Long term	Low	Probable	Medium (negative)
Odour	Traces of volatile organic compounds (VOCs), responsible for odours is found in landfill gas.	Ongoing	Limited	Long term	High	Definite	High (negative)
Vermin and disease vectors	Landfill sites attract vermin and disease vectors, especially when the landfill is not managed properly.	Operational	Limited	Long term	Medium	Probable	Medium (negative)
Illegal dumping	Inadequate security on site could result in the site being used for illegal dumping.	Operational	Local	Long term	Medium	Low	Medium (negative)
Burning of waste	Improper management of a landfill site can lead to fires developing.	Operational	Limited	Short term	Medium	Low	Medium (negative)

5.5 Mitigation of impacts

Table 3 below summarises possible mitigation measures which can be implemented to reduce the negative impacts of a landfill site.

Table 3: Possible mitigation measures

Phase	Impact	Mitigation Measure
	Biophysical	
Construction Phase	Destruction of fauna and flora during construction phase	The construction phase to be managed according to the EMP, including vegetation/tree clearing only as approved by the Engineer, no gathering of firewood, fruit or other natural material, no hunting or trapping.
	Alien species invasion following construction	Immediate top soiling and re-vegetation with grass species indigenous to the area, with removal of alien plant species.
	Soil erosion during construction phase	Covering of loose soil, construction of temporary cut off drains and berms to capture storm water, stockpiles of soil to be stored so as to minimise erosion, top soiling and re-vegetation immediately following construction.
	Soil and water contamination during construction.	Hazardous storage area bunded with impermeable liner, any spills cleaned up and safely disposed of immediately, no washing of equipment and/or vehicles within the construction area.
Operational Phase	Contamination of water sources during operational phase.	Landfill design to include appropriate liner and drainage systems to capture and contain leachate and stormwater. Groundwater monitoring boreholes to be placed around landfill (including upstream and downstream of the site) to check for contamination.
	Air pollution during construction phase	Vehicles and machinery to be in good working condition to avoid excessive emissions, no fires on site, dust control measures to be implemented.
	Air pollution during operational phase	Emissions from the landfill site will be managed appropriately. Engineers will incorporate necessary design measures to manage landfill gas. Would most likely be a passive venting system. Monitoring of landfill gas through the network of boreholes will also provide information on the levels of LFG being generated. If required a flare could be installed to flare off excess gas.
Decommissioning and closure	Contamination of ground and surface water from leachate	Site will be capped once closed which will effectively seal the landfill from rainfall. Generation of leachate is increased when water is allowed to filter through the waste. Actual leachate volumes will therefore decrease over time. Leachate collection system will be in place to capture leachate that is generated.
	Air pollution from landfill gas	Post closure monitoring will ensure that landfill gas is monitored on a regular basis. A flare would be installed if deemed necessary.
	Odours from movement of waste	Closure process will involve some movement of waste during the final shaping of the site. this will be limited to the closure phase and once the site is lined and capped

Phase	Impact	Mitigation Measure
		there should be no significant odour impacts.
	Socio-economic	
Construction Phase	Noise, dust and visual impacts during construction	Vehicles and machinery to be in good working order and to be fitted with silencers, vehicles to keep to a speed limit of 30km/h, dust control measures to be implemented, site to be kept tidy, storage structures to be located to minimise unsightly visual impacts.
	Litter and wind scatter during construction	Bins and/or skips to be provided for litter, all litter to be collected within the construction area daily, no burning of waste allowed, no washing of equipment or vehicles within the construction area
Operational Phase	Odour	Site must be managed properly, waste must be covered and compacted on a daily basis which will minimise the impact of odours. If the site yields a high amount of LFG, a flare should be installed to deal with excess gas.
	Litter and wind scatter during operational phase	Good management practices will decrease the likelihood of this happening. Waste must be compacted and covered on a daily basis. Waste should not be deposited anywhere on site, the working surface must be restricted to one area at any given time.
	Loss of "sense of place" and impact on aesthetics	Proper landfill management is required to reduce the impact on the aesthetics of the area. Use of berms and planting of trees around the buffer zone will also assist with visual impact.
	Land value	Proper landfill management and ongoing maintenance would decrease the risk of negative impacts on neighbouring properties.

6 Details of Public Participation Process

The first round of Public Participation was undertaken towards the beginning of the project so that issues could be screened and identified as early as possible. The project team were advised by municipal officials to ensure that potential stakeholders known to GKM were included in the process. It was at this time that we were also advised of the Kransdraai Farm Committee which consisted of a group of community members living adjacent to the Kranzfontein Farm identified as a potential site. The Farm Committee were using the land for grazing purposes in an understanding with the municipality but were not the legal owners.

The project team attempted to meet with the Kransdraai Farm Committee Chairperson prior to the public meeting however, despite confirming his availability and numerous attempts to get hold of him, the meeting never materialised.

However, the Deputy Chair of the Kraansdraai Committee did attend the scheduled public participation meeting held on 29 August 2011. It was during the meeting that the perceived understanding of land use and ownership were made apparent. It became clear that the issue of

land use and ownership needed to be clarified and worked out between the parties involved as the project team could not get hold of any signed agreement or document that stated this unequivocally.

The Municipality undertook to resolve the land use issue with the community in an internal process which the project team was not involved with and responded with a letter that affirmed the Municipality's support of the project as well confirmed the ownership and availability of the land for development.

Further public participation will be held during the EIA phase. It is expected that more interest in the project will develop as the project becomes site specific.

6.1 Steps to notify potential I&APs

6.1.1 Adverts and Notices

Advertisements were placed in English and Xhosa in local newspapers which informed the public about the initiation of the project and announced the dates and locations of the first round of public meetings. Newspapers were chosen based on region and language preferences in the areas. An English advertisement was placed in the Kokstad Advertiser and a Xhosa one was placed in the East Griqualand Fever (See Appendix 2a). A database of I&APs was compiled and is continually updated for the process.

6.1.2 Background Information Document

A Background Information Document was circulated to I&APs during the scoping phase (Appendix 2b). The BID provided a description of the proposed project and contact details of the EAP so that individuals and organisations could register as Interested and Affected Parties.

6.1.3 Summary of Issues

The issues that came out of the public participation process thus far have not revealed any contentious issues or very negative attitudes towards the project. This might change as the project moves forward into the EIA phase and focus groups begin over the preferred alternative. See Appendix 2c for comments and responses received on the project.

7 Plan of Study for Environmental Impact Assessment

7.1 Tasks that will be undertaken as part of the EIA process

7.1.1 Assessment of Impacts associated with alternate sites and no-development option

Site specific issues will be identified and impacts will be assessed.

7.1.2 Communication of information to I&APs with opportunities for their comment

The methods of disseminating information to I&APs is given in section 7.3 below.

7.1.3 Conduct specialist studies that may be required

The type and amount of specialist studies undertaken would depend on site specific factors. For example, a disturbed agricultural area may not require a biodiversity study.

7.1.3.1 Surface and ground water studies

All geohydrological data and factors affecting groundwater sources must be identified. This usually includes a survey of boreholes within one kilometre from the proposed site to determine the strategic or community value of the water resource. Information on aquifers must be obtained. Boreholes will be drilled to gather necessary information.

Surface water quality tests should be undertaken to determine the quality of water prior to landfill development to provide baseline data that would be needed in future

7.1.3.2 Biodiversity study

If required, a biodiversity will be undertaken to determine vegetation present and identify any sensitive areas.

7.1.3.3 Soils

The quantity and quality of soil on site must be determined. Test-pits may be dug to gather information. Boreholes that have been drilled will also assist to supplement information on soils. Soil permeability may also be tested to determine if it suitable for use as a base layer or cover material.

7.1.3.4 Air quality

Air quality studies to determine the impact the landfill may have on air quality. Odours can sometimes be spread wider than expected due to certain weather conditions such as temperature inversion.

7.1.3.5 Historical Architecture Impact

The remains of a stone kraal on the site which came out with the highest ranking after the desktop ranking exercise led the project team to consider the heritage impact of the site quite early on in the project (See section 3.2.1.3). Due to the fact that the kraal could be considered of historical importance, a heritage survey was commissioned in order to determine whether the site could still be considered for development. The heritage survey concluded that a historical architectural specialist needs to conduct an assessment of the kraal and a deeds search to determine if it is older than 60 years old. If so, a permit for destruction would need to be applied for from Amafa. The full report of the heritage specialist is attached in Appendix 3.

7.1.4 Prepare EIA report and distribute for comment

The EIA report, with the necessary specialist studies, will also contain a draft EMPr.

7.1.5 Prepare draft EMPr to include in EIA report

An EMP will be drafted and will include the following:-

- Overview of the proposed activity and the local context
- Summary of impacts associated with the proposed activity
- Proponent's environmental management policies and commitments
- Institutional arrangements: roles and responsibilities
- Legal requirements
- Management actions
- Roles and responsibilities
- Monitoring
- Performance specifications
- Implementation schedule
- Remedial actions
- Training and capacity building
- Documentation and record keeping
- Reporting procedures
- Stakeholder engagement
- Auditing
- Responding to non-compliance
- Management review and revision of the EMPr.

The EMPr will be finalized to incorporate the conditions of the waste management licence

stipulated by the authorities.

7.2 Stages at which the competent authority will be consulted

- The competent authority will be consulted at the commencement of the EIA/WML phase should any aspects of the next phase not be clear and at any time during the process should guidance be needed. They will be included in the public participation process.
- The consultants will also liaise with authorities when specialist studies are being undertaken, should consultation be beneficial.
- The EIA will be submitted to DAEA for consideration once public comment has been received.

7.3 Particulars of the public participation process that will be conducted during the EIA process

- A circular updating I&APs on the status of the EIA process will be sent to all registered I&APs and the relevant authorities, including Ward Councillors and Ward Forums/Ratepayers Associations.
- Adjacent landowners to specific site/s will be contacted and informed in writing of proposed development and given an opportunity to comment.
- Further meetings may be held with individual property owners or stakeholder groupings as needed.
- I&APs will be invited to comment on the draft EIA report before submission to DAEA.

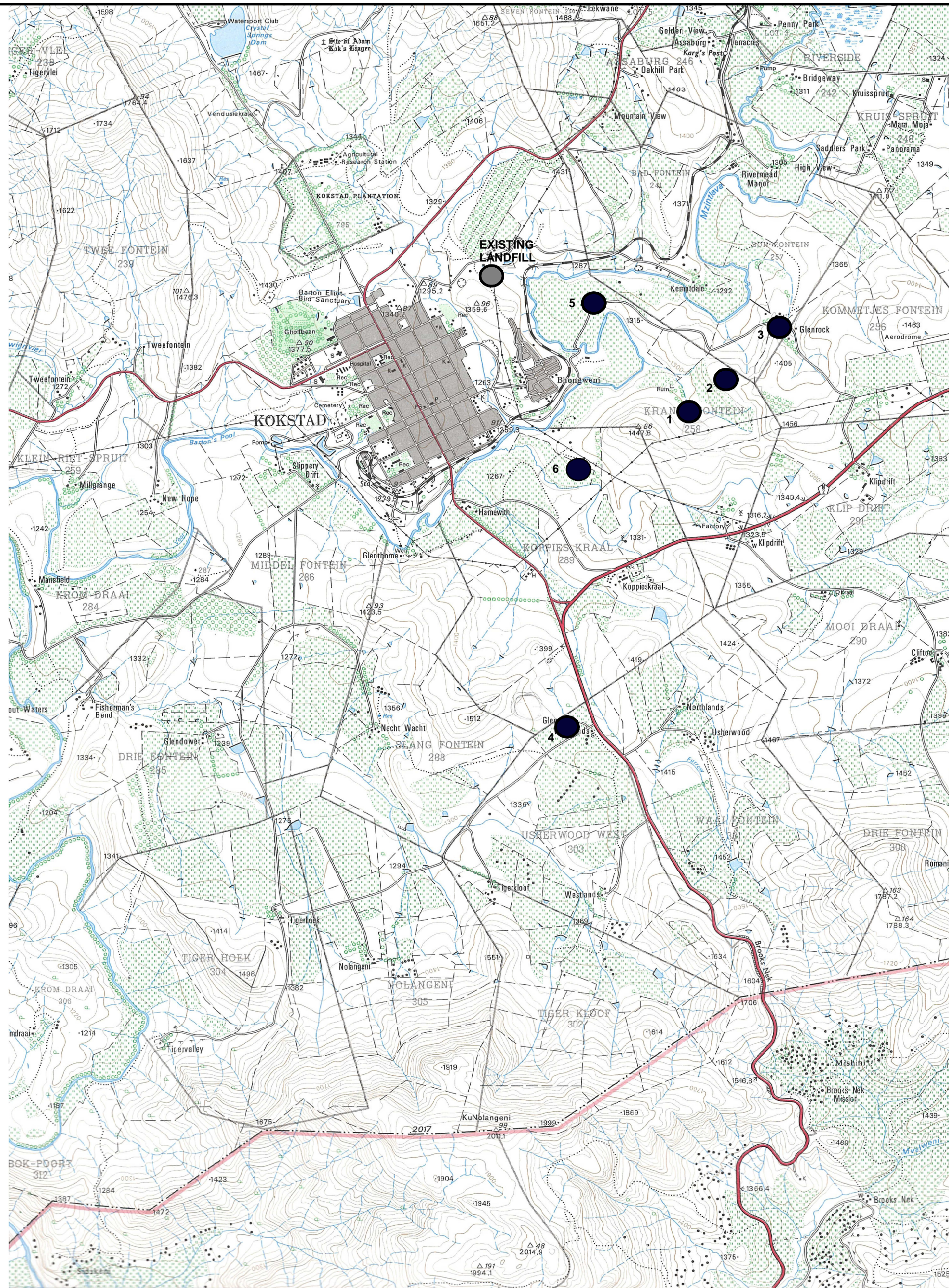
8 Conclusion and recommendations

The ranking exercise showed that the three sites which appear to be the most suitable are Site 1, Site 2 and Site 5. The preliminary investigations show that Sites 1 and 2 are strong candidate sites for the new Kokstad Landfill. The engineering team have already begun preliminary geotechnical investigations and heritage surveys for the preferred site, Site 1.

It is therefore recommended that the detailed investigations continue to proceed for Site 1 with additional investigations for Site 2 to be conducted if a fatal flaw is detected during the investigations for Site 1.

APPENDIX 1: LOCALITY MAP OF ALTERNATIVES SITES

DRAFT



SITE PLAN
1:50 000

KEY

- EXISTING LANDFILL.
- 1 SITE 1 - KRANZ FONTEIN FARM
- 2 SITE 2 - KRANZ FONTEIN FARM
- 3 SITE 3 - KOMMETJES & FONTEIN
- 4 SITE 4 - GLENTHOM
- 5 SITE 5 - KRANZ FONTEIN FARM

DRAWING REFERENCE			
DRAWING NO.	TITLE		
<p style="text-align: center;">NORTH POINT</p>			
NOTES			
NO.	AMENDMENT	APPROVED	DATE
REVISIONS			
CLIENT GREATER KOKSTAD MUNICIPALITY			
THEKWINI GEOCIVILS cc Geotechnical & Civil Engineers Waste Disposal Consultants & Project Managers			
JOINT VENTURE			
Suite 6 4 The Crescent Westway Office Park Westville 3611 Telephone 265-1777		P.O. Box 446 PAVILION 3611 Telefax 265-2727 tgc@tgcengineers.co.za	
		Scientific Roets (PTY) Ltd 96 Hope Street, Kokstad, 4700 PO Box 461, Kokstad, 4700 Tel / Fax: +27 39 727 1515 Cell: 083 265 2652 adriaan@scientificroets.com	
PROJECT NEW LANDFILL SITES			
TITLE CANDIDATE SITES			
CONSULTING ENGINEER		DESIGNED : G.P.	
SIGNATURE:.....		DRAWN : K.M.	
PR. NO.:.....		CHECKED : G.P.	
DATE:.....		SCALE : 1:50 000	
		DATE : MAY 2011	
REFERENCE NO. 50905		FIGURE NO. 1	REVISION

APPENDIX 2: DETAILS OF PUBLIC PARTICIPATION

2a Adverts and Notices

2b BID and Comment Forms

2c Minutes

2d Stakeholder lists

DRAFT

19 August 2011

**NOTICE OF ENVIRONMENTAL IMPACT
ASSESSMENT / WASTE LICENCE
APPLICATION FOR CLOSURE OF EXISTING
LANDFILL SITE AND IDENTIFICATION OF NEW
LANDFILL SITE IN KOKSTAD**

PUBLIC MEETING

Notice is given in terms of Regulation 54 (2) of the regulations published in GNR 543 of the NEMA EIA regulations of 2010, under Sections 24(2)(a) and (d) of the National Environmental Management Act (Act 107 of 1998) and GNR 718 of the National Environmental Management Waste Act (Act 59 of 2008), of the intention to establish a new landfill site.

Project details: The Greater Kokstad Municipality is in the process of initiating the closure of the existing Kokstad Landfill and the identification of a new landfill that will serve the waste management needs of the municipality. Candidate sites for the new landfill are in the process of being identified. A public meeting will be held to discuss the proposed project and allow any interested and affected parties to become involved. The proposed activity requires a waste management licence and an application subject to an environmental impact assessment process. All interested and affected parties are invited to register with Icando (contact details below).

A Public Meeting will be held as follows:

Date: 29 August 2011

Time: 15h00

Venue: Community Hall, Kokstad

Further information: If you would like to obtain further information about the process or to be identified as an interested and affected party please contact the consultants via email, post or fax within 14 days of the publication. A background information document is also available on request. Waste Management Licence numbers are being obtained from KZN Department of Agriculture, Environmental Affairs and Rural Development.

Verusha Nadar

Icando

P.O. Box 115, Link Hills, 3652

Tel: 031-7633 760; Fax: 031-7633 664

Email: verusha@icando.co.za

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PHONE: 039 727 4301

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42 SPECIAL CONSENT

IN THE MAGISTRATE'S COURT FOR THE DISTRICT OF MOUNT CURRIE HELD AT KOKSTAD

Case No. 808/09
In the matter between
SHERWOOD PUMPS CC
Plaintiff
and
ROBIN SHOESMITH
First Defendant
JUSTIN SHOESMITH
Second Defendant

SALE IN EXECUTION

IN PURSUANCE of a Judgment in the Court of the Magistrate of PIETERMARITZBURG and a Writ of Execution, the good listed hereunder will be sold in execution on **FRIDAY, 26th AUGUST 2011 at 9:30am** at the **LOCK-SLEIGH FARM, KARGES POST, KOKSTAD** to the highest bidder:-
1 X FORD TRACTOR 3000
1 X 4X4 TRACTOR DANMAR
1 X BIG SITE OFFICE CONTAINER (4 WINDOWS)
NB: The sale is for cash or bank guaranteed cheque only.
DATED AT PIETERMARITZBURG ON THIS 11th DAY OF AUGUST 2011
EXECUTION CREDITOR'S ATTORNEY JASAT & JASAT ATTORNEYS
18 Prince Edward Street PIETERMARITZBURG, TEL: 033 3420191 REF: 05: 5350-003:NRK

42 SPECIAL CONSENT

IN THE MAGISTRATE'S COURT FOR THE DISTRICT OF MOUNT CURRIE HELD AT KOKSTAD

Case No. 438/09
In the matter between
SHERWOOD PUMPS CC
Plaintiff
and
AVAX SA 204 Cc/a JA CONSULTANTS WASH
Defendant

SALE IN EXECUTION

IN PURSUANCE of a Judgment in the Court of the Magistrate of PIETERMARITZBURG and a Writ of Execution, the good listed hereunder will be sold in execution on **FRIDAY, 26th AUGUST 2011 at 9:30am** at the **LOCK-SLEIGH FARM, KARGES POST, KOKSTAD** to the highest bidder:-
1 X FOG 4 HOIST MACHINE
1 X MORELY 3 PHASE INDUCTION MOTOR, EN 60034 MACHINE
1 X MCM STANTET, BRMSON ELECRISK A
NB: The sale is for cash or bank guaranteed cheque only.
DATED AT PIETERMARITZBURG ON THIS 11th DAY OF AUGUST 2011
EXECUTION CREDITOR'S ATTORNEY JASAT & JASAT ATTORNEYS
18 Prince Edward Street PIETERMARITZBURG, TEL: 033 3420191 REF: 05: 5350-003:NRK

42 THANK YOU

The family of the late **Sibusiso Masinyane** would like to thank the following SAPS, RTL GKM, East Griqualand community & surrounding areas for their love, support and prayers through our time of sorrow.
From the Masinyane Family

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JP - 28.05.10

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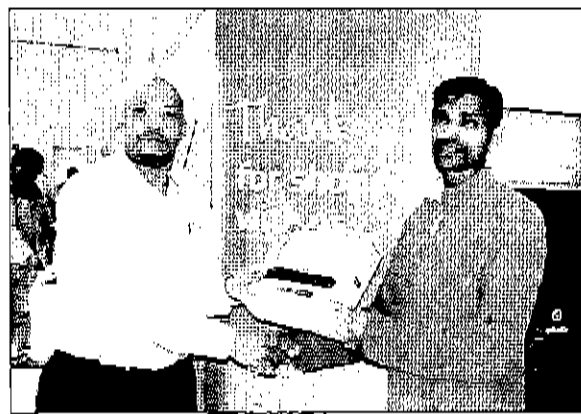
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Ardeep Ramsaram also receives a DVD player from Pick N Pay Store Manager Patrick Nkwanyana after he successfully entered the competition.



Nonkuthazo Kumbaca receiving DVD player from Store Manager Patrick Nkwanyana.

Rose Ndela happily receives a R1000 pension grocery from one of the Pick N Pay manager Clifford Pillay

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INHLANGANISO YOLUNTU

Esi saziso sikhutshwe ngokulandela umthetho we 54(2) kwimithetho ecapashwe kwi GNR 543 yemithetho yeNEMA EJA yonyaka ka 2010 ngaphantsi kwamazolontya 24(a) kunye no 24(d) omthetho weNational Environmental Management Act (okungumthetho we107 wonyaka 1998) nakwi GNR 718 yomthetho weNational Environmental Management: Waste Act (umthetho we99 wonyaka 2008), ngenjongo yokokhulwa kwendawo yokulahlala izibi kwindawo yaseKokstad, linkukakacha Ngomsebenzi: Umasipalati waseKokstad ukwiphulo lokulahlala kwendawo ekhona yokutshisa izibi, nokuchanjwa kwendawo entsha yokulahlala izibi, ezihlangabezana nesidlo sikamasipalati sokuphuhlisa inkonzo zokulahlala izibi. Ngoku kulungwa indawo izimbalewa ekuzochongwa kuzo eyona ekuzolehlwile kuyo izibi. Kuzobanjwa inhlalanganiso yoluntu apho kuzothethwa khona ngawo lo msebenzi. Leyo inhlalanganiso loophinde inike amaqela ananomda naphaphazela kuyo ithuba lokuthabatha inkxaxheba. Xa lo msebenzi ocebeywayo wenzeka, kufuneka kubekhonisa imvume yokongamelela Indawo yokulahlala izibi, isicelo sigo mvume sihambisana nohlahlo lochaphazelo kokusinqongileyo. Onke amaqela ananomda naphaphazela kuyo ayamenywa ukuba mawabhalise kwi ofisi ze-icando (kwezinkukakacha zingaezandi).

Inhlalanganiso yoluntu imingqophelo lulandelayo:

Umhla: 29 Agasti 2011

Ixesho: 13h00 (ngo 3 wasemalanga)

Indawo: EKokstad Community Hall (eholweni yoluntu)

Olunye ulwazi:

Xa ufuna olunye ulwazi ngeliphulo okanye xa ufuna ukuthabatha inkxaxheba ngokumelele iqela qinomda okanye elichaphazelekayo, nceda uqhakamshelane nequmkatho elikhumalansayo (ikonsultants) ngokusebenzisa iposi, i-email okanye, i-fax zingekakagithi Iinkuku ezili 14 sikhutshwe esi saziso. Umqolo ucacisa ngalo msebenzi luyafumaneka kulawo nalowo umntu awucelayo. Inomboro zemvume ze-waste management ziyafumaneka kwisibe lezolimo, imicimbeyokusinqongile nophuhliso lwazigalilani.

Verusha Nadar
Icando
P.O. Box 115, Link Hills, 3652
Tel: 031-7633 760; Fax: 031-7633 664
Email: verusha@icando.co.za

**BACKGROUND INFORMATION DOCUMENT
ENVIRONMENTAL IMPACT ASSESSMENT / WASTE LICENCE
APPLICATION FOR CLOSURE OF EXISTING LANDFILL SITE AND
IDENTIFICATION OF NEW LANDFILL SITE IN KOKSTAD**

1 INTRODUCTION

The Greater Kokstad Municipality is in the process of rehabilitating and closing the existing Kokstad Landfill Site. In order for this to occur, alternative arrangements for the disposal of waste generated by the area needs to be investigated. The Municipality is proposing to identify and establish a new waste disposal facility that is in line with the National Environmental Management: Waste Act (NEM: Waste Act), 2008 (Act 107 of 1998)

Any activity identified in terms of Section 19 (1) of the NEM: Waste Act requires Waste Management Licence (WML) Application. The activities that require licensing under the NEM: Waste Act is as follows:

Government Notice Number	Category and Activity Number	Activity Description
GNR 718	Category A, (20)	The decommissioning of activities listed in this Schedule.
GNR 718	Category B, (10)	The disposal of general waste to land covering an area in excess of 200 m ² .
GNR 718	Category B, (11)	The construction of facilities for activities listed in Category B of this Schedule (not in isolation to associated activity).

In terms of the NEM: Waste Act, any person wishing to carry out a Category A activity is required to conduct a basic assessment process, as stipulated in the environmental impact assessment (EIA) regulations made under section 24(5) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) as part of a waste management licence application.

Similarly, any person wishing to carry out a Category B activity is required to conduct an environmental impact assessment process as part of the waste management licence application.

This background information document describes the proposed activity and the WML/EIA processes that are required.

2 WHAT IS PROPOSED?

The Greater Kokstad Municipality has recognised the need to rehabilitate and close the existing Kokstad Landfill site. However, in so doing, arrangements must also be made to deal with the waste that will still be generated in Kokstad and its surrounds. A new landfill will therefore be required once the old site stops receiving waste.

The site will only accept general waste which includes domestic refuse, non-hazardous industrial waste, commercial waste, garden refuse and builders' rubble. The site will not accept any hazardous waste i.e. waste which has toxic, chemical or long-lasting properties which may have a negative effect on human health or the environment.

Landfill sites cannot and should not be developed on land that is unsuitable. Sites need to be considered carefully in terms of socio-economic and biophysical characteristics. It is for this purpose that the EIA and WML processes have been developed to ensure that future waste disposal facilities are properly sited which did not always happen in the past.

The EIA/WML processes required for the closure of the old site and the identification of the new one are separate processes and also differ in type of assessment that is required by law. The closure of the landfill requires a Basic Assessment and the identification of the new site requires a full Scoping and EIA process. Although these are separate, the two projects will be run concurrently as they are interlinked.

The processes are described in more detail below.

3 EIA FOR IDENTIFICATION OF NEW SITE

3.1 Scoping Phase

In terms of the EIA Regulations a full Scoping and Environmental Impact Assessment process will be followed.

The main objectives of the Scoping Phase are to:-

- Identify possible issues, impacts and concerns relating to the closure of a landfill site;
- Screen out non-issues; and
- Identify alternative sites for the location of the landfills.

A report on the Scoping Phase will be compiled and distributed to all Interested and Affected Parties (I&APs) for comment. Feedback received during this period will be incorporated into the document and submitted to the provincial environmental authority for approval. The provincial authority is the KwaZulu-Natal Department of Agriculture, Environment and Rural Development (KZN DAEARD). A Plan of Study for EIA will be submitted with the Scoping Report and will outline the steps that will be taken during the EIA phase. The authorities will have to assess the documents and approve and/or provide guidance on the course of action to be followed.

3.2 EIA Phase

The purpose of the EIA phase is to:

- Address issues that have been raised during the scoping phase;
- Assess alternatives to the proposed activity in a comparative manner;
- Assess all identified impacts and determine the significance of each impact; and
- Formulate mitigation measures.

The EIA report will be released for comment and discussion before being submitted to the authorities. It will also include the WML application documents which will need to contain all the information required by the licensing authority for them to be able to draft the actual licence and the conditions on which the landfill will be permitted to operate.

4 BASIC ASSESSMENT FOR CLOSURE OF OLD SITE

The overall purpose of the Basic Assessment is the same as that of the EIA for the new site. The main objectives would be to assess the alternatives for the rehabilitation and closure of the site and identify any social and biophysical impacts from the proposed closure.

The engineering team will also be responsible for the closure design of the landfill site.

This includes:

- Remedial design to address identified problem areas
- Final shaping, landscaping and re-vegetation
- Final landfill cover or cap design
- Permanent storm water diversion measures, run off control and anti-erosion measures
- Any infrastructure relating to the end-use plan

5 PUBLIC PARTICIPATION

Public Participation is a statutory requirement for projects of this nature in terms of the Constitution and NEMA. It establishes an ongoing mechanism for the collection and assimilation of I&AP inputs. The objectives of the public participation process can be summarised as follows:

- To inform I&APs of the proposed development;
- To provide an opportunity for I&APs to raise issues, concerns and suggestions;
- To promote transparency and an understanding of the project and its consequences;
- To facilitate liaison and communication with I&APs;
- To serve as a data gathering mechanism for the Scoping phase; and
- To address the issues and concerns raised by I&APs as far as possible.

6 HOW ARE SITES FOR THE NEW LANDFILL SELECTED?

The project team has identified several candidate sites for the proposed location of the new landfill site. These broad areas will be ranked according to economic, social and environmental suitability, explained below:-

- **Social Aspects**

Densely populated areas will be avoided as a landfill site does have the potential to impact on community health, safety and general well-being. For this reason, the landfill will require a sufficient buffer zone for it to be potentially suitable. A buffer zone is the piece of land between the boundary of the landfill and the nearest residential area.

- **Biophysical Aspects**

The biophysical attributes of an area must be considered in order to determine the type and level of risk the landfill will pose to its surrounding environment. The impact that the landfill may have on nearby water sources is usually of most concern, however, other factors such as topography, geology and climate play an important role in determining site suitability.

- **Economic Aspects**

Site selection is also determined by the financial cost of a landfill site. Factors such as access to major routes and distance to waste generation areas can determine the cost of operating a site. Finding a site that is economically feasible must tie in with other considerations because if the site becomes a burden to manage it can potentially impact on the social and biophysical environment.

7 AUTHORITY INVOLVMENT

The provincial environmental authorities will be consulted and kept informed throughout the process. Once the required documentation and reports are submitted, the respective

departments have a certain period of time in which to review it and issue their respective decisions and conditions of approval.

Waste Management Licences will be applied for from the provincial authority, the KwaZulu-Natal Department of Agriculture, Environmental Affairs and Rural Development (KZN DAEARD). However, other departments are also involved during the process, e.g. the National Department of Water Affairs (DWA) who are required to issue an internal Record of Decision in matters dealing with waste.

8 PROJECT TEAM

The Project Applicant is the Greater Kokstad Municipality. The Project Team involved with the proposed landfill sites consists of the following companies:-

- ❖ **Scientific Roets:** Engineering, Agricultural and Rural Development Specialists
- ❖ **Thekwini GeoCivils:** Civil and Structural Engineers; and
- ❖ **Icando:** Environmental and Waste Management Specialists

9 HOW CAN I BE INVOLVED?

Public involvement is an important aspect of the licensing process to ensure that issues and concerns of individuals who may be affected are taken into account. To register as an interested and affected party, or to raise any concerns or issues, please fill in the attached form and fax or email it to the offices of Icando.

10 CONTACT DETAILS

For further information please contact Icando (contact details are given below).

Verusha Nadar
P.O. Box 115, Link Hills, 3652
Tel: 031-763 3760; **Fax:** 031-763 3664
Email: verusha@icando.co.za



ENVIRONMENTAL IMPACT ASSESSMENT / WASTE LICENCE APPLICATION

Closure of Existing Landfill Site Identification of New Landfill Site In Kokstad

Registration & Comment Form

Interested & Affected Parties (I&APs) are invited to participate in the EIA/WML process for the proposed closure of the existing Kokstad Landfill site and the identification of a new landfill in Kokstad. To participate, please complete this form and return it via post, fax or e-mail to Icando.

Name	Cathy Robinson		
Organisation	Kokstad Chamber of Commerce		
Address	138 Main Street Kokstad 4700		
Tel. No.	039 727 5170	Cell No.	084 66 99 609
Fax no.			
E-mail	info@ktschamber.co.za		

PLEASE CHECK APPLICABLE BOX (✓)

I am interested in becoming involved in this study	<input checked="" type="checkbox"/>
I am not interested in the project	<input type="checkbox"/>

I would like to participate in this project in the following way:

Receive documentation only	<input checked="" type="checkbox"/>
Receive documentation and attend meetings/workshops	<input checked="" type="checkbox"/>
Receive a copy of the final report summary	<input checked="" type="checkbox"/>

Are there any interested parties whom you feel should be contacted? If so, please give details:

Clarens Diedericks EG Scrap + Waste	
Clarens Diedericks EG Scrap + Waste	

Do you have any comments regarding the project at this stage?

1. Please provide some indication of the feasibility of recycling eg at source, recycling	
2. Building awareness in community.	

Contact details:
P.O. Box 115, Link Hills, 3652
Tel: 031 7633760, Fax: 031 7633664
Email: verusha@icando.co.za



ENVIRONMENTAL IMPACT ASSESSMENT / WASTE LICENCE APPLICATION

**Closure of Existing Landfill Site
Identification of New Landfill Site In Kokstad**

Registration & Comment Form

Interested & Affected Parties (I&APs) are invited to participate in the EIA/WML process for the proposed closure of the existing Kokstad Landfill site and the identification of a new landfill in Kokstad. To participate, please complete this form and return it via post, fax or e-mail to Icando.

Name	Sonica Naudó - Steyn		
Organisation	Kokstad Advertiser		
Address	7 Hawthorne Street, Kokstad		
Tel. No.	039 727 2066	Cell No.	083 349 6216
Fax no.	039 727 2156		
E-mail	news@kokstadadvertiser.co.za		

PLEASE CHECK APPLICABLE BOX (✓)

I am interested in becoming involved in this study	<input checked="" type="checkbox"/>
I am not interested in the project	<input type="checkbox"/>

I would like to participate in this project in the following way:

Receive documentation only	<input checked="" type="checkbox"/>
Receive documentation and attend meetings/workshops	<input checked="" type="checkbox"/>
Receive a copy of the final report summary	<input checked="" type="checkbox"/>

Are there any interested parties whom you feel should be contacted? If so, please give details:

Not at this stage.

Do you have any comments regarding the project at this stage?

RE: Site 6 = lots of developments in surrounding area. How will it affect property values, development possibilities etc.

Contact details:
P.O. Box 115, Link Hills, 3652
Tel: 031 7633760, Fax: 031 7633664
Email: verusha@icando.co.za



**Public Meeting
Identification of a New Landfill Site
and Closure of the Existing Shayamoya site in Kokstad.
Kokstad Community Hall
29 August 2011 at 15h00**

1 Welcome and Introductions

Verusha Nadar (VN) from Icando welcomed everyone and thanked them for their attendance. She introduced the project team members.

2 Attendance

Trish Chapman	Trash Busters
June Lombard	Icando
D.R. Mabcote	Kraansdraai Farm Committee
M. Madikizela	Scientific Roets
Thuli Mgenge	DAEA
E. Mtshutshane	Kraansdraai Farm Committee
Graham Payne	TGC Engineers
Verusha Nadar	Icando
Sonica Naude-Steyn	Kokstad Advertiser
Joe Ngubo	DAEA
E. Nhsevu	Kraansdraai Farm Committee
Cathy Robinson	Kokstad Chamber
Adriaan Roets	Scientific Roets
Ndaba Sobuce	Greater Kokstad Municipality

3 Project Background and EIA/WML Process

VN provided a background to the project and explained the Environmental Impact Assessment and Waste Management Licence process. The presentation from the meeting is attached as Annexure 1.

She explained that there were two process being run concurrently – a waste management licence for the closure of the existing landfill and another licence application for the establishment of a new landfill.

Mr Graham Payne (GP) from Thekwini GeoCivils then described each of the sites that were being looked at for the new landfill site. Six areas have been identified as suitable for the development of the landfill.

4 Questions and discussion

1.1. Requests from Kraansdraai Farm Committee:

- The Committee requested a meeting with the Municipality
- The request was noted and the project team would communicate with the committee to set up a meeting.
- The Co-op also requested that a hard copy of the reports concerning the process is made available to them.
- The request was noted and the consultant team agreed to provide a hard copies of the documents.

1.2. Question: How would the land be bought or who would be need to budget for the purchase of the land needed for the landfill?

→ The municipality would need to budget for the land.

1.3. Question: How long can the existing landfill cope with accepting municipal waste
The existing site can be flexible.

→ The engineers have allowed for 18 months of continued landfilling but it could go on.

1.4. Question: How were the six sites chosen?

→ The most important things to look for when siting a landfill is proximity to water, soils, topography, access via roads and the ownership of the land.

5 Way forward

The project team stated that I&APs would be kept informed as developments around the sites occurred. Documentation would also be made available and I&APs would have an opportunity to comment on the reports once they have been drafted.

Annexure 1: Presentation from meeting

ENVIRONMENTAL IMPACT ASSESSMENT / WASTE LICENCE APPLICATION

PROPOSED CLOSURE OF EXISTING KOKSTAD LANDFILL AND IDENTIFICATION OF NEW SITE

29 August 2011
Kokstad Community Hall

Proposed Agenda

1. Welcome and introductions
2. Background and EIA / WML process
3. Questions and discussion
4. Next steps

BACKGROUND

- What is needed?
- Two processes:-
 - Current landfill in Kokstad needs to be closed
 - New landfill site must be identified and established
- NEM Waste Act (Act 59 of 2008): Waste related activities require waste licence application.

Listed activities

Landfill closure:-

- **Category A Activity**
 - The decommissioning of activities listed in this Schedule.

Landfill identification:-

- **Category B Activities**
 - The disposal of general waste to land covering an area in excess of 200 m2.
 - The construction of facilities for activities listed in Category B of this Schedule (not in isolation to associated activity).

Proposed Activity: Landfill Closure

- Remedial design to address identified problem areas
- Final shaping, landscaping and re-vegetation
- Final landfill cover or cap design
- Permanent storm water diversion measures, run off control and anti-erosion measures

Proposed Activity: Landfill Establishment

- Disposal of general waste – domestic, dry industrial, builders' rubble and garden refuse
- Require site of sufficient size
- Fenced with gate control
- Site office

Do we need another landfill?

- What is happening now?
 - Waste disposed at Shayamoya landfill – problematic
 - Needs to be closed and rehabilitated
 - Transfer station not viable – distance to nearest landfill – Harding? Too expensive

What areas are suitable?

- Area with suitable geology
- Accessibility
- Transport distance from major centres
- Water quality aspects
- Social aspects

Which laws apply?

- **NEM: Waste Act**
- **National Environmental Management Act**
- **Occupational Health and Safety Act**
- **National Water Act**
- **Bylaws:**
 - Town Planning
 - Rezoning/change of land use

Objectives

- **Assess the impacts associated with proposed activity**
- **Identify alternatives**
- **Identify ways in which any adverse impacts can be minimised**
- **Ensure that Interested & Affected Parties are part of the process**

Public Participation Process

- **Notification of Interested & Affected Parties**
 - Newspaper
 - Stakeholder meeting/s
 - Registration as I&APs
- **I&APs comments & issues gathered & addressed in the Scoping and EIA reports**
- **Ongoing information sharing and documents available for review**
 - Local library
 - Local municipal offices
- **On-site notice once locality known**

Next Steps for Closure of Landfill

1. **I&APs submit issues & concerns in writing**
2. **Assess impacts of proposed activity and address issues (mitigation measures).**
3. **Prepare and submit Draft Basic Assessment Report with WML Application for comment to stakeholders.**
4. **Finalise and submit to DAEARD for decision (authorisation or not)**
5. **Appeal period**

Next Steps for Landfill ID

1. I&APs submit issues & concerns in writing
2. Scoping Report circulated for public comment and submitted to authorities with Plan of Study for EIA
3. Review and amend/acceptance of Scoping Report by authorities
4. Assess impacts of proposed activity and address issues (mitigation measures) – location alternatives
5. Submit Draft EIA Report and WML Application with EMP for comment to stakeholders and DAEARD
6. Finalise and submit to DAEARD for decision (authorisation or not)
7. Appeal period

Issues and Concerns

- Please complete the registration/ comments form and submit to:

Icando

Email: verusha@icando.co.za

Fax: 031 7633 664

Tel: 031 7633 760

Post: P O Box 115, Link Hills, 3652

Name	Surname	Organisation	Designation	Postal Address	Area	Code	Telephone	Fax	Cell	Email
Mnoneleli	Matam	Greater Kokstad Municipality	LED Manager	P.O. Box 8	Kokstad	4700	039 797 6660	039 727 3676	083 435 2501	Mnoneleli.Matam@kokstad.org.za
Sonica	Naude-Steyn	Kokstad Advertiser	Journalist	P.O. Box 99	Kokstad	4700	039 727 2066	039 727 1256	083 349 6216	news@kokstadadvertiser.co.za
Joe	Ngubo	KZN DAEARD					033 355 9621		082 738 7832	nguboc@kzndae.gov.za
Oscar	Madikizela	Scientific Roets					039 727 1515			agriculture@scientificroets.com
Trish	Chapman	Trash Busters		P.O. Box 127	Kokstad	4700	039 727 3357		083 375 6264	trish.chapman@telkomsa.net
Ndaba	Sobuce	Greater Kokstad Municipality		P.O. Box 8	Kokstad	4700	039 797 6652		078 833 3408	ndaba.sobuce@kokstad.org.za
D R	Mabcote	Farmer		Shayamoya					083 5020 400 ?	
E	Ntsevu	Farmer		Shayamoya					078 164 8596	
E	Mtshutshane	Farmer		Shayamoya					071 728 1352	
Thozama	Madikizela	Greater Kokstad Municipality	Ward Councillor						073 183 7905	thozama.madikizela@kokstad.org.za
Cathy	Robinson	Kokstad Chamber of Commerce		PO Box 44068	Kokstad	4700	084 66 99 609	086 556 8893		info@kkschamber.co.za
		Nafcoc Kokstad								
Phumzile	Nocanda	Greater Kokstad Municipality	Ward 1 Councillor						073 306 4038	
Nomasamariya	Dlakavu	Greater Kokstad Municipality	Ward 2 Councillor						078 315 7321	
Zolani	Mhlongo	Greater Kokstad Municipality	Ward 3 Councillor						076 540 9339	
Xolile	Xhelithole	Greater Kokstad Municipality	Ward 4 Councillor						079 902 3152	
Ntobeko	Mavuka	Greater Kokstad Municipality	Ward 5 Councillor						083 673 1468	
Tshibiso	Mohlakoana	Greater Kokstad Municipality	Ward 6 Councillor						083 620 2156	
Lulama	Sithole	Greater Kokstad Municipality	Ward 7 Councillor						073 917 1737	
Monde	Nondabula	Greater Kokstad Municipality	Ward 8 Councillor						083 597 6963	
Tolakele	Parkies	Kransdraai Farm Committee	Chairperson						072 1413891	
June	Lombard	Icando	Senior Consultant	P.O. Box 115	Link Hills	3652	031 763 3760	031 763 3664	083 255 4638	june@icando.co.za
Verusha	Nadar	Icando	Consultant	P.O. Box 115	Link Hills	3652	031 763 3760	031 763 3664	084 555 6288	verusha@icando.co.za
Rosemary	Lombard	Icando	Social Impact Consul	P.O. Box 115	Link Hills	3652	031 763 3760	031 763 3664	083 299 6622	rosemary@icando.co.za
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Graham	Payne	Thekwini GeoCivils	Civil Engineer	P.O. Box 446	Pavilion	3611	031 265 1777	031 265 2727	083 326 4458	Graham@tgcengineers.co.za
Maria	Meth	Thekwini GeoCivils	Personal Assistant	P.O. Box 446	Pavilion	3611	031 265 1777	031 265 2727		tgc@tgcengineers.co.za
Adriaan	Roets	Scientific Roets	Engineer	P.O. Box 461	Kokstad	4700	039 727 1515	039 727 1515	083 265 2652	adriaan@scientificroets.com
Fanie	De Lange	Greater Kokstad Municipality	Manager: Civil Engin	P.O. Box 8	Kokstad	4700	039 797 6646	086 506 2562	082 466 3066	Fanie.delange@kokstad.org.za
Andile	Velem	Greater Kokstad Municipality								
Andile	Velem	Greater Kokstad Municipality	Executive Manager:	P.O. Box 8	Kokstad	4700	039 797 6600	039 727 3676		Lucy.Nongogo@kokstad.org.za
Mxolisi A.	Nkosi	Greater Kokstad Municipality	Municipal Manager	P.O. Box 8	Kokstad	4700	039 797 6601	039 727 3346		Mxolisi.nkosi@kokstad.org.za
Tim	Stubbs	WESSA					039 727 2212			timstubbs2@gmail.com
Thulile	Mgenge	KZN DAEARD					039 834 7600		082 752 3959	Thulile.Mgenge@kzndae.gov.za

APPENDIX3: PRELIMINARY REPORTS

3a Preliminary Geotechnical Report

3b Heritage Survey

DRAFT

**REPORT TO TGC ENGINEERS CC. ON A GEOTECHNICAL
INVESTIGATION FOR A PROPOSED NEW LANDFILL, CANDIDATE SITE 1
KRANTZ FONTEIN FARM KOKSTAD**

1. INTRODUCTION

Drennan, Maud and Partners was requested by Mr Graham Payne of TGC Engineers cc. to undertake a geotechnical investigation of candidate Site 1 Krantz Fontein Farm for the proposed new landfill to service Kokstad. The aim of the investigation was to determine:

- Site geology and subsoil conditions.
- The overall stability of the site and stability considerations regarding the proposed earthworks.
- The excavatability within the site footprint.
- The availability of suitable materials for re-use in the liner system.
- Surface and sub-surface seepage conditions.

2. SITE DESCRIPTION

Site 1 is located as the crow flies approximately 2.1km east of Kokstad, 3km south east of the existing landfill site, 150m south east of the Mzintlava River and 500m south east of Bhongweni Township (refer to the Locality Plan, Drawing No. 22233/1A).

The site is located on the southern portion of Krantz Fontein Farm property on the lower portion of the north-facing slope of a prominent topographical spur. Slope gradients are considered of gentle to moderate steepness (7° to 11°).

The site is bordered to the north east by a broad north-west draining valley line with a planar slope conformation, which eventually drains into the Mzintlava River some 300m north west of the landfill site.

A derelict structure is located on the site, as indicated on the Locality Plan as well as the Geology and Seepage Zone Plan (Drawing No. 22233/1A & 2). This structure is expected to be in excess of 30 years old and may have some historical importance. The relevant Consultant will have to determine the status of this structure and the impact this would have on the proposed development of the site as a landfill.

REPORT TO TGC ENGINEERS CC. ON A GEOTECHNICAL INVESTIGATION FOR A PROPOSED NEW LANDFILL, CANDIDATE SITE 1 KRANTZ FONTEIN FARM KOKSTAD

3. FIELD INVESTIGATION



Plate 1. Approximate Extent of Original Landfill Development Footprint (North ↑). Courtesy of Google Earth.

The proposed development area, as indicated by TGC Engineers cc (Plate 1 above), was investigated on the 20th June 2012 by means of inspection pitting using an Bell HD 820R track mounted excavator, as well as excavation of auger holes along the valley line, seismic testing, Dynamic Cone Penetrometer (DCP) testing and selection of soil and water samples for laboratory analysis.

The inspection pits, designated IP1 to IP13, were examined and described by an Engineering Geologist in accordance with the standard method of profiling recommended by Jennings, J.E, Brink, A.B.A and Williams, A.A.B (1973).

Following the findings of this investigation, it was decided that additional investigative work was required immediately north-west of the original development footprint. As such, on the 5th July 2012, a total of nine additional inspection pits, designated IP14 to IP22, were excavated using the same plant as described above. These pits were examined and described by an Engineering Geologist on the following day, 6th July 2012, in accordance with the standard method of profiling mentioned above. Furthermore, additional seismic testing was carried out across this area (refer to Plate 2 overleaf for the approximate extent of the total investigated area).

REPORT TO TGC ENGINEERS CC. ON A GEOTECHNICAL INVESTIGATION FOR A PROPOSED NEW LANDFILL, CANDIDATE SITE 1 KRANTZ FONTEIN FARM KOKSTAD



Plate 2. Approximate Extent of Recommended Landfill Development Footprint (±13.5ha) (North ↑). Courtesy of Google Earth.

Summarised in Table 1 below, are the coordinate positions for each of the inspection pits, which were recorded using a hand held Garmin GPS 60CSx device with an accuracy of about 3.0m. In addition, the positions have been marked on Drawing No. 22233/2, and the resultant soil profiles are included herewith as Appendix A.

Table 1. Coordinate Positions of the Inspection Pits

IP №	S	E	IP №	S	E
1	30°33'14.80"	29°27'40.80"	12	30°33'02.70"	29°27'37.00"
2	30°33'12.40"	29°27'43.50"	13	30°33'04.30"	29°27'41.40"
3	30°33'11.20"	29°27'45.90"	14	30°33'02.70"	29°27'30.10"
4	30°33'07.30"	29°27'41.90"	15	30°33'01.50"	29°27'33.70"
5	30°33'08.40"	29°27'40.40"	16	30°33'00.00"	29°27'36.80"
6	30°33'09.60"	29°27'37.70"	17	30°32'57.90"	29°27'31.50"
7	30°33'07.40"	29°27'33.70"	18	30°32'59.00"	29°27'29.70"

REPORT TO TGC ENGINEERS CC. ON A GEOTECHNICAL INVESTIGATION FOR A PROPOSED NEW LANDFILL, CANDIDATE SITE 1 KRANTZ FONTEIN FARM KOKSTAD

IP №	S	E	IP №	S	E
8	30°33'04.20"	29°27'34.10"	19	30°33'00.80"	29°27'26.00"
9	30°33'05.80"	29°27'37.30"	20	30°32'56.00"	29°27'26.10"
10	30°33'04.90"	29°27'44.00"	21	30°32'57.90"	29°27'24.10"
11	30°33'07.00"	29°27'45.20"	22	30°32'57.20"	29°27'21.30"

A total of twenty six Dynamic Cone Penetrometer tests, designated DCP1 to DCP26, were carried out along a grid where additional information was considered necessary across the original development area. The results of the DCP tests are recorded graphically in Appendix B of this report. DCP's 1 to 5, DCP15, DCP16 and DCP's 19 to 26 correspond to the area of the site expected to be underlain by shale, DCP6 and DCP14 in the area across the upper south western portion of the site underlain by sandstone, and DCP's 7 to 13 and DCP17 and DCP18 to the area of the original development area underlain by dolerite.

For ease of evaluation, Table 2 below, provides a qualitative indication of the consistency of the cohesive and non-cohesive soils based on the DCP results. It should be noted that the results are specific to DM&P testing equipment and should be used with caution as it is only provided as a guide.

Table 2. Subsoil Consistency Inferred from the DCP Test Results

Cohesive Soils		Non-Cohesive Soils	
No of blows/300 mm Penetration	Subsoil Consistency	No of blows/300 mm Penetration	Subsoil Consistency
< 4	Very Soft	< 8	Very Loose
4 - 8	Soft	8 - 18	Loose
9 - 15	Firm	19 - 54	Medium Dense
16 - 24	Stiff	54 - 90	Dense
25 - 54	Very Stiff	> 90	Very Dense
>54	Hard		

REPORT TO TGC ENGINEERS CC. ON A GEOTECHNICAL INVESTIGATION FOR A PROPOSED NEW LANDFILL, CANDIDATE SITE 1 KRANTZ FONTEIN FARM KOKSTAD

Thirteen auger holes, designated AH1 to AH13, were excavated to a maximum depth of 0.5m along the drainage feature located to the north-east of the landfill development footprint. The positions of the auger holes were also recorded using a hand held Garmin GPS 60CSx device, as such the positions shown on the Seepage Zone Drawing No. 22233/3 are relatively accurately depicted. The resultant soil profiles are included herewith as Appendix C. In addition, the results of this profiling exercise are discussed under Section 6 below.

A total of seven (7 №) 30m seismic traverses, designated T1 to T7, were carried out at site specific locations as indicated on Drawing No. 22233/2 using a 12 channel, signal enhanced, refraction seismograph. The results of the seismic testing are graphically presented in Appendix D and will be discussed in detailed under Section 8.

The following sample analysis was performed by Thekwini Soils Laboratory in Durban to determine the suitability of materials for use in the liner system:

- Full grading including Atterberg Limits and hydrometer analysis to 2 micron size
- Proctor Density
- In-situ Permeability tests
- Re-compacted Permeability tests (95% Proctor)
- Re-compacted Shear box tests (95% Proctor)

The results of the grading, Proctor density and permeability tests are summarised in Table 3. Laboratory Test Summary Table, included herewith in Appendix E. In addition, the material analyses are graphically presented and included with the summary table in Appendix E. Furthermore, the results have been tabulated under Section 4.1 to 4.3 below for ease of reference. Finally, the results are discussed in detail under Section 8 of this report.

The shear box test results are graphically presented in Appendix F of this report, tabulated under Section 4.4 and discussed in detail under Section 7.

Water samples were recovered from the drainage valley line across the north eastern site boundary, as well as from the Mzintlava River approximately 2km downstream of the site. These samples were returned to b.n. kirk (natal) cc. testing laboratory for background chemical analysis. The results of the testing are summarised in Appendix G of this report and tabulated below under Section 4.5.

**REPORT TO TGC ENGINEERS CC. ON A GEOTECHNICAL INVESTIGATION FOR A
PROPOSED NEW LANDFILL, CANDIDATE SITE 1 KRANTZ FONTEIN FARM KOKSTAD**

4. LABORATORY TEST RESULTS

4.1 Grading Analysis

The results of the grading analyses are summarised in the Laboratory Test Summary Table (Table 3) included in Appendix E of this report along with the graphical representations of the material analyses. Furthermore, the results are discussed in detail under Table 4 below.

Table 4. Grading Test Results

IP No	Material Description	LL	LS (%)	PI	% Clay	Classification	
						AASHTO	Unified
IP1	Orange speckled dark grey, clayey SILT (Residual Dolerite)	55.7	11.3	22.3	29	A-7-5	MH
IP2	Highly weathered, olive, medium hard to hard rock SHALE (Beaufort Group)	35.3	4.7	9.1	12	A-4	SM
IP4	Brown speckled very dark grey and patched olive, clayey sandy GRAVEL (Residual Shale - Poorly Developed Ferricrete)	47.6	10.7	21.1	20	A-7-6	SC
IP6	Medium weathered, dark blue, hard rock DOLERITE (Karoo)	43.1	6	12	7	A-2-7	GM
IP7	Medium weathered, grey and olive, hard rock SANDSTONE (Beaufort Group)	33.3	5.3	10.1	6	A-2-6	SC
IP8	Grey, silty sandy GRAVEL (Colluvium)	29.9	6.7	13.1	15	A-6	SC
IP11	Very dark grey, CLAY (Hillwash)	52.7	14.7	29.1	52	A-7-6	CH
IP11	Completely weathered, yellow, soft rock, sandy SHALE (Beaufort Group)	33.2	2.7	5.2	8	A-1-b	GM
IP14	Medium weathered, yellow, soft to medium hard rock SANDSTONE (Beaufort Group)	28.3	2.7	5.1	5	A-1-a	GM
IP18	Dark orange, silty CLAY (Residual Shale)	29.5	6	12.1	37	A-6	CL

**REPORT TO TGC ENGINEERS CC. ON A GEOTECHNICAL INVESTIGATION FOR A
PROPOSED NEW LANDFILL, CANDIDATE SITE 1 KRANTZ FONTEIN FARM KOKSTAD**

4.2 Proctor Density Test Results

The results of the Proctor density tests are summarised in the Laboratory Test Summary Table (Table 3) included in Appendix E. In addition, the results are discussed in detail under Table 5 below.

Table 5. Proctor Density Test Results

IP №	Sample №	Depth (m)	Description	Proctor Density (kg/m ³)	O.M.C (%)
IP1	06100	0.9 - 2.6	Orange speckled dark grey, clayey SILT (Residual Dolerite)	1251	31.6
IP2	06101	1.9 - 3.0	Highly weathered, olive, medium hard to hard rock SHALE (Beaufort Group)	1670	15.4
IP4	06103	0.2 - 0.7	Brown speckled very dark grey and patched olive, clayey sandy GRAVEL (Residual Shale - Poorly Developed Ferricrete)	1605	19.4
IP6	06014	1.0 - 1.9	Medium weathered, dark blue, hard rock DOLERITE (Karoo)	1604	19.7
IP7	06105	0.9 - 1.5	Medium weathered, grey and olive, hard rock SANDSTONE (Beaufort Group)	1745	15.7
IP11	06108	0.0 - 0.6	Very dark grey, CLAY (Hillwash)	1798	13.5
IP11	06107	0.8 - 1.9	Completely weathered, yellow, soft rock, sandy SHALE (Beaufort Group)	1534	19.6
IP14	07040	0.65 - 1.6	Medium weathered, yellow, soft to medium hard rock SANDSTONE (Beaufort Group)	1840	13.5
IP18	07041	0.4 - 1.6	Dark orange, silty CLAY (Residual Shale)	1638	16.2

**REPORT TO TGC ENGINEERS CC. ON A GEOTECHNICAL INVESTIGATION FOR A
PROPOSED NEW LANDFILL, CANDIDATE SITE 1 KRANTZ FONTEIN FARM KOKSTAD**

4.3 Permeability Test Results

Permeability tests were carried out on four selected disturbed samples of the materials occurring on the site, and tested at in-situ density or re-compacted to 95% Proctor Density. The results of the permeability tests are summarised in Table 6 below and included in the Laboratory Test Summary Table (Table 3) attached herewith in Appendix E.

Table 6. Permeability Test Results

IP No	Sample No	Depth (m)	Description	Sample Type	% Fines (Clay & Silt)	Permeability (cms ⁻¹)
4	06103	0.2 - 0.7	Brown speckled very dark grey and patched olive, clayey sandy GRAVEL (Residual Shale - Poorly Developed Ferricrete)	Recomp. To 95% Proctor	38	1.68×10 ⁻⁸
11	06108	0.0 - 0.6	Very dark grey, CLAY (Hillwash)	In-Situ	92	6.76×10 ⁻⁸
11	06107	0.8 - 1.9	Completely weathered, yellow, soft rock, sandy SHALE (Beaufort Group)	Recomp. To 95% Proctor	23	1.91×10 ⁻⁷
14	07041	0.4 - 1.6	Dark orange, silty CLAY (Residual Shale)	Recomp. To 95% Proctor	73	9.96×10 ⁻⁸

4.4 Shear Box Tests

Consolidated Drained shear box tests were carried out on five selected disturbed samples of the materials occurring on the site, re-compacted to 95% Proctor Density, to obtain an indication of the shear strength properties of the prevailing materials. The results of the shear box tests are summarised in Table 7 overleaf. In addition, the results are graphically presented in Appendix F of this report.

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Table 7. Shear Box Test Results

IP No	Sample No	Depth (m)	Description	Sample Type	% Fines (Clay & Silt)	Friction Angle (ϕ°)	Cohesion (kPa)
1	06100	0.9 - 2.6	Orange speckled dark grey, clayey SILT (Residual Dolerite)	Recomp. To 95% Proctor	73	26	6
2	06101	1.9 - 3.0	Highly weathered, olive, medium hard to hard rock SHALE (Beaufort Group)	Recomp. To 95% Proctor	42	30	2
6	06104	1.0 - 1.9	Medium weathered, dark blue, hard rock DOLERITE (Karoo)	Recomp. To 95% Proctor	21	31	3
7	06105	0.9 - 1.5	Medium weathered, grey and olive, hard rock SANDSTONE (Beaufort Group)	Recomp. To 95% Proctor	21	31	4
14	07040	0.65 - 1.6	Highly weathered, yellow, soft to medium hard rock SANDSTONE (Beaufort Group)	Recomp. To 95% Proctor	13	32	10

4.5 Water Sample Test Results

As part of a preliminary background analysis, water samples were recovered from the drainage valley line across the north eastern site boundary (WS1), as well as from the Mzintlava River approximately 2km downstream of the landfill site (WS3). The results have been tabulated overleaf.

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Table 8. Water Sample Test Results

Determinand	WS1 - Drainage Valley Line	WS3 - Mzintlava River
Conductivity at 25°C (mS/m)	57	14
Total Dissolved Solids (mg/L)	374	94
pH at 25°C	8.0	7.7
Sulphate as SO ₄ ²⁻ Acute Health -1 (mg/L)	3.4	0.95
Sulphate as SO ₄ ²⁻ Aesthetic (mg/L)	3.4	0.95
Total Hardness as CaCO ₃ (mg/L)	268	90
Calcium Hardness as CaCO ₃ (mg/L)	120	28
Calcium as Ca (mg/L)	48	112
Magnesium as Mg (mg/L)	35	15
Ammonia as N (mg/L)	<0.1	<0.1
Chloride as Cl ⁻ (mg/L)	15	8
Potassium as K (mg/L)	2.3	2.3
Sodium as Na (mg/L)	48	24
p alkalinity (mg/L)	<2	<2
m alkalinity (mg/L)	2.4	50
Phosphorous as PO ₄ (mg/L)	0.8	2.6
Chemical Oxygen Demand (mg/L)	17	20
Biological Oxygen Demand (mg/L)	11	1.3
E.coli or faecal coliforms (Counts per 100ml)	0	72

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5. SITE GEOLOGY

The regional geology is shown on the Geological Plan Drawing No. 22233/1B taken from the 1:250 000 3028 Kokstad Geological Sheet, and indicates the area to be underlain by parent Adelaide Formation (Beaufort Group) shale and fine grained sandstone bedrock with a large dolerite sill intrusion up-slope and south-west of the proposed landfill site.

In addition, inspection pitting encountered shallow (at 1.2 - 1.6m below existing ground level) hard rock quartzite in the vicinity of IP14, IP15, IP19 and IP20. The quartzite most likely formed as a result of the fine grained parent sandstone bedrock being baked during the emplacement of the dolerite sill intrusion and subsequent metamorphism (refer to the area in "green" hatch on Drawing No. 22233/2 for the approximate extent of the quartzite).

5.1 Adelaide Formation (Beaufort Group)

Across the footprint of the landfill, completely to highly weathered bedrock of the Adelaide Formation can be expected at a shallow depth of 0.4 to 1.6m below existing ground level, and can be described as follows:

- Olive or grey stained dark grey, orange and red, laminated to thinly bedded, very close to closely jointed, soft rock shale which was found to contain 2 - 4mm thick reddish brown clay in-fill material, grey gravely clay in-fill material and iron oxide staining on typically smooth joint surfaces;
- Yellow stained dark brown and orange, very thinly to thinly bedded, very close to medium jointed, soft to medium hard rock sandstone. Joint surfaces in the sandstone are smooth and contain up to 5mm thick dark brown clayey in-fill material, as well as iron oxide staining.

The completely to highly weathered bedrock is typically thin, in the order of 0.2 to 1.1m thick, however thickens to up to 2.2m towards the lower north east portion of the site (refer to IP10, IP11 and IP16) where weathering processes have been more active adjacent to the drainage valley line.

Below the completely to highly weathered bedrock, medium weathered shale or sandstone bedrock can be expected and can be described as a grey and olive stained dark orange, yellow or reddish brown, very thinly to thinly bedded, close to medium jointed, hard rock that was found to contain between 2 and 5mm thick reddish brown and grey clay in-fill material as well as iron oxide staining on slightly rough to smooth joint

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surfaces (the approximate area expected to be underlain by shale has been left unhatched on Drawing No. 22233/2, and the area expected to be underlain by sandstone has been hatched "brown" on this drawing).

The above mentioned quartzite can be described as a medium weathered, grey or olive, medium bedded, close to widely jointed, hard rock which contains typically smooth joint surfaces which do contain iron oxide staining and up to 2mm thick greyish brown clay in-fill material.

Where present, the residuum derived from the in-situ weathering of the shale, sandstone and quartzite bedrock can be described as follows, and is in the order of 0.2 to 1.2m thick (average of 0.5m):

- Brownish red to red patched orange, firm to stiff, sandy clay, or;
- Olive or dark orange variably patched, stiff, fissured, sandy or silty clay, which may or may not contain irregular, platy gravels of shale, or;
- Brown speckled light yellow, very dark grey and orange, clayey sandy gravel, where affected by water for a prolonged period to produce a poorly developed ferricrete horizon (refer to IP4, IP5 and IP21).

The overlying fine gravity deposited soil, loosely term "hillwash", covers the majority of the site and can be described as follows:

- Greyish brown to dark grey, firm to stiff, fissured or shattered, very fine to fine grained sandy clay or clay in the order of 0.45m thick (range of 0.25 to 0.6m), which may or may not overlie the above mentioned residuum.

Across the lower portions of the site, the gravity deposit is coarse grained, and can be described as a brown, medium dense, silty or clayey "colluvial" sand in the order of 0.2m thick (refer to IP13 and IP15).

Across the upper portions of the site, the colluvium is in the order of 0.35m thick (range of 0.2 to 0.5m) and can be described as a typically grey, firm to stiff, shattered, sandy clay containing gravels, cobbles and boulders of the shale, sandstone and dolerite bedrock (refer to IP4, IP5, IP8 and IP14).

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5.2 Karoo Dolerite

As mentioned above, a large intrusive dolerite body has been identified immediately south-west and up-slope of the landfill footprint, the approximate areas of which has been hatched "red" on Drawing No. 22233/2. In addition, it must be understood, that thin intrusive dolerite bodies may also appear within the sedimentary bedrock of the Adelaide Formation below the depths investigated to.

In essence the subsoil profile across the dolerite intrusion comprises a 0.3 to 0.5m thick colluvium described as a grey, firm to stiff, shattered, sandy clay, overlying dark red or orange, stiff to very stiff, residual sandy clays, clayey silts or medium dense clayey sand which can be up to 2.0m in thickness. Both the colluvium and residuum were often found to contain gravel to boulder size, hard rock, rounded corestones. The degree of weathering of the intrusive dolerite body will vary locally depending on its exposure to weathering processes, mainly determined by structural features as well as moisture. The dolerite bedrock in the vicinity of IP1 is generally expected to be more deeply weathered than the bedrock intersected everywhere else.

6. SEEPAGE ZONES

Based on the auger profiles, as far as soil morphology indicators are concerned, the soil within the drainage channel, can be described as follows:

- Very moist to wet, very dark grey, silty or sandy CLAY, in places containing a sulphidic smell.

The above soil description is typical of a permanent / semi-permanent degree of wetness. However, it was also observed that the area immediately adjacent and up-slope of the drainage channel towards the proposed area of landfill development, do not show any soil conditions typical of soil saturation. Despite this, we are of the opinion that although limited in lateral extent (being restricted to the confines of the drainage channel), the defined zone provides stormwater attenuation for natural seepage, and will provide for stormwater run-off from the planned development, and a buffer zone is likely to be required.

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As such, reference should be made to the “blue” line on Drawing No. 22233/3, which roughly marks the edge of the drainage feature on the development side. At this stage a 32m buffer zone has been applied, however will be at the discretion of the Local Authority and the appointed Environmental Officer.

In addition, there is an area of the slope that is hatched “blue” on Drawing No. 22233/3 which indicates an area also considered to be affected by permanent subsoil seepage. This area is likely to represent a spring utilising a fracture zone along the dolerite / shale contact zone in this area as a preferential flow path. The landfill footprint can not be located in this area of permanent seepage, and it was for this reason that the footprint of the landfill was shifted north-west.

Across the investigated site, it is considered that the sloping area is well drained surficially, the soil and weathered bedrock being relatively impermeable. No shallow water table is present on the site, however there are two areas, as shown in “light blue” hatch on Drawing No. 22233/3, which highlight the anticipated extent of seasonal subsoil seepage, which should be taken into account during the subsoil layout planning for preliminary design.

In saying this, as the site is scrubbed / developed, the position (s) of further localised seepage will be identified and drained via subsoil drains.

7. SITE STABILITY

No evidence of past or on-going slope instability was identified during the investigation.

That said, the Adelaide Formation is a sedimentary rock formation and is prone to instability, particularly where dolerite of the likes across this area, has intruded the parent bedrock. In addition, sequences of completely weathered shale are known to weather to clay lenses. These clay lenses may cause stability problems where present, especially where locally the predominant dip direction of the structural features of the sedimentary bedrock is dipping out of the slope.

The shale, sandstone and quartzite bedrock displays numerous localised variations in the dip of the bedding planes, and was expected due to the close proximity to the dolerite intrusion contact zone. Refer to Table 9 overleaf for a summary of the bedding dip and dip direction, where recorded, and comments thereto:

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Table 9. Recorded Shale, Sandstone & Quartzite Bedding Dip & Dip Directions

IP №	Rock Type	Dip (°)	Dip Direction (°)	Comment
5	Shale	22	256 (WSW)	No stability concern
7	Shale & Sandstone	7 - 8	020 - 026 (NNE)	Localised stability concern
8	Shale	4	202 (SSW)	No stability concern
9	Shale	10	190 (SSW)	No stability concern
13	Shale	4 - 10	237 - 268 (SW to W)	No stability concern
14	Sandstone	6	318 (NW)	No stability concern
15	Sandstone	10	170 (SSE)	No stability concern
17	Shale	10	108 (ESE)	No stability concern
19	Quartzite	10	094 (E)	Localised stability concern
20	Quartzite	4	123 (NE)	No stability concern
21	Shale	4	313 (NW)	No stability concern
22	Shale	10	150 (SSE)	No stability concern

Bedding of the Adelaide Formation shale, sandstone and quartzite was in most instances found to be dipping favourably back into the slope, with the exception of two observed locations, namely IP7 and IP19. Here the bedding planes of the sedimentary rock were found to be dipping between 7° and 10° out of the slope (NNE to E) in close proximity to the dolerite intrusion contact zone.

Where observed, the shale, sandstone and quartzite was found to display ten major joint sets (J1 - J10), namely:

- J1: 80°/150 - 165° (Dip direction of SSE into slope)
- J2: 80 - 90°/173 - 187° (Dip direction of S into slope)
- J3: 78 - 85°/262 - 266° (Dip direction of W into slope)
- J4: 82 - 84°/237 - 245° (Dip direction of SW into slope)
- J5: 90°/110 - 126° (Dip direction of roughly SE perpendicular to slope)
- J6: 78 - 82°/193 - 212° (Dip direction of SSW into slope)
- J7: 54 - 87°/292° - 330° (Dip direction of NW locally out of slope)
- J8: 70 - 86°/076 - 088° (Dip direction of ENE locally out of slope)
- J9: 78 - 88°/360 - 008° (Dip direction of N locally out of slope)
- J10: 80 - 86°/014 - 041° (Dip direction of NNE to NE locally out of slope)

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Where observed, the dolerite was found to display four major joint sets (J1 - J4), namely:

- J1: 70°/157° (Dip direction of SSE into slope)
- J2: 80°/120° (Dip direction of SE perpendicular to slope)
- J3: 70 - 77°/235 - 245° (Dip direction of SW into slope)
- J4: 88°/330° (Dip direction of NW locally out of slope)

The shale, sandstone and quartzite bedrock displays four major joint sets, namely J7 to J10, which are potentially adversely dipping in a NW through to NE direction out of slope at localised areas across the landfill footprint. As with the above mentioned areas where localised planar type failure could occur, these areas should also be observed for localised joint controlled wedge type failures.

Taking the above into consideration, it is considered essential that the earthwork be overseen by a competent Geotechnical Engineer or Engineering Geologist during construction, to identify these adversely dipping structural planes and completely weathered clay lenses within the weathered Adelaide Formation bedrock.

The laboratory shear box test results reveal the following:

- The highly weathered, olive, medium hard rock shale has an angle of internal friction (ϕ) of 30° and a cohesion value of 2kPa.
- The highly weathered, yellow, soft to medium hard rock sandstone has an angle of internal friction (ϕ) of 32° and a cohesion value of 10kPa.
- The medium weathered, grey and olive, hard rock sandstone has an angle of internal friction (ϕ) of 31° and a cohesion value of 4kPa.
- The orange, stiff to very stiff, residual dolerite clayey silt has an angle of internal friction (ϕ) of 26° and a cohesion value of 6kPa.
- The medium weathered, dark blue, hard rock dolerite has an angle of internal friction (ϕ) of 31° and a cohesion value of 3kPa.

For preliminary design purposes, theoretically, the creation of temporary cut embankments to a maximum gradient of 1 in 2 (26°) for the hillwash, colluvium, residuum and completely weathered bedrock, increased to a gradient of 1 in 1.75 (30°) in the highly to medium weathered, shale, sandstone and quartzite bedrock, is not expected to produce potentially unstable slopes. However to allow suitable workable conditions for liner placement, consideration will have to be given to a permanent cut embankment gradient of 1 in 2.5 (22°).

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Stability analysis on the final “filled” cell configuration (s) will be analysed during design stage. A Factor of Safety against failure for worst case sections drawn through the proposed landfill cell (s) on completion of the proposed filling, will be based on the landfills maximum thickness, the landfill crest level and the stability berm crest level.

8. EXCAVATABILITY

Drawing No. 22233/4 provides inferred rippability depths, below which blasting is anticipated. In addition, the results of the rippability assessment is summarised in Table 10 below.

Table 10. Rippability Assessment

Traverse №	Rock Type	Seismic Velocity Range (m/s)	Depth Range (m)	Rippability	
				D7G	D8K
T2	Shale	405 - 1257	0.0 - 8.6	R	R
		> 3100	8.6 +	NR	NR
T4	Shale	468 - 1199	0.0 - 5.7	R	R
		> 3100	5.7 +	NR	NR
T5	Shale	549 - 1485	0.0 - 5.5	MR	R
		> 3100	5.5 +	NR	NR
T6	Sandstone / Quartzite	367 - 1606	0.0 - 5.7	MR	R
		> 3200	5.7 +	NR	NR
T7	Sandstone / Quartzite	364 - 1489	6.3	MR	R
		> 3200	6.3 +	NR	NR
T3	Shale	385	0.0 - 1.2	R	R
		1837	1.2 - 6.6	NR	R
		> 3100	6.6 +	NR	NR

Note: The cell block shading above matches the hatch used in Drawing No. 22233/4. It must be noted that this assessment is based purely on the seismic velocities recorded and the description of the materials recovered from the shallow inspection pits.

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The following should be used for preliminary design purposes:

- Clear Hatch - Approximate area of the site expected to be rippable using a D7 bulldozer or equivalent to a depth of between 5.7 and 8.6m below existing ground level.
- Orange Hatch - Approximate area of the site expected to be only marginally rippable using a D7, and rippable using a D8 bulldozer or equivalents to a depth of between 5.5 and 6.3m below existing ground level.
- Red Hatch - Approximate area of the site expected to be only rippable using a D8 bulldozer or equivalent to a depth of approximately 6.6m below existing ground level (may vary locally across this area).

9. ON-SITE MATERIALS SUITABILITY

9.1 Clay Liner

The DWA “Minimum Requirements for Waste Disposal by Landfill” stipulate the following for a clay liner soil:

- Plasticity Index >10%
- Particle size <25mm
- Permeability <1 x 10⁻⁶ cm/s (preferably ≤1 x 10⁻⁸ cm/s in laboratory tests as laboratory tests can be up to two orders of magnitude lower than field tests).

Table 3 of Appendix C summarises the laboratory soil test results and shows that the following soils are anticipated to be suitable for use as a clay liner:

- Hillwash - Greyish brown to dark grey, firm to stiff, very fine to fine grained sandy clay or clay in the order of 0.45m thick (range of 0.25 to 0.6m).
- Residual shale, sandstone and quartzite - In the order of 0.2 to 1.2m thick (average of 0.5m) brownish red to red sandy clay, or, olive or dark orange variably patched, sandy or silty clay, which may or may not contain irregular, platy gravel fragments. Where gravelly, sorting will be required and particles greater than 25mm diameter removed.

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Drawing No. 22233/5 shows the inferred extent of these potential clay liner soils. Approximately 91 400m³ of clayey hillwash, colluvium and residuum is expected to be available on site as clay liner material. In addition, a further 18 500m³ (shale derived - vicinity of IP3) and 25 900m³ (dolerite derived - vicinity of IP1) of clayey material is expected to be available at the two potential borrow sites located immediately south-east of the landfill site (refer to Drawing No. 22233/5 for the approximate location of the two potential borrow sites).

The subsoil profile underlying the dolerite borrow comprises a 0.3 to 0.5m thick colluvium described as a grey sandy clay, overlying dark red or orange residual sandy clays and clayey silts which can be up to 2.0m in thickness. Both the colluvium and residuum were found to contain gravel to boulder size, hard rock, rounded corestones and will require suitable sorting before use as clay liner material.

The completely weathered shale bedrock revealed an acceptable permeability test result. However, it must be noted that the laboratory test was carried out on the material fines, and from visual assessment of compaction of the shale, often the resultant product is a material that contains resistant gravel/cobble/boulder fragments amongst clayey patches. These zones of rock fragments are likely to be permeable while the fines less permeable. As such, we are of the opinion that the shale bedrock would not be suitable for use as clay liner material.

The clay liner must be compacted to a minimum dry density of 95% Proctor maximum dry density at a water content of Proctor optimum +2%.

The responsible Engineer will have to determine whether sufficient material is available on site for use in the clay liner system. Alternatively, consideration should be given to locating a suitable borrow pit, or as a last resort a GCL liner. It should be stressed that the placement of a GCL Liner system is critical so as not to induce instability below the waste pile.

Below, the clay liner will require a Base Preparation Layer (G Layer) and Leakage Detection and Collection Layer (D Layer) both 150mm thick. Above the clay liner, a 150mm Leachate Collection Layer (A Layer) will be required. The base preparation layer must comprise a compacted layer of reworked in-situ soil compacted to the same specification as the clay liner. As benching of the site to create stable platforms on which the waste pile will be created is likely to expose rock at a shallow depth across the site, material for the preparation layer will have to be stockpiled during excavation and then brought back in and suitably compacted.

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The leakage detection and collection layer and leachate collection layer should consist of single sized gravel or crushed rock having a size of between 38 and 50mm. The highly to medium weathered shale, sandstone and quartzite excavated out across the landfill footprint is expected to be suitable material, however will require crushing to obtain the required grading.

Material considered suitable for use as cover material should display a Plasticity Index between 5 and 15 and a maximum particle size of 25mm. The soil and soft weathered bedrock are considered suitable for use as landfill cover material, however may require sorting to meeting the required grading requirement.

10. CONCLUSIONS

The site is located on the southern portion of Krantz Fontein Farm property on the lower portion of the north-facing slope of a prominent topographical spur. Slope gradients are considered of gentle to moderate steepness (7° to 11°). The site is bordered to the north east by a broad drainage valley line with a planar slope conformation, draining this area is a north westerly direction and eventually drains into the Mzintlava River some 300m north west of the landfill site.

A derelict structure is located on the site. This structure is expected to be in excess of 30 years old and may have some historical importance.

The recommended landfill development footprint is approximately 13.5ha in extent and is underlain by completely to highly weathered sedimentary bedrock of the Adelaide Formation (Beaufort Group), which can be expected at a shallow depth of 0.4 to 1.6m below existing ground level.

The completely to highly weathered bedrock is in the order of 0.2 to 1.1m thick, however thickens towards the lower north east portion of the site where weathering processes have been more active adjacent to the drainage valley line. Below the completely to highly weathered bedrock, medium weathered, hard rock shale, sandstone or quartzite bedrock can be expected (the geology of the site is shown on Drawing No. 22233/2).

Where present, the residuum derived from the in-situ weathering of the shale, sandstone and quartzite bedrock can typically be described as a sandy or silty clay which may or may not contain irregular gravel rock fragments, and is expected to be in the order of 0.2 to 1.2m thick.

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The overlying hillwash covers the majority of the site and can be described as a greyish brown to dark grey, very fine to fine grained sandy clay or clay in the order of 0.45m thick (range of 0.25 to 0.6m), which may in some areas directly overlie weathered bedrock.

Across the lower portions of the site, the gravity deposit can be described as a brown silty or clayey colluvial sand in the order of 0.2m thick. Across the upper portions of the site, the colluvium is in the order of 0.35m thick (range of 0.2 to 0.5m) and can be described as a dark grey sandy clay containing gravels, cobbles and boulders of shale, sandstone and dolerite.

A large intrusive dolerite body has been identified immediately south-west and up-slope of the landfill footprint. In addition, thin intrusive dolerite bodies may also appear within the sedimentary bedrock of the Adelaide Formation below the depths investigated to. The subsoil profile across the dolerite intrusion comprises a 0.3 to 0.5m thick colluvium described as a grey sandy clay, overlying dark red or orange residual sandy clays, clayey silts or clayey sands which can be up to 2.0m in thickness. Both the colluvium and residuum were found to contain gravel to boulder size, hard rock, rounded corestones.

No evidence of past or on-going slope instability was identified during the investigation. That said, the Adelaide Formation is a sedimentary rock formation and is prone to instability, particularly where dolerite of the likes across this area, has intruded the parent bedrock. Taking the above into consideration, it is considered essential that the earthwork be overseen by a competent Geotechnical Engineer or Engineering Geologist during construction, to identify adversely dipping structural planes and completely weathered clay lenses within the weathered Adelaide Formation bedrock.

For preliminary design purposes, the creation of temporary cut embankments to a gradient of 1 : 2 (26°) for the hillwash, colluvium, residuum and completely weathered bedrock, increased to a gradient of 1 : 1.75 (30°) in the highly to medium weathered, shale, sandstone and quartzite bedrock, is not expected to produce potentially unstable slopes. To allow liner placement, a permanent cut embankment gradient of 1 : 2.5 (22°) is recommended at this stage of development.

Drawing No. 22233/3 shows the extent of seepage zones requiring drainage beneath the liner system. Once the site is scrubbed, the positions of further minor localised seepage zones on side slopes will be identified and drained via subsoil drainage.

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Refer to Drawing No. 22233/4 for a rippability assessment of the site and the depths below which blasting is anticipated. Based on the results the following should be used for preliminary design purposes:

- Clear Hatch - Approximate area of the site expected to be rippable using a D7 bulldozer or equivalent to a depth of between 5.7 and 8.6m below existing ground level.
- Orange Hatch - Approximate area of the site expected to be only marginally rippable using a D7, and rippable using a D8 bulldozer or equivalents to a depth of between 5.5 and 6.3m below existing ground level.
- Red Hatch - Approximate area of the site expected to be only rippable using a D8 bulldozer or equivalent to a depth of approximately 6.6m below existing ground level.

Drawing No. 22233/5 shows the inferred extent of potential clay liner soils. Approximately 91 400m³ of clayey hillwash, colluvium and residuum is expected to be available on site as clay liner material. In addition, a further 18 500m³ shale derived, and 25 900m³ (dolerite derived clayey material is expected to be available at two potential borrow sites located immediately south-east of the landfill site.



B. RAASCH Pr.Sci.Nat.

REFERENCE 22233

AUGUST 2012

/kr

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REPORT TO TGC ENGINEERS CC.

ON A

GEOTECHNICAL INVESTIGATION

FOR A

PROPOSED NEW LANDFILL,

CANDIDATE SITE 1

KRANTZ FONTEIN FARM

KOKSTAD

Ref № 22233
AUGUST 2012

DRENNAN, MAUD AND PARTNERS
CONSULTING CIVIL ENGINEERS AND ENGINEERING GEOLOGISTS

68 Peter Mokaba Ridge,
Tollgate, Durban, 4001



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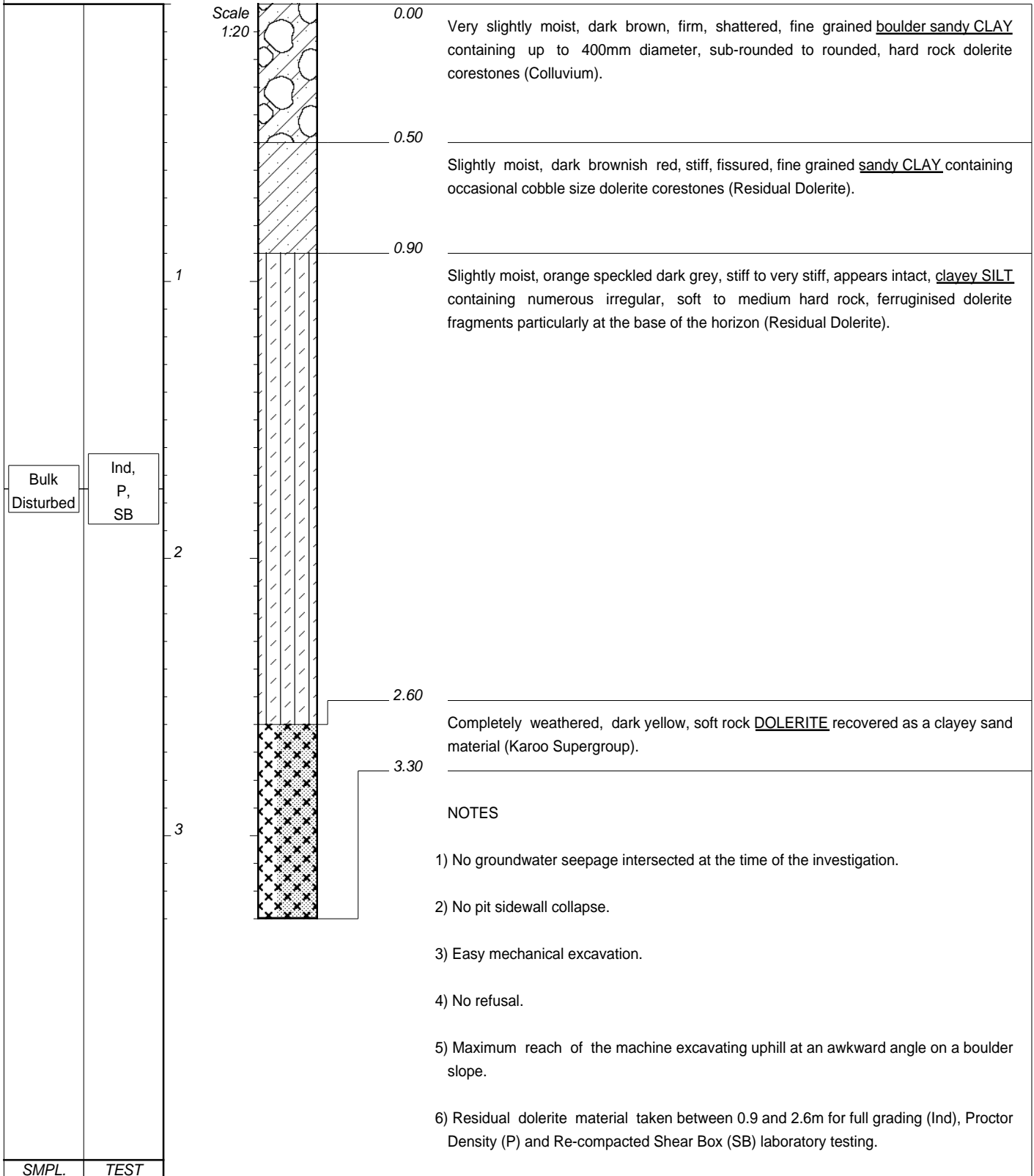
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APPENDIX A

INSPECTION PIT PROFILES (IP1 - IP22)



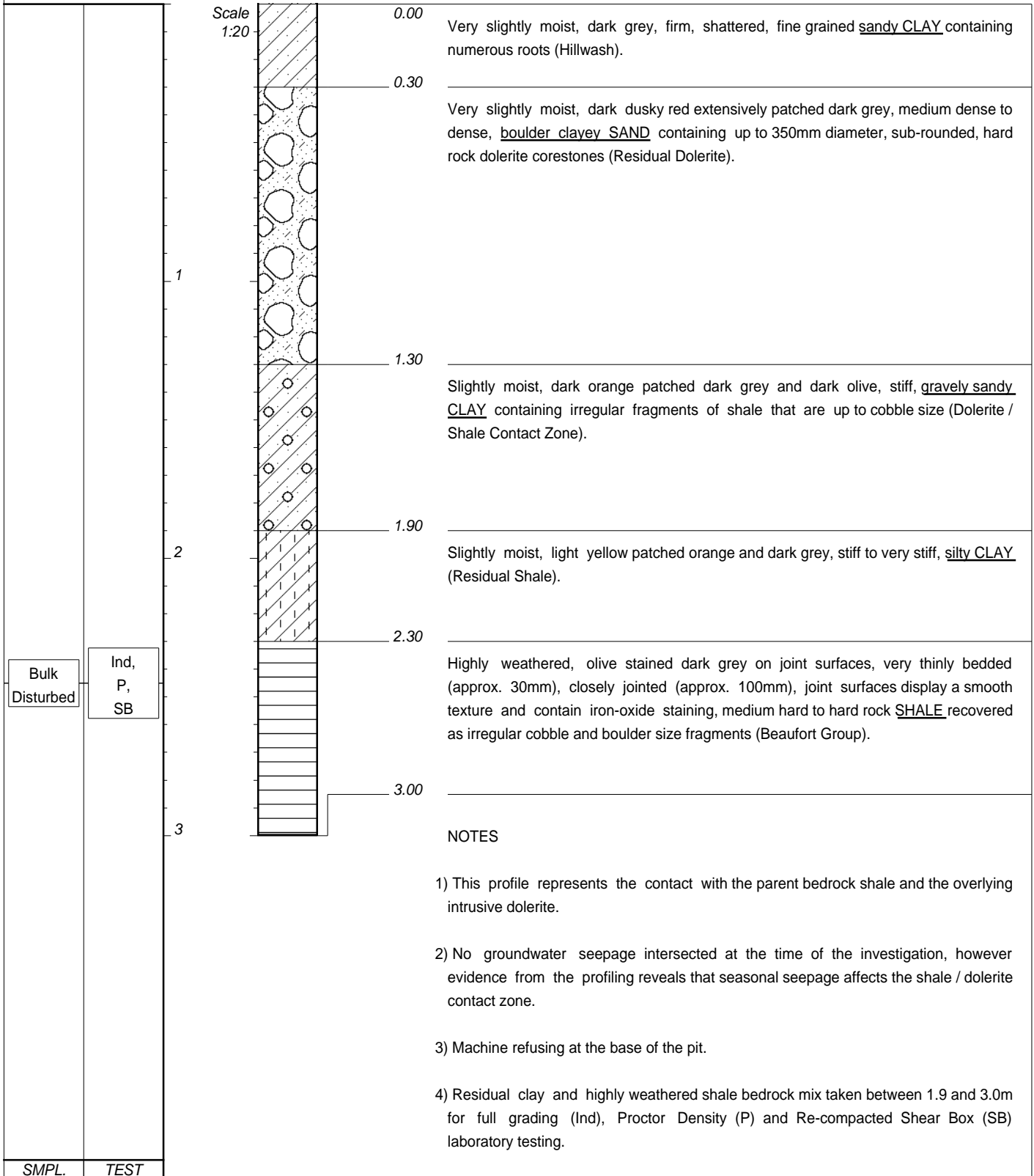
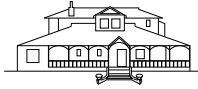
NOTES

- 1) No groundwater seepage intersected at the time of the investigation.
- 2) No pit sidewall collapse.
- 3) Easy mechanical excavation.
- 4) No refusal.
- 5) Maximum reach of the machine excavating uphill at an awkward angle on a boulder slope.
- 6) Residual dolerite material taken between 0.9 and 2.6m for full grading (Ind), Proctor Density (P) and Re-compacted Shear Box (SB) laboratory testing.

CONTRACTOR : PONDO CIVILS
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PROFILED BY : B.R
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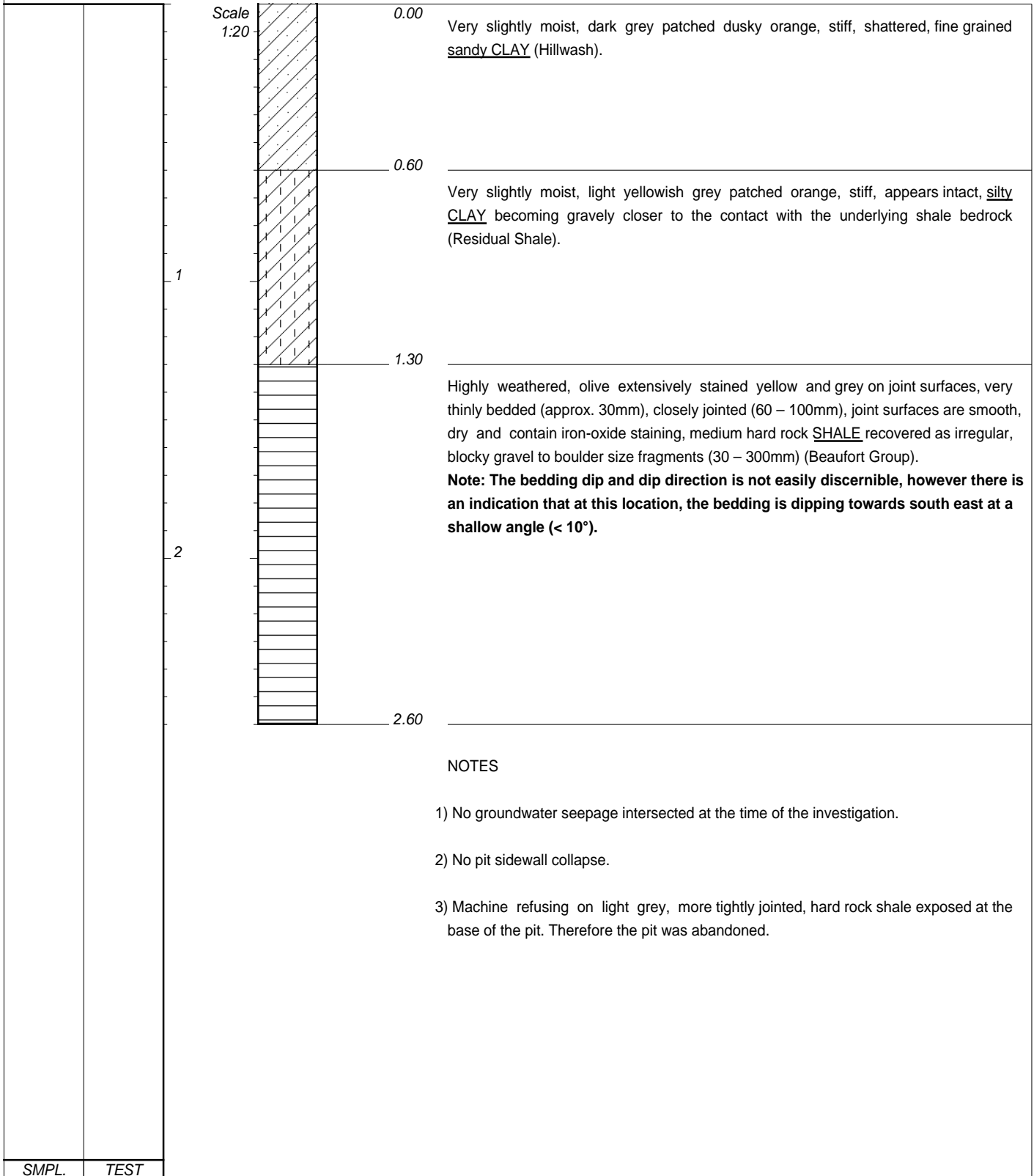
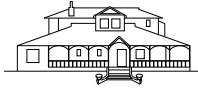
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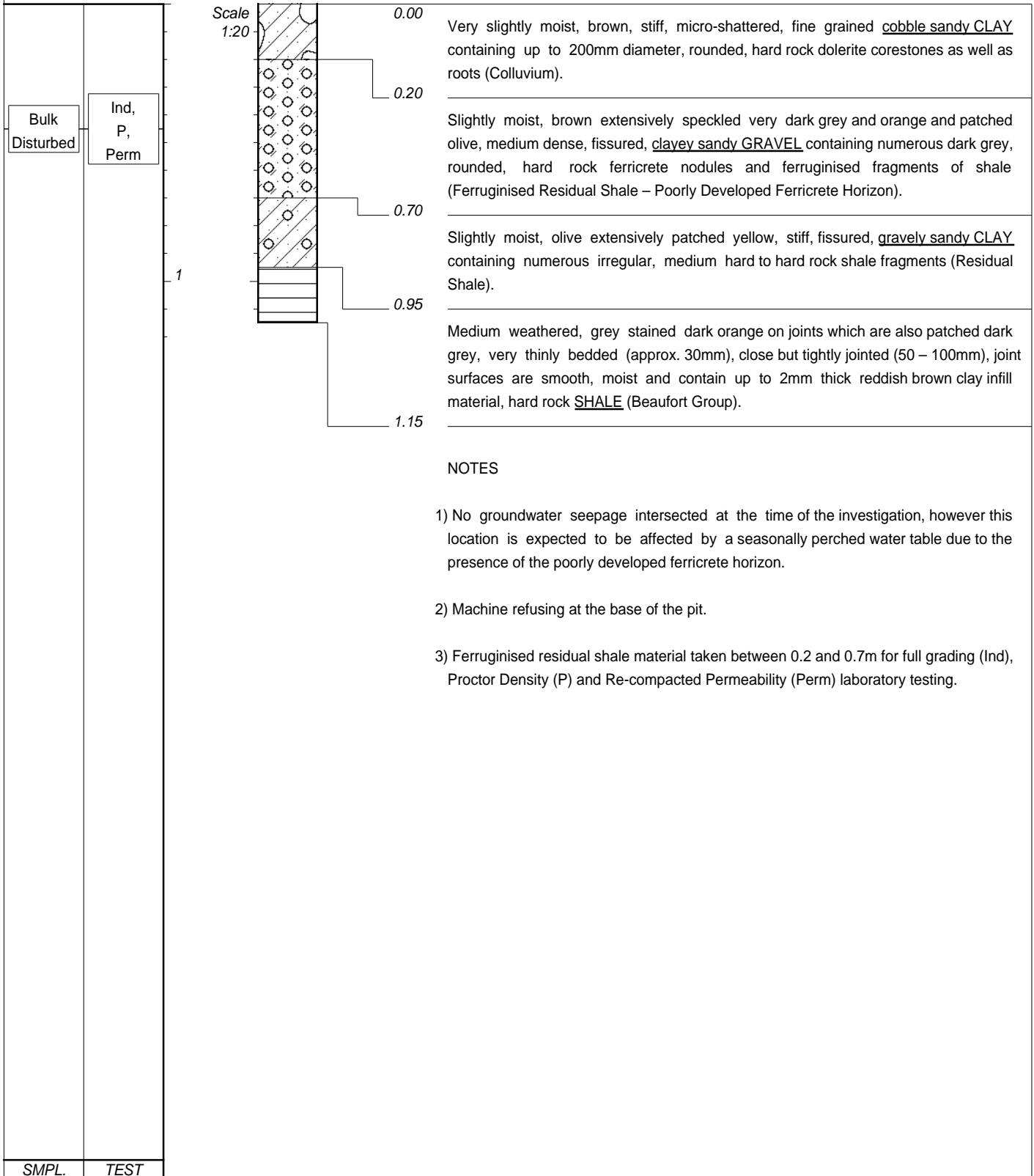
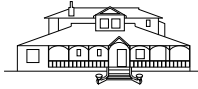
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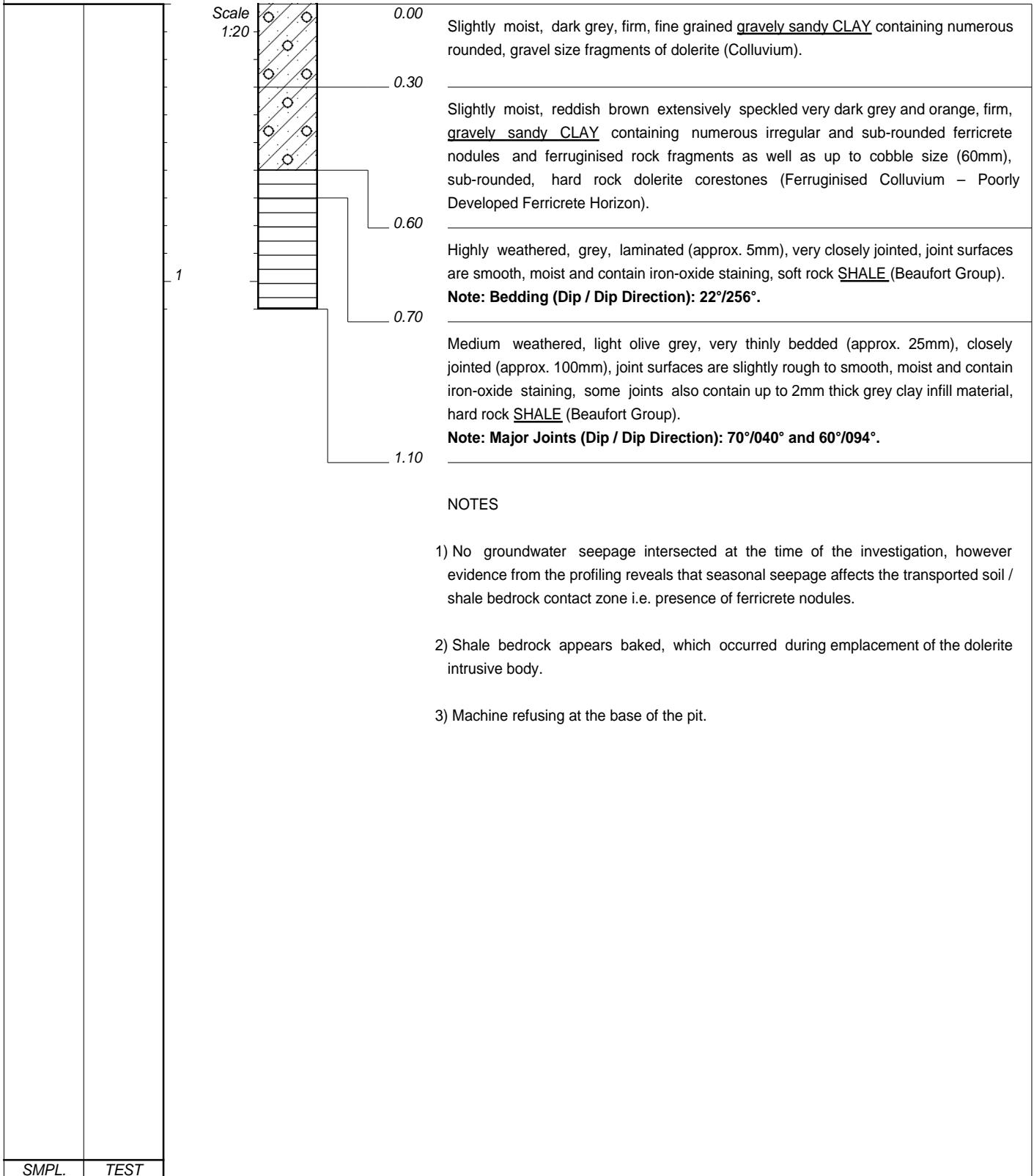
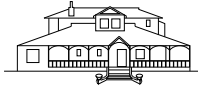
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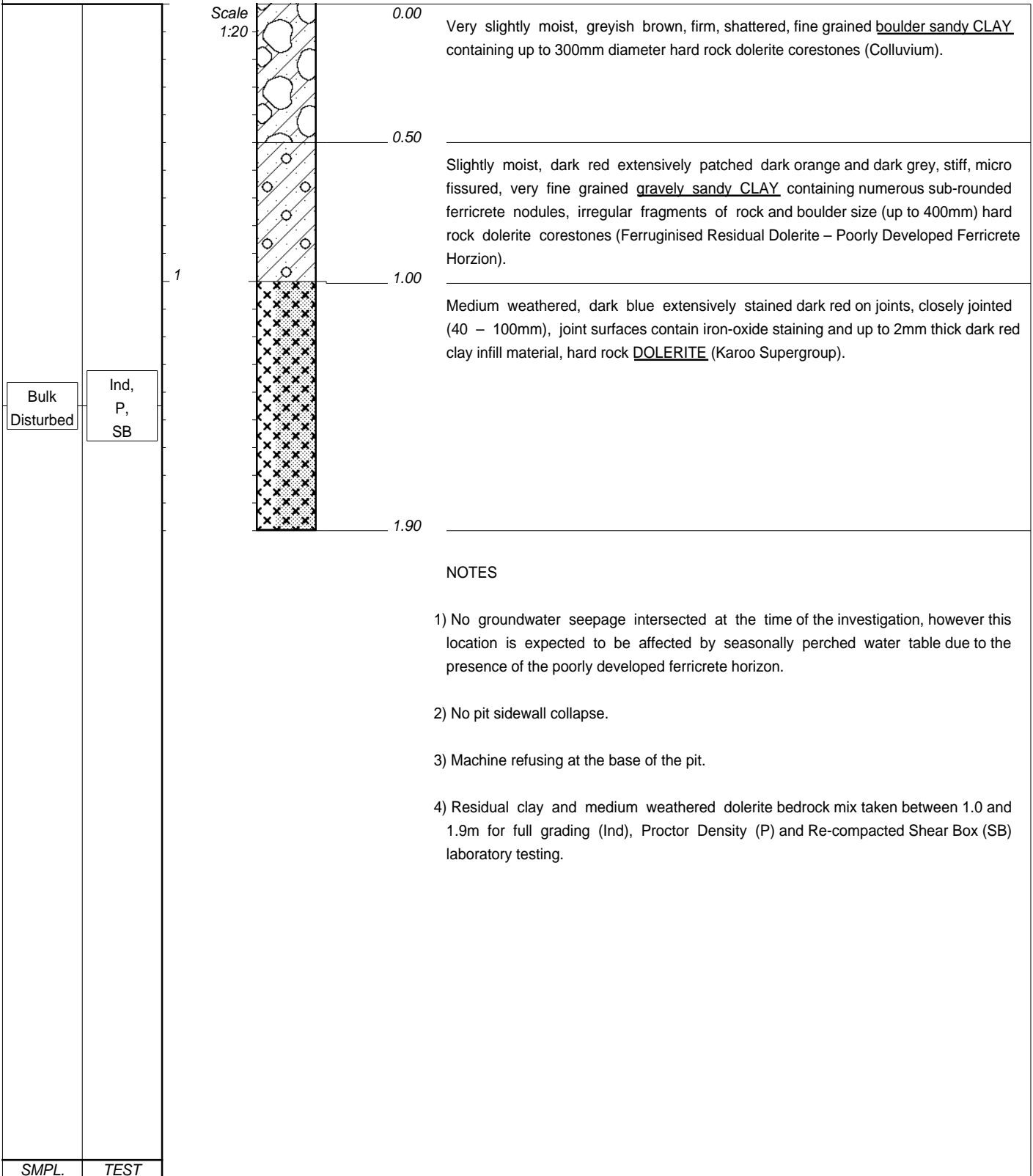
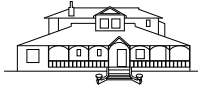
NOTES

- 1) No groundwater seepage intersected at the time of the investigation, however evidence from the profiling reveals that seasonal seepage affects the transported soil / shale bedrock contact zone i.e. presence of ferricrete nodules.
- 2) Shale bedrock appears baked, which occurred during emplacement of the dolerite intrusive body.
- 3) Machine refusing at the base of the pit.

CONTRACTOR : PONDO CIVILS
MACHINE : BELL HD820R
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PROFILED BY : B.R
TYPE SET BY : B.R
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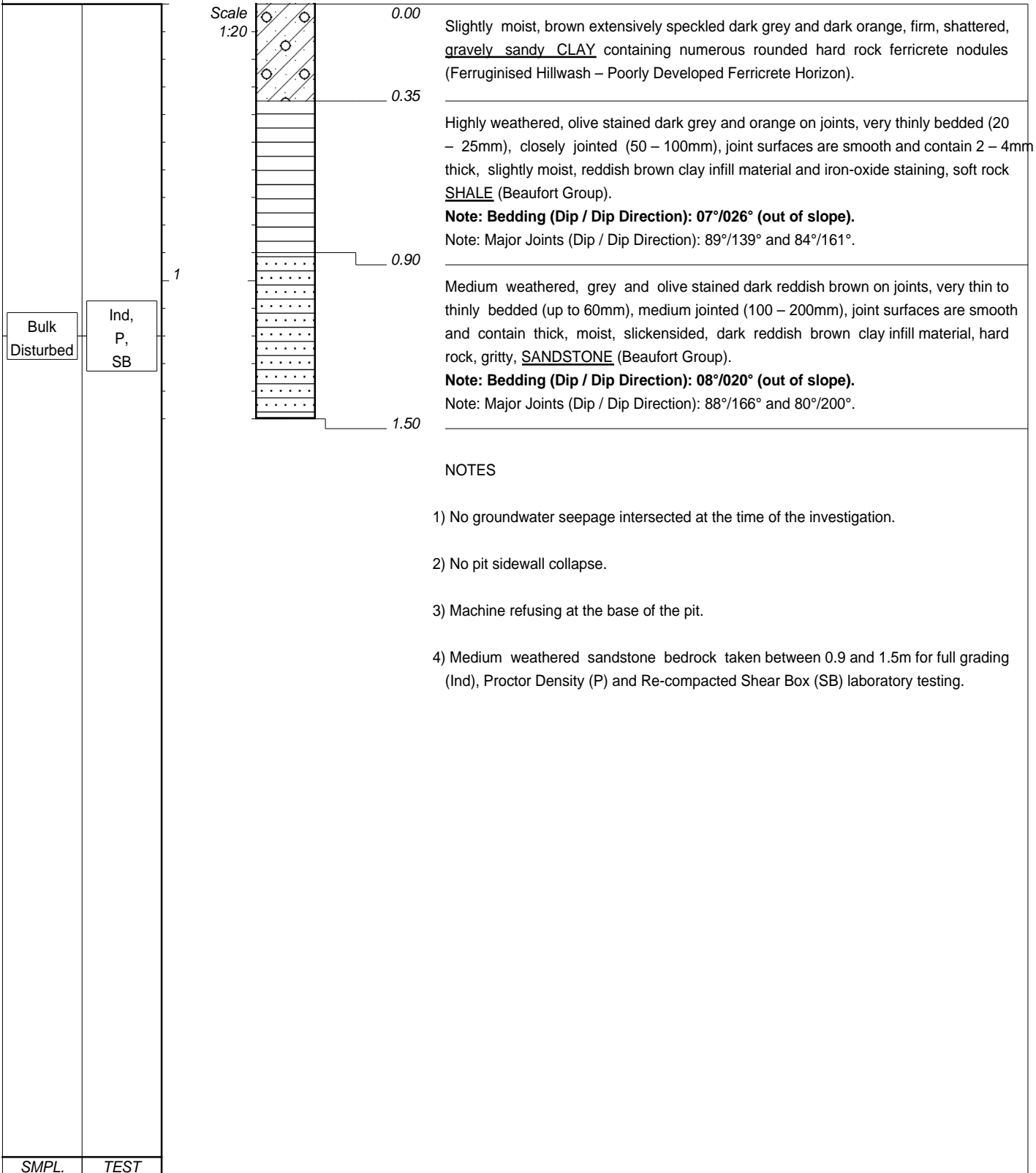
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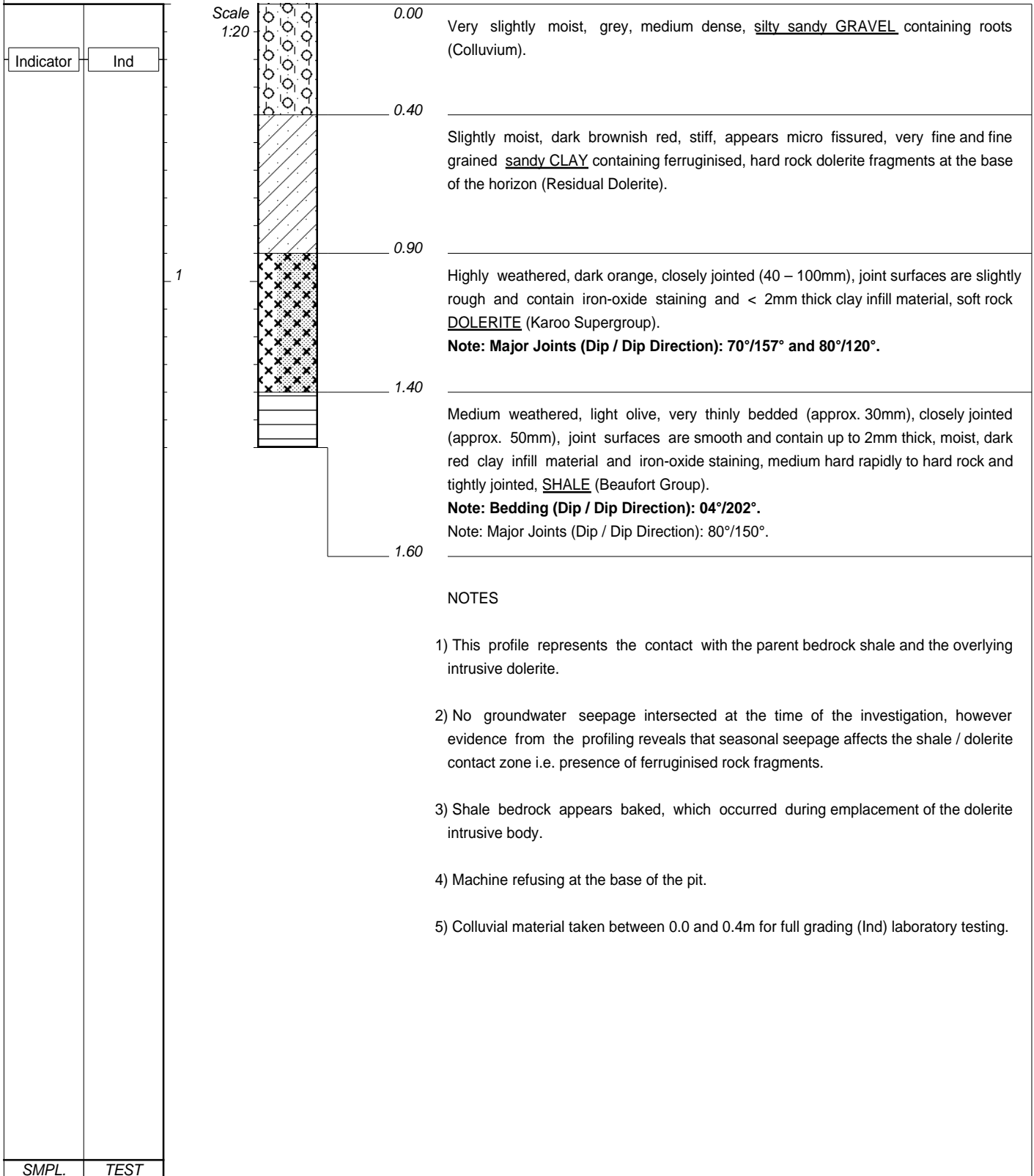
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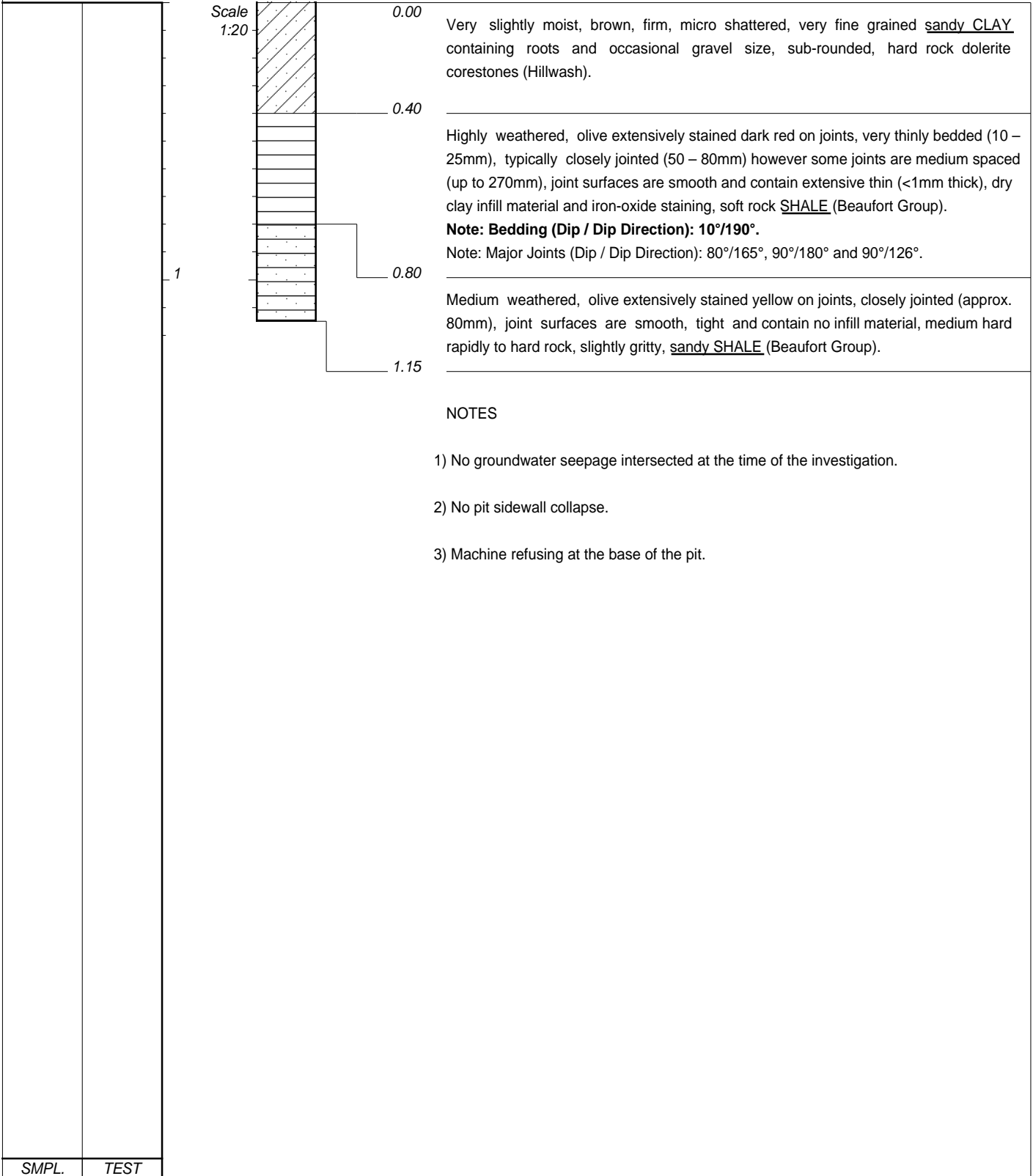
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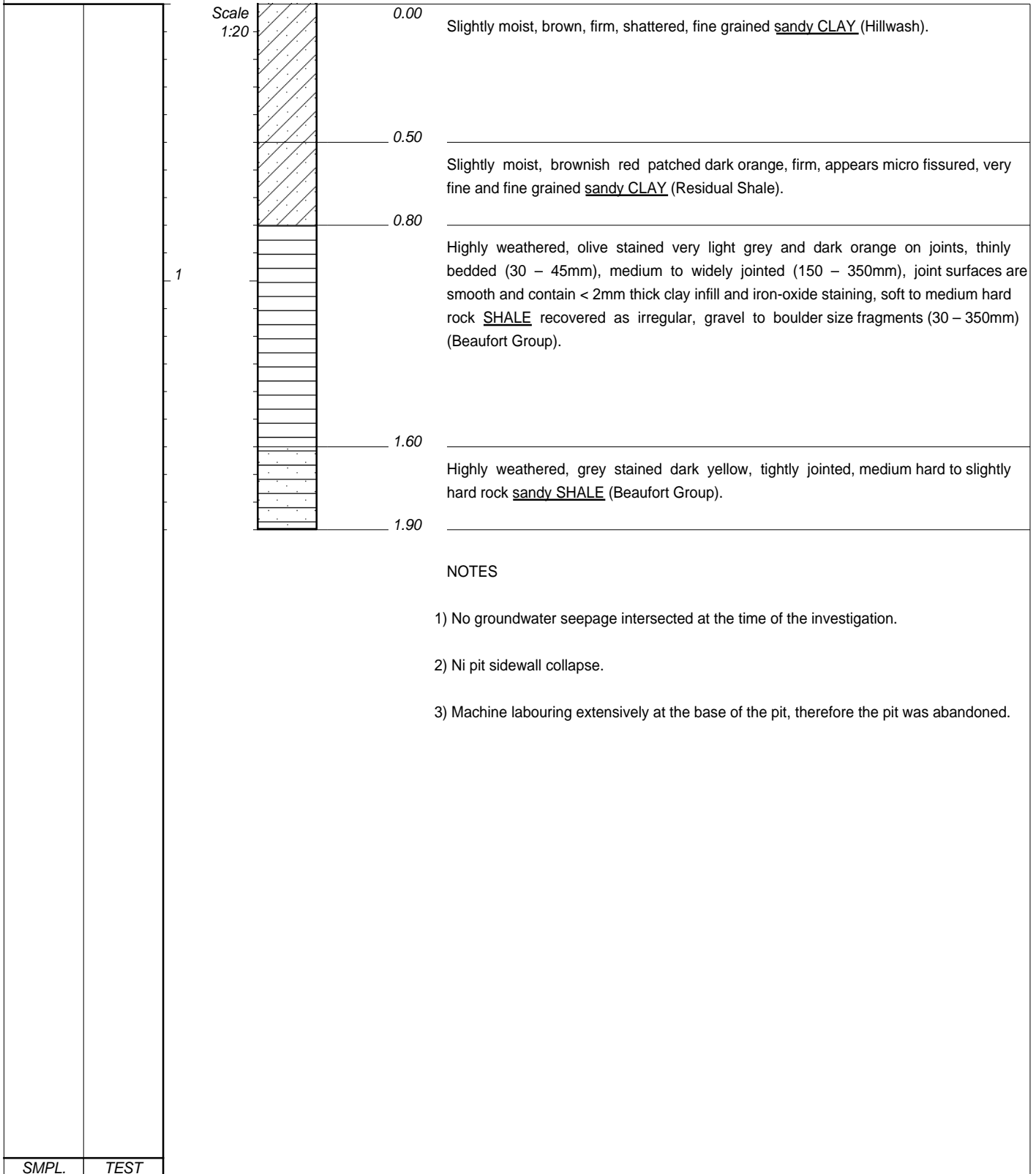
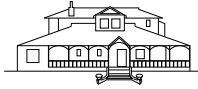
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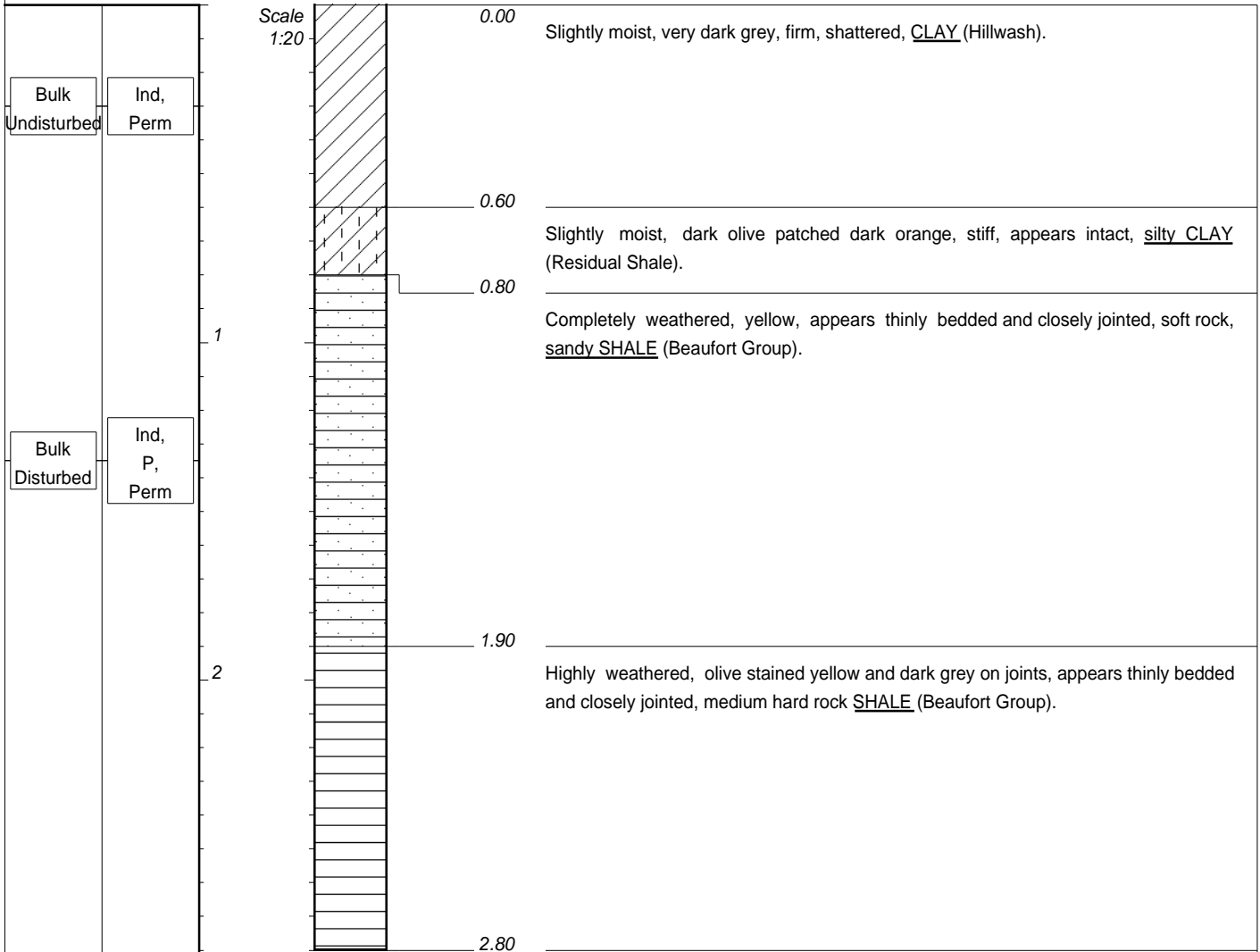
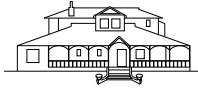
NOTES

- 1) No groundwater seepage intersected at the time of the investigation.
- 2) Ni pit sidewall collapse.
- 3) Machine labouring extensively at the base of the pit, therefore the pit was abandoned.

CONTRACTOR : PONDO CIVILS
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Bulk Undisturbed Ind, Perm

Bulk Disturbed Ind, P, Perm

NOTES

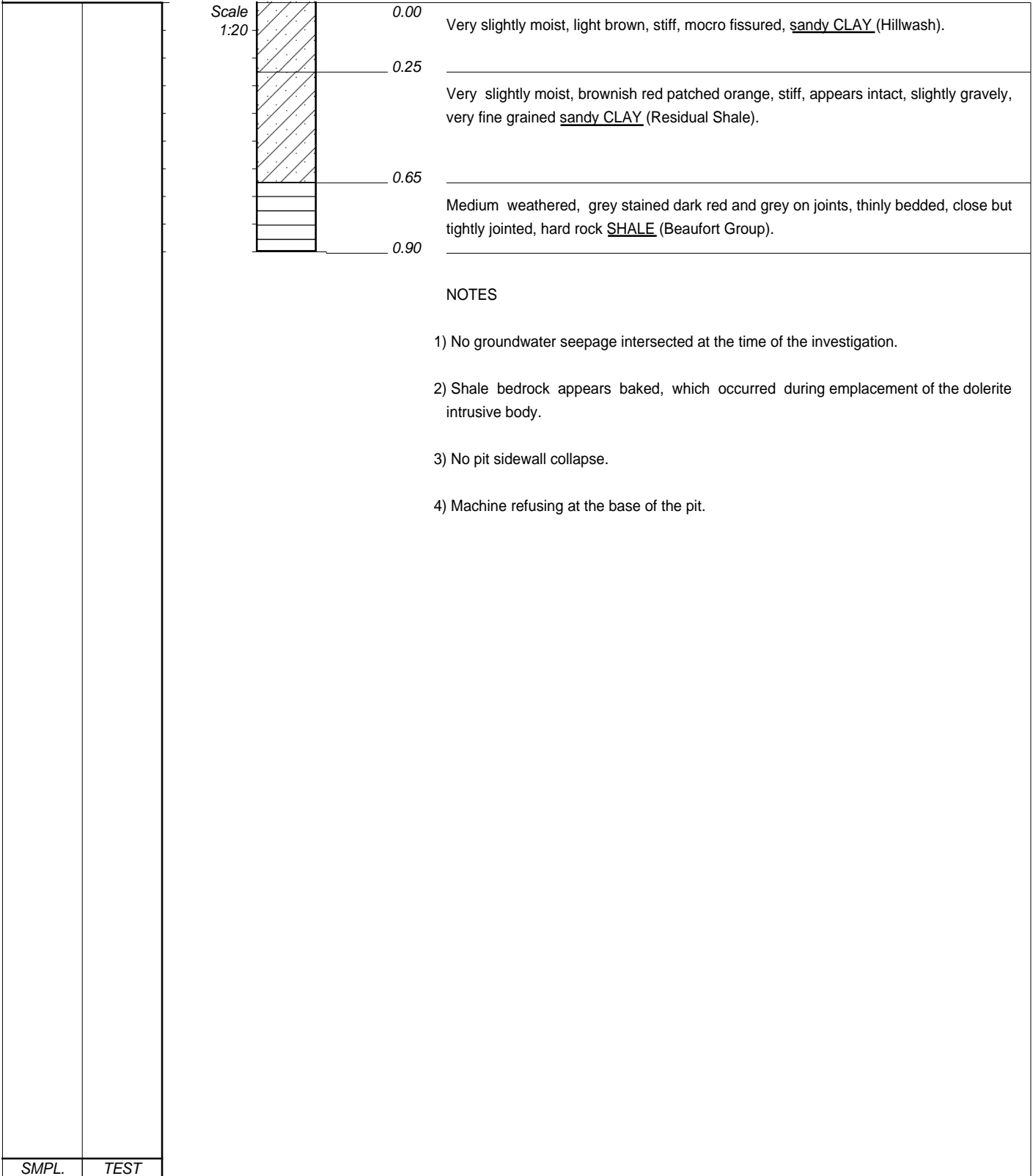
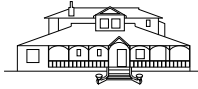
- 1) No groundwater seepage intersected at the time of the investigation.
- 2) Ni pit sidewall collapse.
- 3) Machine labouring extensively at the base of the pit, therefore the pit was abandoned.
- 4) Hillwash material taken between 0.0 and 0.6m for full grading (Ind) and In-Situ Permeability (Perm) laboratory testing.
- 5) Completely weathered shale bedrock taken between 0.8 and 1.9m for full grading (Ind), Proctor Density (P) and Re-compacted Permeability (Perm) laboratory testing.

SMPL. TEST

CONTRACTOR : PONDO CIVILS
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PROFILED BY : B.R
TYPE SET BY : B.R
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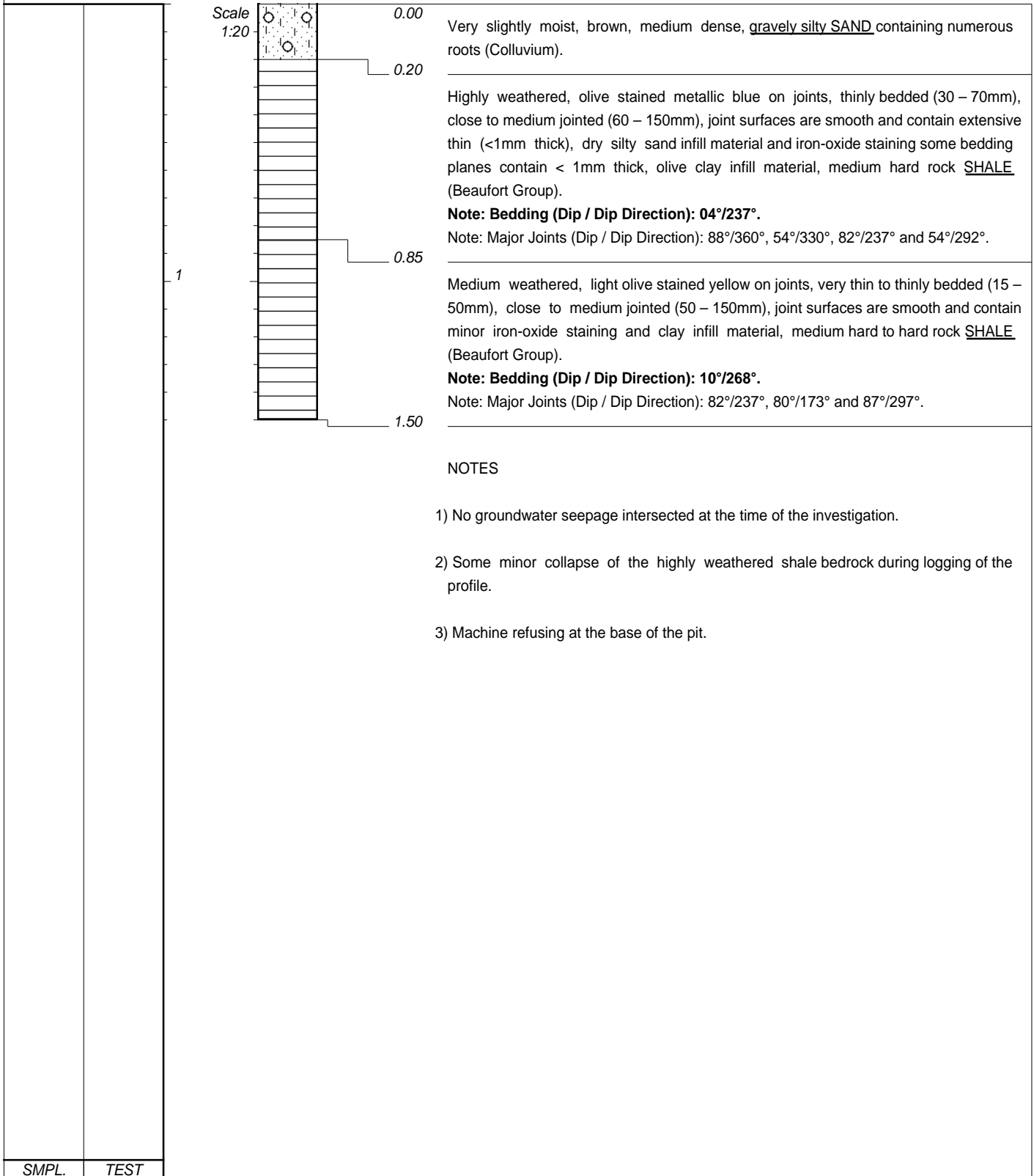
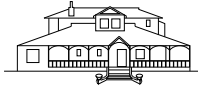
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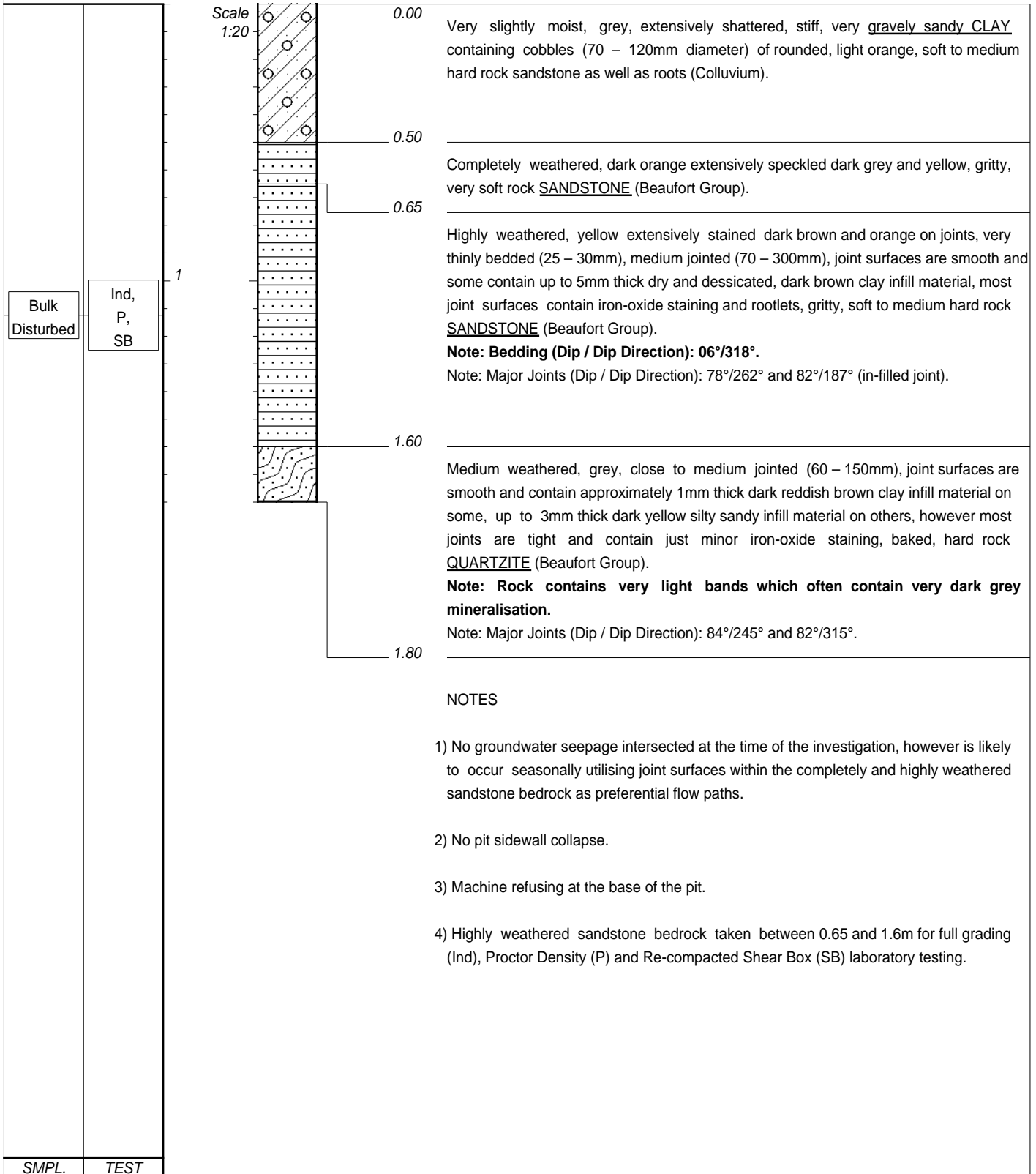
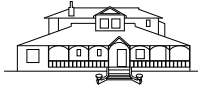
NOTES

- 1) No groundwater seepage intersected at the time of the investigation.
- 2) Some minor collapse of the highly weathered shale bedrock during logging of the profile.
- 3) Machine refusing at the base of the pit.

CONTRACTOR : PONDO CIVILS
MACHINE : BELL HD820R
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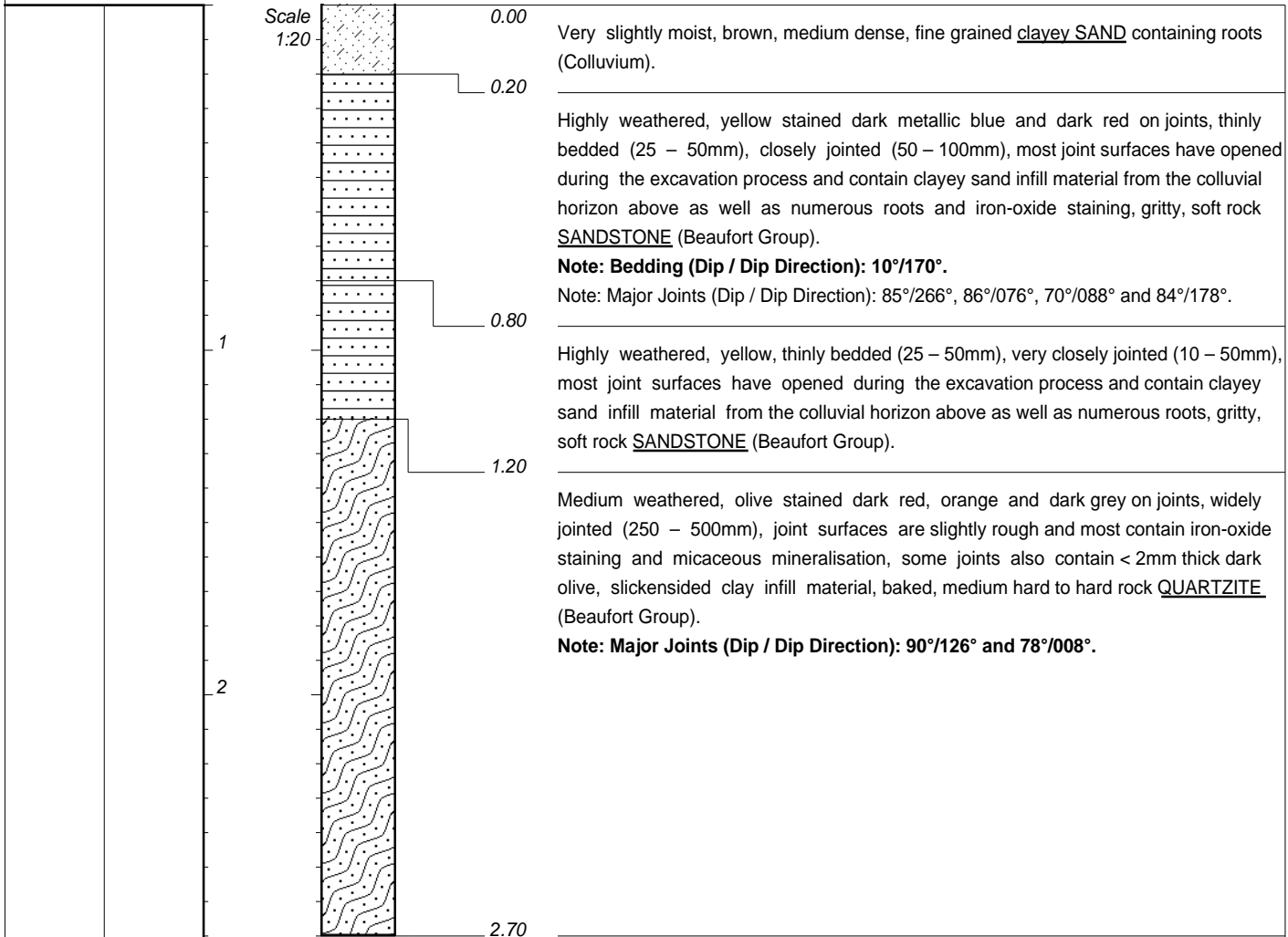
NOTES

- 1) No groundwater seepage intersected at the time of the investigation, however is likely to occur seasonally utilising joint surfaces within the completely and highly weathered sandstone bedrock as preferential flow paths.
- 2) No pit sidewall collapse.
- 3) Machine refusing at the base of the pit.
- 4) Highly weathered sandstone bedrock taken between 0.65 and 1.6m for full grading (Ind), Proctor Density (P) and Re-compacted Shear Box (SB) laboratory testing.

CONTRACTOR : PONDO CIVILS
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X-COORD :
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NOTES

- 1) No groundwater seepage intersected at the time of the investigation.
- 2) No pit sidewall collapse.
- 3) Machine refusing at the base of the pit.
- 4) On the downslope side of the pit, the completely to highly weathered sandstone has weathered completely to produce a dark yellow, slightly clayey, silty sand material.

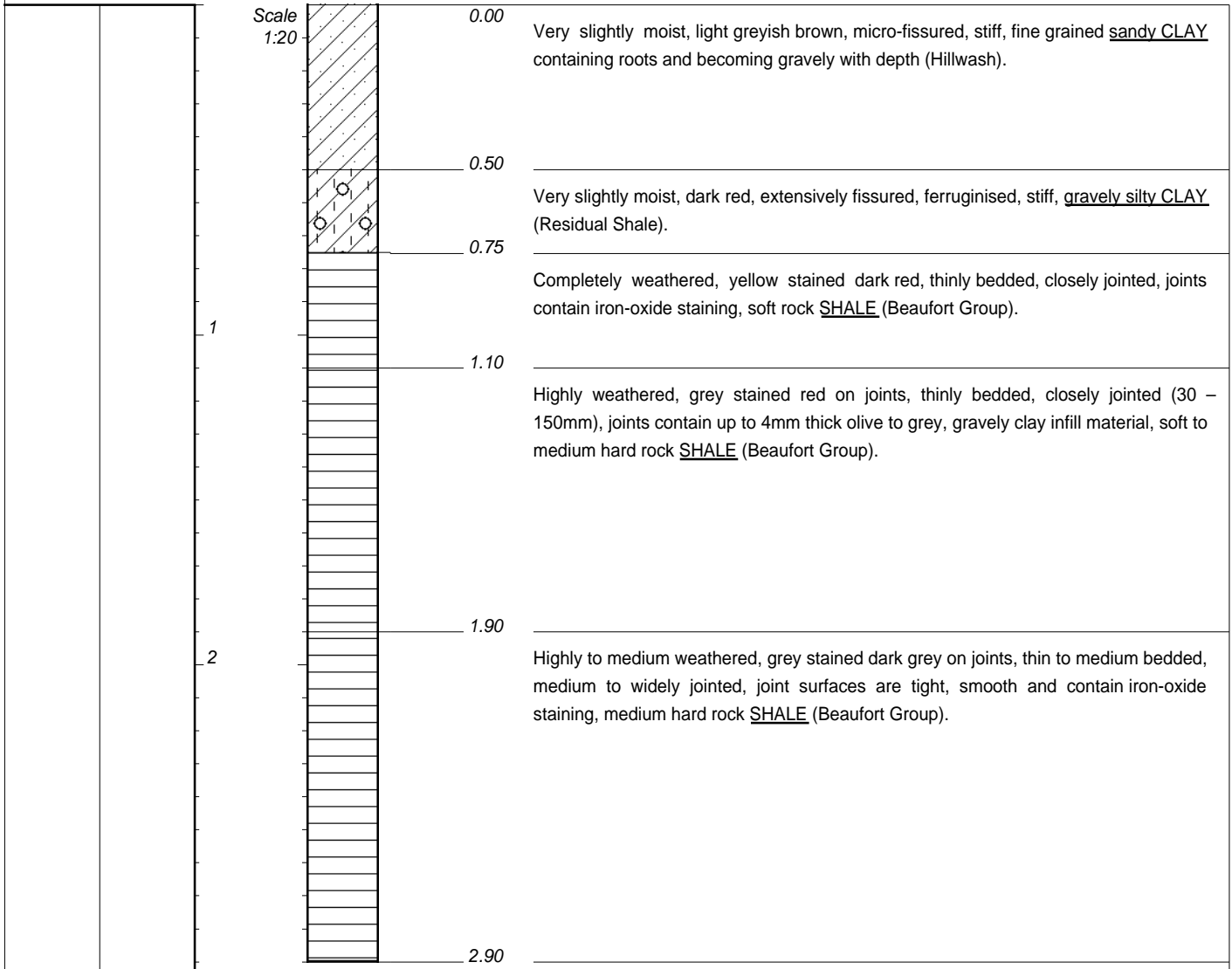
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HOLE No: IP 15



NOTES

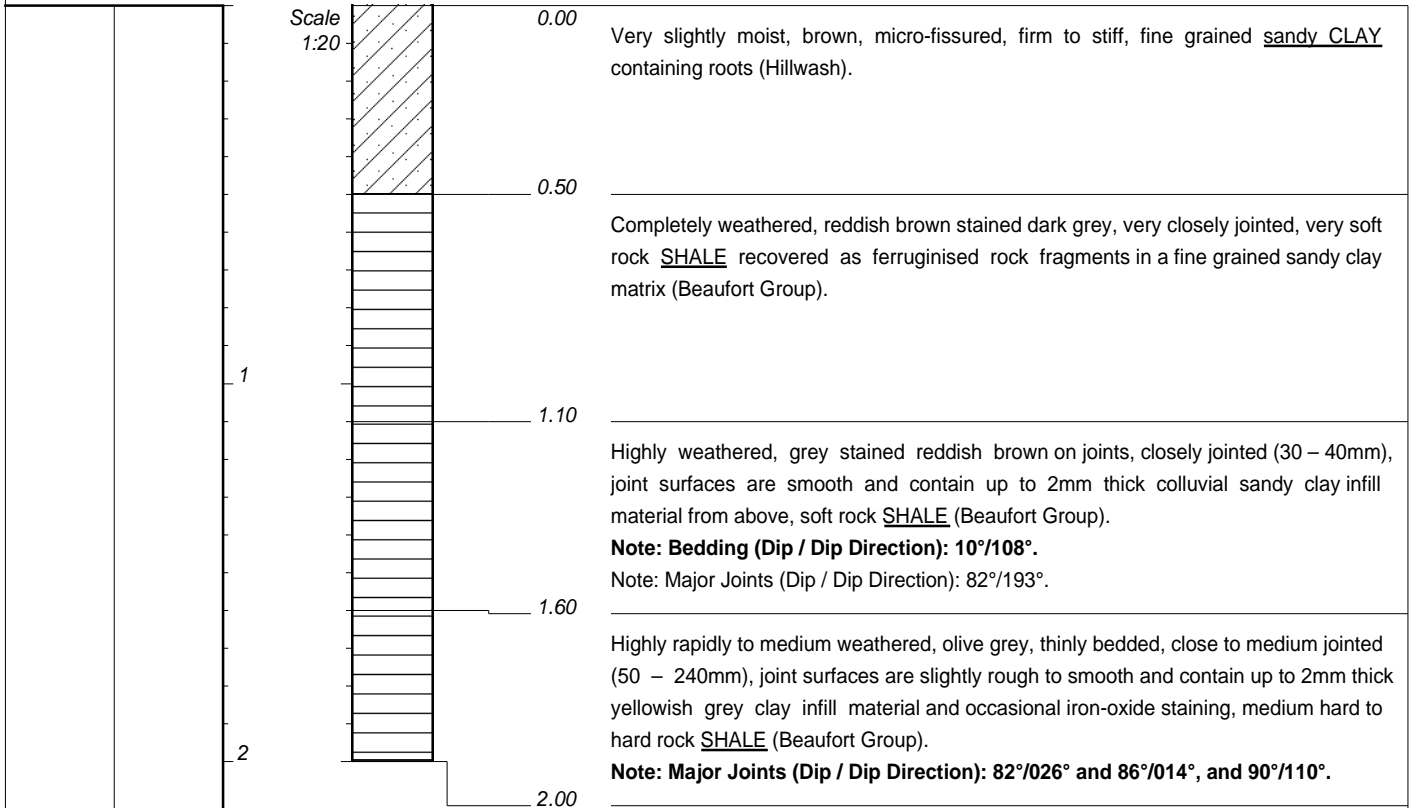
- 1) No groundwater seepage intersected at the time of the investigation.
- 2) No pit sidewall collapse.
- 3) Machine refusing at the base of the pit.
- 4) Unable to get into this pit to measure the bedding and joint orientations due to the excessive depth. However, the bedding of the shale does appear to be dipping back into the slope at this location.

SMPL.	TEST

CONTRACTOR : PONDO CIVILS
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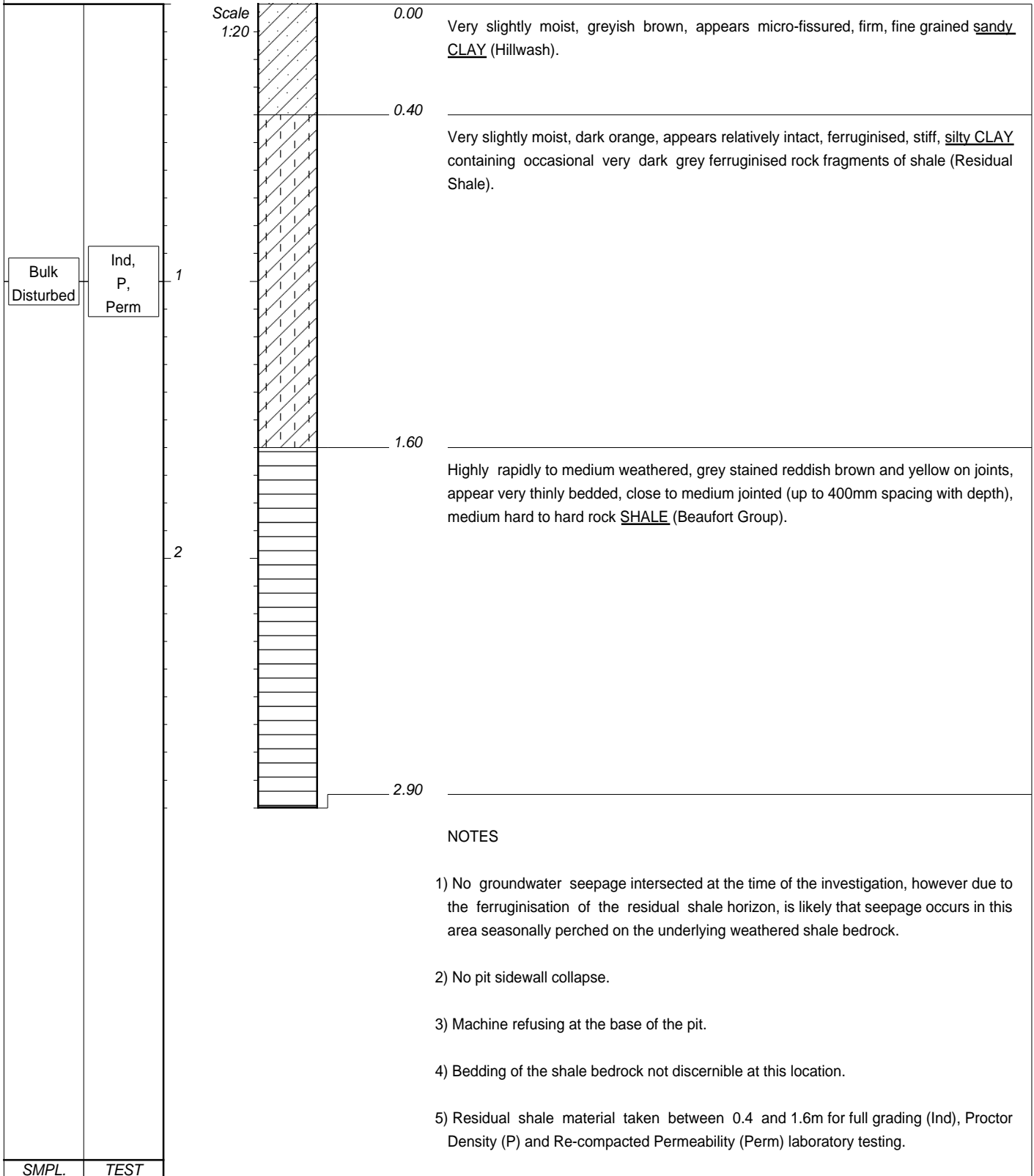
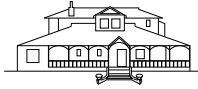
- 1) No groundwater seepage intersected at the time of the investigation.
- 2) No pit sidewall collapse.
- 3) Machine refusing at the base of the pit.

SMPL.	TEST
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CONTRACTOR : PONDO CIVILS
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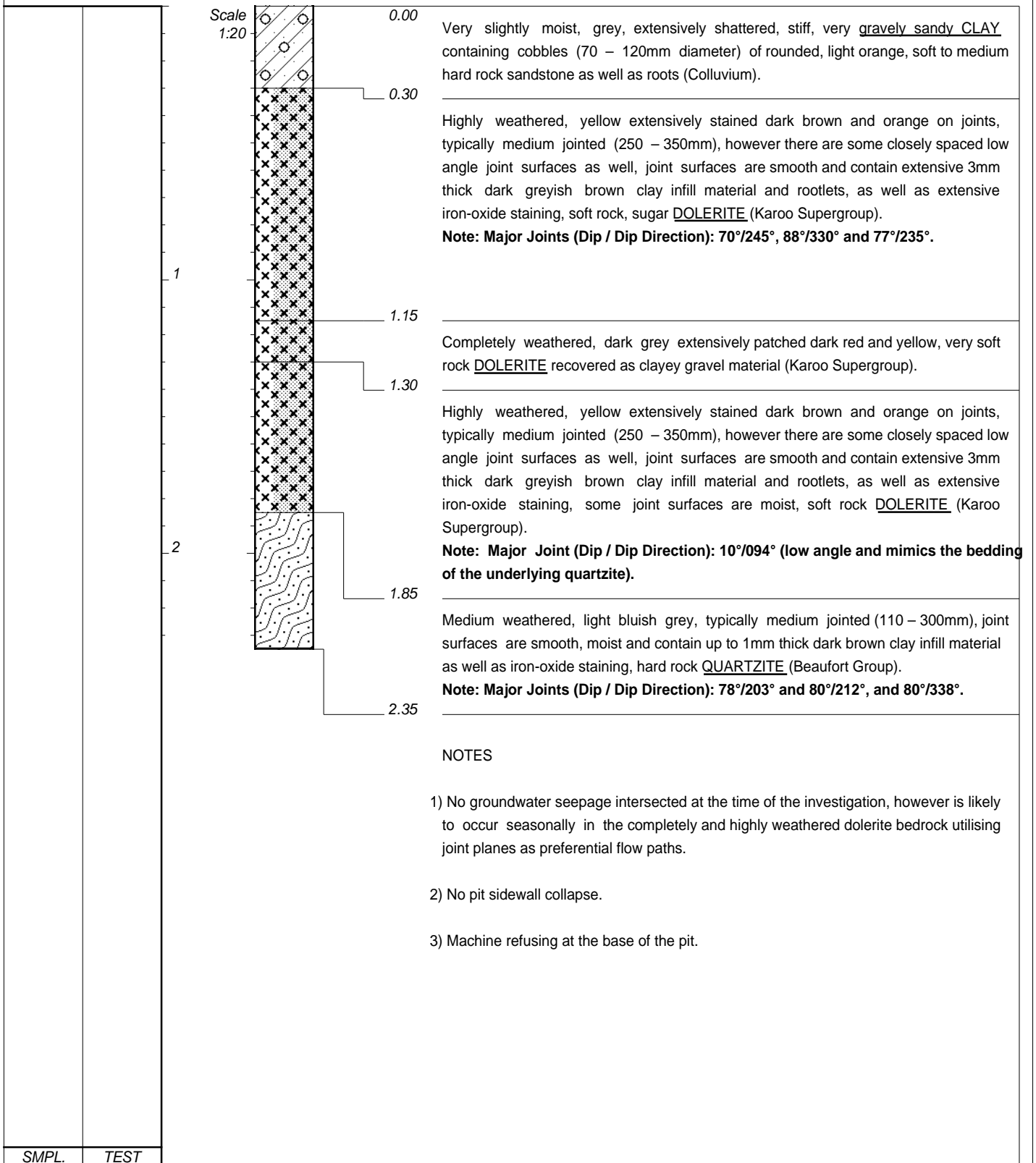
NOTES

- 1) No groundwater seepage intersected at the time of the investigation, however due to the ferruginisation of the residual shale horizon, is likely that seepage occurs in this area seasonally perched on the underlying weathered shale bedrock.
- 2) No pit sidewall collapse.
- 3) Machine refusing at the base of the pit.
- 4) Bedding of the shale bedrock not discernible at this location.
- 5) Residual shale material taken between 0.4 and 1.6m for full grading (Ind), Proctor Density (P) and Re-compacted Permeability (Perm) laboratory testing.

CONTRACTOR : PONDO CIVILS
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DRILLED BY : NA
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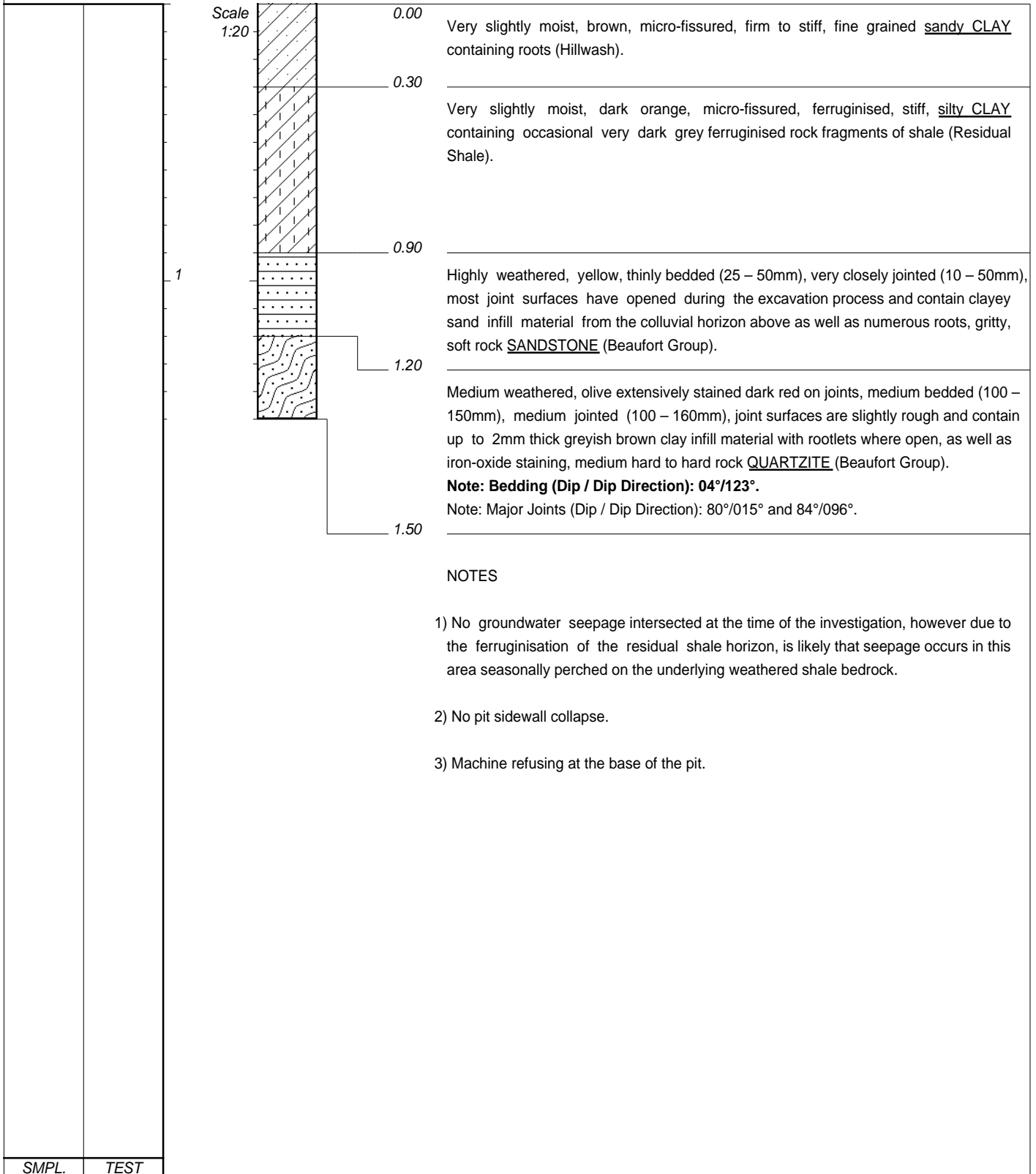
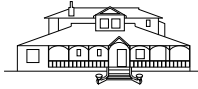
NOTES

- 1) No groundwater seepage intersected at the time of the investigation, however is likely to occur seasonally in the completely and highly weathered dolerite bedrock utilising joint planes as preferential flow paths.
- 2) No pit sidewall collapse.
- 3) Machine refusing at the base of the pit.

CONTRACTOR : PONDO CIVILS
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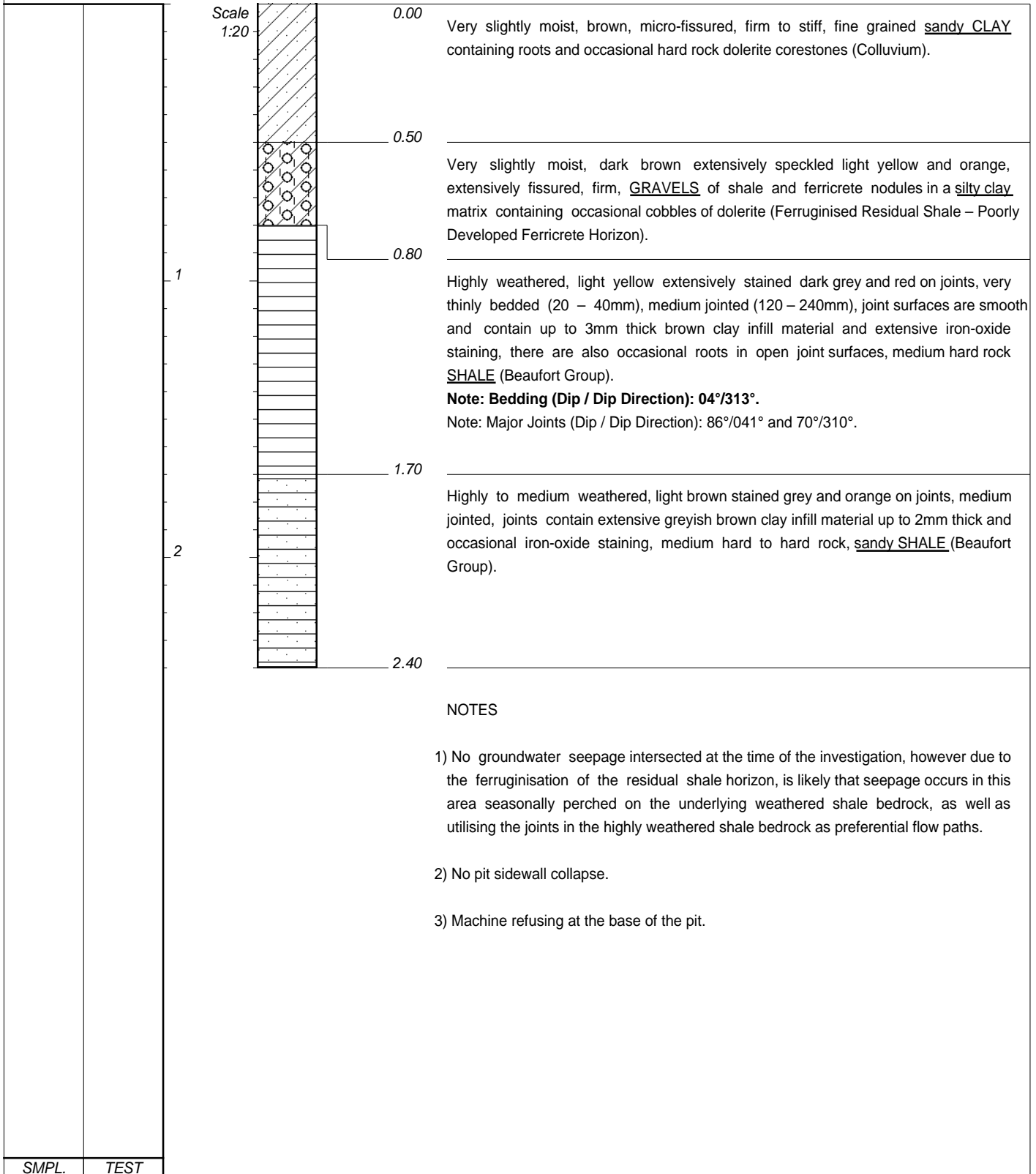
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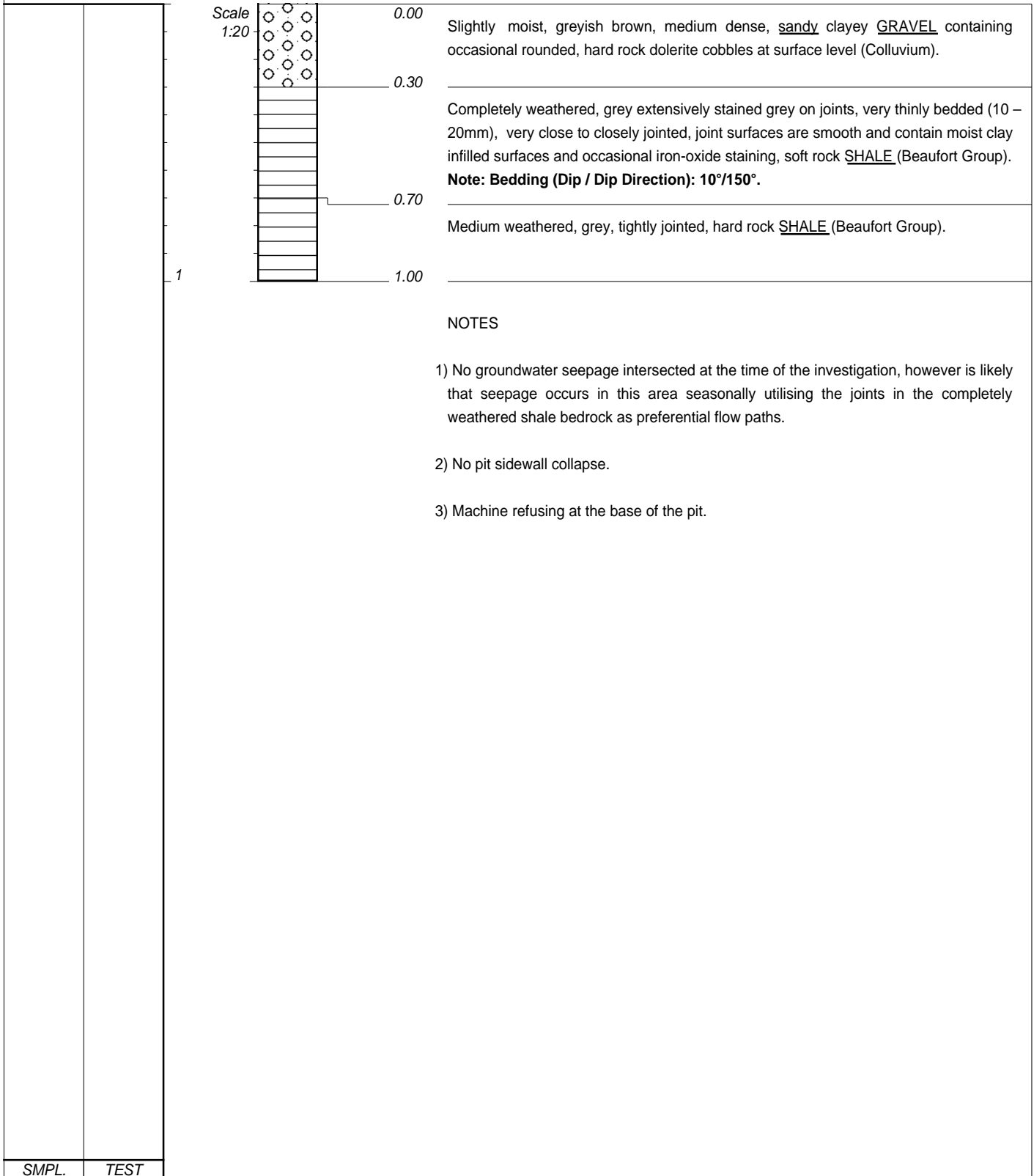
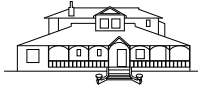
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Y-COORD :



NOTES

- 1) No groundwater seepage intersected at the time of the investigation, however is likely that seepage occurs in this area seasonally utilising the joints in the completely weathered shale bedrock as preferential flow paths.
- 2) No pit sidewall collapse.
- 3) Machine refusing at the base of the pit.

SMPL.	TEST

CONTRACTOR : PONDO CIVILS
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DRILLED BY : NA
PROFILED BY : B.R
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CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY :

INCLINATION :
DIAM :
DATE :
DATE :

ELEVATION :
X-COORD :
Y-COORD :

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LEGEND
SUMMARY OF SYMBOLS

APPENDIX B

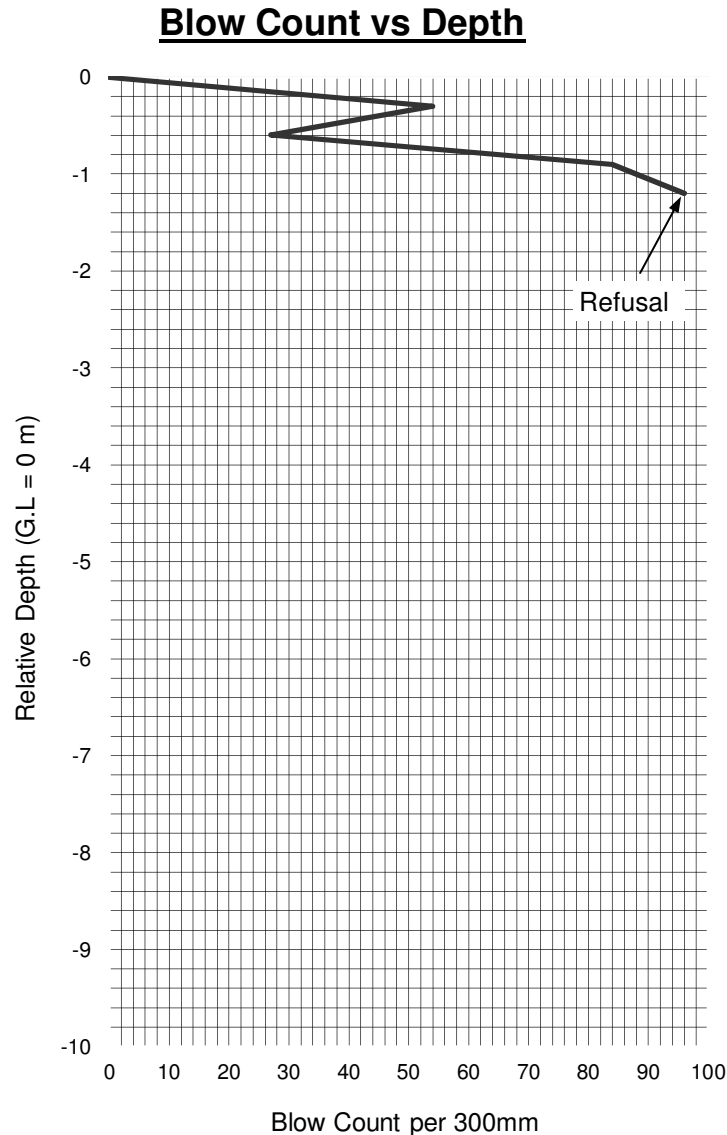
**DYNAMIC CONE PENETROMETER
TEST RESULTS (DCP1 - DCP26)**

Dynamic Cone Penetrometer

Test No. : 1

Project : Kokstad Landfill
Client: TGC Engineers cc.
Date: 21-06-2012 Remarks: Underlain by Shale
Test Location: Site 1 Krantz Fontein Farm -
Date of Test: 20-06-2012 Depth Interval (m) : 0.3

Depth (m)	Count Blows/0.3m
0	0
-0.3	54
-0.6	27
-0.9	84
-1.2	96
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Reference No. : 22233

Drennan Maud & Partners.

Fig. No. -

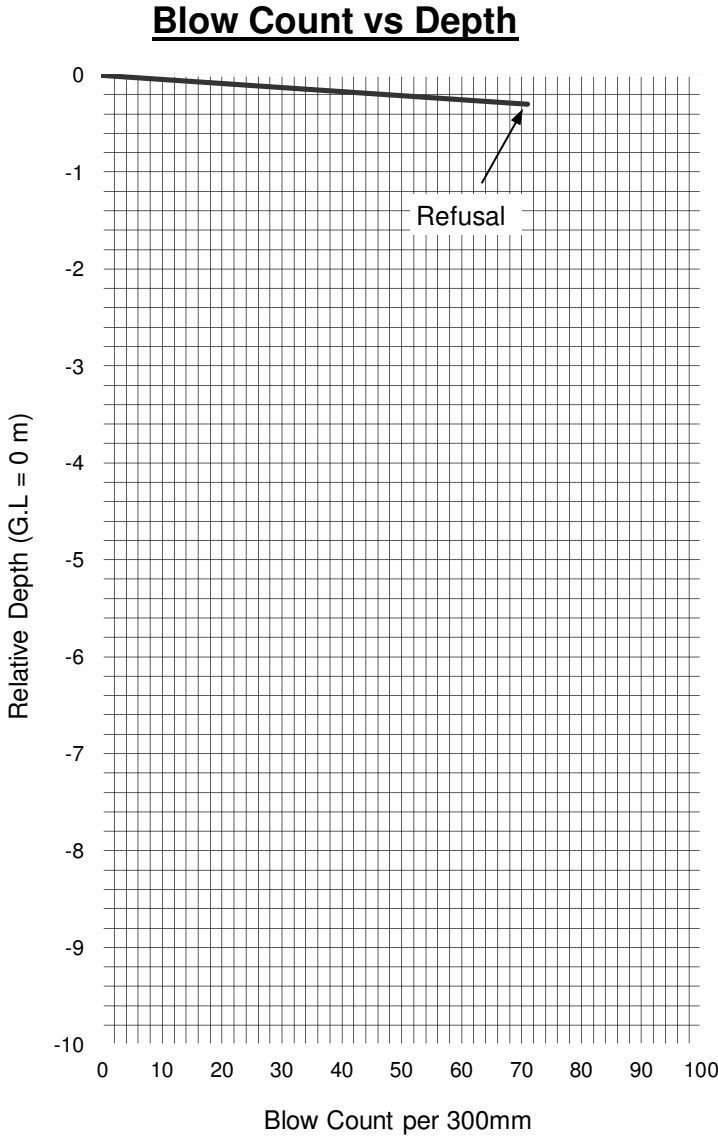
Note: DCP Blow Count equals the number of blows of a 10kg hammer dropping 450mm required to drive a 25mm diameter 60° cone a distance of 300mm.

Dynamic Cone Penetrometer

Test No. : 2

Project : Kokstad Landfill
Client: TGC Engineers cc.
 Date: 21-06-2012 Remarks: Underlain by Shale
 Test Location: Site 1 Krantz Fontein Farm -
 Date of Test: 20-06-2012 Depth Interval (m) : 0.3

Depth (m)	Count Blows/0.3m
0	0
-0.3	71
-	
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Reference No. : 22233

Drennan Maud & Partners.

Fig. No. -

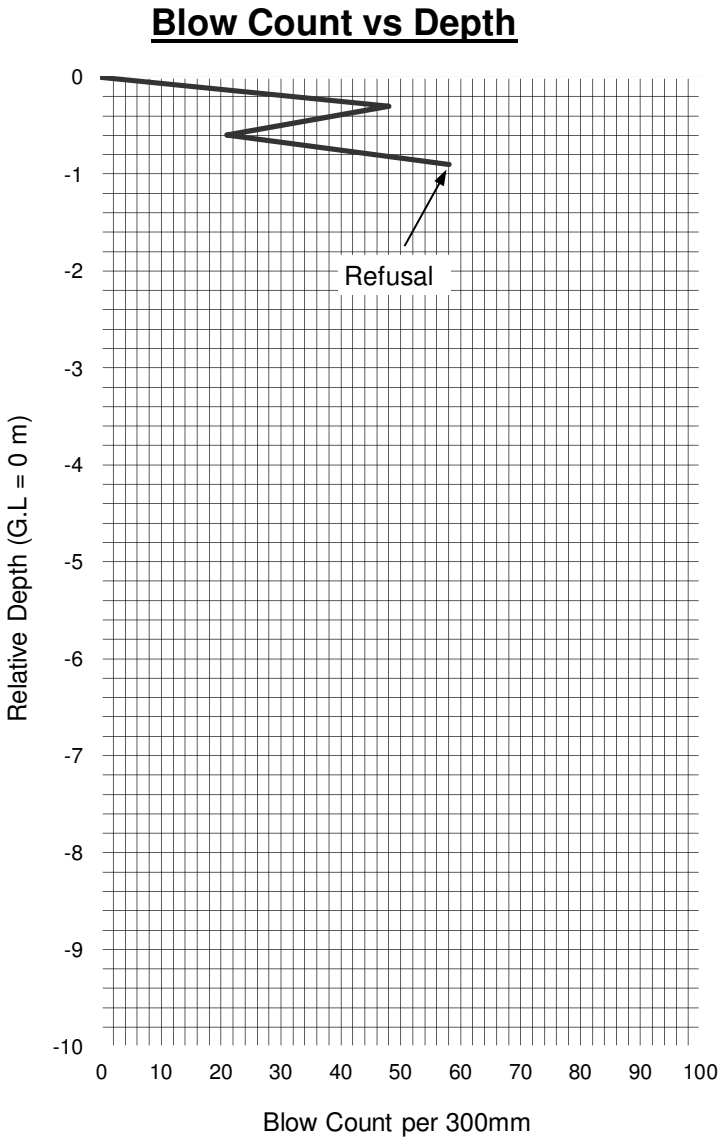
Note: DCP Blow Count equals the number of blows of a 10kg hammer dropping 450mm required to drive a 25mm diameter 60° cone a distance of 300mm.

Dynamic Cone Penetrometer

Test No. : 3

Project : Kokstad Landfill
Client: TGC Engineers cc.
Date: 21-06-2012 Remarks: Underlain by Shale
Test Location: Site 1 Krantz Fontein Farm -
Date of Test: 20-06-2012 Depth Interval (m) : 0.3

Depth (m)	Count Blows/0.3m
0	0
-0.3	48
-0.6	21
-0.9	58
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Reference No. : 22233 Drennan Maud & Partners.

Fig. No. -

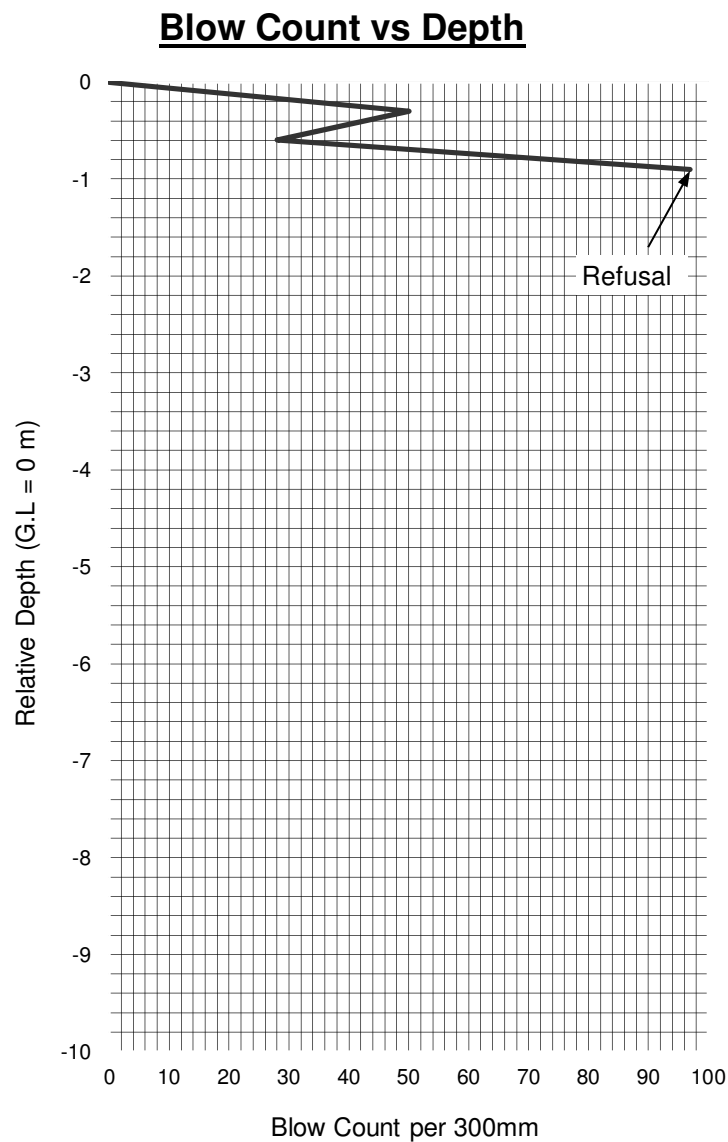
Note: DCP Blow Count equals the number of blows of a 10kg hammer dropping 450mm required to drive a 25mm diameter 60° cone a distance of 300mm.

Dynamic Cone Penetrometer

Test No. : 4

Project : Kokstad Landfill
Client: TGC Engineers cc.
 Date: 21-06-2012 Remarks: Underlain by Shale
 Test Location: Site 1 Krantz Fontein Farm intruded by Dolerite
 Date of Test: 20-06-2012 Depth Interval (m) : 0.3

Depth (m)	Count Blows/0.3m
0	0
-0.3	50
-0.6	28
-0.9	97
-	-
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-	-
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Reference No. : 22233

Drennan Maud & Partners.

Fig. No. -

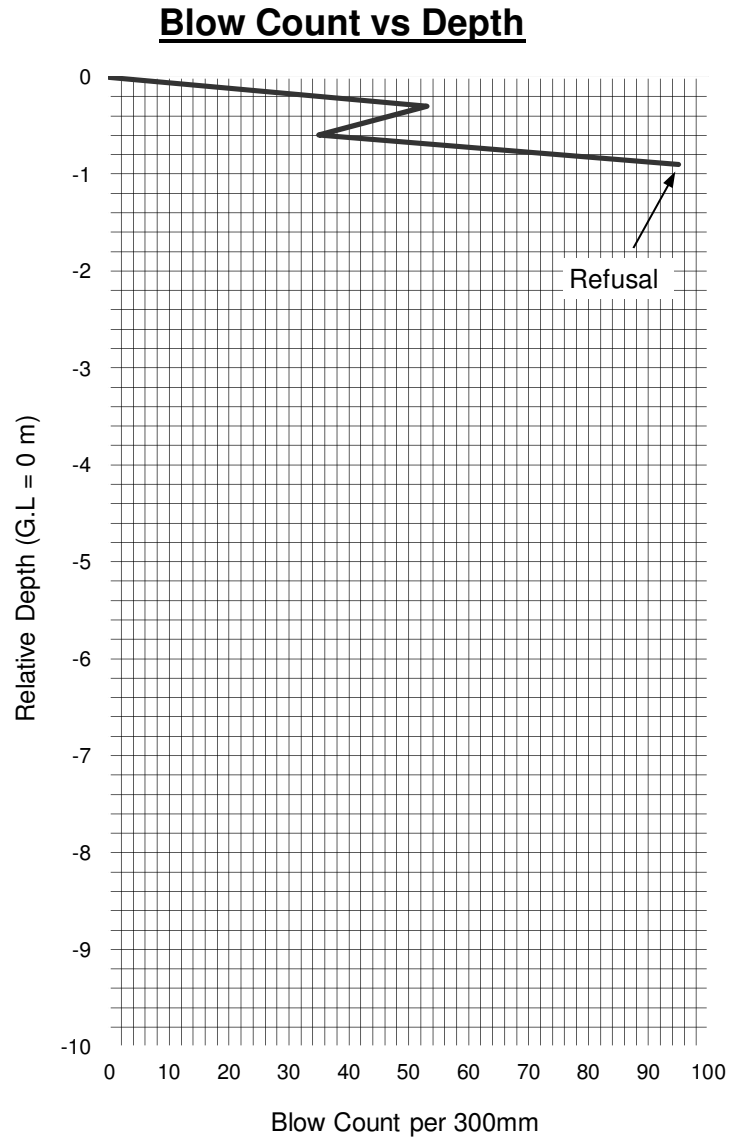
Note: DCP Blow Count equals the number of blows of a 10kg hammer dropping 450mm required to drive a 25mm diameter 60° cone a distance of 300mm.

Dynamic Cone Penetrometer

Test No. : 5

Project :	Kokstad Landfill	Remarks:	Underlain by Shale
Client:	TGC Engineers cc.		
Date:	21-06-2012		
Test Location:	Site 1 Krantz Fontein Farm		-
Date of Test:	20-06-2012	Depth Interval (m) :	0.3

Depth (m)	Count Blows/0.3m
0	0
-0.3	53
-0.6	35
-0.9	95
-	-
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Reference No. : 22233

Drennan Maud & Partners.

Fig. No. -

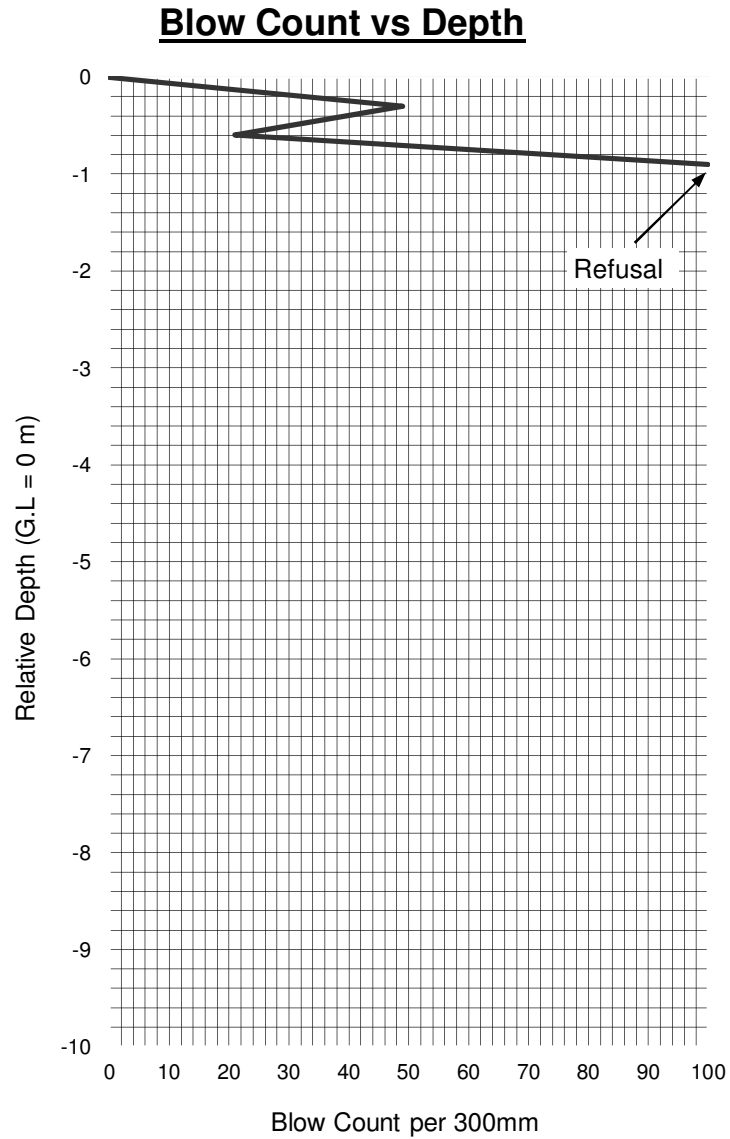
Note: DCP Blow Count equals the number of blows of a 10kg hammer dropping 450mm required to drive a 25mm diameter 60° cone a distance of 300mm.

Dynamic Cone Penetrometer

Test No. : 6

Project :	Kokstad Landfill		
Client:	TGC Engineers cc.		
Date:	21-06-2012	Remarks:	Underlain by Sandstone
Test Location:	Site 1 Krantz Fontein Farm		-
Date of Test:	20-06-2012	Depth Interval (m) :	0.3

Depth (m)	Count Blows/0.3m
0	0
-0.3	49
-0.6	21
-0.9	100
-	
-	
-	
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Reference No. : 22233

Drennan Maud & Partners.

Fig. No. -

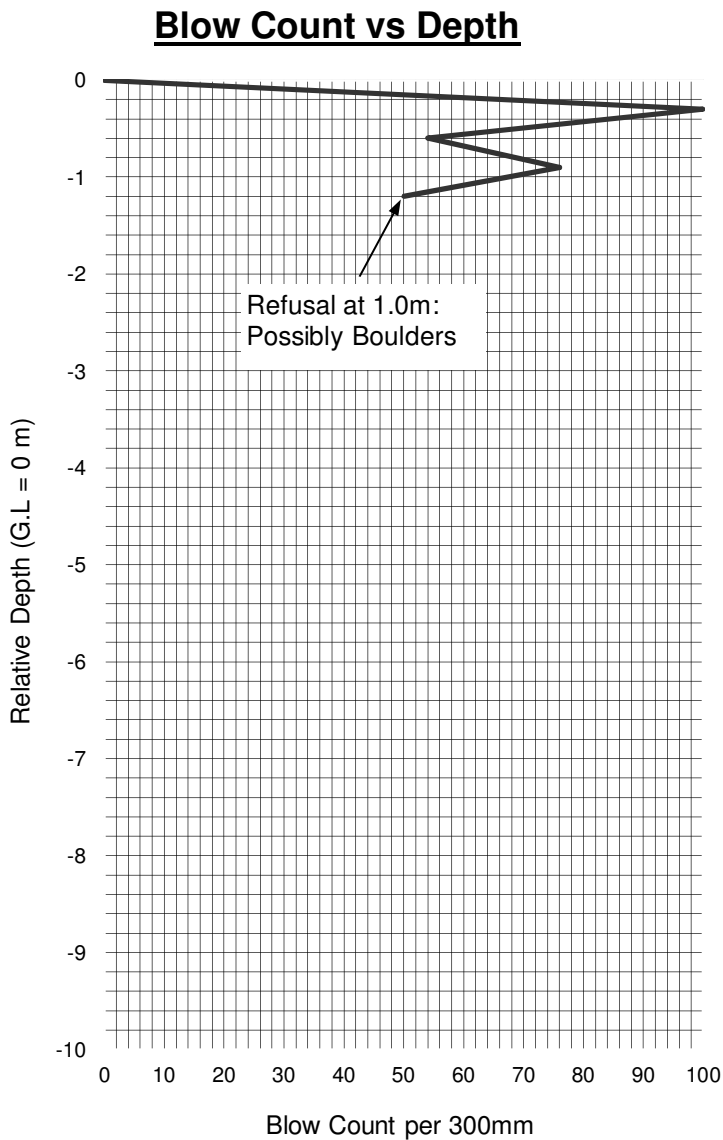
Note: DCP Blow Count equals the number of blows of a 10kg hammer dropping 450mm required to drive a 25mm diameter 60° cone a distance of 300mm.

Dynamic Cone Penetrometer

Test No. : 7

Project : Kokstad Landfill
Client: TGC Engineers cc.
 Date: 21-06-2012 Remarks: Underlain by Dolerite
 Test Location: Site 1 Krantz Fontein Farm
 Date of Test: 20-06-2012 Depth Interval (m) : 0.3

Depth (m)	Count Blows/0.3m
0	0
-0.3	100
-0.6	54
-0.9	76
-1.2	50
-	-
-	-
-	-
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Reference No. : 22233

Drennan Maud & Partners.

Fig. No. -

Note: DCP Blow Count equals the number of blows of a 10kg hammer dropping 450mm required to drive a 25mm diameter 60° cone a distance of 300mm.

Dynamic Cone Penetrometer

Test No. : 8

Project : Kokstad Landfill

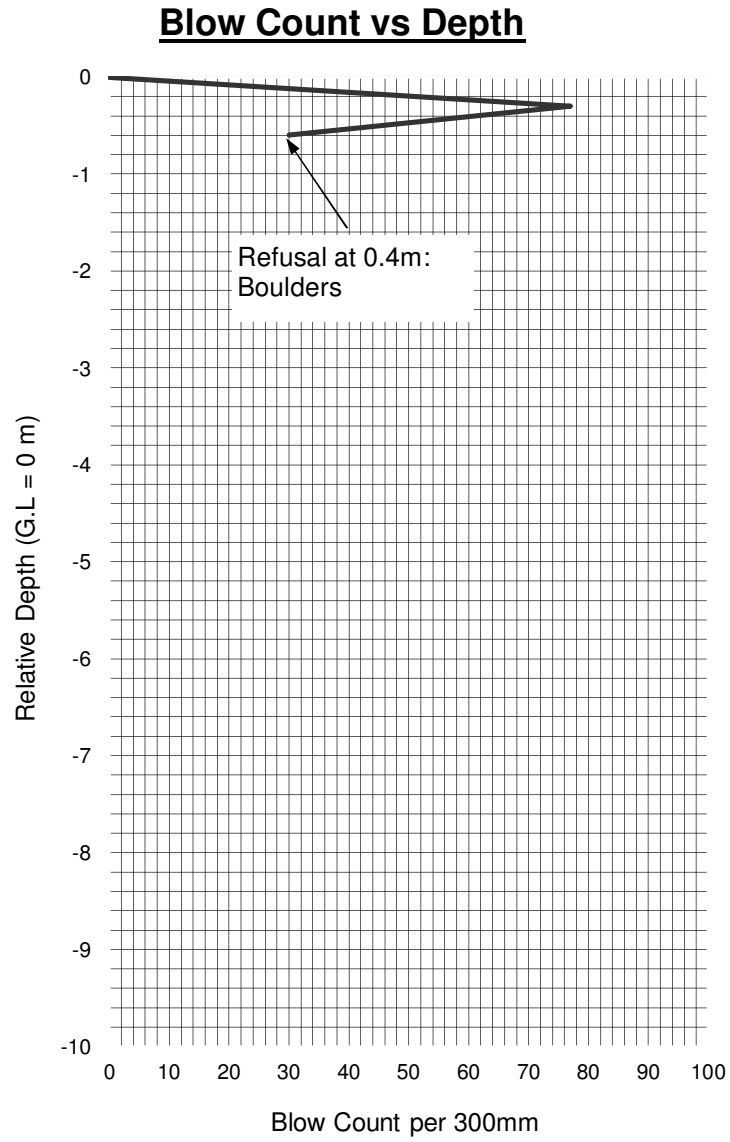
Client: TGC Engineers cc.

Date: 21-06-2012 Remarks: Underlain by Dolerite

Test Location: Site 1 Krantz Fontein Farm -

Date of Test: 20-06-2012 Depth Interval (m) : 0.3

<u>Depth</u> <small>(m)</small>	<u>Count</u> <small>Blows/0.3m</small>
0	0
-0.3	77
-0.6	30
-	-
-	-
-	-
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Reference No. : 22233

Drennan Maud & Partners.

Fig. No. -

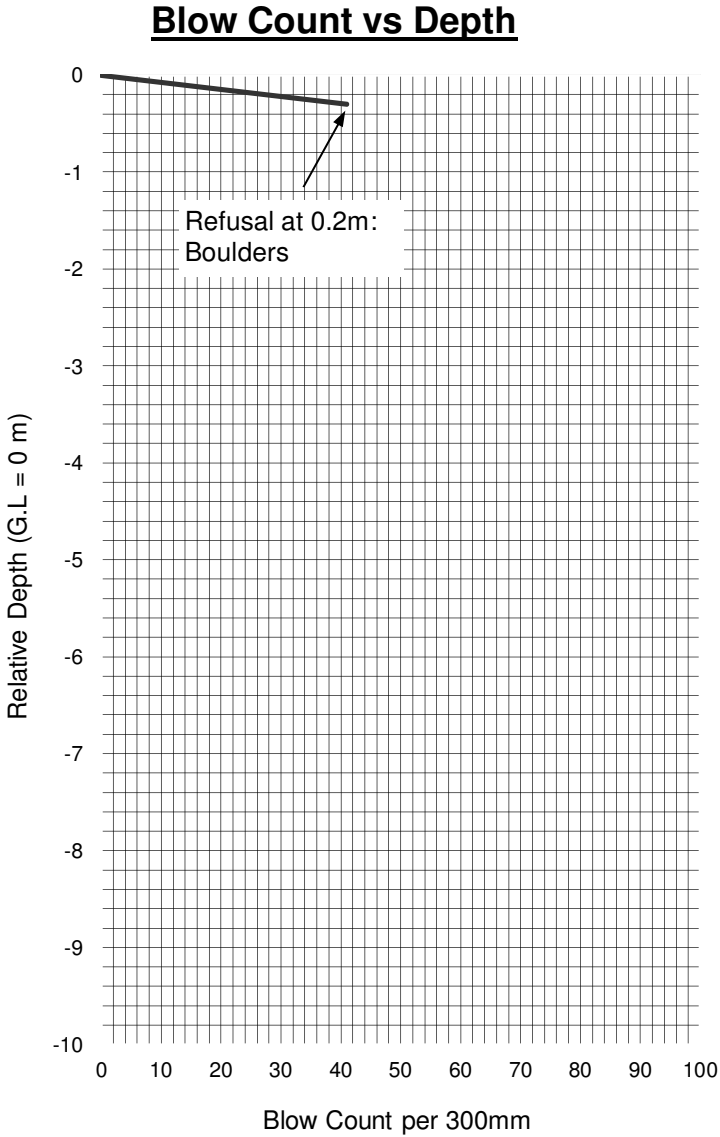
Note: DCP Blow Count equals the number of blows of a 10kg hammer dropping 450mm required to drive a 25mm diameter 60° cone a distance of 300mm.

Dynamic Cone Penetrometer

Test No. : 10

Project : Kokstad Landfill
Client: TGC Engineers cc.
Date: 21-06-2012 **Remarks:** Underlain by Dolerite
Test Location: Site 1 Krantz Fontein Farm
Date of Test: 20-06-2012 **Depth Interval (m) :** 0.3

Depth (m)	Count Blows/0.3m
0	0
-0.3	41
-	-
-	-
-	-
-	-
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Reference No. : 22233

Drennan Maud & Partners.

Fig. No. -

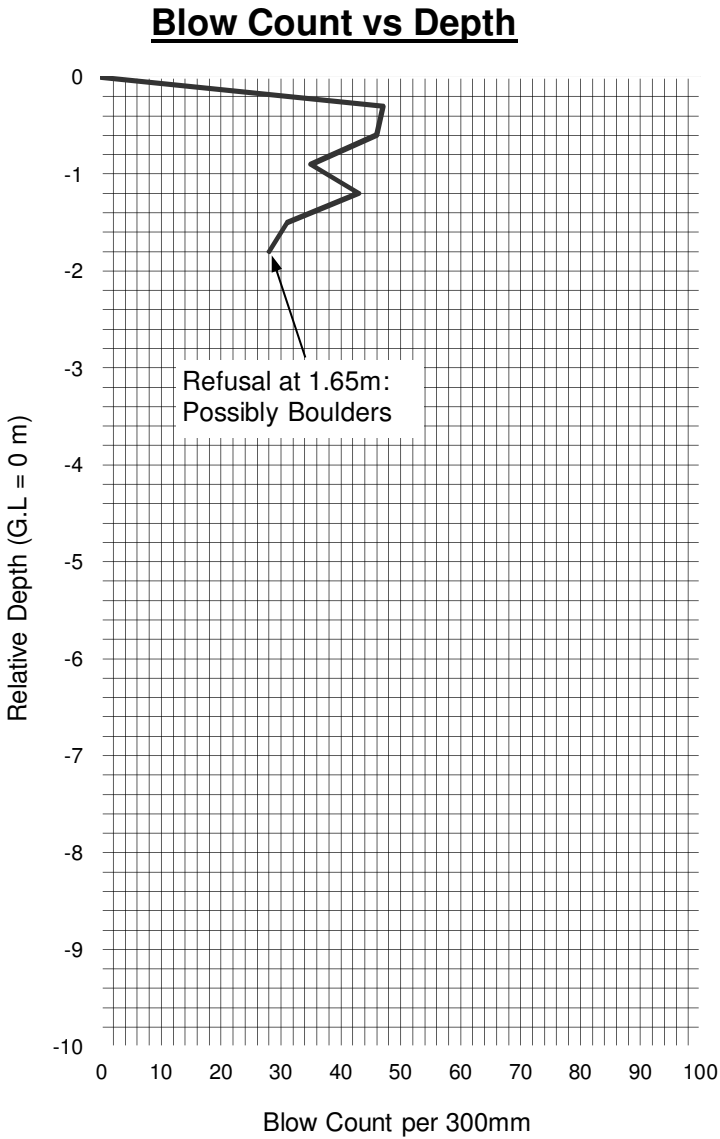
Note: DCP Blow Count equals the number of blows of a 10kg hammer dropping 450mm required to drive a 25mm diameter 60° cone a distance of 300mm.

Dynamic Cone Penetrometer

Test No. : 11

Project : Kokstad Landfill
Client: TGC Engineers cc.
Date: 21-06-2012 Remarks: Underlain by Dolerite
Test Location: Site 1 Krantz Fontein Farm
Date of Test: 20-06-2012 Depth Interval (m) : 0.3

Depth	Count
(m)	Blows/0.3m
0	0
-0.3	47
-0.6	46
-0.9	35
-1.2	43
-1.5	31
-1.8	28
-	-
-	-
-	-
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Reference No. : 22233

Drennan Maud & Partners.

Fig. No. -

Note: DCP Blow Count equals the number of blows of a 10kg hammer dropping 450mm required to drive a 25mm diameter 60° cone a distance of 300mm.

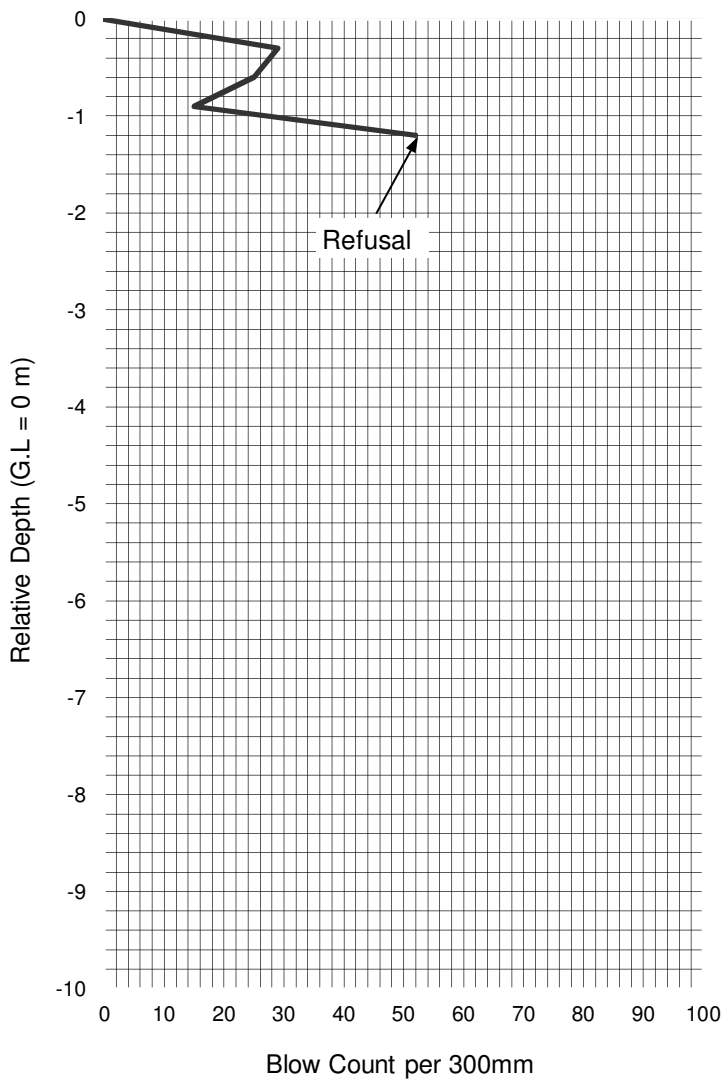
Dynamic Cone Penetrometer

Test No. : 12

Project :	Kokstad Landfill		
Client:	TGC Engineers cc.		
Date:	21-06-2012	Remarks:	Underlain by Dolerite
Test Location:	Site 1 Krantz Fontein Farm		-
Date of Test:	20-06-2012	Depth Interval (m) :	0.3

Depth (m)	Count Blows/0.3m
0	0
-0.3	29
-0.6	25
-0.9	15
-1.2	52
-	
-	
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Blow Count vs Depth



Reference No. : 22233

Drennan Maud & Partners.

Fig. No. -

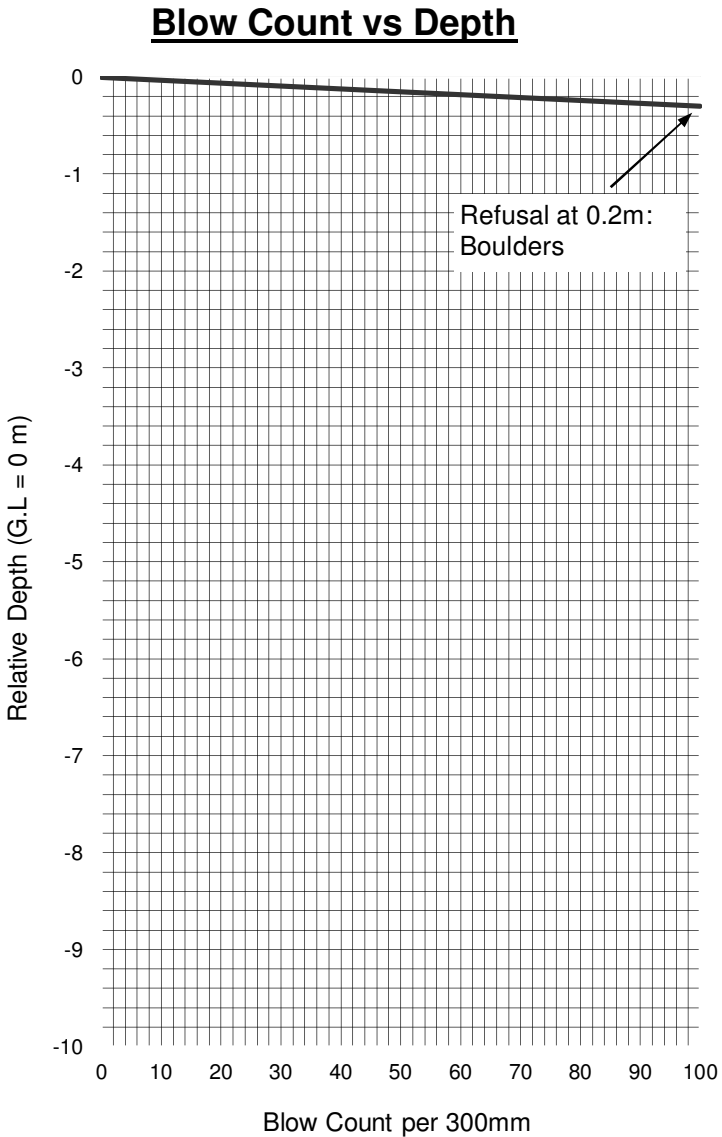
Note: DCP Blow Count equals the number of blows of a 10kg hammer dropping 450mm required to drive a 25mm diameter 60° cone a distance of 300mm.

Dynamic Cone Penetrometer

Test No. : 13

Project : Kokstad Landfill
Client: TGC Engineers cc.
Date: 21-06-2012 Remarks: Underlain by Dolerite
Test Location: Site 1 Krantz Fontein Farm -
Date of Test: 20-06-2012 Depth Interval (m) : 0.3

Depth (m)	Count Blows/0.3m
0	0
-0.3	100
-	-
-	-
-	-
-	-
-	-
-	-
-	-
-	-
-	-
-	-
-	-
-	-
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Reference No. : 22233

Drennan Maud & Partners.

Fig. No. -

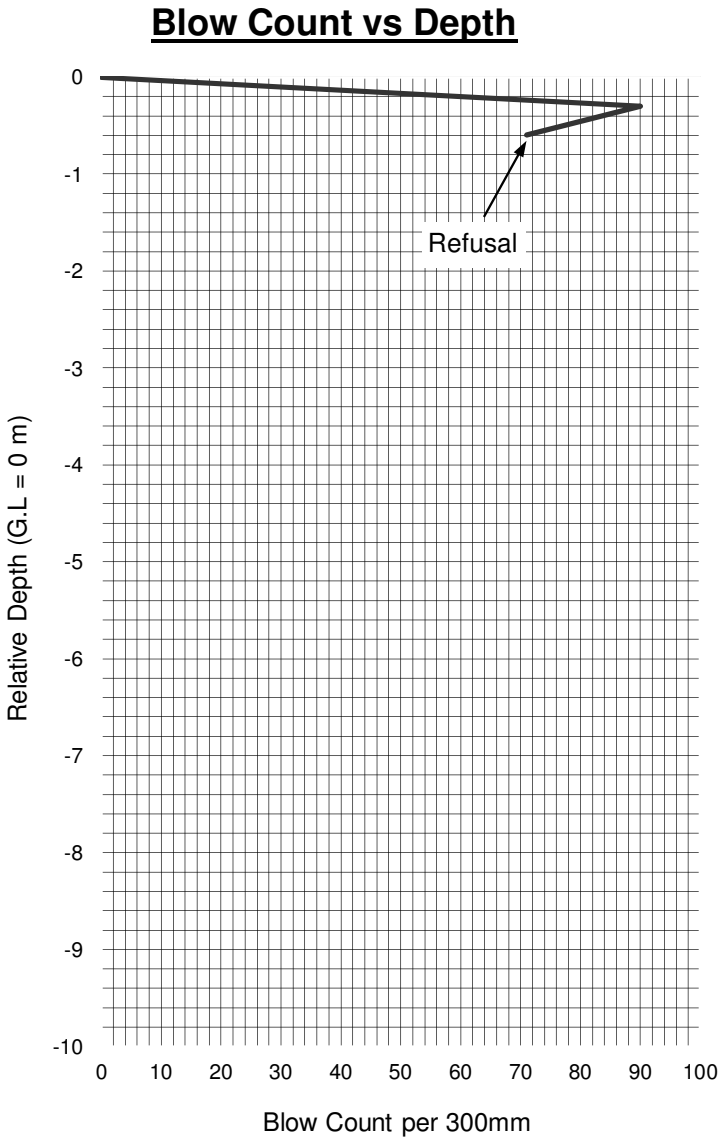
Note: DCP Blow Count equals the number of blows of a 10kg hammer dropping 450mm required to drive a 25mm diameter 60° cone a distance of 300mm.

Dynamic Cone Penetrometer

Test No. : 14

Project : Kokstad Landfill
Client: TGC Engineers cc.
Date: 21-06-2012 **Remarks:** Underlain by Sandstone
Test Location: Site 1 Krantz Fontein Farm
Date of Test: 20-06-2012 **Depth Interval (m) :** 0.3

Depth (m)	Count Blows/0.3m
0	0
-0.3	90
-0.6	71
-	-
-	-
-	-
-	-
-	-
-	-
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Reference No. : 22233

Drennan Maud & Partners.

Fig. No. -

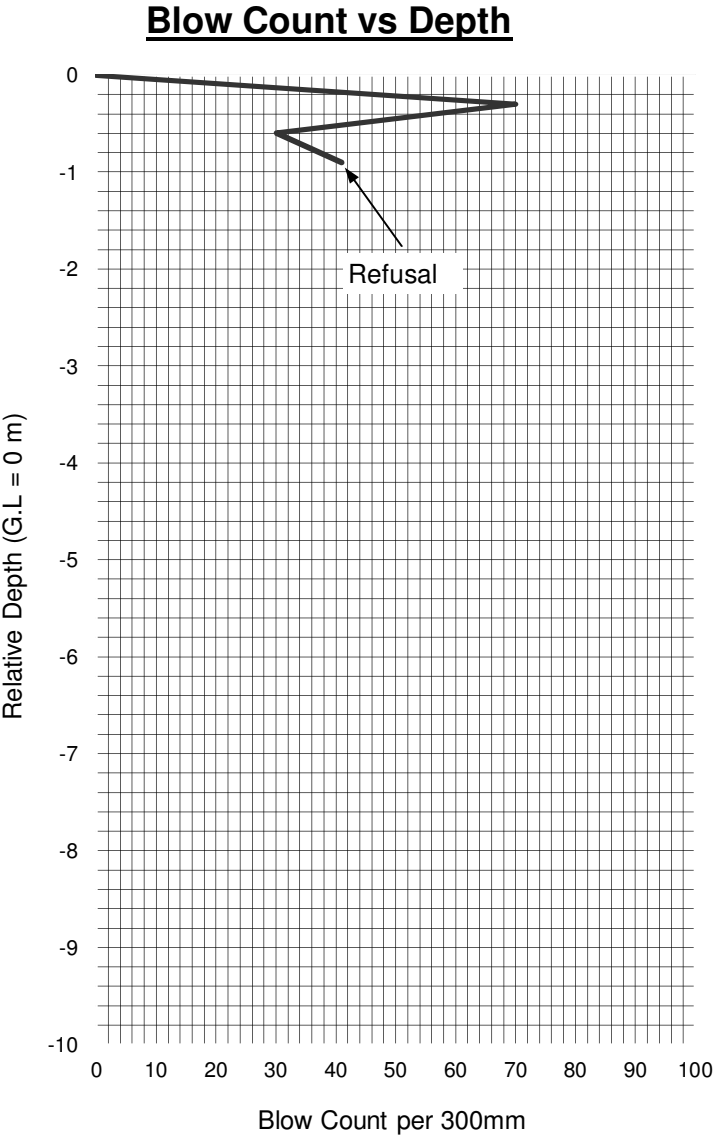
Note: DCP Blow Count equals the number of blows of a 10kg hammer dropping 450mm required to drive a 25mm diameter 60° cone a distance of 300mm.

Dynamic Cone Penetrometer

Test No. : 15

Project :	Kokstad Landfill		
Client:	TGC Engineers cc.		
Date:	21-06-2012	Remarks:	Underlain by Shale
Test Location:	Site 1 Krantz Fontein Farm		-
Date of Test:	20-06-2012	Depth Interval (m) :	0.3

Depth (m)	Count Blows/0.3m
0	0
-0.3	70
-0.6	30
-0.9	41
-	-
-	-
-	-
-	-
-	-
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Reference No. : 22233

Drennan Maud & Partners.

Fig. No. -

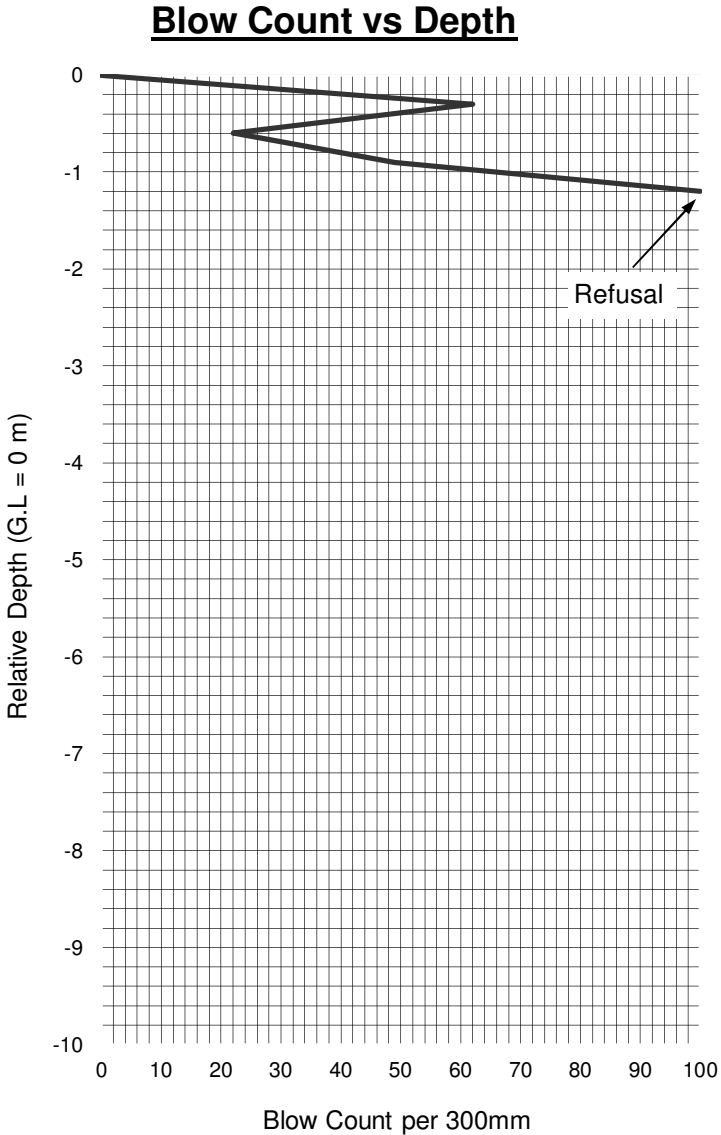
Note: DCP Blow Count equals the number of blows of a 10kg hammer dropping 450mm required to drive a 25mm diameter 60° cone a distance of 300mm.

Dynamic Cone Penetrometer

Test No. : 16

Project :	Kokstad Landfill		
Client:	TGC Engineers cc.		
Date:	21-06-2012	Remarks:	Underlain by Shale
Test Location:	Site 1 Krantz Fontein Farm		-
Date of Test:	20-06-2012	Depth Interval (m) :	0.3

Depth (m)	Count Blows/0.3m
0	0
-0.3	62
-0.6	22
-0.9	49
-1.2	100
-	
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Reference No. : 22233

Drennan Maud & Partners.

Fig. No. -

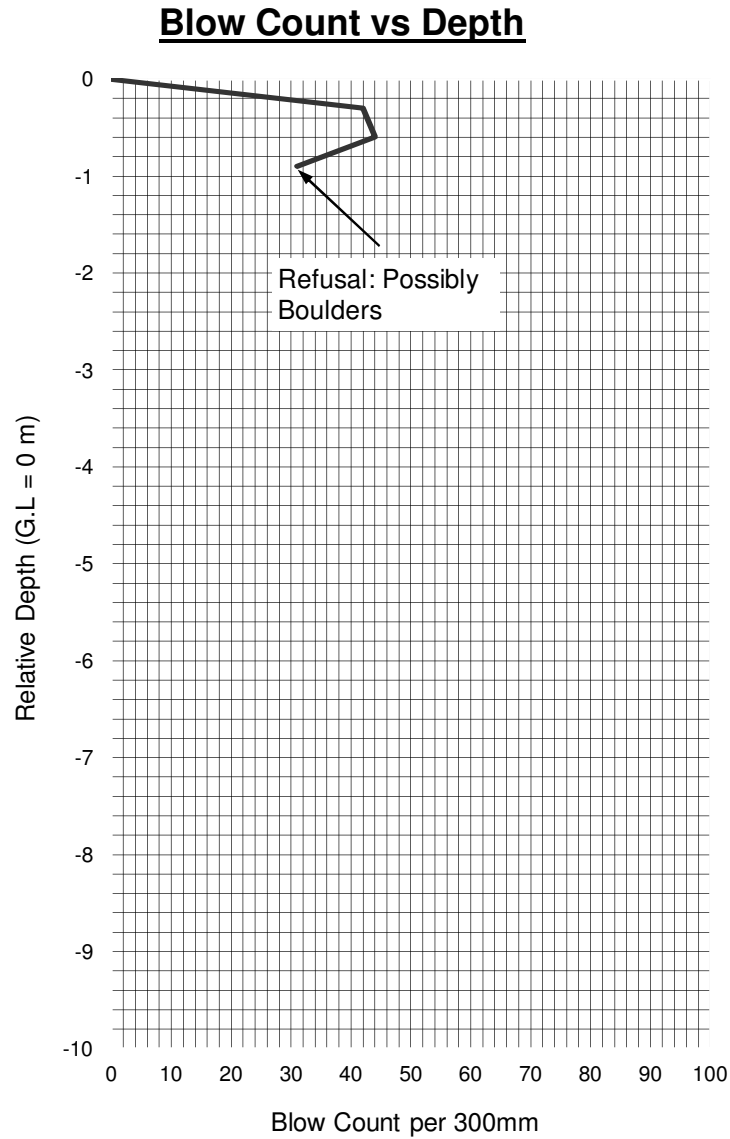
Note: DCP Blow Count equals the number of blows of a 10kg hammer dropping 450mm required to drive a 25mm diameter 60° cone a distance of 300mm.

Dynamic Cone Penetrometer

Test No. : 17

Project : Kokstad Landfill
Client: TGC Engineers cc.
 Date: 21-06-2012 Remarks: Underlain by Dolerite
 Test Location: Site 1 Krantz Fontein Farm -
 Date of Test: 20-06-2012 Depth Interval (m) : 0.3

Depth (m)	Count Blows/0.3m
0	0
-0.3	42
-0.6	44
-0.9	31
-	
-	
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Reference No. : 22233

Drennan Maud & Partners.

Fig. No. -

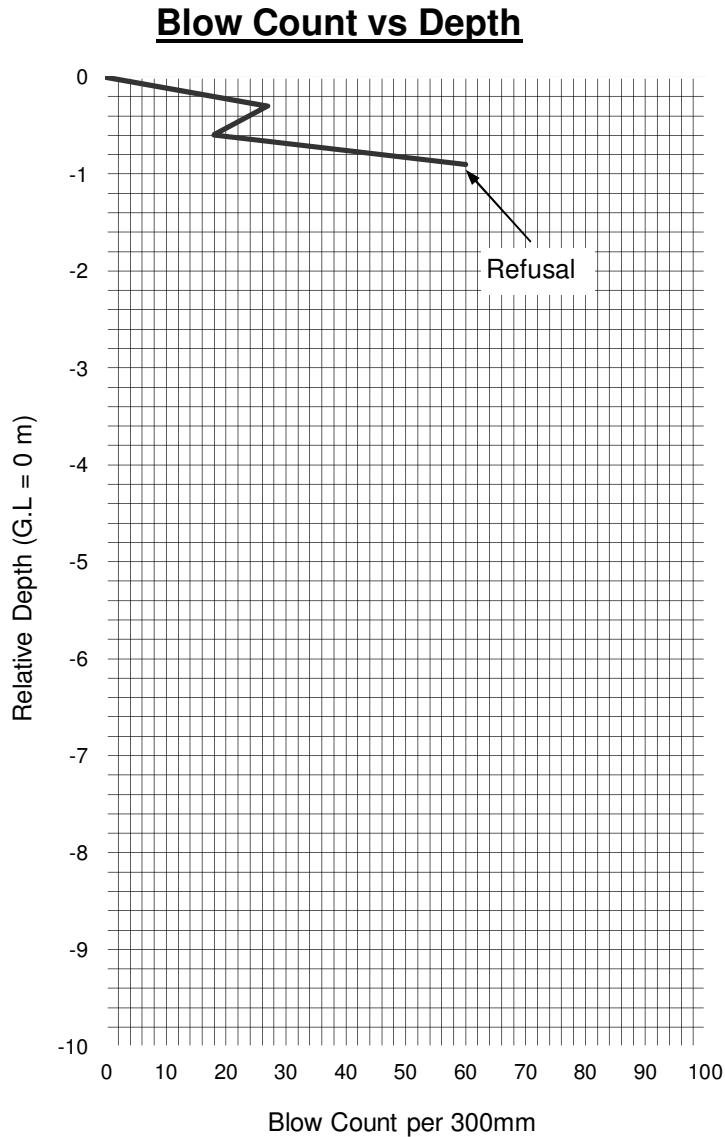
Note: DCP Blow Count equals the number of blows of a 10kg hammer dropping 450mm required to drive a 25mm diameter 60° cone a distance of 300mm.

Dynamic Cone Penetrometer

Test No. : 20

Project : Kokstad Landfill
Client: TGC Engineers cc.
Date: 21-06-2012 **Remarks:** Underlain by Shale
Test Location: Site 1 Krantz Fontein Farm -
Date of Test: 20-06-2012 **Depth Interval (m) :** 0.3

Depth (m)	Count Blows/0.3m
0	0
-0.3	27
-0.6	18
-0.9	60
-	
-	
-	
-	
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Reference No. : 22233

Drennan Maud & Partners.

Fig. No. -

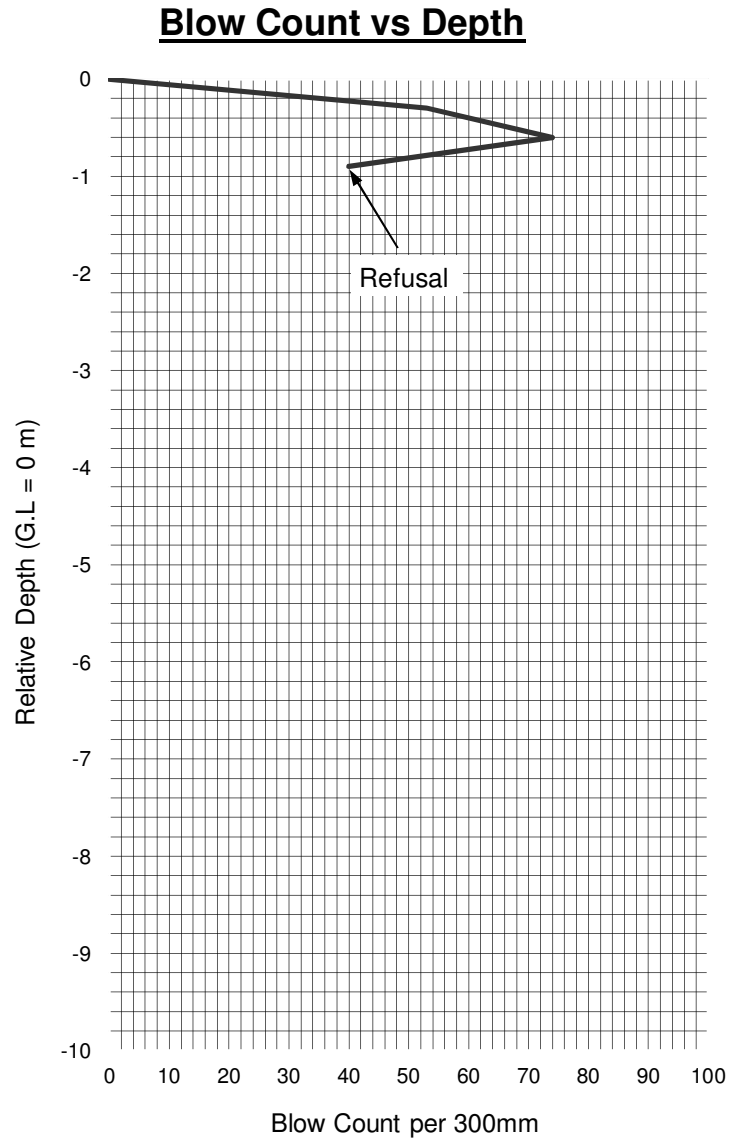
Note: DCP Blow Count equals the number of blows of a 10kg hammer dropping 450mm required to drive a 25mm diameter 60° cone a distance of 300mm.

Dynamic Cone Penetrometer

Test No. : 22

Project : Kokstad Landfill
Client: TGC Engineers cc.
 Date: 21-06-2012 Remarks: Underlain by Shale
 Test Location: Site 1 Krantz Fontein Farm -
 Date of Test: 20-06-2012 Depth Interval (m) : 0.3

Depth (m)	Count Blows/0.3m
0	0
-0.3	53
-0.6	74
-0.9	40
-	
-	
-	
-	
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Reference No. : 22233

Drennan Maud & Partners.

Fig. No. -

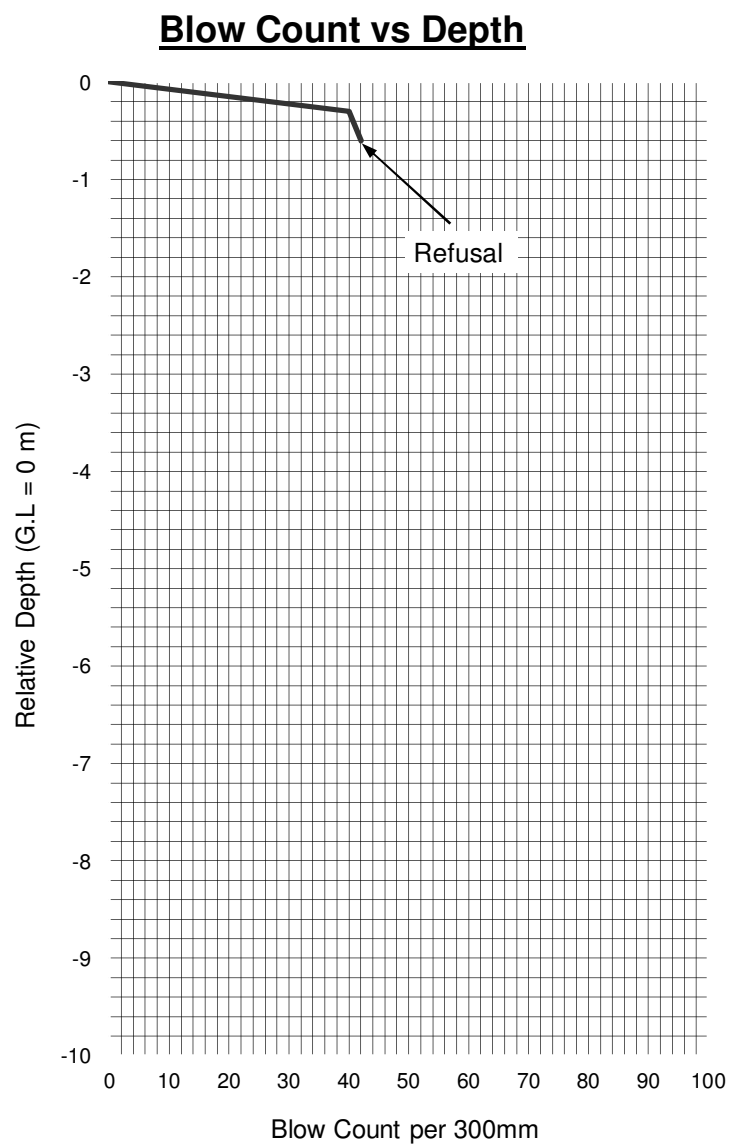
Note: DCP Blow Count equals the number of blows of a 10kg hammer dropping 450mm required to drive a 25mm diameter 60° cone a distance of 300mm.

Dynamic Cone Penetrometer

Test No. : 23

Project : Kokstad Landfill
Client: TGC Engineers cc.
 Date: 21-06-2012 Remarks: Underlain by Shale
 Test Location: Site 1 Krantz Fontein Farm -
 Date of Test: 20-06-2012 Depth Interval (m) : 0.3

Depth (m)	Count Blows/0.3m
0	0
-0.3	40
-0.6	42
-	
-	
-	
-	
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Reference No. : 22233 **Drennan Maud & Partners.**

Fig. No. -

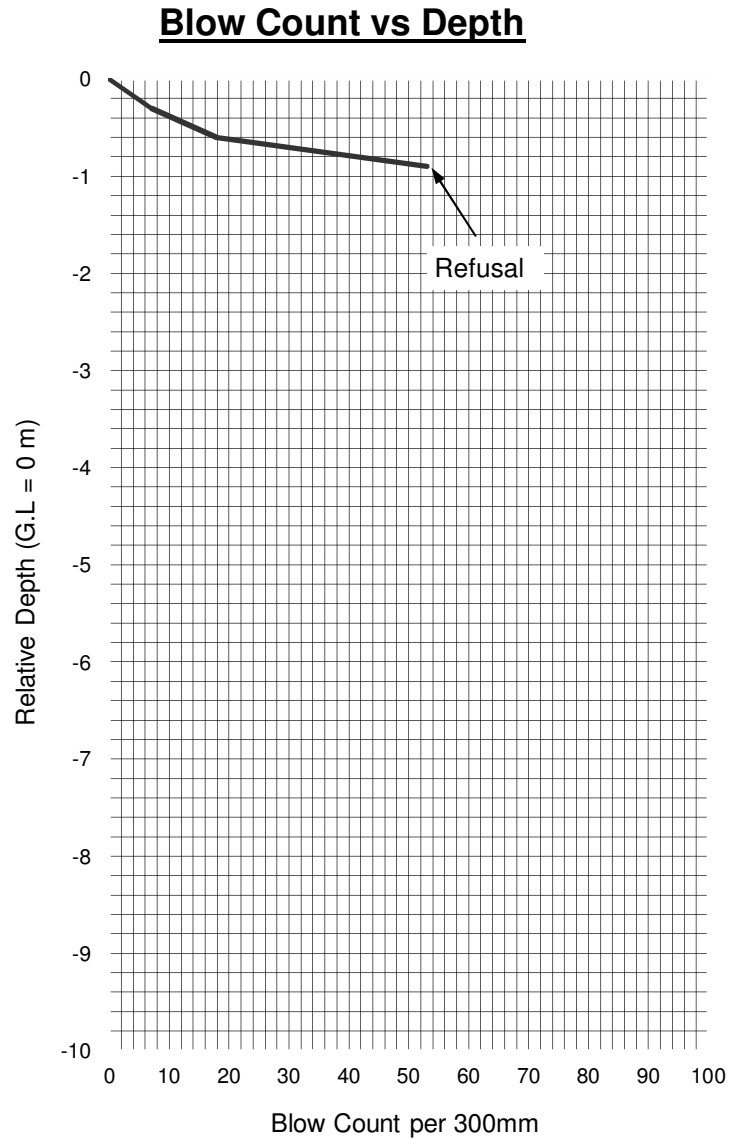
Note: DCP Blow Count equals the number of blows of a 10kg hammer dropping 450mm required to drive a 25mm diameter 60° cone a distance of 300mm.

Dynamic Cone Penetrometer

Test No. : 24

Project : Kokstad Landfill
Client: TGC Engineers cc.
Date: 21-06-2012 Remarks: Underlain by Shale
Test Location: Site 1 Krantz Fontein Farm -
Date of Test: 20-06-2012 Depth Interval (m) : 0.3

Depth (m)	Count Blows/0.3m
0	0
-0.3	7
-0.6	18
-0.9	53
-	-
-	-
-	-
-	-
-	-
-	-
-	-
-	-
-	-
-	-
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-	-
-	-
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Reference No. : 22233

Drennan Maud & Partners.

Fig. No. -

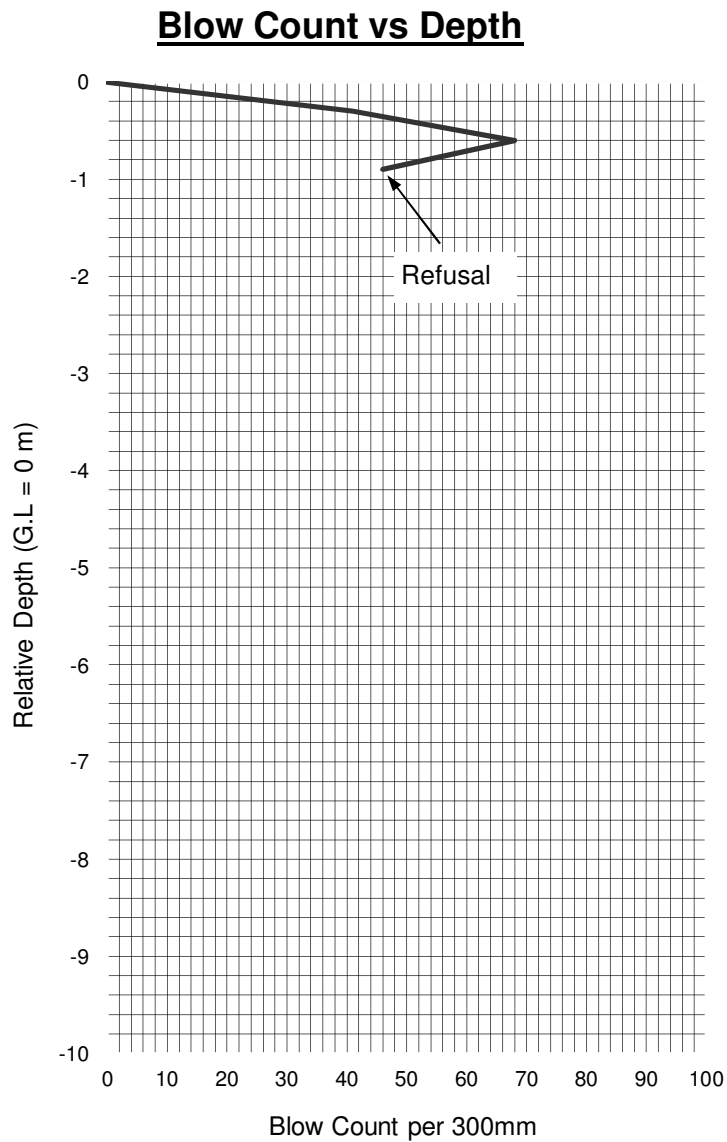
Note: DCP Blow Count equals the number of blows of a 10kg hammer dropping 450mm required to drive a 25mm diameter 60° cone a distance of 300mm.

Dynamic Cone Penetrometer

Test No. : 25

Project : Kokstad Landfill
Client: TGC Engineers cc.
 Date: 21-06-2012 Remarks: Underlain by Shale
 Test Location: Site 1 Krantz Fontein Farm -
 Date of Test: 20-06-2012 Depth Interval (m) : 0.3

Depth (m)	Count Blows/0.3m
0	0
-0.3	41
-0.6	68
-0.9	46
-	
-	
-	
-	
-	
-	
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-	
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-	
-	
-	



Reference No. : 22233

Drennan Maud & Partners.

Fig. No. -

Note: DCP Blow Count equals the number of blows of a 10kg hammer dropping 450mm required to drive a 25mm diameter 60° cone a distance of 300mm.

APPENDIX C

AUGER HOLE PROFILES (AH1 - AH13)

AUGER HOLE PROFILES
KOKSTAD LANDFILL

AH 1**Depth (m)****Description**

0,00 - 0,50

Relatively moist, very dark grey, silty CLAY containing occasional rock fragments (Alluvium).

Note:

No sulphidic smell.
The profile is moist from 0.35m depth.
Auger located at the edge of the wet zone.

AH 2**Depth (m)****Description**

0,00 - 0,20

Very slightly moist, brown, fine grained sandy CLAY containing occasional small light yellow rock fragments (Hillwash).

Note:

Refusal of auger.
No mottling.
Auger located in line with tree line about 15m from the edge of the wet zone.

AH 3**Depth (m)****Description**

0,00 - 0,50

Very moist, very dark grey, silty CLAY (Alluvium).

Note:

No sulphidic smell.
Auger located at the edge of the wet zone.

AH 4**Depth (m)****Description**

0,00 - 0,40

Moist, dark grey very lightly speckled orange, very fine and fine grained sandy CLAY (Hillwash).

0,40 - 0,50

Moist, greyish brown patched dusky orange, very fine and fine grained sandy CLAY (Hillwash).

Note:

No sulphidic smell.
Auger located at edge of tree line and the wet zone.

AH 5**Depth (m)****Description**

0,00 - 0,50

Moist to very moist, very dark grey, silty CLAY containing a very slight sulphidic smell (Alluvium)

Note:

Auger located at the edge of the wet zone.

AUGER HOLE PROFILES
KOKSTAD LANDFILL

AH 6**Depth (m)****Description**

0,00 - 0,05

Very slightly moist, light brown, very fine and fine grained sandy CLAY (Hillwash).

Note:

Auger hole located amongst trees some 20m from the edge of the wet zone.

AH 7**Depth (m)****Description**

0,00 - 0,30

Wet, dark grey, very fine and fine grained sandy CLAY (Alluvium).

Note:

No sulphidic smell.
Hole abandoned due to continuous collapse of the saturated clay material in to the hole.
Auger hole located about 5m within the wet zone.

AH 8**Depth (m)****Description**

0,00 - 0,20

Slightly moist, brown, sandy CLAY containing very small orange rock fragments (Hillwash).

Note:

Slow excavation, therefore the hole was abandoned.
Auger hole located about 10m from the edge of the wet zone.

AH 9**Depth (m)****Description**

0,00 - 0,10

Very moist, grey mottled orange, very fine and fine grained sandy CLAY containing a sulphidic smell (Alluvium).

0,10 - 0,50

Wet, very dark grey mottled orange, silty CLAY containing a sulphidic smell (Alluvium).

Note:

Auger located at the edge of the wet zone.
Water table intersected at the base of the hole.

AH 10**Depth (m)****Description**

0,00 - 0,18

Slightly moist, brown mottled orange, speckled very light grey, slightly gravely, sandy CLAY (Hillwash).

0,18 - 0,25

Slightly moist, yellow patched orange, gravely sandy CLAY (Residual Sandstone).

Note:

Auger located 5m up-slope of AH9.

AUGER HOLE PROFILES
KOKSTAD LANDFILL

AH 11**Depth (m)****Description**

0,00 - 0,10

Very slightly moist, brown, gravely sandy CLAY containing orange, very soft rock fragments (Hillwash).

Note:

Auger located 5m up-slope of AH10.

AH 12**Depth (m)****Description**

0,00 - 0,35

Very moist, grey extensively mottled brownish orange, very fine and fine grained sandy CLAY containing a sulphidic smell (Alluvium).

0,35 - 0,50

Wet, very dark grey, silty CLAY containing a sulphidic smell (Alluvium).

Note:

Auger located just downstream of dam wall at the edge of the wet zone.

AH 13**Depth (m)****Description**

0,00 - 0,05

Very moist, dark grey to very dark grey, very fine and fine grained sandy CLAY (Alluvium).

Note:

No sulphidic smell.

No mottling.

Auger located 5m up-slope of AH12.

APPENDIX D

SEISMIC TEST RESULTS

SEISMIC SURVEY

REF. NO: 22233

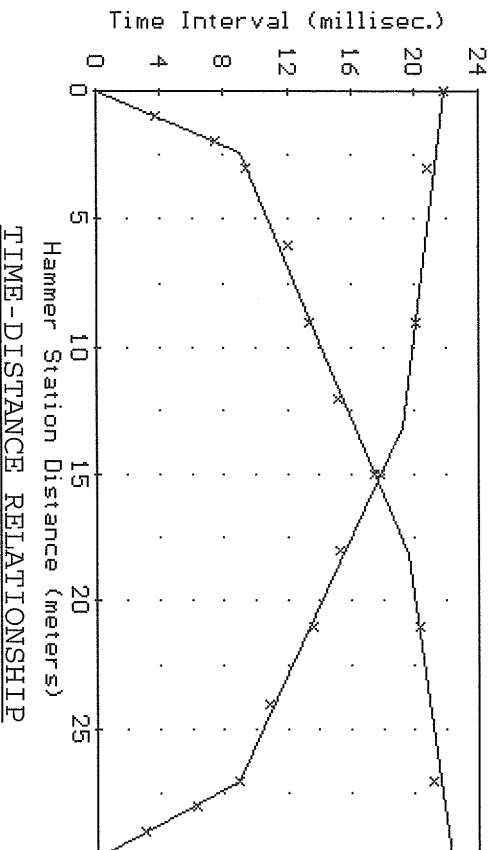
PROJECT: KOKSTAD LANDFILL

DATE: 20-06-2012

TRAVERSE NO: 1

FIELD DATA

Distance (m)	Forward (ms)	Reverse (ms)	Distance (m)	Forward (ms)	Reverse (ms)
1.0	2.8	2.8	12.0	14.2	15.0
2.0	6.5	6.0	15.0	16.5	17.6
3.0	8.4	8.7	21.0	19.3	19.8
6.0	11.0	10.6	27.0	20.2	20.6
9.0	12.4	13.4	30.0	21.4	21.6



<p><u>FORWARD</u></p> <p>U1 ≈ 270m/s D1 ≈ 1m</p> <p>U2 ≈ 1481m/s D2 ≈ 7.2m</p> <p>U3 ≈ 4286m/s D3 ≈ 13.1m</p> <p>U4 ≈ 6429m/s*</p>	<p><u>REVERSE</u></p> <p>U1 ≈ 339m/s D1 ≈ 1.2m</p> <p>U2 ≈ 1348m/s D2 ≈ 7.4m</p> <p>U3 ≈ 5000m/s D3 ≈ 13.4m</p> <p>U4 ≈ 7500m/s*</p>
---	---

Dip. ≈ -0.5°
True U2 ≈ 1412m/s

NOTE: Velocity marked '*' has been assumed to define the minimum proven depth of the material with the next lowest velocity.

SEISMIC SURVEY

REF. NO: 22233

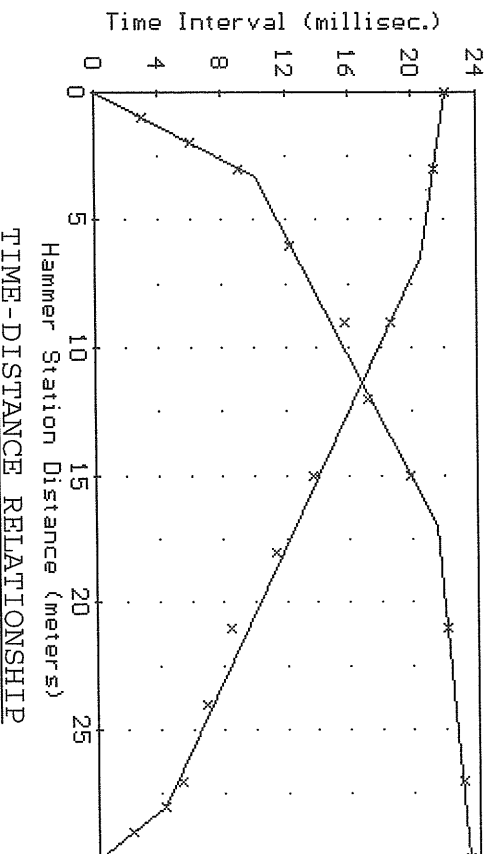
PROJECT: KOKSTAD LANDFILL

DATE: 20-06-2012

TRAVERSE NO: 2

FIELD DATA

Distance (m)	Forward (ms)	Reverse (ms)	Distance (m)	Forward (ms)	Reverse (ms)
1.0	3.0	2.9	12.0	17.1	12.0
2.0	6.0	5.0	15.0	19.7	14.4
3.0	9.0	6.0	21.0	22.0	19.4
6.0	12.2	7.6	27.0	23.0	22.1
9.0	15.6	9.2	30.0	23.4	22.8



<p>FORWARD</p> <p>U1 # 333m/s U2 # 1200m/s U3 # 6429m/s U4 # 9643m/s*</p> <p>D1 # 1.2m D2 # 8.1m D3 # 14.3m</p> <p>NOTE: Velocity marked '*' has been assumed to define the minimum proven depth of the material with the next lowest velocity.</p>	<p>REVERSE</p> <p>U1 # 476m/s U2 # 1319m/s U3 # 4286m/s U4 # 6428m/s*</p> <p>D1 # 0.7m D2 # 9.1m D3 # 14.8m</p> <p>DIP. # 0.7° True U2 # 1257m/s</p>
---	---

SEISMIC SURVEY

REF. NO: 22233

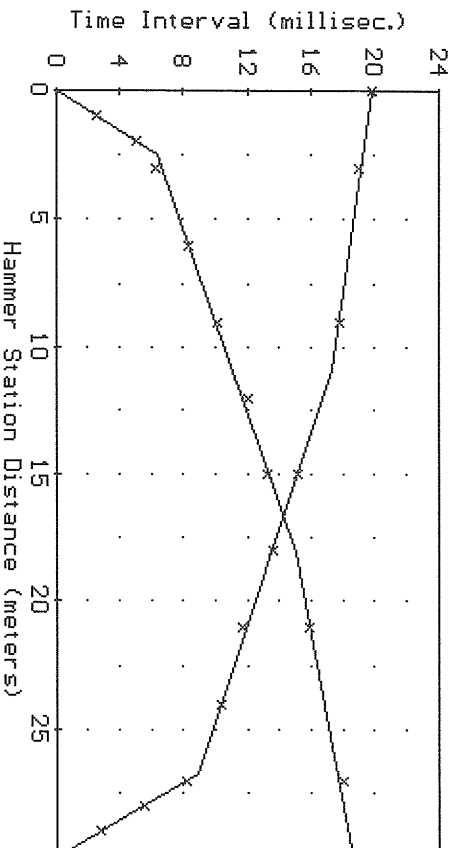
PROJECT: KOKSTAD LANDFILL

DATE: 20-06-2012

TRAVERSE NO: 3

FIELD DATA

Distance (m)	Forward (ms)	Reverse (ms)	Distance (m)	Forward (ms)	Reverse (ms)
1.0	3.0	2.8	12.0	12.4	13.6
2.0	5.5	5.6	15.0	13.7	15.2
3.0	6.7	8.2	21.0	16.3	17.8
6.0	8.7	10.4	27.0	18.4	19.0
9.0	10.5	11.7	30.0	19.0	19.8



<p>FORWARD</p> <p>U1 ≈ 400m/s D1 ≈ 1m</p> <p>U2 ≈ 1800m/s D2 ≈ 5.9m</p> <p>U3 ≈ 3333m/s D3 ≈ 11.4m</p> <p>U4 ≈ 5000m/s*</p>	<p>REVERSE</p> <p>V1 ≈ 370m/s D1 ≈ 1.3m</p> <p>V2 ≈ 1875m/s D2 ≈ 7.3m</p> <p>V3 ≈ 4500m/s D3 ≈ 13m</p> <p>V4 ≈ 6750m/s*</p>
---	---

Dip. ≈ 0.3°
True U2 ≈ 1837m/s

NOTE: Velocity marked '*' has been assumed to define the minimum proven depth of the material with the next lowest velocity.

SEISMIC SURVEY

REF. NO: 22233

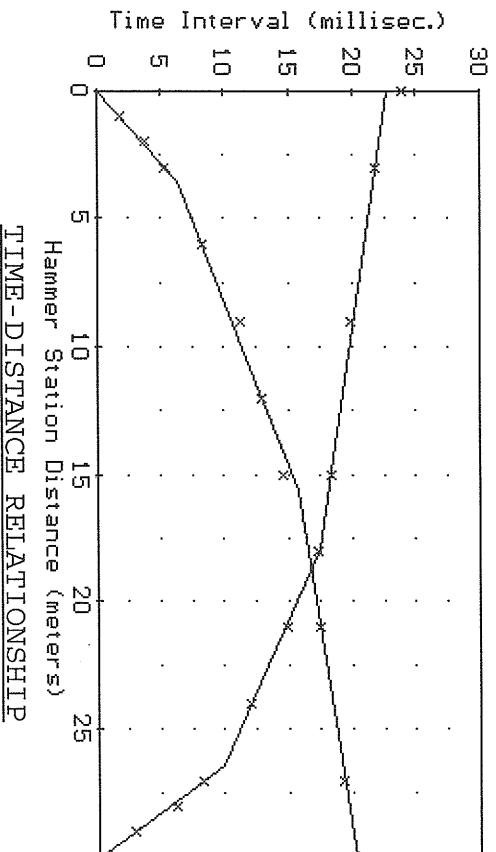
PROJECT: KOKSTAD LANDFILL

DATE: 20-06-2012

TRAVERSE NO: 4

FIELD DATA

Distance (m)	Forward (ms)	Reverse (ms)	Distance (m)	Forward (ms)	Reverse (ms)
1.0	0.6	3.0	12.0	11.7	17.5
2.0	2.6	6.3	15.0	13.4	18.4
3.0	4.1	8.5	21.0	16.2	20.0
6.0	7.0	12.2	27.0	18.0	22.0
9.0	10.0	15.0	30.0	19.0	24.0



<p><u>FORWARD</u></p> <p>U1 # 571m/s D1 # 1.1m</p> <p>U2 # 127m/s D2 # 6m</p> <p>U3 # 3214m/s D3 # 11.9m</p> <p>U4 # 4821m/s*</p>	<p><u>REVERSE</u></p> <p>U1 # 364m/s D1 # 1.3m</p> <p>U2 # 1132m/s D2 # 5.3m</p> <p>U3 # 3333m/s D3 # 11.4m</p> <p>U4 # 5000m/s*</p>
--	---

Dip. # -1.9°
True U2 # 1199m/s

NOTE: Velocity marked '*' has been assumed to define the minimum proven depth of the material with the next lowest velocity.

SEISMIC SURVEY

REF. NO: 22233

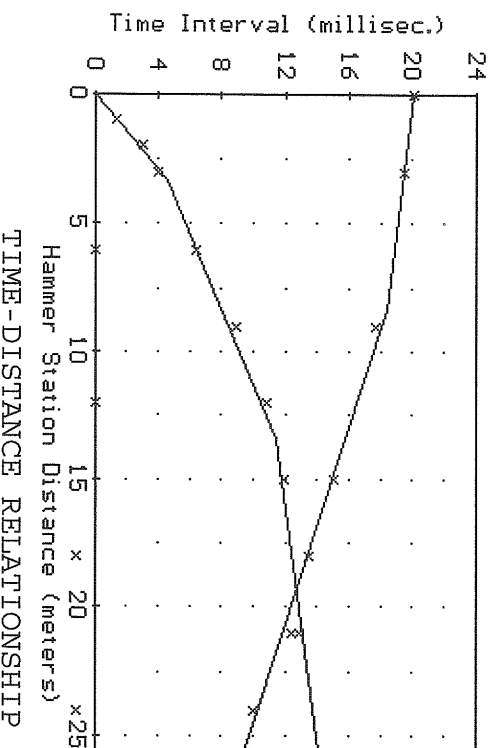
PROJECT: KOKSTAD LANDFILL

DATE: 21-06-2012

TRAVERSE NO: 5

FIELD DATA

Distance (m)	Forward (ms)	Reverse (ms)	Distance (m)	Forward (ms)	Reverse (ms)
1.0	2.5	2.8	15.0	13.1	15.0
2.0	4.2	5.8	18.0	0.0	0.0
3.0	5.2	8.4	21.0	14.0	17.7
6.0	7.6	10.0	24.0	0.0	0.0
9.0	10.1	12.4	27.0	15.4	19.4
12.0	12.0	13.5	30.0	16.4	20.0



TIME-DISTANCE RELATIONSHIP

<p>FORWARD</p> <p>U1 ≈ 741m/s D1 ≈ 1m</p> <p>U2 ≈ 1485m/s D2 ≈ 5.5m</p> <p>U3 ≈ 4597m/s D3 ≈ 11.6m</p> <p>U4 ≈ 6896m/s*</p>	<p>REVERSE</p> <p>U1 ≈ 357m/s D1 ≈ 1.3m</p> <p>U2 ≈ 1935m/s D2 ≈ 8.4m</p> <p>U3 ≈ 5000m/s D3 ≈ 14m</p> <p>U4 ≈ 7500m/s*</p>
---	---

Dip. ≈ 3.7°
True U2 ≈ 1677m/s

NOTE: Velocity marked '*' has been assumed to define the minimum proven depth of the material with the next lowest velocity.

SEISMIC SURVEY

REF. NO: 22233

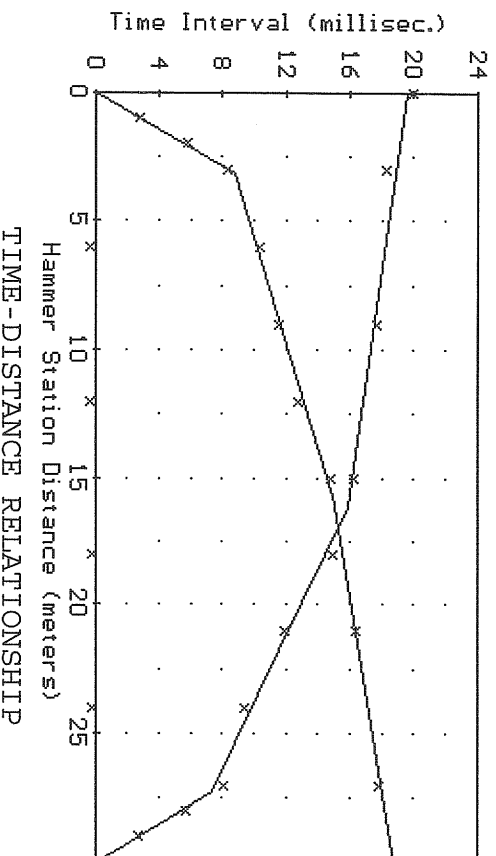
PROJECT: KOKSTAD LANDFILL

DATE: 21-06-2012

TRAVERSE NO: 6

FIELD DATA

Distance (m)	Forward (ms)	Reverse (ms)	Distance (m)	Forward (ms)	Reverse (ms)
1.0	3.0	3.0	15.0	15.0	16.5
2.0	6.0	6.0	18.0	0.0	0.0
3.0	8.5	8.4	21.0	16.6	18.0
6.0	10.6	9.7	24.0	0.0	0.0
9.0	11.8	12.2	27.0	18.0	18.6
12.0	13.0	15.2	30.0	19.1	20.3



FORWARD
 U1 # 364m/s D1 # 1.3m
 U2 # 2083m/s D2 # 5.4m
 U3 # 3684m/s D3 # 11.1m
 U4 # 3526m/s*

REVERSE
 U1 # 370m/s D1 # 1m
 U2 # 1310m/s D2 # 6m
 U3 # 4403m/s D3 # 12.1m
 U4 # 6604m/s*

Dip. # -3°
 True U2 # 1606m/s

NOTE: Velocity marked '*' has been assumed to define the minimum proven depth of the material with the next lowest velocity.

SEISMIC SURVEY

REF. NO: 22233

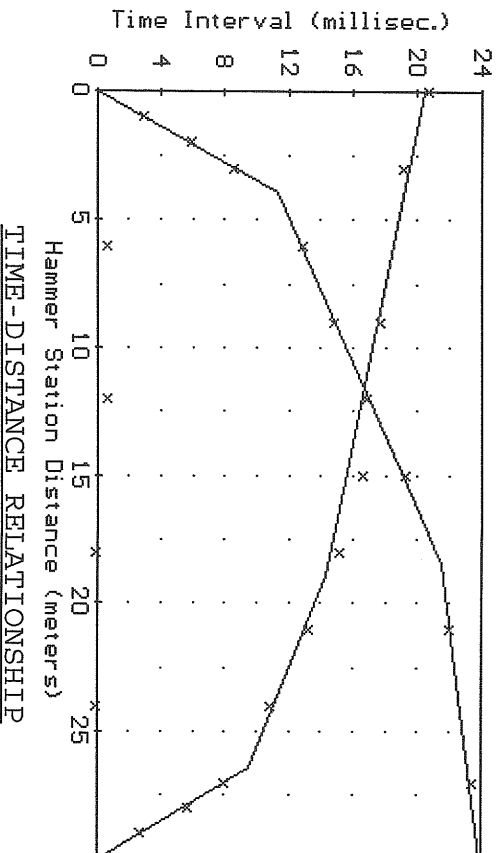
PROJECT: KOKSTAD LANDFILL

DATE: 21-06-2012

TRAVERSE NO: 7

FIELD DATA

Distance (m)	Forward (ms)	Reverse (ms)	Distance (m)	Forward (ms)	Reverse (ms)
1.0	3.0	2.0	15.0	19.3	16.0
2.0	6.0	5.0	18.0	0.0	0.0
3.0	8.7	7.3	21.0	22.1	17.0
6.0	13.0	10.2	24.0	0.0	0.0
9.0	14.9	12.6	27.0	23.5	18.5
12.0	17.0	14.5	30.0	23.9	20.0



<p>FORWARD</p> <p>U1 # 351m/s D1 # 1.5m</p> <p>U2 # 1429m/s D2 # 8.2m</p> <p>U3 # 4884m/s D3 # 14.1m</p> <p>U4 # 7326m/s*</p>	<p>REVERSE</p> <p>U1 # 377m/s D1 # 1.4m</p> <p>U2 # 1554m/s D2 # 4.4m</p> <p>U3 # 3111m/s D3 # 10.5m</p> <p>U4 # 4667m/s*</p>
---	---

NOTE: Velocity marked '*' has been assumed to define the minimum proven depth of the material with the next lowest velocity. Dip. # 0.6° U2 # 1489m/s

APPENDIX E

**GRADING, PROCTOR DENSITY &
PERMEABILITY LABORATORY TEST
RESULTS**

Job Description: Kokstad Landfill - Ref. 22233
Job no.: 6604
Date: 04-07-2012

Table 3 Laboratory Test Summary



THEKWINI SOILS LAB. CC
V.A.T. REGISTRATION NO. 4590210961
 68 Ridge Road, P.O. Box 30454,
 Tollgate, DURBAN, MAYVILLE, 4058
 Tel : (031) 201-8992 Fax : (031) 201-7920

Lab no.		06100	06101	06103	06104	06105	06106	06108	06107	07040	07041
Location		IP 1	IP 2	IP 4	IP 6	IP 7	IP 8	IP 11	IP 11	IP 14	IP 18
Depth		0.9 - 2.6m	1.9 - 3.0m	0.20 - 0.7m	1.0 - 1.9m	0.9 - 1.5m	0.0 - 0.4m	0.0 - 0.6m	0.8 - 1.9m	0.65 - 1.6m	0.4 - 1.6m
Description		Org.Cl.SILT (Res. Dolerite)	H/Wh.Olv. SHALE	Br.Cl.Sa.GRAVEL (Res.Shale: PDF)	M/Wh.Dk.Bl. DOLERITE (Karoo)	M/Wh.Gr.&Olv. SANDSTONE	Gr.Si.Sa.GRAVEL (Colluvium)	V.Dk.Gr.CLAY (Hillwash)	C/Wh.Yel. Sa.SHALE	H/Wh.Yel. SANDSTONE	Dk.Org.Si.CLAY (Res. Shale)
Binder Material		-	-	-	-	-	-	-	-	-	-
Particle Size (mm)	75		96	100	92	95			90	87	
	53		90	95	79	88			85	77	
	37.5		86	91	70	85			73	69	
	26.5		81	87	62	82			66	59	
	19		77	86	59	80			60	55	
	13.2	100	72	69	47	67	100		49	44	
	9.5	98	69	63	43	62	97		43	39	100
	4.75	97	66	56	36	55	86	100	38	34	100
	2	96	64	47	33	48	69	100	34	31	95
	0.425	89	61	43	29	36	58	99	31	27	86
	0.25	85	59	42	27	31	56	99	30	24	85
	0.15	80	55	41	25	27	53	97	27	19	82
	0.075	74	45	39	21	22	45	93	24	14	75
	0.05	71	41	37	20	20	40	91	23	13	71
	0.02	56	29	30	15	14	29	77	17	9	57
0.005	37	16	24	10	9	20	62	12	7	43	
0.002	29	12	20	7	6	15	52	8	5	37	
Soil Mortar	Coarse Sand <2.0 >0.425mm	7.1	4.5	8.1	11.6	24.0	16.1	0.7	8.4	13.7	9.1
	Fine Sand <0.425>0.05mm	26.8	56.8	58.2	70.6	60.4	50.1	9.0	71.0	75.4	26.4
	Silt <0.05 >0.005	31.4	23.2	11.3	9.4	8.9	16.6	28.4	9.9	5.1	25.2
	Clay <0.005	34.7	15.4	22.4	8.5	6.6	17.2	61.9	10.7	5.9	39.3
Atterberg Limits	Liquid Limit	55.7	35.3	47.6	43.1	33.3	29.9	52.7	33.2	28.3	29.5
	Plasticity Index	22.3	9.1	21.1	12	10.1	13.1	29.1	5.2	5.1	12.1
	Linear Shrinkage	11.3	4.7	10.7	6	5.3	6.7	14.7	2.7	2.7	6
	Natural MC	-	-	-	-	-	-	-	-	-	-
Proctor Density	Dry Density kg/m ³	1251	1670	1605	1604	1745		1798	1534	1840	1638
	OMC	31.6	15.4	19.4	19.7	15.7		13.5	19.6	13.5	16.2
CBR	100%										
	98%										
	95%										
	93% (Inferred)										
	90%										
	CBR Swell										
AASHTO Soil Classification		A - 7 - 5 (18)	A - 4 (1)	A - 7 - 6 (3)	A - 2 - 7 (0)	A - 2 - 6 (0)	A - 6 (2)	A - 7 - 6 (30)	A - 1 - b (0)	A - 1 - a (0)	A - 6 (7)
Grading Modulus TRH 14 (1985)		0.41	1.29	1.72	2.17	1.94	1.28	0.09	2.11	2.29	0.44
Permeability cm/sec				1.68 x 10 ⁻⁸				6.76 x 10 ⁻⁸	1.91 x 10 ⁻⁷		9.96 x 10 ⁻⁸

MATERIALS ANALYSIS

THEKWINI SOILS LAB. CC

V.A.T. REGISTRATION NO. 4590210961.

68 Ridge Road,
Tollgate, DURBAN
Tel : (031) 201-8992

P.O. Box 30464,
MAYVILLE, 4058
Fax : (031) 201-7920

Project: Kokstad Landfill - Ref. 22233

Ref no.: 6604 **Lab no.:** 06100 **Borehole/Pit no.:** IP 1 **Fig no.:** -

Depth: 0.9 - 2.6m

Grading Analysis	
Grain Size (mm)	%Passing
75	100.0
53	100.0
37.5	100.0
26.5	100.0
19	100.0
13.2	100.0
9.5	97.6
4.75	96.9
2	95.6
0.425	88.8
0.25	85.0
0.15	80.3
0.075	74.5
0.05	71.2
0.02	55.9
0.005	37.3
0.002	28.6

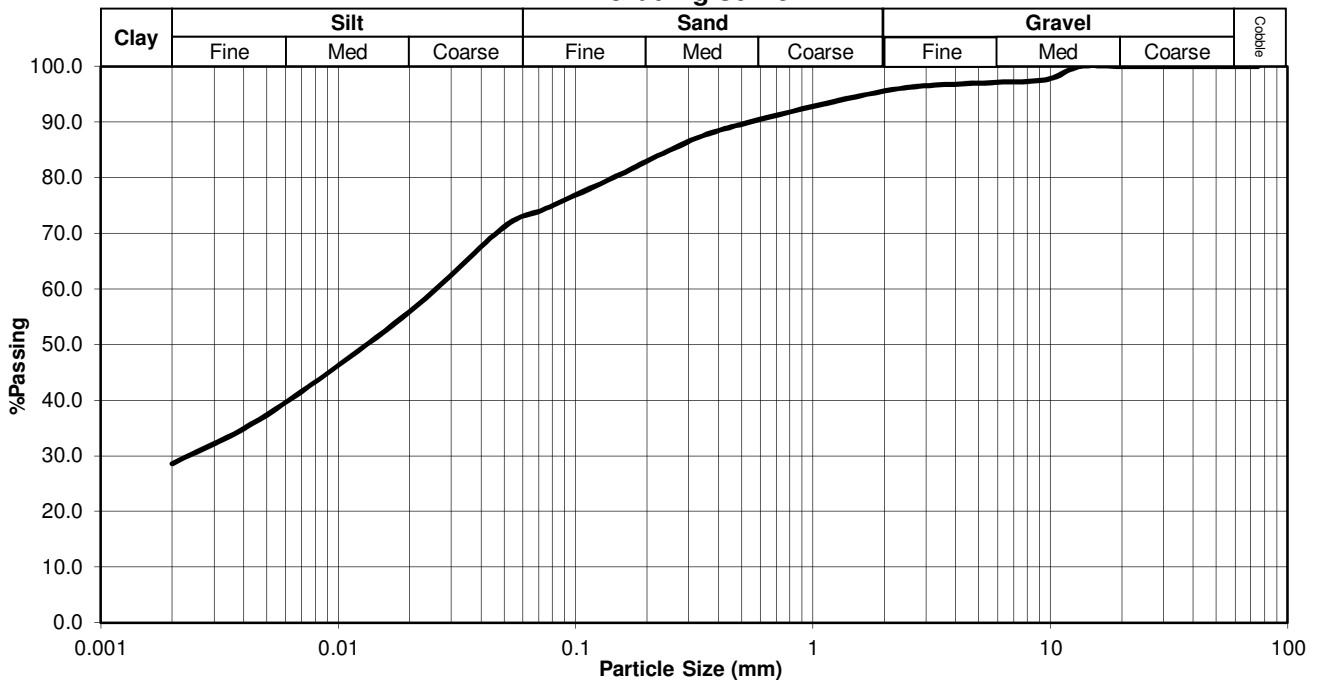
M.I.T SIZE CLASSIFICATION	
Cobble%	0.0
Gravel%	4.4
Coarse	0.0
Medium	2.9
Fine	1.5
Sand%	23.1
Coarse	6.0
Medium	6.9
Fine	10.2
Silt%	43.9
Coarse	16.6
Medium	17.3
Fine	10.0
Clay%	28.6

PLASTICITY	
Liquid Limit	55.7
Plasticity Index	22.3
Linear Shrinkage	11.3

GRADING	
D10 Size (mm)	<0.002
Uniformity Coefficient	NA
Grading Modulus	0.41

CLASSIFICATION	
Potential Expansiveness	Medium
Group Index	18
AASHTO Soil Classification	A - 7 - 5
Unified Classification	MH or OH

Grading Curve



Ref no.: 6604

Fig no.: -

MATERIALS ANALYSIS

THEKWINI SOILS LAB. CC

V.A.T. REGISTRATION NO. 4590210961.

68 Ridge Road,
Tollgate, DURBAN
Tel : (031) 201-8992

P.O. Box 30464,
MAYVILLE, 4058
Fax : (031) 201-7920

Project: Kokstad Landfill - Ref. 22233

Ref no.: 6604 **Lab no.:** 06101 **Borehole/Pit no.:** IP 2 **Fig no.:** -

Depth: 1.9 - 3.0m

Grading Analysis	
Grain Size (mm)	% Passing
75	96.4
53	89.7
37.5	86.3
26.5	80.7
19	77.4
13.2	72.0
9.5	68.5
4.75	66.1
2	64.3
0.425	61.4
0.25	59.0
0.15	55.0
0.075	45.0
0.05	40.5
0.02	29.0
0.005	16.2
0.002	12.5

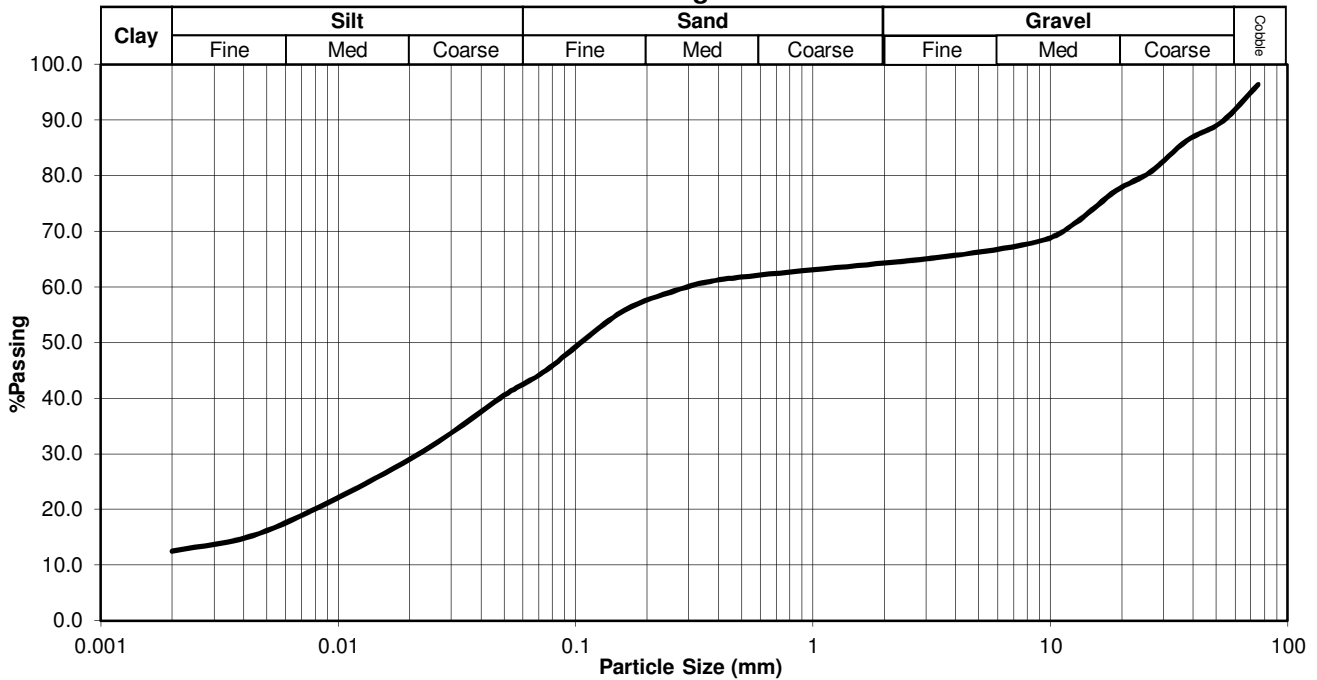
M.I.T SIZE CLASSIFICATION	
Cobble%	8.2
Gravel%	27.5
Coarse	14.0
Medium	11.1
Fine	2.4
Sand%	22.0
Coarse	2.6
Medium	4.7
Fine	14.7
Silt%	29.8
Coarse	13.3
Medium	12.0
Fine	4.5
Clay%	12.5

PLASTICITY	
Liquid Limit	35.3
Plasticity Index	9.1
Linear Shrinkage	4.7

GRADING	
D10 Size (mm)	<0.002
Uniformity Coefficient	NA
Grading Modulus	1.29

CLASSIFICATION	
Potential Expansiveness	Low
Group Index	1
AASHTO Soil Classification	A - 4
Unified Classification	SM

Grading Curve



Ref no.: 6604

Fig no.: -

MATERIALS ANALYSIS

THEKWINI SOILS LAB. CC

V.A.T. REGISTRATION NO. 4590210961.

68 Ridge Road,
Tollgate, DURBAN
Tel : (031) 201-8992

P.O. Box 30464,
MAYVILLE, 4058
Fax : (031) 201-7920

Project: Kokstad Landfill - Ref. 22233

Ref no.: 6604 **Lab no.:** 06103 **Borehole/Pit no.:** IP 4 **Fig no.:** -

Depth: 0.20 - 0.7m

Grading Analysis	
Grain Size (mm)	% Passing
75	100.0
53	94.8
37.5	90.5
26.5	86.8
19	85.8
13.2	68.6
9.5	63.4
4.75	56.5
2	46.7
0.425	42.9
0.25	42.2
0.15	41.1
0.075	38.6
0.05	36.7
0.02	29.7
0.005	24.4
0.002	20.1

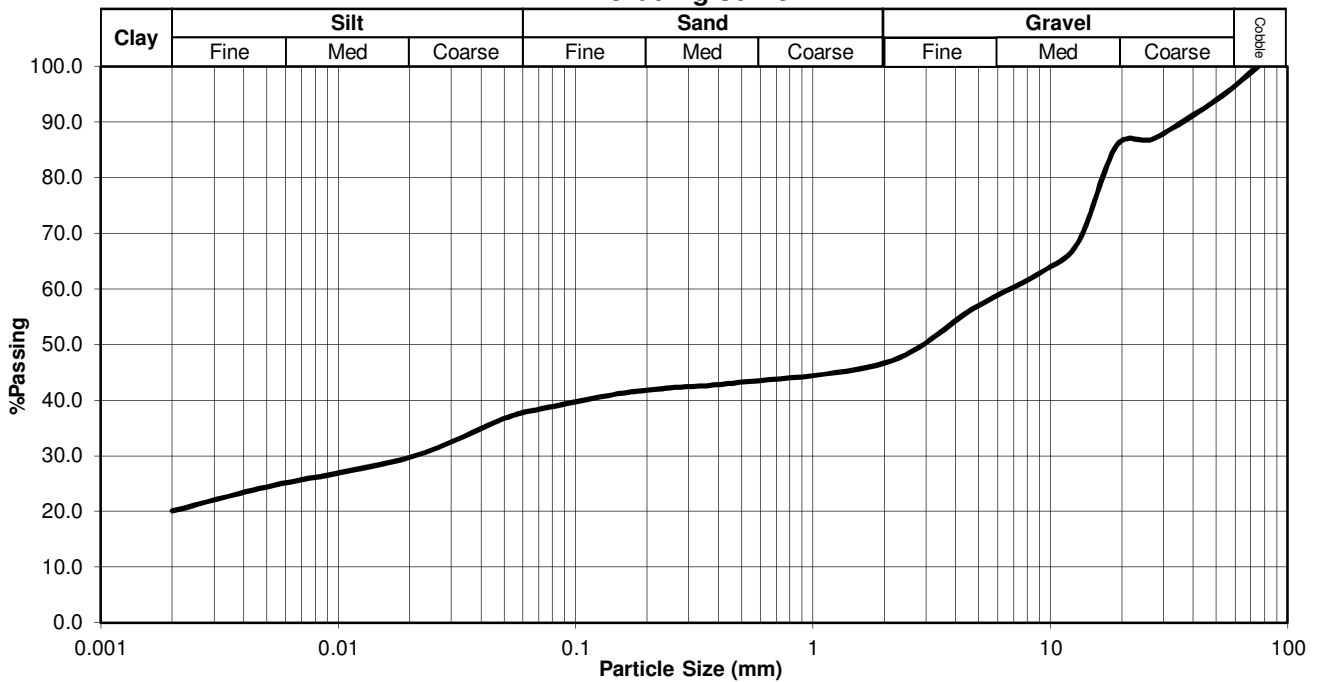
M.I.T SIZE CLASSIFICATION	
Cobble%	3.6
Gravel%	49.8
Coarse	10.5
Medium	27.6
Fine	11.6
Sand%	9.2
Coarse	3.3
Medium	1.7
Fine	4.2
Silt%	17.4
Coarse	7.7
Medium	5.0
Fine	4.7
Clay%	20.1

PLASTICITY	
Liquid Limit	47.6
Plasticity Index	21.1
Linear Shrinkage	10.7

GRADING	
D10 Size (mm)	<0.002
Uniformity Coefficient	NA
Grading Modulus	1.72

CLASSIFICATION	
Potential Expansiveness	Low
Group Index	3
AASHTO Soil Classification	A - 7 - 6
Unified Classification	SC

Grading Curve



Ref no.: 6604

Fig no.: -

MATERIALS ANALYSIS

THEKWINI SOILS LAB. CC

V.A.T. REGISTRATION NO. 4590210961.

68 Ridge Road,
Tollgate, DURBAN
Tel : (031) 201-8992

P.O. Box 30464,
MAYVILLE, 4058
Fax : (031) 201-7920

Project: Kokstad Landfill - Ref. 22233

Ref no.: 6604 **Lab no.:** 06104 **Borehole/Pit no.:** IP 6 **Fig no.:** -

Depth: 1.0 - 1.9m

Grading Analysis	
Grain Size (mm)	% Passing
75	92.2
53	79.3
37.5	69.9
26.5	62.3
19	58.8
13.2	47.3
9.5	43.2
4.75	36.3
2	32.5
0.425	28.8
0.25	27.4
0.15	25.3
0.075	21.3
0.05	20.2
0.02	15.1
0.005	9.6
0.002	7.3

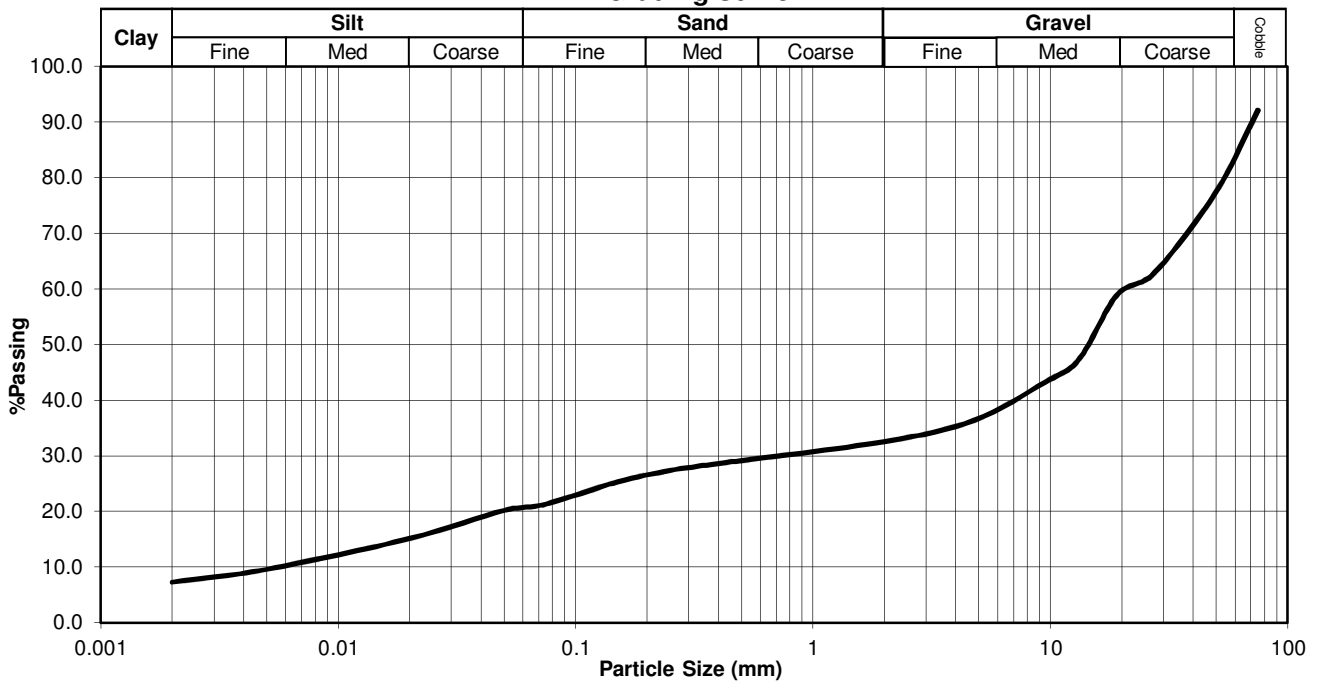
M.I.T SIZE CLASSIFICATION	
Cobble%	16.6
Gravel%	50.9
Coarse	24.2
Medium	21.1
Fine	5.6
Sand%	11.9
Coarse	3.4
Medium	2.9
Fine	5.7
Silt%	13.3
Coarse	5.5
Medium	5.2
Fine	2.7
Clay%	7.3

PLASTICITY	
Liquid Limit	43.1
Plasticity Index	12
Linear Shrinkage	6

GRADING	
D10 Size (mm)	0.0056
Uniformity Coefficient	>99
Grading Modulus	2.17

CLASSIFICATION	
Potential Expansiveness	Low
Group Index	0
AASHTO Soil Classification	A - 2 - 7
Unified Classification	GM

Grading Curve



Ref no.: 6604

Fig no.: -

MATERIALS ANALYSIS

THEKWINI SOILS LAB. CC

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Fax : (031) 201-7920

Project: Kokstad Landfill - Ref. 22233

Ref no.: 6604 **Lab no.:** 06105 **Borehole/Pit no.:** IP 7 **Fig no.:** -

Depth: 0.9 - 1.5m

Grading Analysis	
Grain Size (mm)	%Passing
75	94.6
53	88.1
37.5	84.9
26.5	82.3
19	80.1
13.2	67.4
9.5	61.7
4.75	54.6
2	47.9
0.425	36.4
0.25	31.0
0.15	26.6
0.075	22.2
0.05	20.5
0.02	14.4
0.005	8.7
0.002	6.0

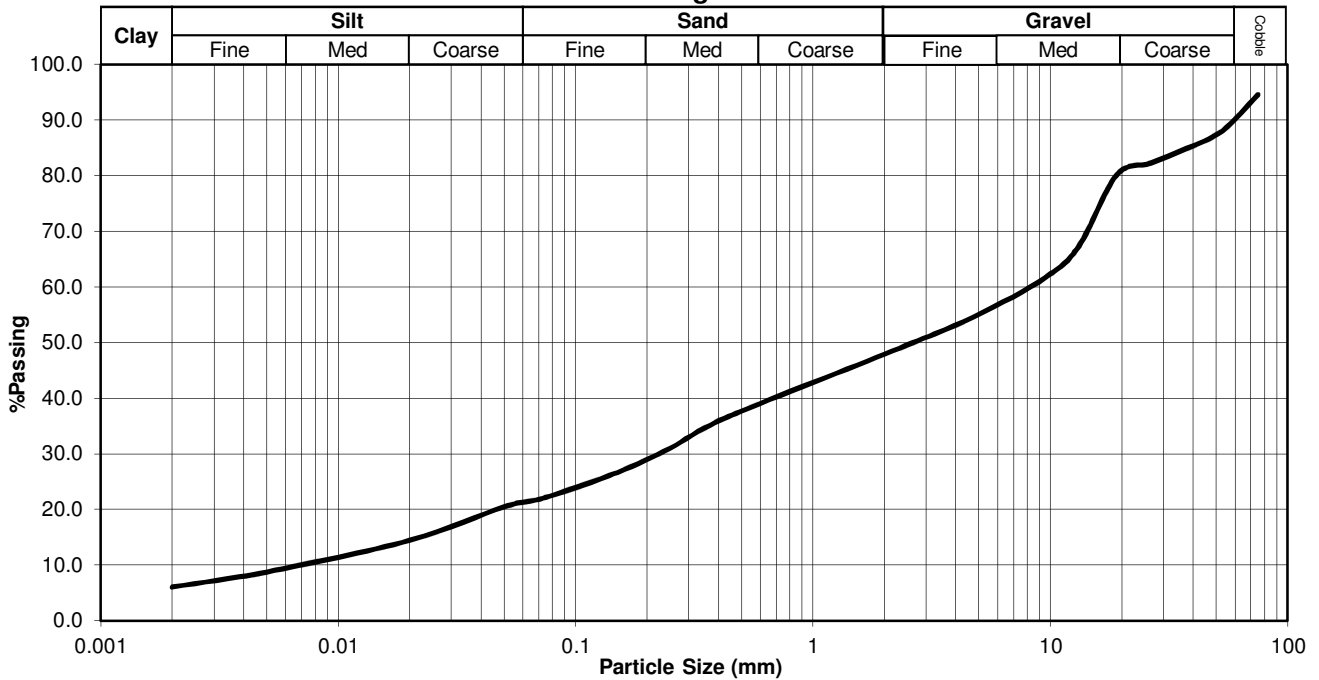
M.I.T SIZE CLASSIFICATION	
Cobble%	9.9
Gravel%	42.2
Coarse	9.8
Medium	23.9
Fine	8.6
Sand%	26.7
Coarse	10.2
Medium	8.9
Fine	7.7
Silt%	15.1
Coarse	6.7
Medium	5.3
Fine	3.1
Clay%	6.0

PLASTICITY	
Liquid Limit	33.3
Plasticity Index	10.1
Linear Shrinkage	5.3

GRADING	
D10 Size (mm)	0.0068
Uniformity Coefficient	>99
Grading Modulus	1.94

CLASSIFICATION	
Potential Expansiveness	Low
Group Index	0
AASHTO Soil Classification	A - 2 - 6
Unified Classification	SC

Grading Curve



Ref no.: 6604

Fig no.: -

MATERIALS ANALYSIS

THEKWINI SOILS LAB. CC

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P.O. Box 30464,
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Fax : (031) 201-7920

Project: Kokstad Landfill - Ref. 22233

Ref no.: 6604 **Lab no.:** 06106 **Borehole/Pit no.:** IP 8 **Fig no.:** -

Depth: 0.0 - 0.4m

Grading Analysis	
Grain Size (mm)	% Passing
75	100.0
53	100.0
37.5	100.0
26.5	100.0
19	100.0
13.2	100.0
9.5	97.2
4.75	85.6
2	69.3
0.425	58.1
0.25	56.2
0.15	52.6
0.075	44.6
0.05	40.3
0.02	28.8
0.005	20.5
0.002	15.2

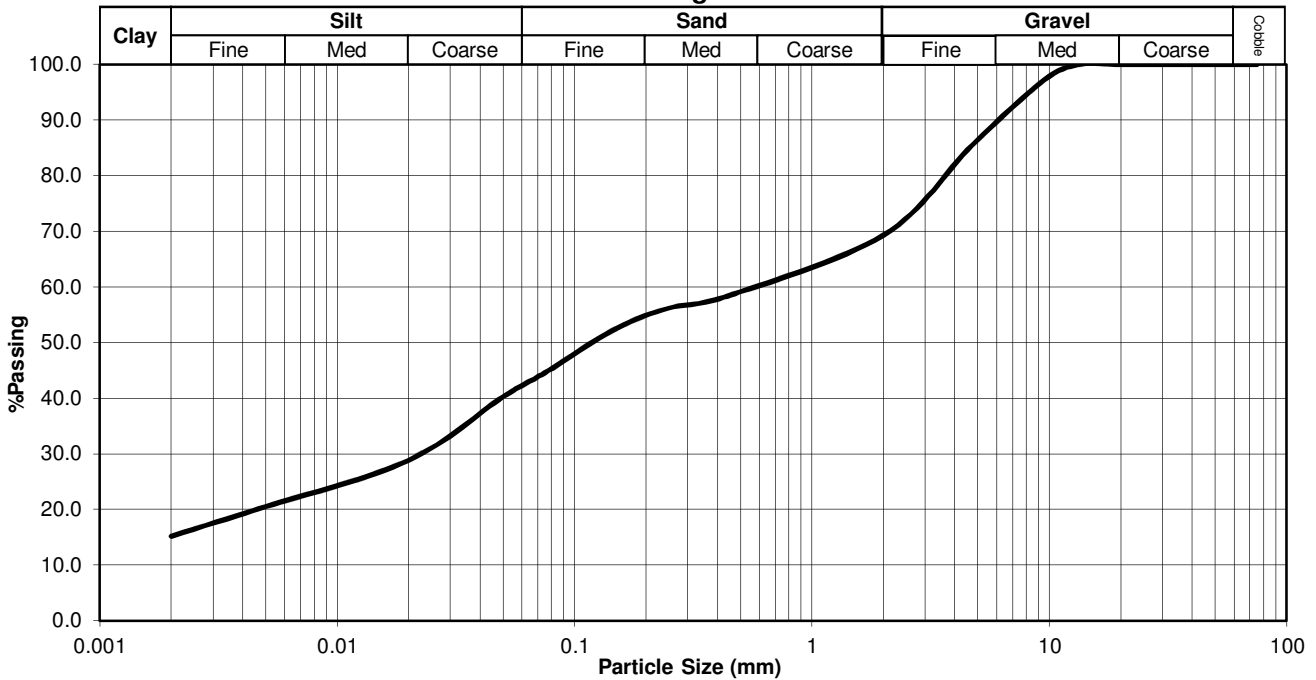
M.I.T SIZE CLASSIFICATION	
Cobble%	0.0
Gravel%	30.7
Coarse	0.0
Medium	11.4
Fine	19.3
Sand%	27.3
Coarse	9.9
Medium	5.0
Fine	12.4
Silt%	26.8
Coarse	13.2
Medium	7.8
Fine	5.9
Clay%	15.2

PLASTICITY	
Liquid Limit	29.9
Plasticity Index	13.1
Linear Shrinkage	6.7

GRADING	
D10 Size (mm)	<0.002
Uniformity Coefficient	NA
Grading Modulus	1.28

CLASSIFICATION	
Potential Expansiveness	Low
Group Index	2
AASHTO Soil Classification	A - 6
Unified Classification	SC

Grading Curve



Ref no.: 6604

Fig no.: -

MATERIALS ANALYSIS

THEKWINI SOILS LAB. CC

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Project: Kokstad Landfill - Ref. 22233

Ref no.: 6604 **Lab no.:** 06108 **Borehole/Pit no.:** IP 11 **Fig no.:** -

Depth: 0.0 - 0.6m

Grading Analysis	
Grain Size (mm)	%Passing
75	100.0
53	100.0
37.5	100.0
26.5	100.0
19	100.0
13.2	100.0
9.5	100.0
4.75	100.0
2	99.7
0.425	99.0
0.25	98.5
0.15	97.2
0.075	92.7
0.05	90.9
0.02	77.1
0.005	62.4
0.002	51.5

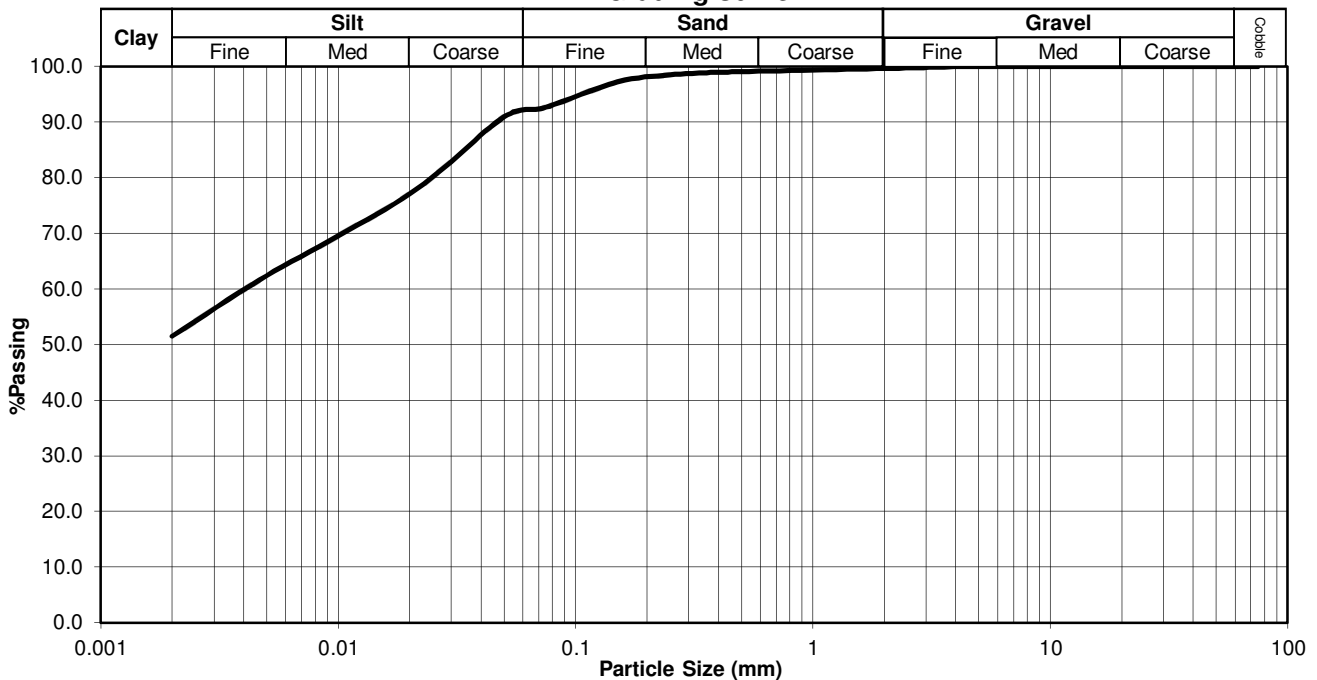
M.I.T SIZE CLASSIFICATION	
Cobble%	0.0
Gravel%	0.3
Coarse	0.0
Medium	0.0
Fine	0.3
Sand%	8.0
Coarse	0.6
Medium	1.2
Fine	6.2
Silt%	40.1
Coarse	14.6
Medium	13.7
Fine	11.8
Clay%	51.5

PLASTICITY	
Liquid Limit	52.7
Plasticity Index	29.1
Linear Shrinkage	14.7

GRADING	
D10 Size (mm)	<0.002
Uniformity Coefficient	NA
Grading Modulus	0.09

CLASSIFICATION	
Potential Expansiveness	Medium
Group Index	30
AASHTO Soil Classification	A - 7 - 6
Unified Classification	CH or OH

Grading Curve



Ref no.: 6604

Fig no.: -

MATERIALS ANALYSIS

THEKWINI SOILS LAB. CC

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Project: Kokstad Landfill - Ref. 22233

Ref no.: 6604 **Lab no.:** 06107 **Borehole/Pit no.:** IP 11 **Fig no.:** -

Depth: 0.8 - 1.9m

Grading Analysis	
Grain Size (mm)	%Passing
75	90.2
53	84.6
37.5	73.3
26.5	65.9
19	60.0
13.2	49.0
9.5	43.5
4.75	38.2
2	33.9
0.425	31.0
0.25	29.5
0.15	27.3
0.075	23.8
0.05	22.5
0.02	17.0
0.005	11.7
0.002	7.8

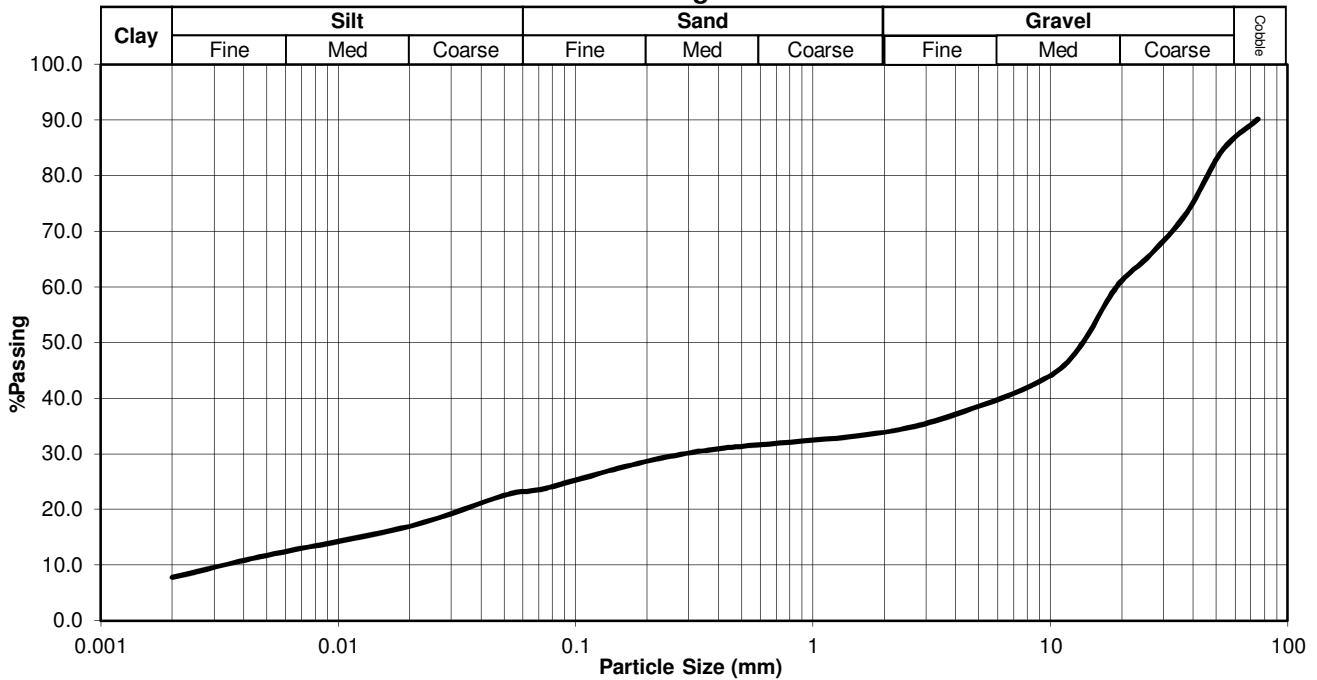
M.I.T SIZE CLASSIFICATION	
Cobble%	13.7
Gravel%	52.5
Coarse	25.6
Medium	21.2
Fine	5.7
Sand%	10.8
Coarse	2.5
Medium	2.9
Fine	5.4
Silt%	15.2
Coarse	6.1
Medium	4.9
Fine	4.3
Clay%	7.8

PLASTICITY	
Liquid Limit	33.2
Plasticity Index	5.2
Linear Shrinkage	2.7

GRADING	
D10 Size (mm)	0.0033
Uniformity Coefficient	>99
Grading Modulus	2.11

CLASSIFICATION	
Potential Expansiveness	Low
Group Index	0
AASHTO Soil Classification	A - 1 - b
Unified Classification	GM

Grading Curve



Ref no.: 6604

Fig no.: -

MATERIALS ANALYSIS

THEKWINI SOILS LAB. CC

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Project: Kokstad Landfill - Ref. 22233

Ref no.: 6604 **Lab no.:** 07040 **Borehole/Pit no.:** IP 14 **Fig no.:** -

Depth: 0.65 - 1.6m

Grading Analysis	
Grain Size (mm)	% Passing
75	86.9
53	76.7
37.5	69.1
26.5	59.5
19	54.6
13.2	43.6
9.5	38.6
4.75	34.0
2	30.9
0.425	26.7
0.25	23.7
0.15	18.8
0.075	13.9
0.05	12.7
0.02	9.2
0.005	6.8
0.002	5.0

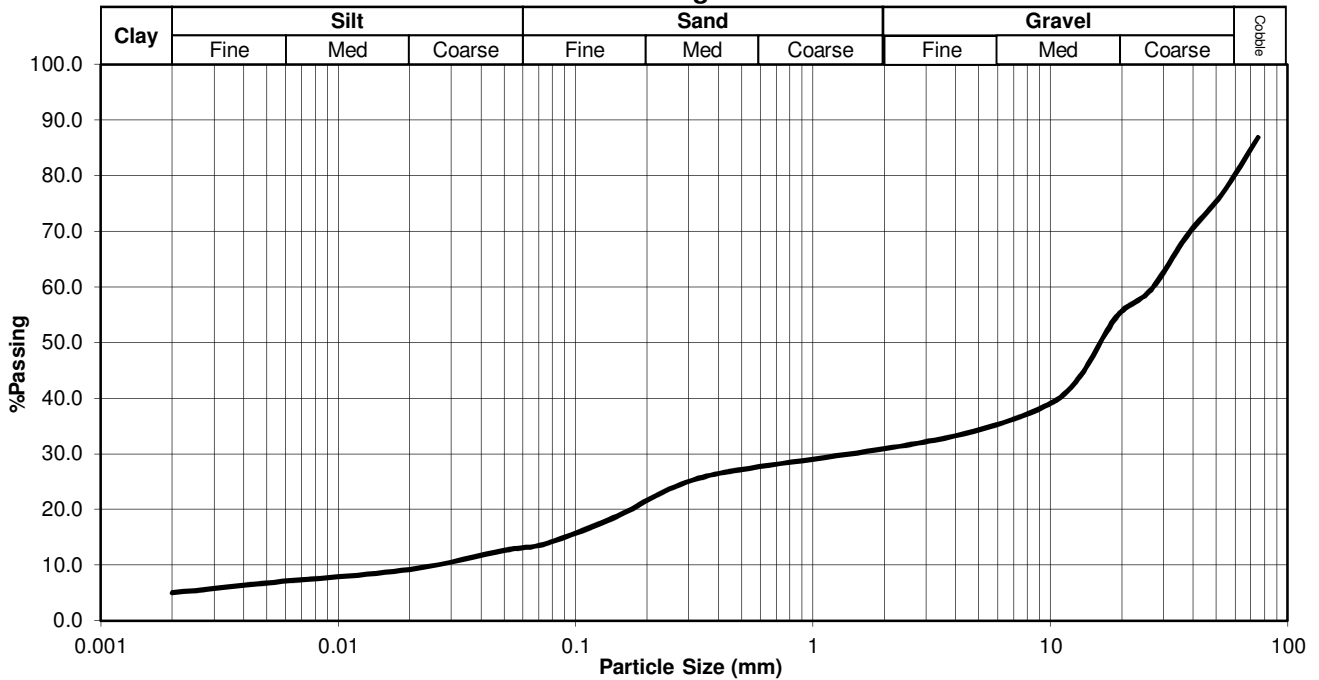
M.I.T SIZE CLASSIFICATION	
Cobble%	20.0
Gravel%	49.1
Coarse	24.7
Medium	20.1
Fine	4.3
Sand%	17.8
Coarse	3.8
Medium	5.9
Fine	8.1
Silt%	8.1
Coarse	3.9
Medium	2.2
Fine	2.0
Clay%	5.0

PLASTICITY	
Liquid Limit	28.3
Plasticity Index	5.1
Linear Shrinkage	2.7

GRADING	
D10 Size (mm)	0.025
Uniformity Coefficient	>99
Grading Modulus	2.29

CLASSIFICATION	
Potential Expansiveness	Low
Group Index	0
AASHTO Soil Classification	A - 1 - a
Unified Classification	GM

Grading Curve



Ref no.: 6604

Fig no.: -

MATERIALS ANALYSIS

THEKWINI SOILS LAB. CC

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Fax : (031) 201-7920

Project: Kokstad Landfill - Ref. 22233

Ref no.: 6604 **Lab no.:** 07041 **Borehole/Pit no.:** IP 18 **Fig no.:** -

Depth: 0.4 - 1.6m

Grading Analysis	
Grain Size (mm)	% Passing
75	100.0
53	100.0
37.5	100.0
26.5	100.0
19	100.0
13.2	100.0
9.5	100.0
4.75	99.9
2	94.9
0.425	86.3
0.25	85.3
0.15	82.1
0.075	74.9
0.05	70.9
0.02	56.9
0.005	43.2
0.002	36.7

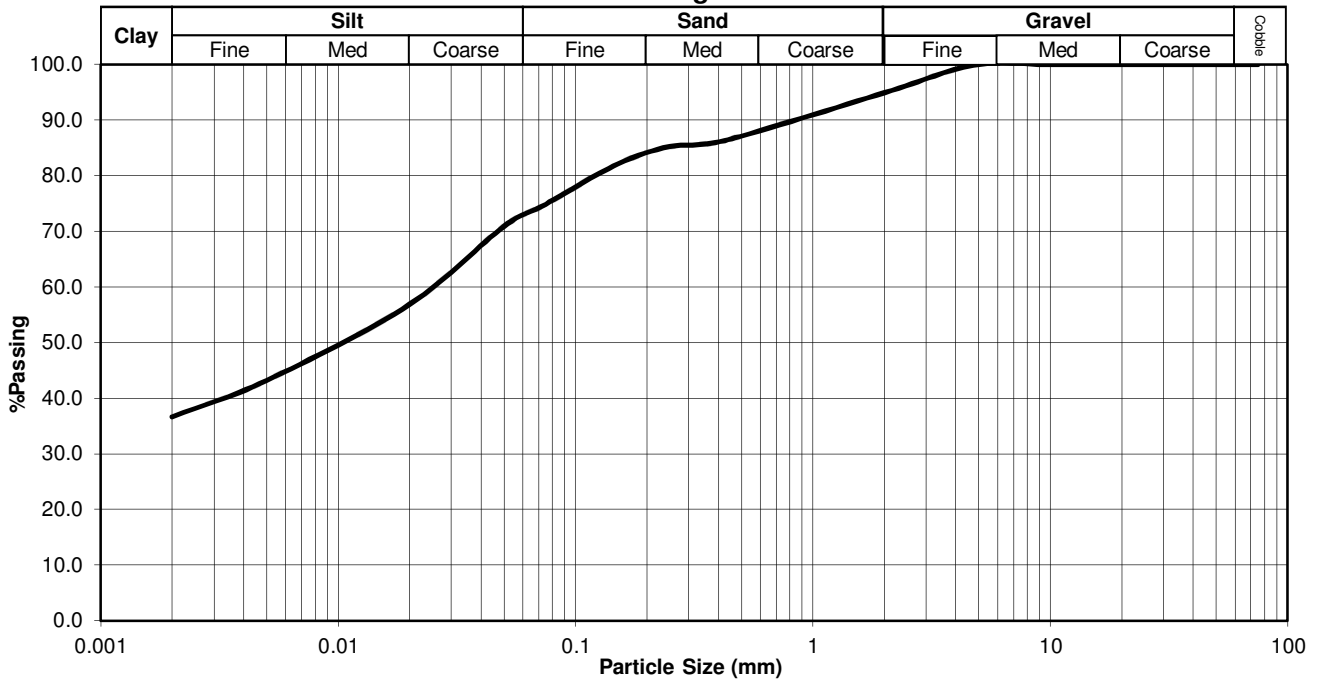
M.I.T SIZE CLASSIFICATION	
Cobble%	0.0
Gravel%	5.1
Coarse	0.0
Medium	0.1
Fine	5.0
Sand%	22.4
Coarse	7.6
Medium	3.6
Fine	11.2
Silt%	35.9
Coarse	15.7
Medium	12.8
Fine	7.4
Clay%	36.7

PLASTICITY	
Liquid Limit	29.5
Plasticity Index	12.1
Linear Shrinkage	6

GRADING	
D10 Size (mm)	<0.002
Uniformity Coefficient	NA
Grading Modulus	0.44

CLASSIFICATION	
Potential Expansiveness	Low
Group Index	7
AASHTO Soil Classification	A - 6
Unified Classification	CL or OL

Grading Curve



Ref no.: 6604

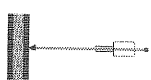
Fig no.: -

APPENDIX F

SHEAR BOX TEST RESULTS

CONSOLIDATED DRAINED SHEAR BOX TEST

Project Kokstad Landfill - Ref. 22233
Ref no. 6604
Lab no. 06100
Depth (m): 0.9 - 2.6
Position: IP 1
Sample Type Reconsolidated To 95% of Proc.
Description: IP 1
Org: SILT (Res. Dolerite)



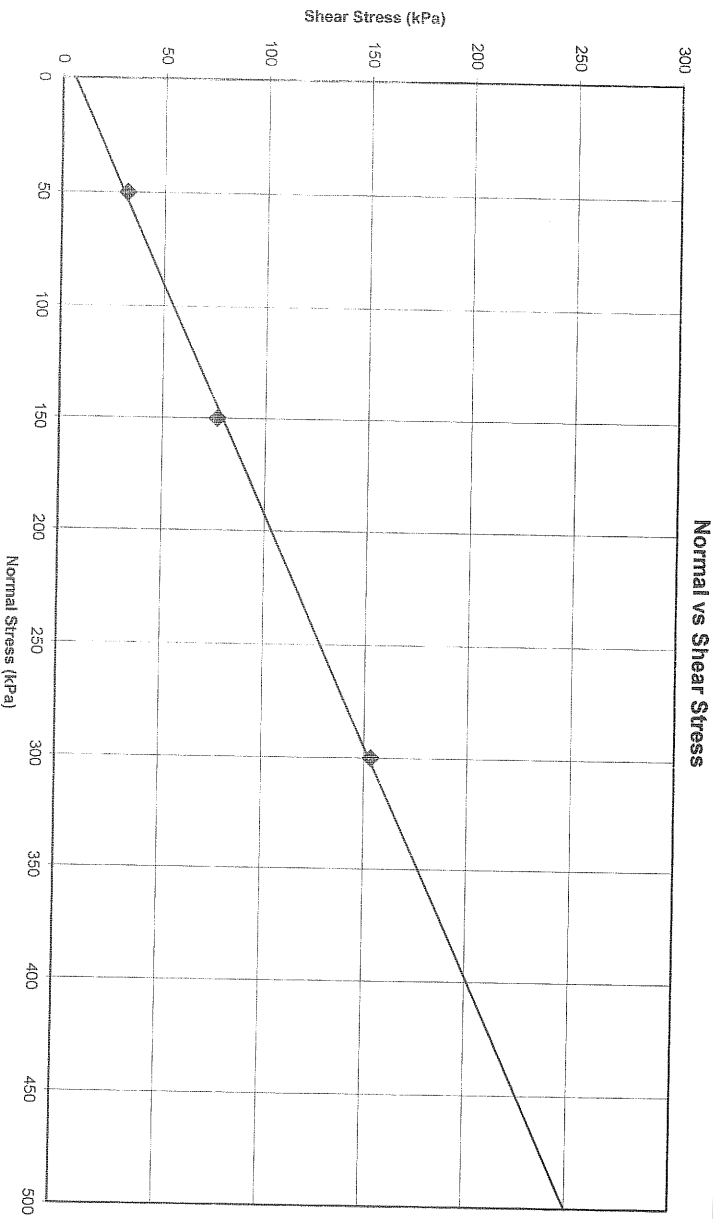
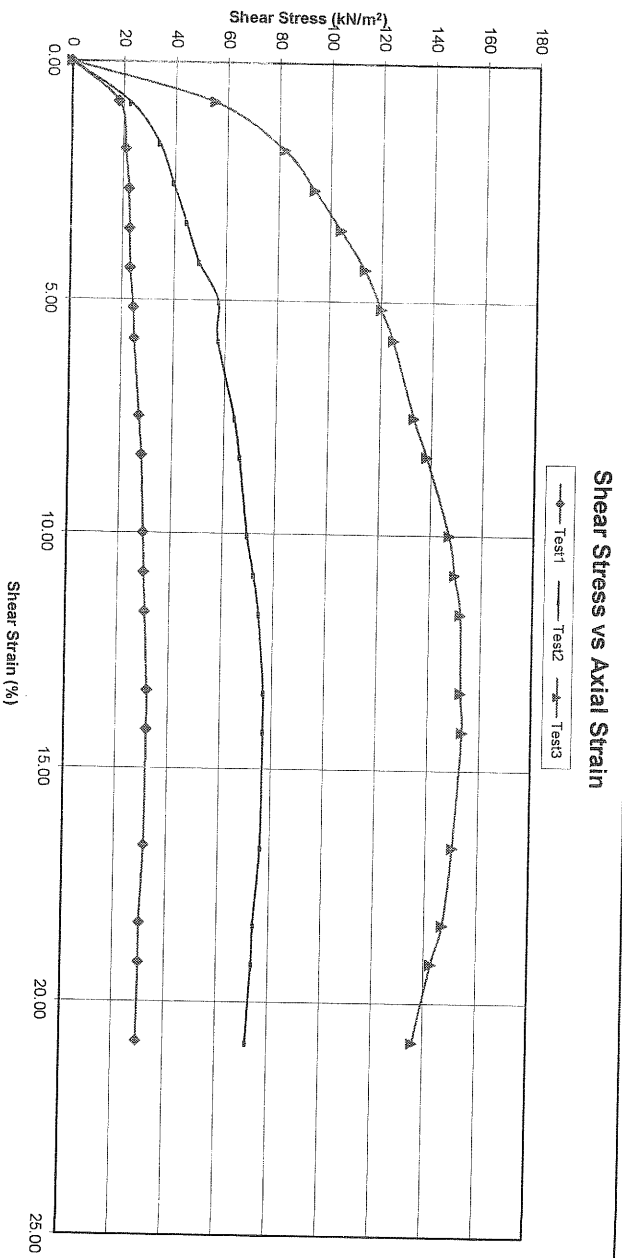
THEKWINI SOILS LAB. CC

V.A.T REGISTRATION NO. 4680210661
 68 Ridge Road,
 Tolgate, DURBAN
 Tel: (031) 201-8982
 P.O. Box 30464,
 MAYVILLE 4058
 Fax: (031) 201-7920

	Test 1	Test 2	Test 3
Normal Stress (kN/m ²)	50	150	300
Dry Density (kg/m ³)	1188	1188	1188
Moisture Content (%)	31.6	31.6	31.6
Shear Strain (%)	13.3	13.3	14.2
Shear Stress (kN/m ²)	31.9	76.7	153.4

Shear Strength Parameters

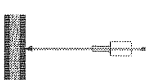
Angle of Internal Friction (0°) 26
 Cohesion (kPa) 6



CONSOLIDATED DRAINED SHEAR BOX TEST

THEEKWINI SOILS LAB. CC

V.A.T. REGISTRATION NO. 459021/0991



68 Ridge Road,
Tolgate, DURBAN
Tel : (031) 201-8992

P.O. Box 30464,
MAYVILLE, 4058
Fax : (031) 201-7920

Project Kokstad Landfill - Ref. 22233

Ref no. 6604

Lab no. 06101

Depth (m): 1.9 - 3.0

Position: IP 2

Sample Type

Recompacted To 95% of Proc.

Description:

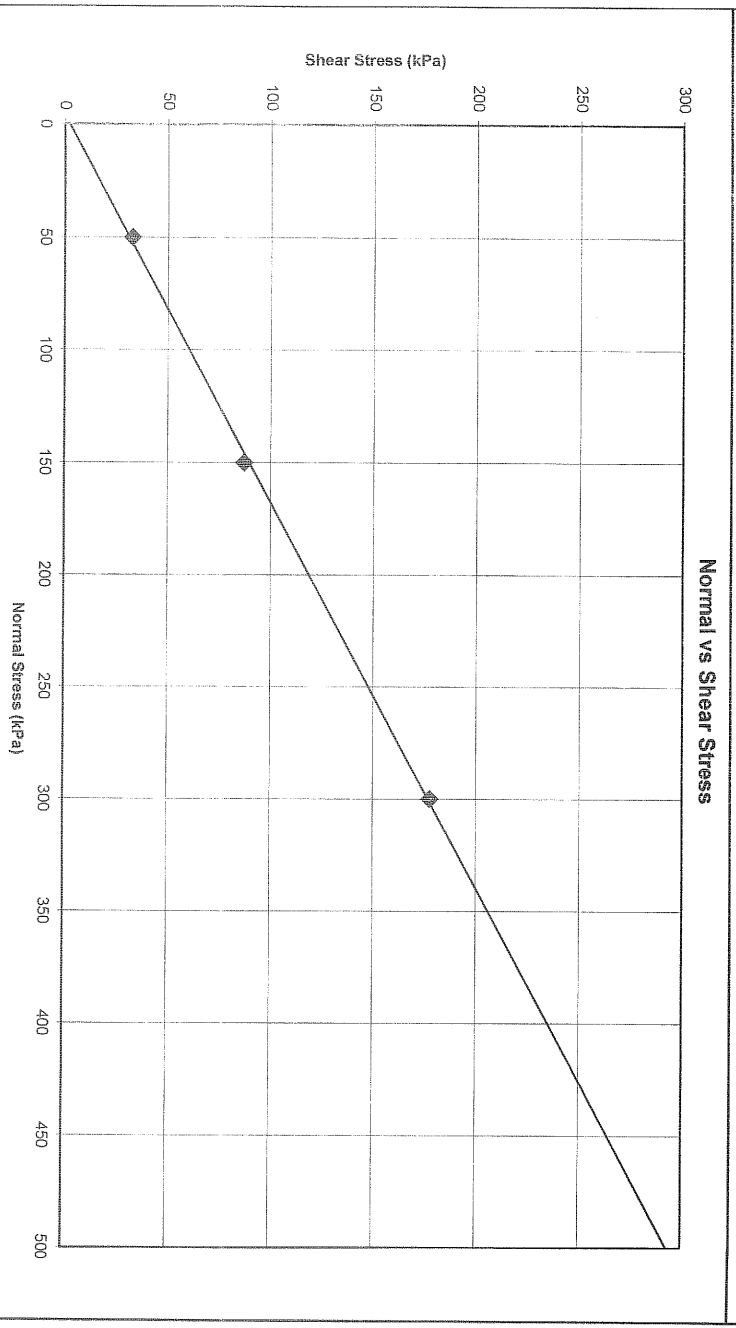
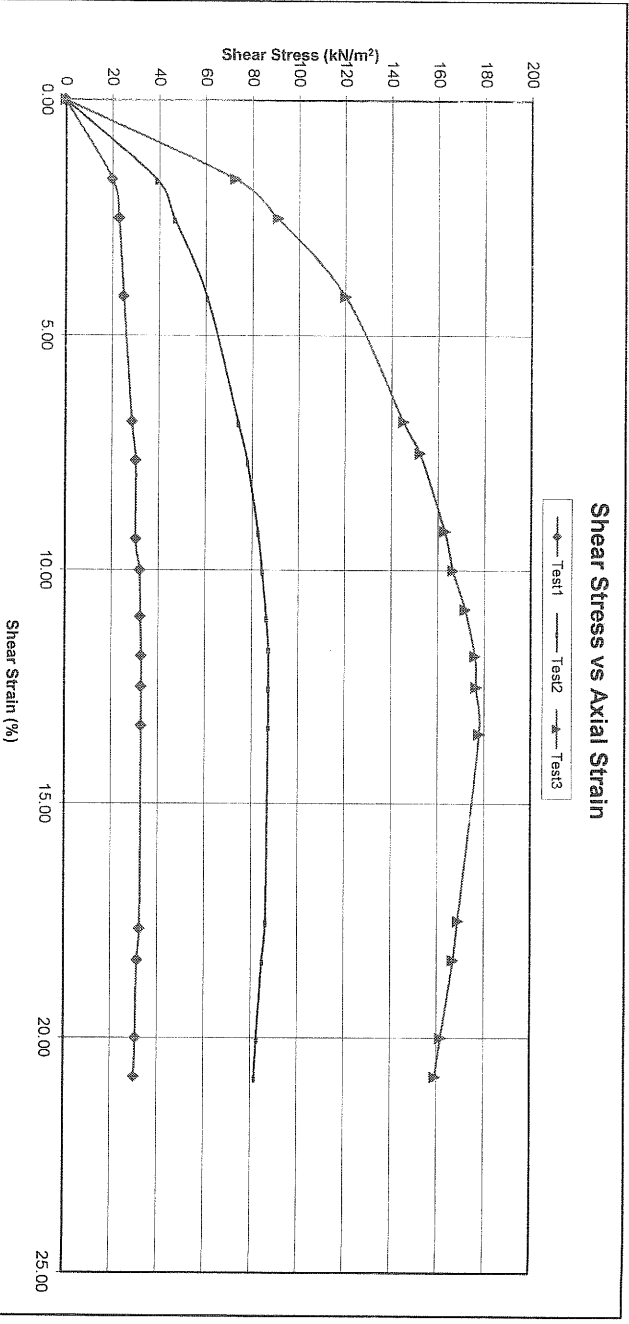
HWH.Oliv.SHALE

	Test 1	Test 2	Test 3
Normal Stress (kN/m ²)	50	150	300
Dry Density (kg/m ³)	1587	1587	1587
Moisture Content (%)	15.4	15.4	15.4
Shear Strain (%)	11.8	11.7	13.5
Shear Stress (kN/m ²)	32.9	87.3	177.9

Shear Strength Parameters

Angle of Internal Friction (O°) 30

Cohesion (kPa) 2



CONSOLIDATED DRAINED SHEAR BOX TEST

Project Kokstad Landfill - Ref. 22233
Ref no. 6604
Lab no. 06104
Depth (m): 1.0 - 1.9
Position: IP 6
Sample Type Recompacted To 95% of Proc.
Description: M/W/h DK.BI. DOLERITE



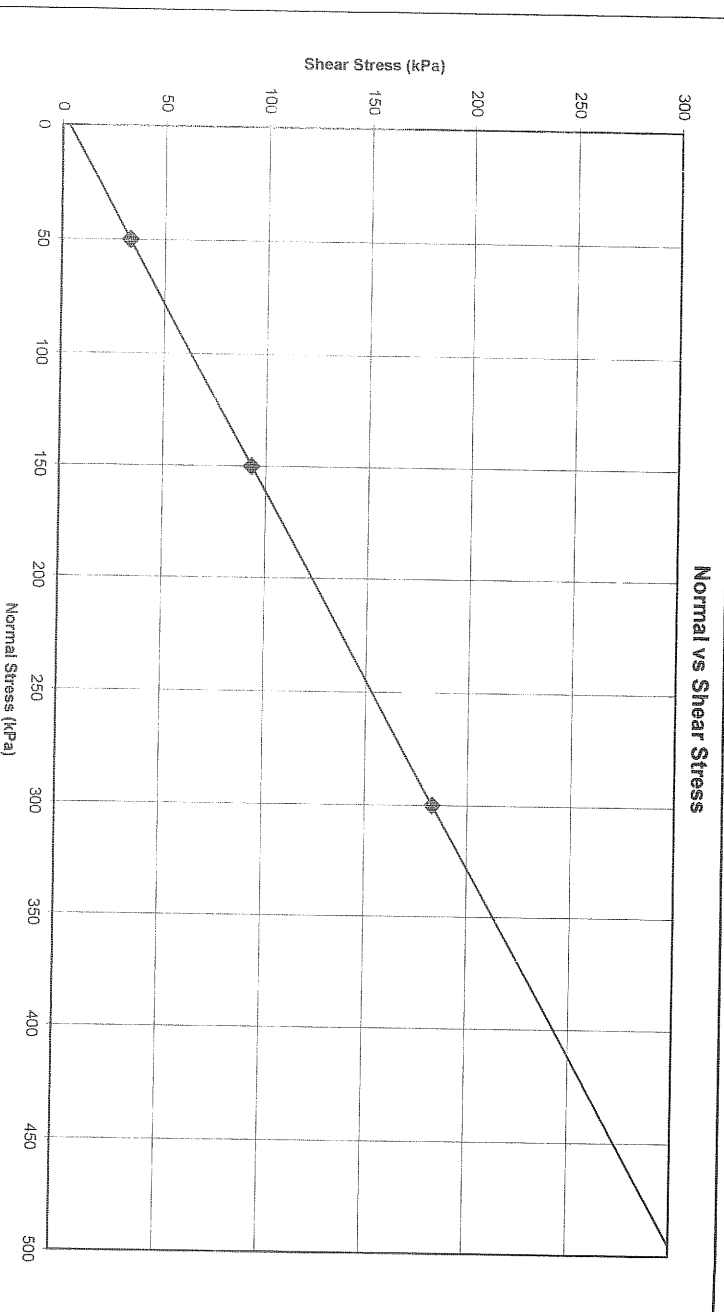
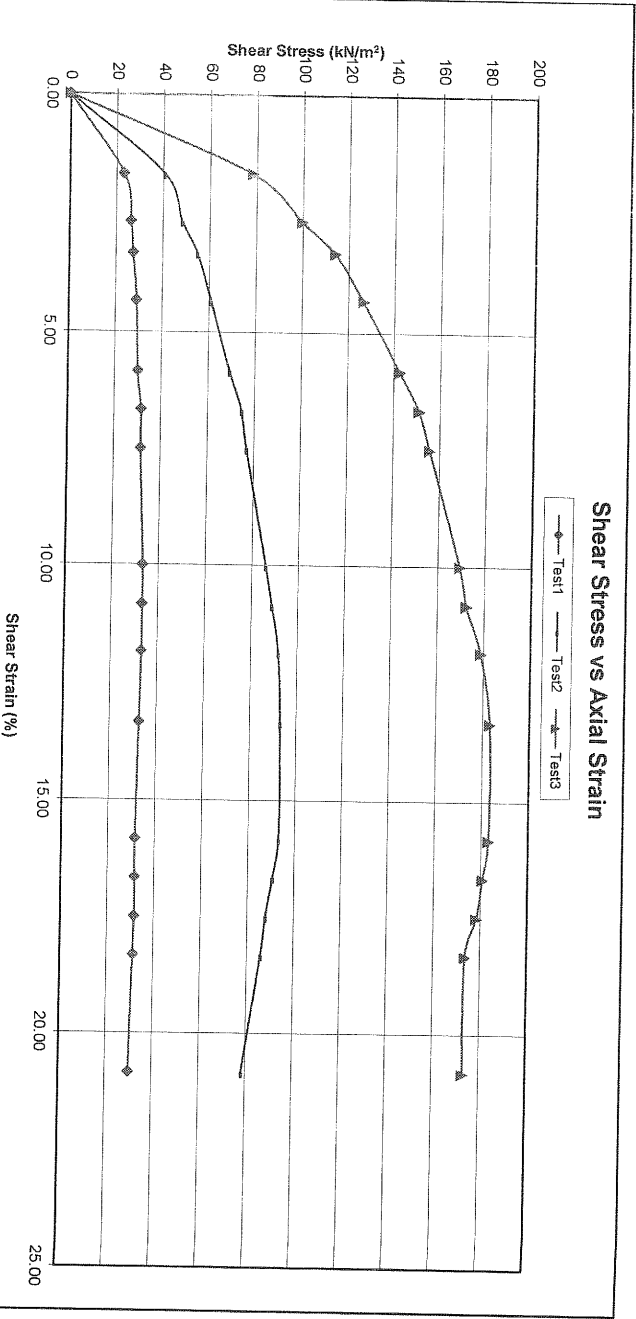
THEKWINI SOILS LAB. CC

V.A.T. REGISTRATION NO. 460210661.
 68 Ridge Road,
 Tolgate, DURBAN
 Tel: (031) 201-8992
 P.O. Box 30464,
 MAYVILLE 4058
 Fax: (031) 201-7920

	Test 1	Test 2	Test 3
Normal Stress (kN/m ²)	50	150	300
Dry Density (kg/m ³)	1524	1524	1524
Moisture Content (%)	19.7	19.7	19.7
Shear Strain (%)	10.0	13.3	13.3
Shear Stress (kN/m ²)	33.4	93.2	183.2

Shear Strength Parameters

Angle of Internal Friction (0°) 31
 Cohesion (kPa) 3



CONSOLIDATED DRAINED SHEAR BOX TEST

Project: Kokstad Landfill - Ref: 22233
 Ref no.: 6604
 Lab no.: 06105
 Depth (m): 0.9 - 1.5
 Position: IP 7
 Sample Type: Recompacted to 95% of Proc.
 Description: M/Mh.Gr. SANDSTONE



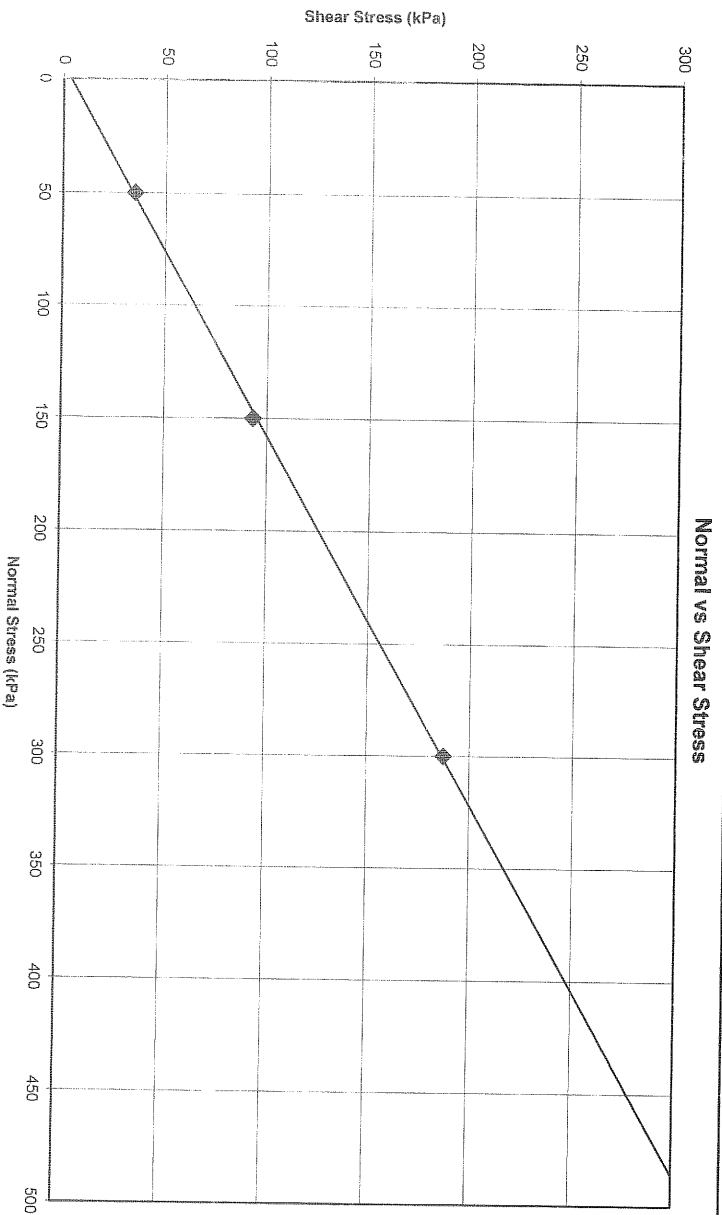
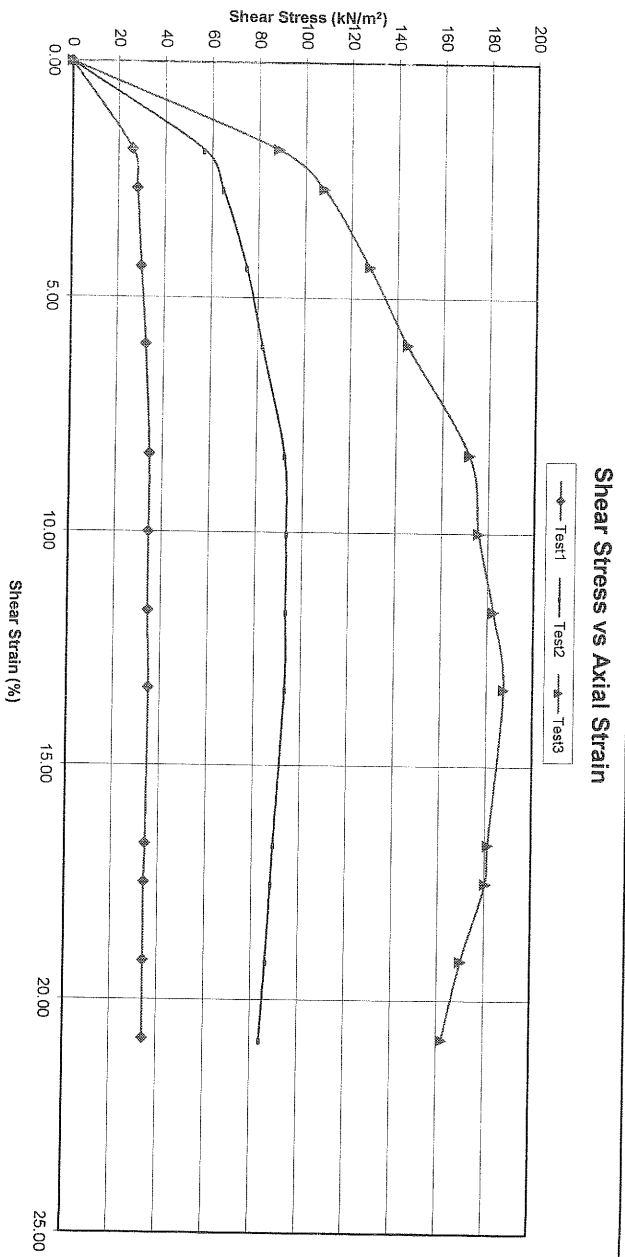
THEKWINI SOILS LAB. CC

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 P.O. Box 30464,
 MAYVILLE 4058
 Fax : (031) 201-7920

	Test 1	Test 2	Test 3
Normal Stress (kN/m ²)	50	150	300
Dry Density (kg/m ³)	1658	1658	1658
Moisture Content (%)	15.7	15.7	15.7
Shear Strain (%)	13.3	10.0	13.3
Shear Stress (kN/m ²)	35.3	93.3	187.5

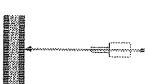
Shear Strength Parameters

Angle of Internal Friction (0°) 31
 Cohesion (kPa) 4



CONSOLIDATED DRAINED SHEAR BOX TEST

Project Kokstad Landfill - Ref. 22233
Ref no. 6604
Lab no. 07040
Depth (m): 0.65 - 1.6
Position: IP 14
Description: H/Wb. Yel. SANDSTONE



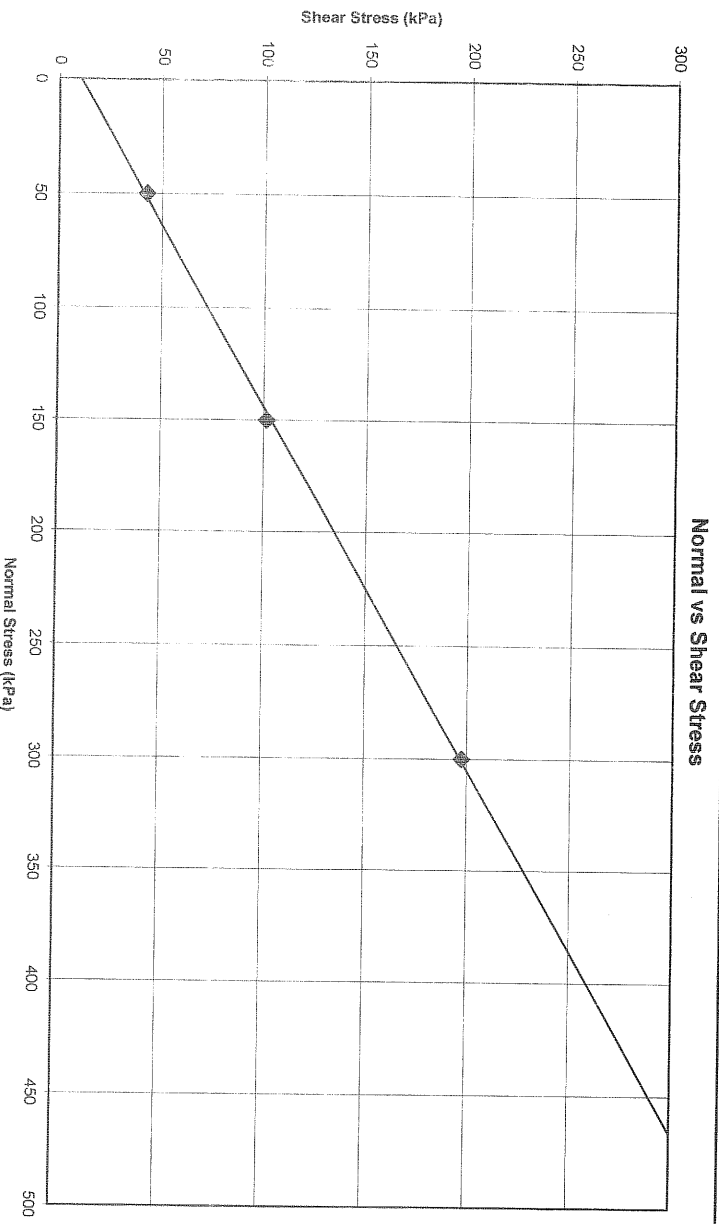
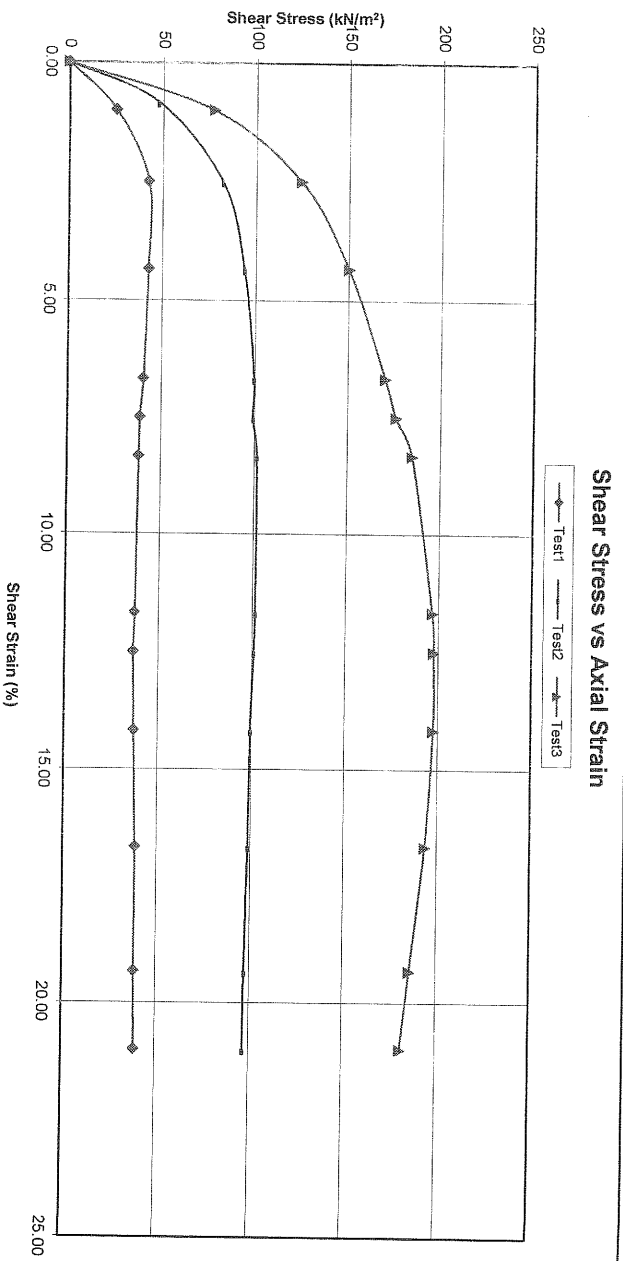
THEKWINI SOILS LAB. CC

V.A.T. REGISTRATION NO. 4590270981.
 68 Ridge Road,
 Tolgate, DURBAN
 Tel : (031) 201-8992 Fax : (031) 201-7920
 P.O. Box 30464,
 MAYVILLE, 4058

	Test 1	Test 2	Test 3
Normal Stress (kN/m ²)	50	150	300
Dry Density (kg/m ³)	1748	1748	1748
Moisture Content (%)	13.4	13.4	13.4
Shear Strain (%)	2.5	8.3	12.5
Shear Stress (kN/m ²)	42.8	101.5	197.6

Shear Strength Parameters

Angle of Internal Friction (O°) 32
 Cohesion (kPa) 10



APPENDIX G

WATER SAMPLE TEST RESULTS

CERTIFICATE OF ANALYSIS - BN Kirk (Natal)cc

CLIENT:	Dreman Mand and Partners	BNK Reference No.:	DMP 16-07 Kokstad
ADDRESS:	68 Peet Morkaba Ridge Tollgate 4001	Client Order No	22233 Ref No Kokstad Landfill
ATTENTION:	<i>B Raach</i>	DATE RECEIVED	16-07-2012
Email:	Ground.details	ANALYSIS DATE	27-07-2012
Report Date	13-Aug-12		

ANALYTICAL RESULTS

1	2	3	4	WSI Kokstad Landfill
Determinand	Test Method No	SANS 241-1:2011 aesthetic, operational, chemical and Microbiological determinands		Standard Units a
		Risk	Unit	

Physical and aesthetic determinands:					
Conductivity at 25°C	P09/004	<i>Acidic</i>	<i>mS/m</i>	≤ 170	57
Total Dissolved Solids	P09/031	<i>Acidic</i>	<i>mg/L</i>	≤ 1200	374
pH at 25°C c	P09/042	<i>Operational</i>	<i>pH units</i>	≥ 5.0, ≤ 9.7	8.0

Chemical determinands - macro-determinands					
Sulphate as SO ₄ ²⁻	P09/035	<i>Acute health - 1</i>		≤ 500	3.4
		<i>Aesthetic</i>		≤ 250	3.4
Total Hardness as CaCO ₃	P09/013	<i>n/s</i>	<i>mg/L</i>	<i>n/s</i>	268
Calcium Hardness as CaCO ₃	P09/005	<i>n/s</i>	<i>mg/L</i>	<i>n/s</i>	120
Calcium as Ca	P09/004	<i>n/s</i>	<i>mg/L</i>	<i>n/s</i>	48
Magnesium as Mg	P09/016	<i>n/s</i>	<i>mg/L</i>	<i>n/s</i>	35
Ammonia as N	P09/002	<i>Acidetic</i>	<i>mg/L</i>	≤ 1.5	<0.1
Chloride as Cl ⁻	P09/007	<i>Acidetic</i>	<i>mg/L</i>	≤ 300	15
Potassium as K	P09/047	<i>n/s</i>	<i>mg/L</i>	<i>n/s</i>	2.3
Sodium as Na	P09/047	<i>Acidetic</i>	<i>mg/L</i>	≤ 200	48
p alkalinity		<i>n/s</i>	<i>mg/L</i>	<i>n/s</i>	<2
Phosphorous as PO ₄ Total		<i>n/s</i>	<i>mg/L</i>	<i>n/s</i>	204
Chemical Oxygen Demand	P09/006	<i>n/s</i>	<i>mg/L</i>	<i>n/s</i>	0.8
Biological Oxygen Demand	P09/003	<i>n/s</i>	<i>mg/L</i>	<i>n/s</i>	17

a = The health-related standards are based on the consumption of 2 L of water per day per person of a mass of fdkg over a period of 70 years.
b = Values in excess of those given in column 4 may negatively impact distribution.
c = Low pH values can result in structural problems in the distribution system.
d = This is equivalent to nitrate at 50mg NO₃⁻ /L and nitrite as 3mg NO₂⁻ /L.
e = Microscopy only needs to be measured when an algal bloom (>20 000 cyanobacteria cells per millilitre) is present in a raw water source. In the absence of algal monitoring, an algal bloom is deemed to occur where the surface water is visibly green in the vicinity of the abstraction, or samples taken have a strong musty odour.
f = Low pH values can result in structural problems in the distribution system.

MICROBIOLOGICAL RESULTS

E.coli^a or faecal coliforms b	P09/046	Acute health - 1	Count per 100ml	Not detected	0
--	---------	-------------------------	------------------------	---------------------	----------

a = Definitive, preferred indicator of faecal pollution.
b = Indicator of unacceptable microbial water quality, could be tested instead of E.coli, but is not the preferred indicator of faecal pollution. Also provides information on treatment efficiency and afeigrowth in distribution networks.
c = Confirms a risk of human infection and faecal pollution and also provides information on treatment efficiency. The detection of selected viruses confirms faecal pollution of human origin.
d = Confirms a risk of infection and faecal pollution and also provides information on treatment efficiency. The detection of selected protozoan parasites confirms a human health risk. The detection of selected protozoan parasites confirms a human health risk.
e = Indicates potential faecal pollution and provides information on treatment efficiency and afeigrowth.
f = Process indicator that provides information on treatment efficiency, afeigrowth in distribution networks and adequacy of disinfectant residuals.
g = Process indicator that provides information on treatment efficiency.

TECHNICAL SIGNATORY:

V Moolali - Microbiology Supervisor

D Subban - Chemistry Supervisor

for and on behalf of B N KIRK (Natal)cc

13-Aug-12

Disclaimer:

1. While every reasonable precaution is taken in obtaining these results the Company does not accept responsibility for any matters arising from the further use of these results.
2. In the case of samples submitted by the client, the results expressed in this certificate represent only the samples as received.
3. This certificate shall not be reproduced except in full, without the written approval of the Company.

CERTIFICATE OF ANALYSIS - BN KIRK (Natal)cc

CLIENT:	Dreman Maud and Partners	BNK Reference No.:	DMP 26-06 Kokstad
ADDRESS:	68 Peter Mokaba Ridge Tollgate 4001	Clients Order No	22233
ATTENTION:	<i>B Research</i>	DATE RECEIVED	26-06-2012
eMail:	<i>Group@bnk</i>	ANALYSIS DATE	05-07-2012
Report Date	10-07-2012		

ANALYTICAL RESULTS

Determination	Test Method No	SANS 241-1:2011 Aesthetic, operational, chemical and Microbiological determinands				Standard limits a	WSS Kokstad Landfill
		1	2	3	4		
Risk	Unit	Physical					

Physical and aesthetic determinands							
Conductivity at 25°C	P09/014	Aesthetic	n/S/m	≤ 170			14
Total Dissolved Solids	P09/031	Aesthetic	mg/L	≤ 1200			94
pH at 25°C c	P09/042	Operational	pH units	≥ 5 to ≤ 9.7			7.7

Chemical determinands - macro-determinands							
Sulphate as SO ₄ ²⁻	P09/035	Acute health - 1	mg/L	≤ 500			0.95
Total Hardness as CaCO ₃	P09/013	Aesthetic	mg/L	≤ 250			0.95
Calcium Hardness as CaCO ₃	P09/005	n/S	mg/L	n/S			96
Calcium as Ca	P09/004	n/S	mg/L	n/S			28
Magnesium as Mg	P09/016	n/S	mg/L	n/S			112
Ammonia as N	P09/002	Aesthetic	mg/L	≤ 1.5			15
Chloride as Cl ⁻	P09/007	Aesthetic	mg/L	≤ 300			<0.1
Potassium as K	P09/047	n/S	mg/L	n/S			8.0
Sodium as Na	P09/047	Aesthetic	mg/L	≤ 200			2.3
p alkalinity		n/S	mg/L	n/S			24
Free alkalinity		n/S	mg/L	n/S			<2
Phosphorous as PO ₄ Total		n/S	mg/L	n/S			50
Chemical Oxygen Demand	P09/006	n/S	mg/L	n/S			2.6
Biological Oxygen Demand	P09/003	n/S	mg/L	n/S			20

a = The health-related standards are based on the consumption of 2 L of water per day per person of a mass of 60kg over a period of 70 years.

b = Values in excess of those given in column 4 may negatively impact disinfection.

c = Low pH values can result in structural problems in the distribution system.

d = This is equivalent to nitrate at 5mg NO₃⁻ /L and nitrite as 3mg NO₂⁻ /L

e = Microcystin only needs to be measured where an algal bloom (>20 000 cyanobacteria cells per millilitre) is present in a raw water source. In the absence of algal monitoring, an algal bloom is deemed to occur where the surface water is visibly green in the vicinity of the abstraction, or samples taken have a strong musky odour.

MICROBIOLOGICAL RESULTS

E.coli ^a or faecal coliforms ^b	Acute health - 1		Not detected	72
	P09/046	Count per 100ml		

a = Definitive, preferred indicator of faecal pollution.

b = Indicator of unacceptable microbial water quality, could be tested instead of E.coli, but is not the preferred indicator of faecal pollution.

Also provides information on treatment efficiency and aftergrowth in distribution networks.

c = Confirms a risk of human infection and faecal pollution and also provides information on treatment efficiency; confirms faecal pollution of human origin.

d = Confirms a risk of infection and faecal pollution and also provides information on treatment efficiency.

The detection of selected protozoan parasites confirms a human health risk.

e = Indicates potential faecal pollution and provides information on treatment efficiency and aftergrowth.

f = Process indicator that provides information on treatment efficiency; aftergrowth in distribution networks and adequacy of disinfectant residuals.

g = Process indicator that provides information on treatment efficiency.

TECHNICAL SIGNATORY:

CHEMISTRY SUPERVISOR:


D. SUBBAN

MICROBIOLOGY SUPERVISOR:


D. SUBBAN

for and on behalf of B N KIRK (Natal)cc

10-07-2012

D. BESTER-LABORATORY MANAGER

Date

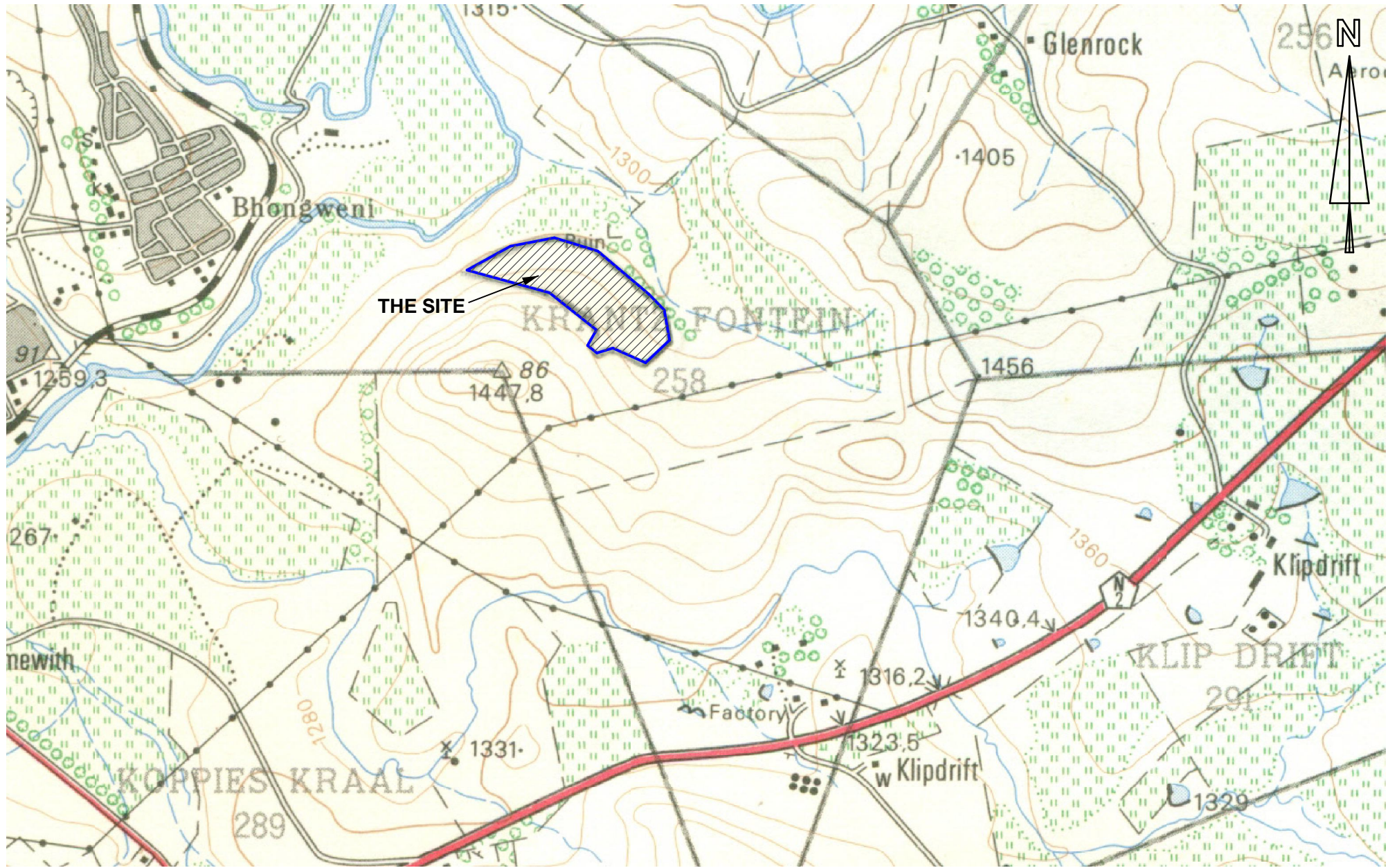
Disclaimer:

1. While every reasonable precaution is taken in obtaining these results the Company does not accept responsibility for any matters arising from the further use of these results.
2. In the case of samples submitted by the client, the results expressed in this certificate represent only the samples as received.
3. This certificate shall not be reproduced except in full, without the written approval of the Company

End of Report

DRAWING No. 22233/1A

LOCALITY PLAN



**DRENNAN, MAUD
AND PARTNERS**
Consulting Civil Engineers

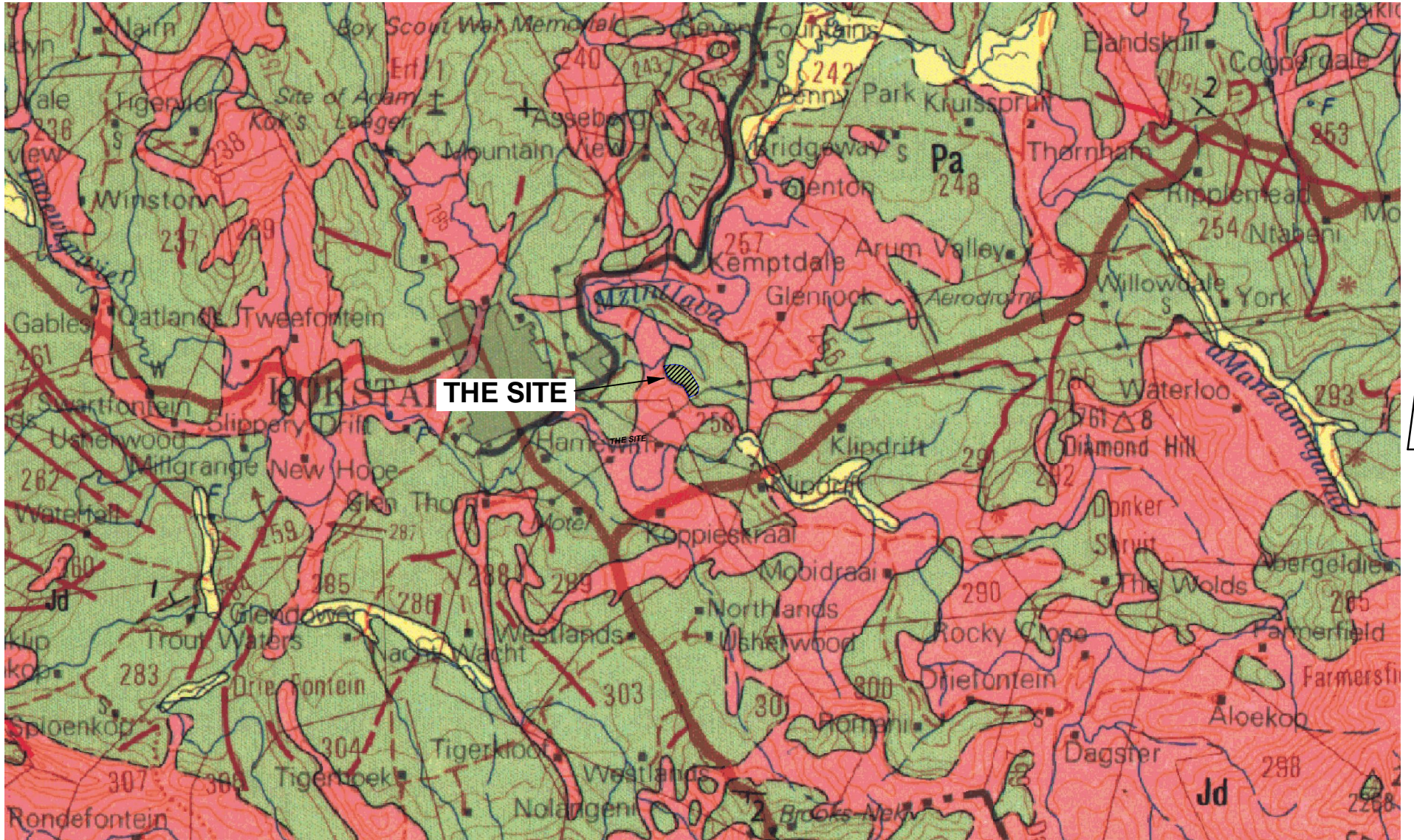
DESIGNED : B.R.
DRAWN : S.P.
DATE : 20/08/2012
SCALE : N.T.S.
CHECKED :

**LOCALITY PLAN
PROPOSED LANDFILL DEVELOPMENT
SITE 1 KRANTZ FONTEIN FARM, KOKSTAD**

REF. NO.
22233
FIG. NO.
1A

DRAWING No. 22233/1B

GEOLOGICAL PLAN



KEY



SHALE, FINE GRAINED SANDSTONE
QUARTZITE (ADELAIDE FORMATION,
BEAUFORT GROUP)



KAROO DOLERITE (INTRUSIVE)



**DRENNAN, MAUD
AND PARTNERS**
Consulting Civil Engineers

DESIGNED :	B.R.
DRAWN :	S.P.
DATE :	22/08/2012
SCALE :	N.T.S.
CHECKED :	

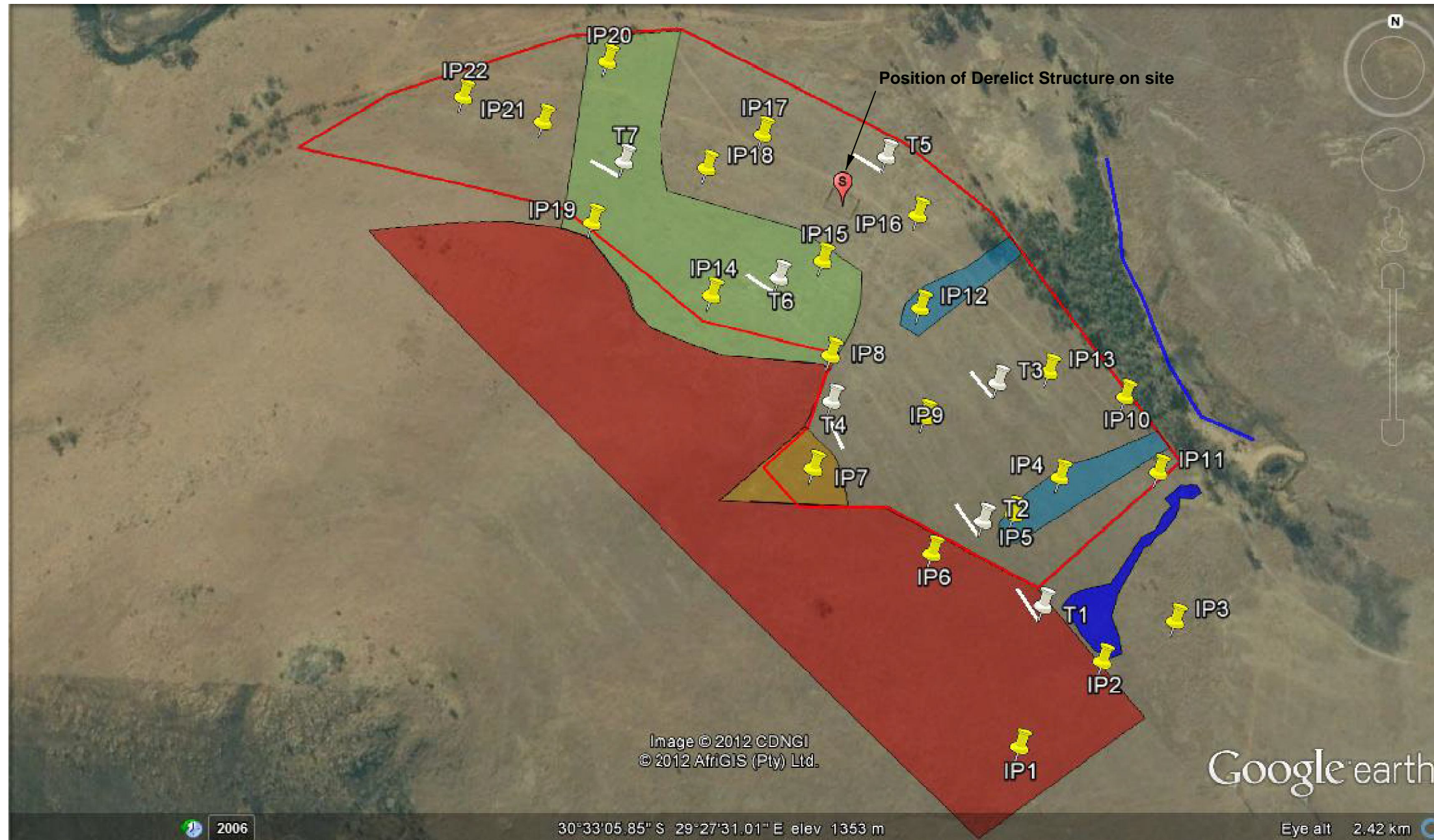
**GEOLOGICAL PLAN
PROPOSED LANDFILL DEVELOPMENT
SITE 1 KRANTZ FONTEIN FARM, KOKSTAD**

REF. NO.
22233

FIG. NO.
1B

DRAWING No. 22233/2

GEOLOGY & SEEPAGE ZONES



KEY

Approximate Positions of Inspection Pits

T4 Approximate Positions of Seismic Traverses

Edge of area affected by permanent or at least seasonal groundwater seepage (as determined by auger hole profiling). At this stage a 32m buffer zone has been applied, however this must be determined by the requirements of the Local Authority and the Appointed Environmental Officer.



Approx. area of the site which can be described as an area of permanent seepage. This area is likely to represent a spring, utilising a fractured zone along the shale / dolerite contact zone in this area as a preferential flow path. The landfill cannot be located in this area.



Approx. areas of the site likely to be affected by seasonal groundwater seepage.



Extent of area that is recommended for use as the proposed landfill based on the results of the geotechnical investigation



Approx. area of the site underlain by shale and sandy shale of the Adelaide Formation (Beaufort Group).



Approx. area of the site underlain by sandstone of the Adelaide Formation (Beaufort Group).



Approx. area of the site underlain by sandstone and quartzite of the Adelaide Formation (Beaufort Group).



Approx. area of the site intruded by a large dolerite sill (Karoo Supergroup).

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Consulting Civil Engineers & Engineering Geologists

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DURBAN
4001
Telephone 201-8992



P.O. Box 30464
MAYVILLE
4058
Telefax 201-7920
e-mail: dmp@iafrica.com

DESIGNED : B.R.

DRAWN : S.P.

DATE : 17/08/2012

SCALE : N.T.S.

CHECKED :

**GEOTECHNICAL INVESTIGATION FOR LANDFILL DEVELOPMENT, KOKSTAD
SITE GEOLOGY & SEEPAGE**

REF. NO.

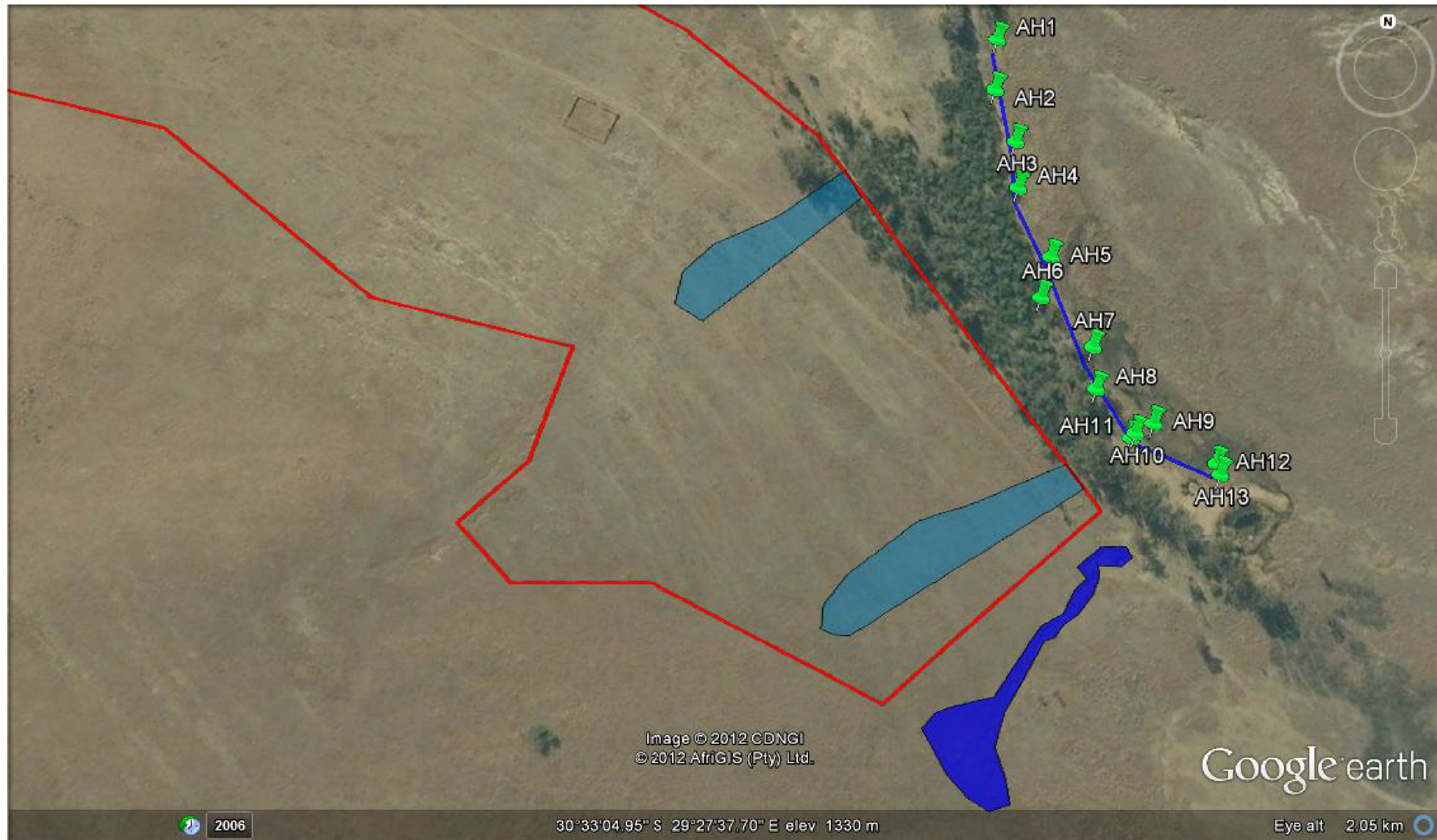
22233

FIG. NO.





2

DRAWING No. 22233/3

FOCUS ON SEEPAGE ZONES



KEY

-  Approx. position of Auger Holes
-  Edge of area affected by permanent or at least seasonal groundwater seepage (as determined by auger hole profiling). At this stage a 32m buffer zone has been applied, however this must be determined by the requirements of the Local Authority and the Appointed Environmental Officer.
-  Approx. area of the site which can be described as an area of permanent seepage. This area is likely to represent a spring, utilising a fractured zone along the shale / dolerite contact zone in this area as a preferential flow path. The landfill cannot be located in this area.
-  Approx. areas of the site likely to be affected by seasonal groundwater seepage.

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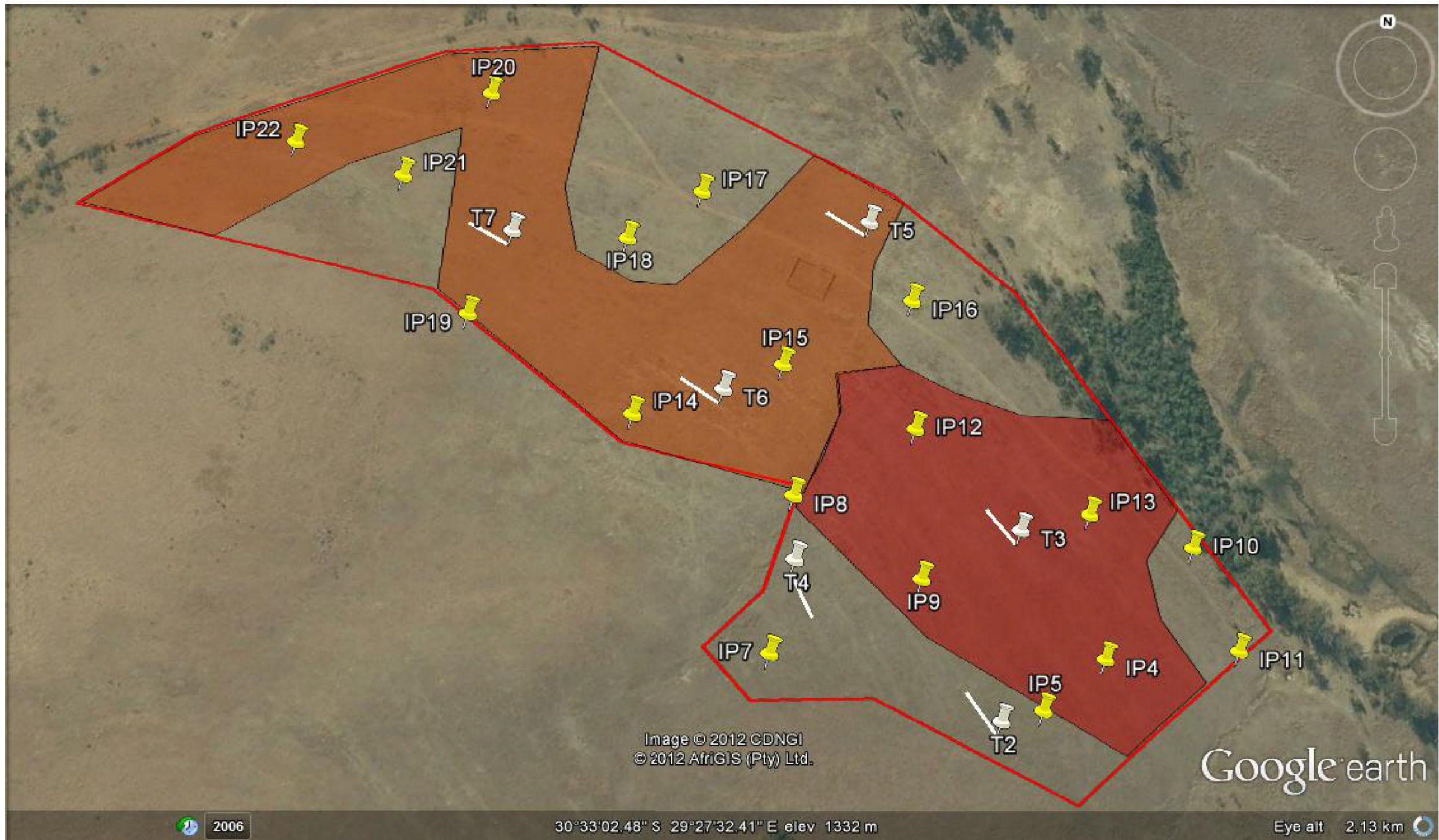
DESIGNED :	B.R.
DRAWN :	S.P.
DATE :	17/08/2012
SCALE :	N.T.S.
CHECKED :	





**GEOTECHNICAL INVESTIGATION FOR LANDFILL DEVELOPMENT, KOKSTAD
FOCUS ON SEEPAGE ZONES**

REF. NO.	22233
FIG. NO.	3

DRAWING No. 22233/4

RIPPABILITY ASSESSMENT



<p>KEY</p> <p> Approximate Positions of Relevant Inspection Pits</p> <p>T4 Approximate Positions of Relevant Seismic Traverses</p>	<p> Approx. area of the site expected to be only marginally rippable using a D7 bulldozer or equivalent, and rippable using a D8 bull dozer or equivalent to a depth of between 5.5 and 6.3m. Below these depths, blasting is expected.</p> <p> Approx. area of the site expected to be only rippable using a D8 bulldozer or equivalent to a depth of approximately 6.6m. Below these depths, blasting is expected.</p>	<p> Approx. area of the site expected to be rippable using a D7 bulldozer or equivalent to a depth of between 5.7 and 8.6m. Below these depths, blasting is expected.</p>
---	--	--

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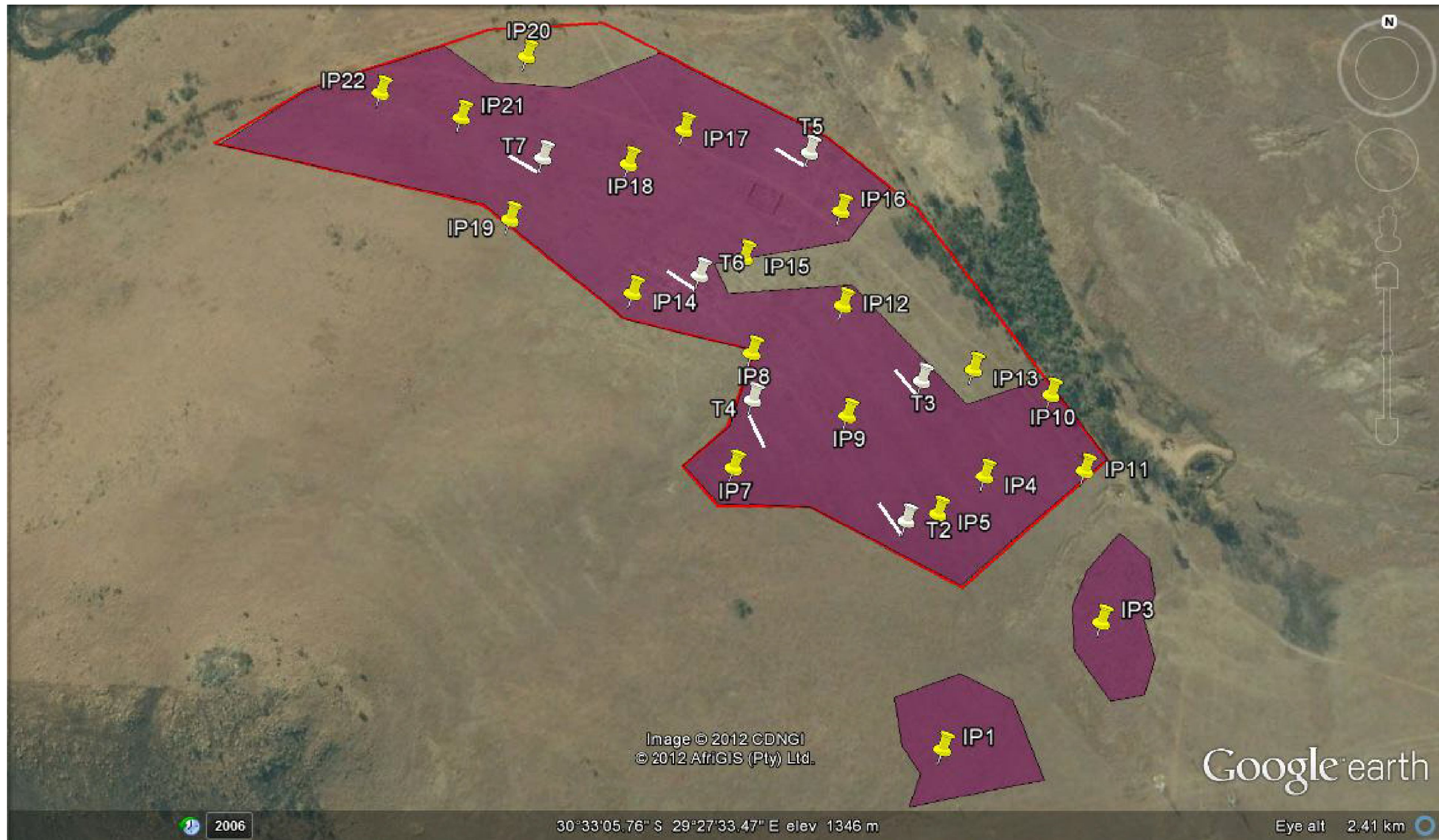
DESIGNED :	B.R.
DRAWN :	S.P.
DATE :	17/08/2012
SCALE :	N.T.S.
CHECKED :	

**GEOTECHNICAL INVESTIGATION FOR LANDFILL DEVELOPMENT, KOKSTAD
RIPPABILITY ASSESSMENT**

REF. NO.	22233
FIG. NO.	4

DRAWING No. 22233/5

**SUITABLE ON-SITE SOILS FOR USE IN THE
LINER SYSTEM**



KEY

- Approximate Positions of Relevant Inspection Pits
- Extent of area that is recommended for use as the proposed landfill based on the results of the geotechnical investigation
- Anticipated Extent of Suitable "Clay Liner Soils"
- Approximate Positions of Relevant Seismic Traverses

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DESIGNED : B.R.
DRAWN : S.P.
DATE : 17/08/2012
SCALE : N.T.S.
CHECKED :

**GEOTECHNICAL INVESTIGATION FOR LANDFILL DEVELOPMENT, KOKSTAD
SUITABLE ON-SITE SOILS FOR USE IN THE LINER SYSTEM**

REF. NO.
22233

FIG. NO.
5

**APPENDIX 4: DRAFT WASTE MANAGEMENT LICENCE APPLICATION FOR
PREFERRED SITE**

DRAFT



agriculture & environmental affairs

Department:
Agriculture
& Environmental Affairs
PROVINCE OF KWAZULU-NATAL

Application for a waste management licence (new facility, expansion or decommissioning)

in terms of section 45 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008), and the Environmental Impact Assessment Regulations, 2010

(For official use only)

File Reference No:	
NEAS Reference No.	
Date Received:	
Office:	

Kindly take note:

1. This form must be used for applications for waste management licences for new facilities, as well as expansion of existing facilities or decommissioning / closure of existing facilities. A separate application form must be submitted for variation, renewal or transfer of waste management licences.
2. Whilst this application is to be submitted in terms of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) ("Waste Act"), the assessment process to be followed is the Environmental Impact Assessment ("EIA") process as specified in the EIA Regulations, 2010 issued in terms of section 24(5) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) ("NEMA"):
 - The Basic Assessment process must be followed for Category A listed waste management activities.
 - The Scoping and EIA process must be followed for Category B listed waste management activities.
3. An Environmental Assessment Practitioner ("EAP") must be appointed for all waste management licence applications.
4. It is the responsibility of the applicant and the EAP to determine who the licensing authority will be in terms of section 43 of the Waste Act. Where the national Department of Environmental Affairs ("DEA") is the licensing authority, the application must be made to DEA on their application form, available from the South African Waste Information Centre website (<http://www.sawic.org.za>).
5. Definitions in this form are as per the NEMA, the EIA Regulations, the Waste Act and the waste management activities list in terms of the Waste Act.
6. This form is current as of 01 April 2012. It is the responsibility of the EAP to ascertain whether subsequent versions of this form have been published or produced by this department.
7. The required information must be typed within the spaces provided in the form. The sizes of the spaces provided are not necessarily indicative of the amount of information to be provided and additional relevant information may be attached to the back of this application form.
8. Where appropriate, indicate applicable boxes in the form with an "x".
9. Incomplete applications may not be registered and may be returned to the applicant or EAP for amendment.

10. The use of “not applicable” in the form must be done with circumspection. If used in respect of information that is required by the licensing authority for assessing the application, it may result in the rejection of the application.
11. Unless protected by law, all information contained in, and attached to this application, will become public information on receipt by the licensing authority. Upon request, any interested and affected party may be provided with the information contained in and attached to this application, during any stage of the application process.
12. No faxed or e-mailed applications will be accepted.
13. This application must be delivered to or posted to the appropriate Regional Office of the KwaZulu-Natal Department of Agriculture and Environmental Affairs at one of the following addresses:

- **FOR APPLICATIONS IN NORTHERN KWAZULU-NATAL** (Amajuba, Umkhanyakude, Uthungulu, Umzinyathi and Zululand District Municipalities)

Environment: North Region
KwaZulu-Natal Department of Agriculture and Environmental Affairs
Private Bag X1048
RICHARDS BAY
3900

4th Floor ABSA Building
Lakeview Terrace
RICHARDS BAY

Contact Person: Ms Zama Mbanjwa
Telephone No.: (035) 780 6765

- **FOR APPLICATIONS IN SOUTHERN KWAZULU-NATAL** (eThekweni Metro, Ilembe, Sisonke, Ugu, uMgungundlovu and Uthukela District Municipalities):

Environment: South Region
KwaZulu-Natal Department of Agriculture and Environmental Affairs
Private Bag X6005
HILTON
3245

A Block
4 Pin Oak Avenue
HILTON

Contact Person: Ms Mavis Padayachee
Telephone No.: (033) 343 8495

1. GENERAL INFORMATION

1.1 Contact details

Name of applicant:	Greater Kokstad Municipality		
Trading name (if any):			
Contact person:	Mr F.T. Nxumalo		
Postal address:	P.O. Box 8		
	Kokstad	Postal code:	4700
Telephone:	039 797 6601	Cell:	
Fax:	039 727 3346	E-mail:	

Environmental Assessment Practitioner (EAP):	Icando		
Contact person:	June Lombard		
Postal address:	P.O. Box 115		
	Link Hills	Postal code:	3652
Telephone:	031 7633760	Cell:	083 2554638
Fax:	031 7633664	E-mail:	june@icando.co.za
EAP Qualifications	BSc Hon, MSc		
EAP Registration/Associations	SFIWMSA, CEAPSA, Pr. Sci. Nat		

Name of landowner or person in control of the land:	Greater Kokstad Municipality		
Contact person:	Mr F.T. Nxumalo		
Postal address:	P.O. Box 8		
	Kokstad	Postal code:	4700
Telephone:	039 797 6601	Cell:	
Fax:	039 727 3346	E-mail:	

Please note: Written notice of the proposed activity must be given to the owner or person in control of the land on which the activity is to be undertaken. Proof of serving such a notice must be attached to this application form.

1.2 Waste management activity details

Project title:	Identification of Waste Disposal Facility																				
Property location: (Farm/Erf name & number including portion)	Kransfontein 258																				
Local municipality:	Greater Kokstad Local Municipality																				
District municipality:	Sisonke District Municipality																				
Property size: (m ²)	84304.7616m ²																				
Waste management activity site size: (m ²)	To be determined																				
SG21 Digit code	N	0	E	S	0	0	0	0	0	0	0	0	0	2	5	8	0	0	0	0	0

Coordinates:	Please note that coordinates must be provided for all corners of the waste management activity site. The coordinates must be in degrees, minutes, seconds.					
		Latitude (S)		Longitude (E)		
	Corner 1	30° 33' 01.40"		29° 27' 35.44"		
	Corner 2	30° 33' 13.05"		29° 27' 35.44"		
	Corner 3	30° 33' 16.39"		29° 27' 45.70"		
	Corner 4	30° 33' 06.07"		29° 27' 22.53"		
	Corner 5					
	Corner 6					

Physical address:	No physical address. East of Kokstad Town		
Closest City/Town:	Kokstad	Distance	±3 km
Current land use of property:	Agricultural grazing land		
Zoning of Property:	Private Open Space		

Is a rezoning application required?	YES	NO
Is a consent use application required?	YES	NO
Is building plan approval required?	YES	NO

1.3 Type of application

Is this application for a waste management licence for the establishment of a new facility or for the expansion of an existing facility or for the decommissioning / closure of an existing facility?	NEW	EXPANSION	CLOSURE
---	-----	-----------	---------

Is this an application that is subject to a Basic Assessment process?	YES	NO
If yes, please indicate when the Basic Assessment Report will be submitted.	N/A	
Is this an application that is subject to a Scoping and EIA process?	YES	NO
If yes, please indicate when the Scoping Report will be submitted.	October 2012	
Does this activity, or development associated with this activity, require environmental authorization?	YES	NO
If yes, please complete section 2.2 below.		
Has environmental authorization been granted for this activity, or development associated with this activity?	YES	NO
If yes, please provide the relevant EIA reference number.		

1.4 Information to be submitted with this application form

Locality map:	<p>A locality map must be attached to the back of this form, as <u>Appendix A</u>. The scale of the locality map must be at least 1:50 000. The scale must be indicated on the map. The map must indicate the following:</p> <ul style="list-style-type: none"> • An accurate indication of the project site and all site alternatives. • Road names or numbers of all the major roads as well as the roads that provide access to the site(s) • A north arrow.
Site Plan:	<p>Detailed site plan(s) must be prepared for each alternative site or alternative activity. It must be attached as <u>Appendix B</u> to this form. The site plan must contain or conform to the following:</p> <ul style="list-style-type: none"> • The detailed site plan must be at a scale of 1:500 or larger. The scale must be indicated on the plan. • A reference number is be assigned to the plan and the plan must be dated. • The property boundaries and numbers of all the properties within 50m of the site must be indicated on the site plan. • The current land use (not zoning) as well as the land use zoning of each of the adjoining properties must be indicated on the site plan. • The position of each element of the application as well as any other structures on the site must be indicated on the site plan. • Services, including electricity supply cables (indicate above or underground), water supply pipelines, boreholes, sewage pipelines, storm water infrastructure and access roads that will form part of the development must be indicated on the site plan. • Servitudes indicating the purpose of the servitude must be indicated on the site plan. • Sensitive environmental elements within 100m of the site must be included on the site plan, including (but not limited to): <ul style="list-style-type: none"> o Rivers. o Flood lines (i.e. 1:10, 1:50, year and 32 meter set back line from the banks of a river/stream). o Ridges. o Cultural and historical features. o Areas with indigenous vegetation (even if it is degraded or infested with alien species). • Whenever the slope of the site exceeds 1:10, then a contour map of the site must be submitted. <p><u>Please Note:</u> If the above mentioned site plan(s) is not attached to this application, such plan(s) must be submitted as part of the Basic Assessment Report or Scoping Report.</p>
Project plan (e.g. Gantt chart): (for applications that will follow Scoping /EIA process only)	<p>A project planning schedule must be submitted as <u>Appendix C</u> to this form, and must include <i>inter alia</i> details of target dates for:</p> <ul style="list-style-type: none"> • public participation (dates for advertisements, workshops and other meetings, obtaining comment from organs of state including state departments); • the commencement of parallel application processes required in terms of other statutes and where relevant, the alignment of these application processes with the EIA process; • the submission of key documents (Scoping Reports and Plan of Study, and EIA reports); • planned commencement of the activity. <p><u>Please Note:</u> All of the above dates must consider the statutory timeframes for authority responses as stipulated in the EIA regulations. Please note further that possible appeals may impact project timeframes.</p>
Applications for expansion or for decommissioning / closure of an existing facility	
Reference number of the existing Waste Management Licence:	
Date of issue of the Waste Management Licence:	
Date of expiry of the Waste Management Licence:	
Activity/ies for which the Waste Management Licence was granted:	
Please Note: A certified copy of the Waste Management Licence must be attached to this application.	

2. APPLICABLE LISTED ACTIVITIES

2.1 Listed waste management activities applied for

All potential waste management activities associated with the proposed project that are listed in Government Notice No. 718 of 03 July 2009 (in terms of the Waste Act) as Category A and those listed as Category B must be indicated below.

Government Notice No. 718 - Category A activity no(s):	Describe the relevant waste management activity as per the project description:
N/A	N/A
Government Notice No. 718 - Category B activity no(s):	Describe the relevant waste management activity as per the project description:
10	The disposal of general waste to land covering an area in excess of 200m ² .
11	The construction of facilities for activities listed in Category B of this Schedule (not in isolation to associated activity).

2.2 EIA listed activities applicable

If applicable, all potential listed activities for Basic Assessment and Scoping / EIA (GN No. R. 544, 546 and GN No. R. 545 activities in terms of the EIA Regulations) associated with the proposed project must be indicated below.

N/A

Government Notice R544 Activity No(s):	Describe the relevant activity as per the project description:
Government Notice R546 Activity No(s):	Describe the relevant activity as per the project description:
Government Notice R545 Activity No(s):	Describe the relevant activity as per the project description:

Please note the following regarding subsection 2.1 and 2.2 above:

- Only those activities for which the applicant applies will be considered for licensing. The onus is on the applicant to ensure that all the applicable listed activities are included in the application. Failure to do so may invalidate the application.
- If any of the EIA listed activities in 2.2 above are triggered then a separate application form for environmental authorisation must be submitted, but a single EIA process for the application for a waste management licence and an environmental authorisation must be undertaken.
- A Basic Assessment process must be followed for the expansion or the decommissioning / closure of all listed waste management activities regardless of which Category (ie. A or B) activities are triggered unless the closure of a facility forms part of a project that triggers a Category B listed waste management activity or an activity listed in Government Notice No. R 545, in which case a Scoping / EIA process must be followed. If permission is sought for an expansion or decommissioning / closure application to be subject to a Scoping / EIA process, then section 3 of this form must be completed.

3. APPLICATION FOR PERMISSION TO SUBJECT THE APPLICATION TO SCOPING / EIA INSTEAD OF BASIC ASSESSMENT

3.1 If only Category A listed waste management activities are involved (which must be subjected to Basic Assessment), while listed

activities in terms of GN No. R. 545 are also involved (which must be subjected to Scoping and EIA), permission to subject the application for a waste management licence to Scoping and EIA can be applied for, in order for a single Scoping and EIA process to be followed for both the application for environmental authorisation and the application for a waste management licence.		
Is this scenario applicable to your proposed development? If yes, then please consider completing section 3.2 below.	YES	NO

3.2 I hereby apply for permission to subject the application to a Scoping / EIA process instead of a Basic Assessment process as per regulation 20(3) of the EIA Regulations.	YES	NO
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4. DESCRIPTION OF THE ACTIVITY

Indicate the type of activity:	Storage of waste	Reuse, recycling and recovery	Treatment of waste	Disposal of waste
Please provide a description of the project and associated infrastructure:				
Design and construction of new landfill site in Greater Kokstad Municipality. Site will likely be a G:S:B+ site. According to <i>Minimum Requirements for Waste Disposal by Landfill (Department of Water Affairs & Forestry, Second Edition, 1998. Waste Management Series)</i> , site classification is as follows. G: Waste accepted will be limited to General refuse M: Site will be Medium in size. Expected rate of deposition will be greater than 150 tonnes but less than 500 tonnes per day. B+: Water Balance of site would result in significant generation of leachate.				

5. WASTE QUANTITIES (not applicable for decommissioning / closure applications)

Indicate the applicable waste types and quantities expected to be handled:

Type of waste (e.g. garden waste, building rubble, industrial effluent)	Main source	Quantity		On-site handling process	Intended purpose and location if removed off-site
		Quantity /day	Quantity /month		
General Waste					
General, including domestic, builders' rubble and garden refuse	Main towns in GK Municipality, e.g. Kokstad	± 30 tonnes/day	± 900 tonnes/month	Deposit, cover and compact	N/A
Hazardous Waste					
N/A No hazardous waste will be handled on site					

6. STATE DEPARTMENTS IDENTIFIED IN TERMS OF NEMA S 24 O

Please indicate to which State departments reports related to your application will be forwarded to provide comments in terms of section 24 O (2) of NEMA:

Please note: details of the relevant contact person and the address of the State department must be provided. You may delete those which are not applicable to your application and/or add the names and other details for State departments not listed.

Name of Department	Contact person	Address
Department of Water Affairs	Bongiwe Sambo	sambob@dwa.gov.za P.O. Box 1018, Durban, 4000
Ezemvelo KZN Wildlife	Andy Blackmore	andyb@kznwildlife.com P.O. Box 13069, Cascades, 3202
Amafa	Sello Mokhanya	sellom@amafapmb.co.za P.O. Box 2685, Pietermaritzburg
Department of Agriculture, Forestry and Fisheries	Mr J. Tladi Director: Land Use and Soil Management (Acting)	DLUSM@daff.gov.za Agriculture Place 20 Beatrix Street

Department of Agriculture and Environmental Affairs, KwaZulu-Natal	Waste Management Licence Application Form	Page 6 of 9
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		Arcadia Pretoria 0002
Department of Cooperative Governance and Traditional Affairs	Ms D N Qhobosheane	nonhlanhla.qhobosheane@kzncogta.gov.za Private Bag X 9078, Pietermaritzburg, 3200
Department of Transport	Mr Chris Hlabisa	Chris.Hlabisa@Kzntransport.gov.za Private Bag X9043 / 172 Burger Street Pietermaritzburg 3200

Please note that this Department may amend the abovementioned list. If the list is amended you will be notified accordingly. Reports must be submitted to all State departments listed above, including those identified by this Department. This Department will inform the abovementioned State departments that their comments must, in terms of section 24 O (3) of NEMA be provided within 40 days of such a request (or in the case of the Department of Water Affairs regarding a record of decision, within 60 days).

7. ECONOMIC AND SOCIAL INFORMATION

7.1 Capital value

Please provide an estimate of the capital value of the project on completion:	R To be determined
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7.2 Job creation

Please provide details of the number of employees expected to benefit from the operational phase of the project:

Type of employment	Number of employees
Permanent employees	To be determined – will be provided in Scoping Report
Contract workers	To be determined – will be provided in Scoping Report

8. COMPETENCE TO UNDERTAKE WASTE MANAGEMENT ACTIVITY

In terms of sections 48(f) and 59 of the Waste Act the licensing authority must take into account whether the applicant is a “fit and proper” person. To assess the applicant’s competence to undertake the activity and operate the facility, please disclose the following:

Legal compliance

Yes / No	Details
No	N/A
No	N/A
No	N/A

NB: Details required above include any information that the applicant wants the licensing authority to take into consideration in determining whether they are a “fit and proper person” and this includes reasons why the offence happened and measures in place to prevent recurrence

Technical competence

What technical skills are required to undertake the activity and operate the facility?

How will the applicant ensure and maintain technical competency in the operation of the facility?

Person/s in charge of overseeing the closure of the landfill site must be a registered Geotechnical or Civil Engineer with experience in the waste management field.
Staff must undergo waste management training as part of municipal skills development programme through an accredited training provider.

Details of applicant’s experience and qualifications along with that of relevant employees must be summarised as shown in the table below: **Details of employees will be included when EIA report is submitted as this is likely to change.**

Name	Position	Duties and responsibilities	Qualifications and experience

9. DECLARATIONS

9.1 Declaration by the applicant

I, _____, declare that:

- I am, or represent, the applicant in this application;
- I have appointed an environmental assessment practitioner to act as the independent environmental assessment practitioner for this application;
- I will provide the environmental assessment practitioner and the licensing authority with access to all information at my disposal that is relevant to this application;
- I will be responsible for the costs incurred in complying with the Waste Act and the EIA Regulations, including but not limited to –
 - costs incurred in connection with the appointment of the environmental assessment practitioner or any person contracted by the environmental assessment practitioner;
 - costs incurred in respect of the undertaking of any process required in terms of the Waste Act or the EIA Regulations;
 - costs in respect of any fee prescribed by the Minister or MEC in respect of the Waste Act or the EIA Regulations;
 - costs in respect of specialist reviews, if the licensing authority decides to recover costs; and
 - the provision of security to ensure compliance with conditions attached to a waste management licence, should it be required by the licensing authority;
- I will ensure that the environmental assessment practitioner is competent to comply with the requirements of the Waste Act and the EIA Regulations, and will take reasonable steps to verify whether the environmental assessment practitioner complies with the Waste Act and the EIA Regulations;
- I will inform all registered interested and affected parties of any suspension of the application, as well as of any decisions taken by the licensing authority in this regard;
- I am responsible for complying with the conditions of any waste management licence issued by the licensing authority;
- I hereby indemnify the Government of the Republic of South Africa, the licensing authority and all its officers, agents and employees, from any liability arising out of the content of any report, any procedure or any action for which the applicant or environmental assessment practitioner is responsible in terms of the Waste Act and the EIA Regulations;
- I will not hold the licensing authority responsible for any costs that may be incurred by the applicant in proceeding with an activity prior to obtaining a waste management licence or prior to an appeal being decided in terms of the Waste Act and the EIA Regulations;
- I will perform all other obligations as expected from an applicant in terms of the Waste Act and the EIA Regulations;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 71 of the EIA Regulations and is punishable in terms of section 24F of NEMA.

Signature of the applicant / Signature on behalf of the applicant¹

Name of applicant

Date

¹ If the applicant is a juristic person, a signature on behalf of the applicant is required as well as proof of such authority

9.2 Declaration by the environmental assessment practitioner

I, _____, declare that:

- I act as the independent environmental assessment practitioner in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting environmental impact assessments, including knowledge of NEMA and the Waste Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with NEMA and the Waste Act, regulations and all other applicable legislation;
- I will take the provisions of regulation 7(2) of the EIA Regulations into account when preparing any report relating to this application;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the licensing authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to this application by the licensing authority, and – the objectivity of any report, plan or document to be prepared by me for submission to the licensing authority;
- I will ensure that information containing all relevant facts in respect of the application is distributed or made available to interested and affected parties and the public and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application;
- I will ensure that the comments of all interested and affected parties are considered and recorded in reports that are submitted to the licensing authority in respect of the application, provided that comments that are made by interested and affected parties in respect of a final report that will be submitted to the licensing authority may be attached to the report without further amendment to the report;
- I will keep a register of all interested and affected parties that participate in the public participation process;
- I will provide the licensing authority with access to all information at my disposal regarding this application, whether such information is favourable to the applicant or not;
- all the particulars furnished by me in this form are true and correct;
- I will perform all other obligations as expected from an Environmental Assessment Practitioner in terms of the EIA Regulations; and
- I realise that a false declaration is an offence in terms of regulation 71 of the EIA Regulations and is punishable in terms of section 24F of NEMA.

Disclosure of vested interest (delete whichever is not applicable)

- I do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Waste Act and the EIA Regulations;
- I have a vested interest in the proposed activity proceeding, such vested interest being:

Signature of the environmental assessment practitioner

Name of environmental assessment practitioner

Date