REPORT ON
PRELIMINARY GEOTECHNICAL INVESTIGATIONS
FOR THE PROPOSED NEW
ALLENDALE PRISON PAARL

JULY 2005

K&T PROJECT REFERENCE: 10912GG
# REPORT ON PRELIMINARY GEOTECHNICAL INVESTIGATIONS FOR
# THE PROPOSED NEW ALLENDALE PRISON PAARL

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1. TERMS OF REFERENCE

In terms of written instructions, Kantey & Templer was instructed by Mr Fatgie Moos of PD Naidoo & Associates Consulting Engineers to undertake preliminary geotechnical investigations at the above site.

In particular, we were requested to investigate and advise on the following:

- Site Geology
- Site Geohydrology
- Foundation Conditions
- Excavation Conditions
- Materials Utilisation Potential

2. INFORMATION AVAILABLE

The following information was provided:

- an untitled 1:2000 scale generic site layout plan indicating the extent of the proposed development, existing and proposed roads and services, and building locations;
- it was stated that the geotechnical information is required for finalisation of the Paarl prison extension feasibility studies;
- the existing prison is situated on the corner of Meaker and Van Der Stel Streets in Paarl.

3. SCOPE OF INVESTIGATION

3.1 Field Investigations

Following a walkover inspection of the site, nine machine dug trial holes were put down to depths of up to 3,00m below existing ground level at selected positions over the proposed development area.

Subsoil conditions were assessed by detailed visual examination of the in-situ materials exposed in the trial holes. A limited number of disturbed soil samples were extracted from selected trial holes for further laboratory analysis.

In addition, Dynamic Cone Penetrometer (DCP aka DPL) tests were carried out inside some of the trial holes. In this test a cone tipped steel rod is driven into the ground by means of a
standardised falling weight, the penetration per blow providing an useful indication of in-situ density.

The trial hole and DCP test positions are indicated on the attached layout drawing (number 10912GG) while the trial hole profiles and DCP results are given on sheets 2 – 18, also attached.

3.2 Laboratory Investigation

The soil samples were subjected to CBR and indicator testing to establish the soil constants and utilisation potentials. The tests have not been completed yet and the results will be submitted as an addendum to this report upon receipt.

4. ANALYSIS OF RESULTS

4.1 Site Geology and Soils Profile

Based on published geological data and previous investigations undertaken by Kantey & Templer in the Paarl area, it is known that the site is underlain at depth by deeply weathered meta-sedimentary strata of the Moorreesburg Formation, Malmesbury Group, with a variable cover of naturally transported (colluvial) and/or residual soils.

The above was confirmed by the trial holes which revealed fairly uniform subsoil conditions across the area investigated, the general profile comprising the following:

Transported material : ranging from 0,5m to 0,9m thick and comprising gravel, cobbles and boulder fragments matrix supported in clayey to sandy grit; consistency tends to be low ranging from loose to medium dense, the loose conditions largely due to past agricultural activities (ploughing).

Residual soils : underlying the transported material and derived from the in-situ decomposition and weathering of the underlying Malmesbury Group phyllites. The upper approximately 0,5m (ave.) of this material occurs as reworked residual clay / silt of soft to firm consistency; in turn underlain by more competent residual clayey silt of firm to stiff consistency; the firm to stiff material was intersected at the following depths:

Area of TH1 - 1,1m below existing ground level
Area of TH2 - 1,1m below existing ground level
Area of TH3 - 1,5m below existing ground level
4.2 Site Geohydrology

Groundwater was not intersected in any of the trial holes and soil moisture conditions ranged from slightly moist to very moist only.

Although our investigation was undertaken during the winter months, the current groundwater conditions are not considered representative of conditions throughout the year. A significant increase in soil moisture can be anticipated towards the end of the rainy season and after periods of heavy rainfall when perched groundwater conditions are likely to develop over most of the site.

Previous investigations undertaken in Paarl during the winter months have, almost without exception, indicated the presence of strong groundwater flows at depths of as little as 0.5m below ground level.

Should construction therefore be undertaken during the latter part of the rainy season, shallow groundwater flows could be intersected and should be borne in mind when planning excavation of foundation and services trenches.

4.3 Founding Conditions

Given the relatively high consistency of the residual soils as exposed in the trial holes, conditions for the use of conventional spread footings are considered to be favourable.

Due to the somewhat variable nature and unacceptably loose consistency of the transported soils, shallow founding would not be possible. Foundations should therefore at all times be taken into the reworked and / or residual soils at a depth of not less than 0.60m (area of TH's 6, 7 and 8) to 0.8m (area of TH9) below the existing ground level.

The bearing capacity of the reworked residual soils is estimated to be of the order of 80 kPa. However, as indicated in paragraph 4.1 above significantly more competent firm to stiff material occurs at depth. These soils will safely support bearing pressures of up to 150 kPa.
For final design (and dimensioning) of the foundations, founding levels will have to be fixed according to building platform levels, structural loadings and anticipated bearing pressures.

Insofar as surface beds are concerned it is our opinion that satisfactory subgrade support can be achieved by heavy vibratory surface compaction with no need for large scale removal and replacement of material.

Although the residual soils typically classify as clay / silt and clayey silt of low expansiveness, it should be noted that these soils would be susceptible to some volumetric change under adversely fluctuating soil moisture conditions. Care should therefore be taken to ensure that foundation excavations / trenches are not exposed to the elements for extended periods of time and that concrete be cast as soon as possible after trenching to prevent adverse softening or drying of the moisture sensitive soils.

As a precautionary measure and to ensure that footings are at all times taken into/ onto competent naturally deposited soils, foundation excavations should be inspected and approved by a suitably qualified person prior to casting of concrete.

4.4 Excavation Conditions

In view of the relatively low consistency of the transported material and generally "unconsolidated" nature of the residual soils, excavation conditions are considered to be relatively favourable down to 2.0 to 3.0m depth. Conventional machine excavation of deep foundation and services trenches should therefore pose no untoward problems over the bulk of the site.

4.5 Materials Utilisation Potential

Although the laboratory test results are not available yet, based on our observations on site and on the basis of available test data and investigations undertaken earlier in the immediate vicinity of the site, the following assessments can be made regarding the soils likely to be encountered during construction, viz:

- The transported material will be suitable for use as subgrade and even structural fill once selected and compacted to 95 – 98% of the modified AASHTO density;

- The residual soils are typically of relatively high plasticity and fine clay content and are regarded as highly moisture sensitive. These soils would accordingly require very accurate control of the soil moisture during compaction in order to achieve any useful density. Due to the cohesive nature of this material such control would be extremely
difficult, if not impossible. Where excavated, these soils should therefore preferably be
spoiled off site or used for landscaping only.

4.6 Subgrade Conditions

Subgrade conditions for roadways at ground level (existing) are generally regarded as
favourable. Satisfactory subgrade support will be provided once the sandy to gravely
transported soils have been reworked and compacted to 95 – 98% of the Modified AASHTO
density to a depth of at least 300mm below the top of selected subgrade.

Where terraces / building platforms are taken into the more clayey subsoils it should be noted
that, whilst these soils have a high in-situ CBR strength which would provide entirely
satisfactory support to overlying pavement layerworks and surface beds, care should be
taken not to unduly disturb these soils during earthworks operations. Once disturbed the in-
situ shear strength would be destroyed and unacceptably low CBR strengths would result,
particularly during wet weather conditions. Earthworks and, in particular the depth and timing
of excavation, should therefore be planned accordingly.

5. CONCLUSIONS

• The site is underlain by completely weathered residual clay / silts and clayey silt derived
  from the underlying Malmesbury Group strata with a 0,5 – 0,9m cover of transported
  materials.

• Groundwater was not intersected during our field investigations but shallow perched
  groundwater conditions are likely to develop during the latter part of the rainy season.

• Founding conditions for conventional spread footings founded in the residual soils are
  considered to be favourable. The bearing capacity of the founding soils is estimated to
  be of the order of 80 kPa (shallow founding) to 150 kPa (deeper founding) and the
  foundations should be dimensioned accordingly.

• Excavation down to depths of ±3,0m would largely classify as “soft” in terms of SABS
  1200.

• Whilst subgrade conditions for roads are considered to be favourable in-situ density
  should be improved by reworking and compaction.

KANTEY & TEMPLER
F DU PLESSIS

NEW ALLENDALE PRISON PAARL – GEOTECHNICAL INVESTIGATION

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KANTEY & TEMPLER
JULY 2005
Very moist light brown loose to medium dense ferruginous PEBBLES and quartz GRAVEL with quartz boulder fragments (up to 200mm dia.) in a clayey, silty and sandy grit matrix; TRANSPORTED (reworked through ploughing).

Very moist to moist dark yellow occasionally mottled red soft shattered clayey SILT; REWORKED RESIDUAL.

Moist dark yellow brown to light greyish white mottled red stiff with depth laminated (shattered) clayey SILT with remnant bedding structure; RESIDUAL MALMESBURY.

NOTES

1) No groundwater intersected.

2) Soil sample taken at 0.0---0.55m.
Very moist red brown loose ferruginous PEBBLES and occasional QUARTZ and sandstone COBBLES in a micaceous sandy, clayey and silty sand/ grit matrix; TRANSPORTED (reworked through ploughing).

Very moist to moist red and occasionally yellow soft fissured to shattered CLAY/SILT with occasional quartz gravel and fine roots; REWORKED RESIDUAL.

Moist dark yellowish brown and light greyish white mottled red firm becoming stiff with depth laminated (shattered) clayey SILT with occasional vein quartz and remnant bedding structure; RESIDUAL MALMESBURY.

NOTES
1) No groundwater intersected.
2) Soil sample taken at 0.55–1.10m.
Very moist brown loose silty to sandy ferruginous pebble and quartz GRAVEL with grit and abundant grassroots; ESTABLISHED LAWN.

Very moist to saturated brown loose slightly clayey, silty and sandy ferruginous pebble and quartz GRAVEL with grit; TRANSPORTED (reworked through ploughing).

Saturated medium dense QUARTZ and ferruginous pebble GRAVEL with grit and sandy silt; TRANSPORTED.

Very moist to saturated red mottled yellowish olive soft to firm shattered slightly sandy CLAY/SILT with occasional ferruginous pebble and quartz gravel; REWORKED RESIDUAL.

Very moist light grey mottled yellow and occasionally stained black firm shattered micaceous clayey SILT with scattered vein quartz; RESIDUAL MALMESBURY.

NOTES

1) Moderate water seepage from 0.50m.

2) Soil sample taken from 0.60--1.35m.
Very moist brown loose silty to sandy ferruginous pebble and quartz GRAVEL with grit and abundant grassroots; ESTABLISHED LAWN.

Very moist to saturated brown loose slightly clayey, silty and sandy ferruginous pebble and quartz GRAVEL with grit; TRANSPORTED (reworked through ploughing).

Saturated light grey and reddish brown loose to medium dense silty to clayey ferruginous pebble and quartz GRAVEL with grit; TRANSPORTED.

Very moist to saturated yellowish olive speckled red soft to firm shattered slightly sandy CLAY/SILT with occasional ferruginous and quartz gravel; REWORKED RESIDUAL.

Moist yellowish olive mottled light greyish white soft to firm fissured to shattered, silty CLAY with vein quartz; RESIDUAL MALMESBURY.

Moist light greyish white mottled yellowish olive and purplish red occasionally stained black soft to firm and stiff shattered very slightly sandy to clayey SILT with remnant bedding structure; RESIDUAL MALMESBURY.

NOTES

1) Water seepage at 0.90m.

2) Soil sample taken from 1.20--1.80m.
Very moist brown loose silty to sandy ferruginous pebble and quartz GRAVEL with grit and abundant grassroots; ESTABLISHED LAWN.

Very moist brown loose slightly clayey, silty and sandy ferruginous pebble and quartz GRAVEL with grit and ferruginous sandstone cobbles; TRANSPORTED (reworked through ploughing).

Very moist yellow mottled light greyish white and red soft to firm fissured to shattered CLAY/ SILT with occasional quartz pebbles; REWORKED RESIDUAL.

Moist light olive yellow mottled light greyish white and reddish brown firm to stiff micaceous clayey SILT with remnant bedding structure tending completely weathered very soft rock shale; RESIDUAL MALMESBURY.

NOTES

1) No groundwater intersected.

2) Soil sample taken from 0.05--0.70m.
Moist to very moist with depth light reddish brown medium dense to dense ferruginous rounded to subrounded sandstone GRAVEL with scattered quartz gravel in a slightly sandy grit matrix; TRANSPORTED (reworked through ploughing).

Very moist orange brown mottled red soft to firm shattered CLAY/SILT with scattered ferruginous pebbles; REWORKED RESIDUAL.

Moist yellow to reddish brown and streaked light grey, white and red soft to firm shattered, micaceous clayey SILT with remnant bedding structure and occasional vein quartz; RESIDUAL MALMESBURY.

NOTES
1) No groundwater intersected.
Very moist red brown loose ferruginous QUARTZ, sandstone GRAVEL and COBBLES in a micaceous clayey and silty sand/grit matrix; TRANSPORTED (reworked through ploughing).

Very moist to moist olive yellow speckled purplish red soft to firm shattered CLAY/SILT with scattered ferruginous pebble grit and occasional quartz pebbles; REWORKED RESIDUAL.

Moist yellow to reddish brown streaked light grey, white and red firm shattered micaceous clayey SILT with remnant bedding structure and occasional vein quartz; RESIDUAL MALMESBURY.

NOTES
1) No groundwater intersected.
Very moist light brown silty SAND with occasional gravel and abundant roots; ESTABLISHED LAWN.

Very moist light brown medium dense to dense micaceous silty SAND with ferruginous pebbles and occasional grit; TRANSPORTED (reworked through ploughing).

Very moist light brown and reddish purple dense ferruginous sandstone and quartz GRAVEL with pebbles and grit in a micaceous sandy silt matrix; TRANSPORTED.

Very moist yellow speckled red soft to firm shattered and fissured CLAY/SILT with soft and hard rock shale fragments; REWORKED RESIDUAL.

Moist light greyish olive stained dark brown intensely laminated closely jointed highly weathered very soft to soft rock PHYLLITIC SHALE with micaceous clayey silt in joints and bedding planes; MALMESBURY GROUP.

NOTES

1) Water at bottom of hole.
Very moist yellowish brown very soft to soft micaceous CLAY/SILT with grit and quartzitic sandstone gravel; TRANSPORTED.

Very moist yellowish brown to purplish light grey occasionally stained black stiff micaceous CLAY/SILT with remnant bedding structure; RESIDUAL MALMESBURY.

NOTES

1) No groundwater intersected.
Test carried out inside trial hole 1
Test carried out inside trial hole 2
Test carried out inside trial hole 3
Test carried out inside trial hole 4
Test carried out inside trial hole 5
Test carried out inside trial hole 6
Test carried out inside trial hole 7
Test carried out inside trial hole 9