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Verw: 1718DOV-S2(Hut)

Datum: 05/06/2017

Messrs Sangasdrift Trust
P.O. Box 15
Bonnievale
6730

Sir,

**PRELIMINARY DESIGN REPORT FOR THE PROPOSED NEW HUT-DAM ON THE FARM VAN DER WATTS KRAAL 394, PORTION 5, DISTRICT SWELLENDAM.**

Your instruction regarding the investigation and preliminary design of the construction of the above mentioned dam, refers.

## 1. BACKGROUND

The proposed or suggested dam project is located in the Swellendam district, approximately 14km in an easterly direction from the town Riviersonderend, refer ***Appendix 1***.

The preliminary design of a dam normally follows after the scoping or feasibility stage during which the position, basic layout as well as the intended storage volume range along with the initial costing had been determined. The preliminary design will then serve as the basis for the final dam design and contract specifications in line with dam safety regulations in terms of sections 117 to 123, chapter 12 of the National Water Act, 1998 (Act 36 of 1998).

In addition to the aforementioned, before a *"License to Construct"* can be issued, an environmental impact assessment, namely an *"Environmental Authorisation (EA)"* (previously referred to as the ROD) as well as a *"Water Use License"* have to be obtained. In order to address these two aspects, a preliminary dam design is required containing specific technical information, which also then serve as a supplement to the specific applications.

The main purpose of this dam is to expand the total irrigation while optimising gravitational benefits and minimizing losses.

## 2. ASSIGNMENT

***Sarel Bester Engineers*** has been appointed as the project engineers and coordinator overseeing the various actions and duties. Instruction and appointment was received to continue with the preliminary dam design stage for licensing purposes.

The original applications for the Water Use Licensing (WULA) was submitted in 2003 by the late Mr Adolf Jonker himself, as well as the Environmental Impact Assessment (EIA) according to NEMA guidelines during 2005 which have since been halted and discarded. Currently both the WULA and EIA are in the process of being revised and resubmitted along with this Preliminary Design.

The preliminary design normally follows after and is based on the outcome from the feasibility study, which in this case was not done as such, however we do acknowledge the volumetric calculations and figures of the original WULA done by ***Sinclair & Associates*** as the basis for this study. In addition to this, the preliminary design calculations would normally be based on actual contours generated from an official survey compared to those obtained from GIS data used in the desk-top study. This assignment therefore takes it further by focussing on certain design as well as certain legal implications including a first round of concept design drawings.

Again, because of the lack of a formal site survey, the preliminary design takes it forward by conducting a full desk-top study involving and including 3D-modelling by making use of available topographical and contour information obtained from GIS data sources. Amongst other dam characteristics, the most effective size and positioning of the dam wall were determined, and in doing so some design calculations and a first round of drawings were prepared.

The intention of the Preliminary Dam Design Report is and therefore will be used to:

- inform you as client of the concerned investigation regarding storage options along with cost estimations,
- serve as motivational technical appendix to DWA regarding the license application,
- serve as information to DEADP regard to the environmental impact assessment, and
- serve as a basis to Dam Safety Office regarding proper classification and APP matters.

Apart from a small contribution in the form of an ELU, the application for the dam is mainly based on two new water takings from different sources abstracted at two separate locations. Basic hydrological runoff calculations had been done within the appropriate catchment areas as part of the license application to ensure that there is enough available water.

The relevant application was intercepted and also motivated in terms of section 27 of the Water Act.

## 3. DAM SAFETY & CLASSIFICATION

The project entails the new proposed Hut-Dam (upper) and one of the first steps is to have the dam classified in terms of dam safety regulations. The application will be submitted to the Dam Safety Office along with this preliminary design, refer attached ***Appendix 2***. An application for the approval as the APP for the design and construction supervision of the dam has also still to be submitted to DWAF for approval and will follow when the WUL has been authorised.

## 4. WATER AVAILABILITY

Since both properties are being farmed as a farming unit, both have been researched and evaluated. The deeds information regarding the relevant properties, as well as the verified water use information documents have been requested and verified with BGCMA where applicable.

A) Existing Water Use:

**Farm Van Der Watts Kraal 394, Portion 3:**

- Zonderendrivier WUA (Summer) ~ 348 502m$^3$ (58ha @ 6 000m$^3$/ha/a) – Irrigation
- Zonderendrivier WUA (Summer) ~ 11 498m$^3$ (1.9ha @ 6 000m$^3$/ha/a) – Feedlots

**Farm Van Der Watts Kraal 394, Portion 5:**

- Zonderendrivier WUA (Summer) ~ 48 502m$^3$ (8ha @ 6 000m$^3$/ha/a) – Irrigation
- Zonderendrivier WUA (Summer) ~ 11 498m$^3$ (1.9ha @ 6 000m$^3$/ha/a) – Feedlots
- Surface Water ~ 55 358m$^3$

B) Application – Storing (Current WULA):

- **120 000m³ ~** NEW Taking ~ surplus winter water from Eksteenskloof (50% portion)
- **155 000m³ ~** NEW Taking ~ surplus winter water from Adjacent Local Catchment
- **55 358m³ ~** ELU (existing surface water (farm 394/5)
- **TOTAL** = **330 358m³** (Proposed Hut-Dam)

## 5. APPLICATION & MOTIVATION

The Water Use Licence Application (WULA) as such with its motivation is dealt with in full in a separate report done by our office, ***Sarel Bester Engineers***. We refer to 16109WULA-W2, dated May 2017. The owner, *Sangasdrift Trust* is planning to develop a BEE project of about 55ha of nut orchards following the authorisation of the WULA. The proposed new dam will ensure long term economic viability as well as sustainability of the project by creating permanent jobs within the agricultural industry.

The dam site is located within a tributary catchment of Riviersonderend which forms part of the larger Breede River and lies within the H60K quaternary drainage area. Both the ELU's as well as the downstream uses have been protected by a DWS recommended 50% MAR as the Reserve that has to be released into the Riversonderend River. Furthermore, building a dam of this calibre will not have any noticeable impact on any of the existing lawful water uses further downstream thereof.

Other motivational information as required in terms of Section 27 of the National Water Act, forms part of and is included in the WULA submitted separately.

## 6. ENVIRONMENTAL IMPACT

Government Notices R385, R386 & R387 of 21 April 2006, issued under Chapter 5 of the National Environmental Management Act, 1998 (Act 107 of 1998), also known as the "NEMA" procedures determines that Hut-Dam does qualify for a full Environmental Impact Study. The impact assessment and application, including the requested Fresh Water Study, is currently under way handled by ***Messrs EnviroAfrica.***

## 7. EMPOWERMENT

This licence application is based on the BBBEE vision previously submitted in 2010 as part of the previous application however, this time round, Mrs Olivia Jonker, being one of two trustee's of *Sangasdrift Trust*, is applying in her own capacity as a **woman** on behalf of *Sangasdrift Trust* for this licence.

*Sangasdrift Trust* is an entity in which Mrs Olivia Jonker, as a **South African woman**, currently has 50% of the decision making power in her capacity as one of the two trustees. *Sangasdrift Trust* currently owns two neighbouring properties, namely Van der Wattskraal 394 Portion 3 & 5 and are farmed as a combined unit in the Swellendam district. However, Mrs Olivia Jonker still has the long term vision of establishing a BBBEE project on one of the properties, namely Van der Wattskraal 394 portion 5, entailing a development ±50ha of a variety of nuts. The DRAFT Business Plan is available on request.

## 8. HYDROLOGY

The proposed Hut-Dam is located within the H60K quaternary catchment, in a smaller catchment of a tributary to the Riviersonderend River which forms part of the larger Breede River, see ***Appendix 3 & 4***. The volume of water applied for is 'new' water, both from the Eksteenskloof as well as the adjacent kloof. The water will be diverted via a contour furrow to the dam.

**A)** The hydrology of the new taking from the Eksteenskloof (a 50% portion of available water) was undertaken by a specialist in the field of Hydrology, *Mr Gerald Howard* and we refer to his report, available on request and summarised in ***Table 1***.

***Table 1: Summary of Hydrology Study,*** *according to G Howard, Feb 2017:*

| CATCHMENT DESCRIPTION | Area (km2) | MAP (mm) | MAR ($x10^6m^3$) |
|---|---|---|---|
| Upper (sub-catchment A) | 7.2 | 598 | 0.93 |
| Lower (sub-catchment B) | 1.3 | 450 | 0.08 |
| Lower (sub-catchment C) | 1.2 | 429 | 0.06 |
| Total | 9.7 | n/a | 1.07 |

***Table 2*** below however indicate the available surplus winter water when using above *Hydrology* figures after the ELU's and the Reserve has been protected.

***Table 2: Available surplus winter water:***

| WATER AVAILABILITY (Hydrology Study; G Howard; Mrt 2017) | | |
|---|---|---|
| | **SUB-CATCHMENT** | |
| | **Cumulative Catchment Eksteenskloof** | |
| Primary Catchment | 1.070 | $x10^6m^3$ |
| **VIRGIN MAR** | **1.070** | **$x10^6m^3$** |
| - MAR (50%) IFR | 0.535 | $x10^6m^3$ |
| - Existing Use (Sangasdrift Trust) | 0.055 | $x10^6m^3$ |
| - Existing Use: Servitude (Viljoen Trust) | 0.240 | $x10^6m^3$ |
| **NETT MAR / AVAILABLE** | **0.240** | **$x10^6m^3$** |

Of this calculated available surplus winter water from the Eksteenskloof, *Sangasdrift* Trust has applied for a 50% share of the available water, amounting to 120 000$m^3$.

**B)** Based on the same methodology used by the hydrologist, *Mr G Howard*, we have calculated the available surplus winter water runoff from the adjacent stream to be in the order of 270 000$m^3$ of which the intended '*taking'* would only be 155 000$m^3$.

***Table 3: The quaternary catchment characteristics according to the WRC Report 298/4.1/94:***

| Catchment | Quaternary: | Adjacent Local: |
|---|---|---|
| Name / Description - Catchment | H60K | Part of H60K |
| Area [$km^2$] | 262 | 2,72 |
| Mean Annual Precipitation (MAP) [mm] | 371 | 385 |
| Mean Annual Runoff (MAR) [mm] | 44 | 98 |
| Gross Average Runoff (MAR) [x $10^6$ $m^3$] | 10,5 | 0,27 |

## 9. GEOLOGY

According to the Geological Survey of South Africa, the proposed site is situated on Sedimentary Rock formations, which as such forms part of the larger Cape System. We refer to ***Appendix 5***.

The Sedimentary rock consists out of various types of alluvial material including amongst other, Light-grey to pale-red sandy soil (Qg), Talus, Alluvial fan gravel grading into piedmont gravel, Calcrete (Qc) with High-level silcrete & ferricrete (Tg) and Light-grey quartzitic sandstone outcrops toward the south-western side of the site.

The geological overview also shows two fault-lines both located between 2-3km north-northeast from the site at a north-west south-east orientation. Given the distance from the site, it should not have a negative impact on the sealing of the cut-off and basin as such. However, care should be taken when performing the site investigation and exploration work in order to verify the conditions on site.

An investigative first round of soil sampling and testing was done by the owner for choosing a site. However, formal and in depth sampling and testing will be done as part of the final design stage which should shed more light and also give clarity on this matter.

The soil on the site varies from sandy to gravelly which is considered suitable for a dam structure of this nature based on experience with similar dams in the area.

## 10. SITE PROFILE

The Water Research Commission have recently published their updated study of the Water Resources of South Africa since the previous version thereof dated 1990. The updated report, *TT382/08 dated March 2009*, is well recommended by the Department and widely used throughout South Africa as basis when it comes to water management and development issues.

The table below shows a summary of such characteristics or profile regarding the proposed dam site.

| Figure | Property Description | Zone / Index / Value | Unit / Scale |
|---|---|---|---|
| Figure 0 | Water Management Area | 18 ~ Breede | |
| Figure 1 | Rainfall: MAR | 300-400 | [mm] |
| Figure 2a | Evaporation (WR90 S-pan) | 1400-1500 | [mm] |
| Figure 2b | Evaporation (A-pan) | 1800-2000 | [mm] |
| Figure 3 | Runoff: MAR | 20-50 | [mm] |
| Figure 4a | Landcover | Dryland Agriculture | |
| Figure 6 | Simplified Geology (WR90) | Intercalated arena and agrillaceous strata | |
| Figure 7 | Soils (WR90) [Depth / Texture / Relief] | Moderate to deep / Clayey loam / Undulating | |
| Figure 8 | Sediment (WR90) [Erodibility Index] | 18 ~ Low | **H**igh 1-8<br>**M**edium 9-15<br>**L**ow 16-20 |
| Figure 9 | Vegetation (Acocks Veld Types) | Sclerophyllous bush types | |
| Figure 10 | EWR Management Class | Class C (Moderately modified) | [A-F] |
| Figure 11 | Surface Water Quality - TDS | 1000-1500 | [mg/l] |
| Figure 12 | Population Density | 0-100 | [People / km²] |
| DWAF GRA2 (2005) | Utilisable Groundwater Exploitation Potential | 10 001 – 15 000 | [m³/km²/a] |

All of the above properties and/or characteristics are well within an acceptable range for when it comes to building a dam and the overall observation and interpretation thereof does not show any alarms as such regarding the design and construction of a dam of this nature.

## 11. CONCEPTUAL DESIGN

The proposed project entails the construction of a new dam. Hut-Dam is considered an instream dam having an open U-shape layout or alignment across the valley with a spillway on the mountain side.

i. Design Characteristics:
The proposed dam is considered an off-stream dam with the following characteristics:

| | |
|---|---|
| Location | 34°05' 32"S 20°02' 16"E |
| Wall crest level (masl) | 180,0 |
| Full supply level (masl) | 178,5 |
| Lowest ground level (masl) | 166,0 |
| Max wall height (m) | 14 |
| Crest length (m) | 520 |
| Crest width (m) | 4,0 |
| Upstream slope | 1 : 3 |
| Downstream slope | 1 : 2 |
| Free board (m) | 1,5 |
| Embankment volume (m³) | 130 000 |
| Total earthworks (m³) | 141 000 |
| Nett storage capacity (m³) | ±330 000 |
| Flooded area (ha) | 4,5 |
| Embankment footprint (ha) | 2,3 |

*(#) The estimated cost is based on recent tenders for similar works.*

ii. Foundation: Preliminary visual inspections show a topsoil layer that vary between ±0,3 to 0,6m thick on a white to yellowish gravely, sandy, clayey alluvium layer between 1,7 to 2,0m on a greyish sandy gravel foundation according to a number of trial-pits on the dam-site. The formation is considered adequate and suitable for this type of structure.

iii. Material investigation: a First round of investigative soil analyses has been done by the client. Other dams in the vicinity is of similar material and their behaviour over time is considered consistent and stable. The more gravelly sandy material will be used as mass fill within the up- and downstream embankment zones while the more clayey material will be incorporated within the central core and cut-off zones. Visual inspection of the proposed dam site provisionally suggests that the availability of material from the dam basin seems to be sufficient. Light dispersiveness is expected on these types of material based on general erosion marks elsewhere in the valley. This characteristic will be addressed formally in the final design by way of optional stabilisation, increased compaction specifications with built-in sand filters.

iv. Embankment design: The overall layout and alignment of the embankment is influenced and dictated by the overall topography with the optimum aligned across the valley limited by the property boundary on the northern side. The proposed internal profile will be zoned with selected clayey core and cut-off zones plus unselected up- and downstream mass earthfill zones protected by rip-rap against the upstream slope. Awaiting the outcome of the formal soil testing to be carried out for final design purposes, consideration will be given to the necessity and introduction of built-in sand drains. Due to the possibility of dispersiveness, the core and cut-off zones will be compacted to a higher density in the order of 98% Proctor. The planned maximum wall height is in the order of ±14m with the upstream slope provisionally at 1v : 3h, the downstream slope at 1v : 2h and the crest width at 4m.

v. Drainage: Due to the height and the possibility of dispersiveness of materials in the surrounding area and pending the outcome of the soil tests, the internal embankment profile might require an optional built-in drainage system in the form of a curtain drain on the downstream side of the core plus a blanket drain or evenly spaced strip drains over the downstream solumn area. Apart from this, drainage will also rely on the normal phreatic movement of moisture through the earthfill structure itself.

vi. Stability: This aspect is considered part of the final design exercise when a complete slope and internal stability analysis will be conducted based on the results forthcoming from the soil testing. Pending the outcome of these results, including the stability calculations, the proposed profile has been evaluated against and based upon applicable statistics obtained from a database of dams without any obvious risks being identified. However, the final design will include a formal design approach based on finite element stability calculation models.

vii. Outlet works: The outlet is currently planned as a single ø300mm pipe in reinforced concrete with a flanged sluice-gate control valve and manifold on the downstream side and a sieve pipe on pedestals or alternatively a custom built float unit at the upstream inlet end. This will be sufficient for irrigation purposes as well as for emptying the dam or lowering the water level in case of an emergency condition, say within 10 to 30 days.

viii. Spillway & Flood management: Due to the relative small catchment with reduced flood peaks, an open channel or by-wash spillway will be provided on the left flank leading the water safely past the embankment toe-line. The erodibility index is 18 on a scale of 1 to 20 with 1 being high and 20 being low. Based on this we regard the formation as suitable for the intended purpose and propose an unlined earth channel. The dry freeboard is provisionally set at 1,5m in line with SANCOLD recommendations.

ix. Maintenance and Operation: The dam is situated in a winter rainfall area and will be filled during the winter season primarily with surplus run-off from water from the adjacent Eksteenskloof catchment along with a small percentage from its own catchment. The operation and supervision of the dam will take place under the direct control of the owners or delegated authority on a seasonal cycle.

x. Specifications: Relevant and applicable specifications are envisaged for this purpose. Although it might not be a requirement for a category I dam as such, it is recommended that the following standardized specifications be considered as basis and part of the construction contract:

- General Conditions of Contract for Construction Works (2010)
- SANS/SABS 1200AD: General (Small Dams)
- SANS/SABS 1200DE: Small Earth Dams
- SANS/SABS 1200GA: Concrete (Small Works)
- SANS/SABS 1200L: Medium Pressure Pipeline

## 12. QUALITY CONTROL

The site surveying, planning, design and construction supervision will be handled by personnel of *Sarel Bester Engineers*. Regular inspections and in-situ compaction tests will be conducted during construction in order to ensure quality of workmanship.

## 13. DOWNSTREAM DEVELOPMENT

The proposed dam site is located about 14km east from the town Riviersonderend and about 3km north from the main road, namely the N2. Flood water going down the stream crosses a farmroad about 0,4km downstream of the dam before the confluence with the larger Riviersonderend River about 1.7km downstream. The potential flood zone reaches unto and touches some orchards and cultivated lands along the way. The application for classification is due and will be submitted to the Dam Safety Office shortly who will will then determine the hazard rating and subsequent clasification.

## 14. COSTING

The estimated costing of the project is based on recent tender prices of similar type projects within the Western Cape region. The basic costing of the project was done by using related data from other projects and dividing the sum total of all the earthmoving and related costs by the sum total of all the bulk earthmoving volumes in order to obtain an all inclusive unit price for earthmoving. Additional allowance was then made for other costs such as overhead costs, concrete & outlet related costs as well as diverse & unforeseen cost items. These were all added up as the estimated project cost on the attached preliminary design evaluation sheet as summarized below.

| Description | |
|---|---|
| Max Wall Height (m) | 14 |
| Total Earthmoving (m³) | 141 000 |
| Nett Storage Capacity (m³) | ±330 000 |
| Storage : Earthworks | 2.35 |
| Estimated Cost (R) | ±R 9.8mil |

The figures above show average favourable storage ratios, being just greater than 2 and as such contributing to better economics regarding the overall cost per unit storage capacity. However, dam sites are considered more economical when the storage ratio is about 5 and higher.

In this case the earthworks costing was calculated at a basic rate of **±R45/m³** accounting for ±65% of the total cost which translates to an estimated project cost in the order of **R9,75mill**, excluding fees etc.

## 15. SUMMARY

Hut-Dam is an in-stream dam within the catchment area of a tributary to the Riviersonderend River, about half a kilometre upstream of the confluence with Riviersonderend River. The water use license application (WULA) is mainly based on a new water use with the primary taking coming from the adjacent Eksteenskloof and the secondary taking coming from its own catchment. Water taken from the Eksteenskloof will be abstracted at an old damaged weir which will have to be rehabilitated as part of the project along with a diversion pipeline to the dam. All existing and downstream water uses will be protected including the recommended allowance of 50% MAR for the Reserve which have to be released into the Riviersonderend River.

The new water taking is intended for the development of a BBEEE project under the name of Sangasdrift Trust. The construction of Hut-Dam will thus ensure both agricultural development as well as the improvement of the socio-economical status of the farming community of the area.

The basic layout of the dam will be U-shaped across the valley abstracting surplus winter run-off water from within the upper reaches of the Riviersonderend catchment. It will also be equipped with a piped outlet and an open side channel spillway on the left bank.

The application for a licence to take and store water from DWS as well as the environmental impact study for DEADP are both in process of being revised and resubmitted along with this Preliminary Dam Design. The purpose of this document is also to provide certain technical information as part of the above procedures to the various departments regarding the proposed works.

Although on the slightly expensive side, based on the geotechnical information gathered for this purpose as well as topographical conditions, the site is considered suitable for a dam of this nature.

## 16. APPENDICES:

i. Locality Map
ii. Classification Application, dated May 2017
iii. Eksteenskloof Catchment
iv. Local Catchment
v. Geological Map
vi. Preliminary Design Evaluation: Quantities & Costing
vii. Drawing 1718-02; Contour Layout Plan & Sections
viii. Water Use Licence Application, dated June 2017
*(Available on Request)*

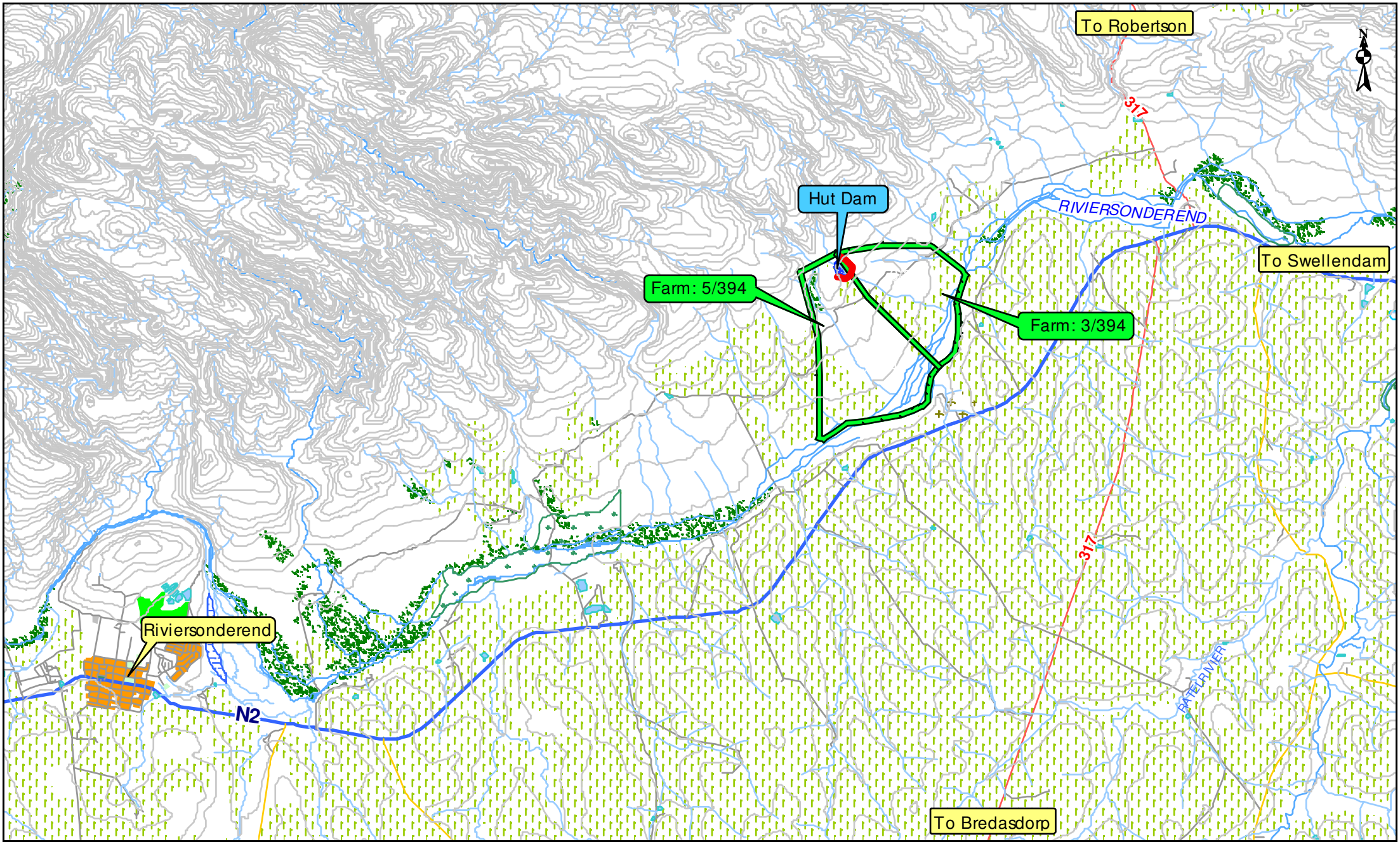
You are welcome to contact us in case more information is required and/or in case of any uncertainty.

We trust that you will find the above in order.

Yours faithfully

M Charl Bester (Pr Ing)

| | |
|---|---|
| Copies to: | Mr Peet Botes, EnviroAfrica, Somerset West<br>Me Vhengani Ligudu, BGCMA, Worcester |

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**Client:** Sangasdrift Trust
PO Box 15
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6730

**Scale:** 1: 75 000

**Project:** Application Taking & Storing

**Map Ref:** 3420AA Riversdale

**Details:** Locality Map

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

# DAM SAFETY OFFICE

**PRIVATE BAG X313 PRETORIA 0001**

## APPLICATION FOR CLASSIFICATION OF A PROPOSED NEW DAM OR ENLARGEMENT OR ALTERATION OF AN EXISTING DAM

***Only applicable if the maximum wall height of the dam exceeds 5 metres and the gross storage capacity is more than 50 000 cubic metres***

## 1. PARTICULARS OF THE DAM OWNER

1.1. Name of dam owner: SANGASDRIFT TRUST

1.2. Owner's postal address: PO Box 15
BONNIEVALE
Postal code: 6730

1.3. Tel/cel. no. of dam owner: 082 575 3831

1.4. E-mail address of DAM OWNER: info@mooiuitsig.co.za

1.5 Name and postal address of person in control of the dam (*if applicable*)
Olivia Jonker
PO Box 15
Bonnievale
Postal code: 6730

1.6. Tel/cel. no. of person in control of the dam: 082 575 3831

1.7. E-mail address of person in control of the dam: info@mooiuitsig.co.za

## 2. PROPERTY ON WHICH THE DAM IS OR WILL BE SITUATED AND LOCALITY

2.1. Property description as per title deed: VAN DER WATTS KRAAL
FARM NO: 394, PORTION 3

2.2. Magisterial district: SWELLENDAM RD

2.3. Nearest city/town: Riviersonderend

2.4. Distance to nearest city or town: 14,0 km

2.5. Direction from nearest city or town: EAST

2.6. Number of 1:50 000 scale topographical map: * 3420AA

* ***A copy of the relevant portion of this map which clearly indicates the position of the dam and downstream area must be attached***

2.7. Position of the centre of the dam wall to an accuracy of one second

Latitude: 34° 05' 32" Longitude: 20° 02' 16"

2.8. Title deed number: T63111/2000

## 3. GENERAL INFORMATION

3.1. Name of dam: HUT DAM

3.2. Name of watercourse or source: TRIBUTARY OF RIVIERSONDEREND RIVER

3.3. For **clean water** dams, give the purpose of the dam (*mark **all** applicable purposes with X*)

| | | | | | |
|---|---|---|---|---|---|
| domestic supply | | irrigation | X | industrial use | |
| stock watering | | fisheries | | other (specify below) | |
| Describe "other" | | | | | |

3.4. For **wastewater** dams, give the purpose of the dam (*mark **all** applicable purposes with X*)

| | | | | | |
|---|---|---|---|---|---|
| pollution control | | wastewater disposal | | industrial residue | |
| oxidation / evaporation | | mine residue | | other (specify below) | |
| Describe "other" | | | | | |

3.5. For an existing dam describe the nature and extent of the proposed alterations or enlargements

N/A

3.6. Proposed starting date of construction: 2018/09

3.7. Name and postal address of designer or consultant (*if available*)

CHARL BESTER
SAREL BESTER ENGINEERS
P.O. Box 21, Ceres
Postal code 6835

3.8. Tel. no. of designer or consultant: 023 312 2017

3.9. E-mail adress of designer or consultant: charl@sbri.co.za

## 4. PARTICULARS OF DAM AND BASIN

**(*For enlargement or alteration of an existing dam, particulars must be for the completed structure*)**

4.1. Type of dam (*mark applicable type with X - mark more than one for composite dams*)

| | | | | | |
|---|---|---|---|---|---|
| earthfill | X | rockfill | | gravity | |
| buttress | | arch | | multi-arch | |
| earth "service" reservoir | | reinforced concrete "service" reservoir | | | |
| mine residue deposit * | | industrial residue deposit * | | | |

**** This also means any structure generally termed a "tailings or slimes dam"***

other (*specify*):

4.2. Maximum wall height ** : 14 m

***** Note! Wall height is the vertical difference between the lowest downstream ground elevation on the outside of the dam wall and the non-overspill crest level or the general top level of the dam wall***

4.3. Crest length of wall: 519 m

4.4. Gross storage capacity: 330000 m³

4.5. Area of water surface at full supply level: 4,5 ha

4.6. Maximum full supply water depth (*must be provided*): 11,5 m

## 5. PARTICULARS OF DEVELOPMENT DOWNSTREAM OF THE DAM

*Describe with the aid of a 1:50 000 scale map the nature and situation of development downstream of a dam that would be threatened by a failure of the dam. Development means any houses, dwellings, other buildings, roads, bridges, cultivated lands, orchards, powerline foundations etc.*

*The area downstream of the dam wherein all development must be described is defined as follows;*

*- For every one metre of maximum wall height, at least one kilometre of the valley downstream of the dam wall should be analysed*

*- For the calculation of the width of the strip the following heights above river bed may be assumed;*

2/3 of maximum wall height for the first kilometre downstream and 1/2 of the maximum wall height for the rest of the downstream distance

### 5.1. Development downstream of the dam (houses, dwellings and other similar structures)

| Distance downstream (km) | Purpose or use of structure | Height above river bed (m) | Distance from river (m) | Number of inhabitants or users |
|---|---|---|---|---|
| 2 | Small dwelling(Effect negligible due to large river) | 0-10 | 120 | 6 |
| 3 | StormSvlei town with small dwellings | 15 | 145 | 2000 |
| 3-13 | Due to the large Riviersonderend river, the effect of the additional 315 000m³ is considered negligible. | | | |
| | | | | |
| | | | | |

### 5.2. Road and railway crossings downstream of the dam

| Distance downstream (km) | (1) Type of road or railway | If a road, is it tarred? (Y/N) | Height of road / railway above river bed (m) | Bridge, culvert or pipe openings: Width (mm) | Height (mm) | Diameter (mm) | How many? | (2) Type of crossing | (3) Visibility distance (m) | Number of vehicles per day |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.59 | FRD | N | 0 , | | | | | D | 100<br>100 | 50 |
| 3 | MRD | Y | 5 , | ±30000 | ±4000 | | 2 | B | 90<br>130 | 500 |
| | | | , | | | | | | i<br>ii | |
| | | | , | | | | | | i<br>ii | |
| | | | , | | | | | | i<br>ii | |
| | | | , | | | | | | i<br>ii | |

(1) *Type of road or railway - Use one of the following abbreviations*

*NRD = national road* *MRD = main road* *SRD = secondary road* *DRD = district road*

*FRD = farm road* *STR = single track railway* *MTR = multi-track railway*

*Explain other abbreviations* =

(2) *Type of crossing - Use one of the following abbreviations*

*C = culverts or pipes encased in concrete* *E = culverts or pipes buried in earthfill or rockfill*

*B = concrete bridge with piers* *D = drift with same height as river bed*

*Explain other abbreviations* =

(3) *Visibility distance - This is the distance to a bridge or crossing from where a motorist can see if there is any danger in using the bridge or crossing. Both approach distances are required.* ***The order in which i and ii are written does not matter.***

*If the distance equals or exceeds 1 kilometre, enter 999*

**5.3. Other development downstream of the dam, not covered by 5.1 or 5.2**

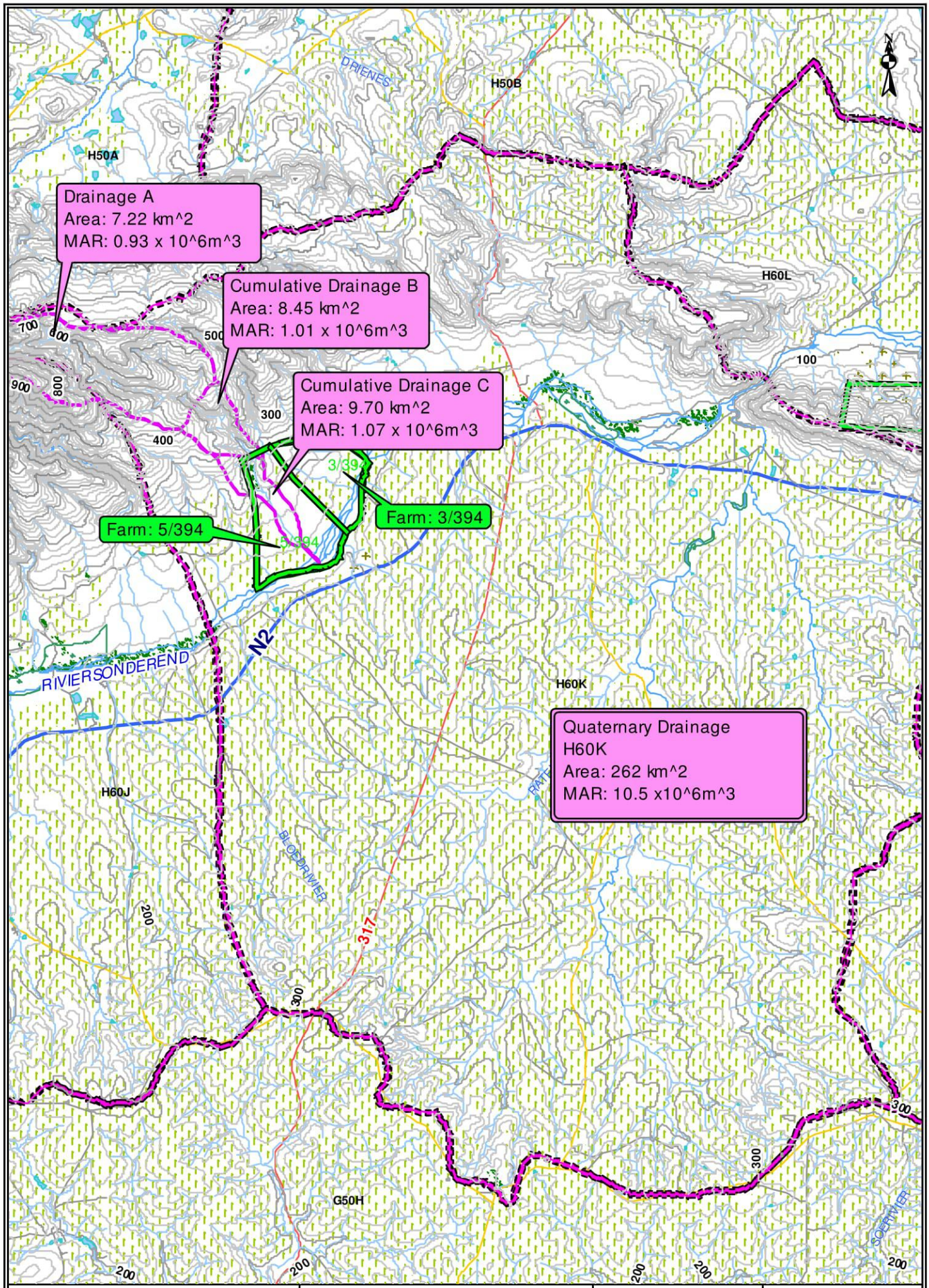
| 0-1.7 Agricultural land and joins Riviersonderend river |
|---|
| |
| |
| |
| |
| |
| |
| |

## 6. DECLARATION BY APPLICANT

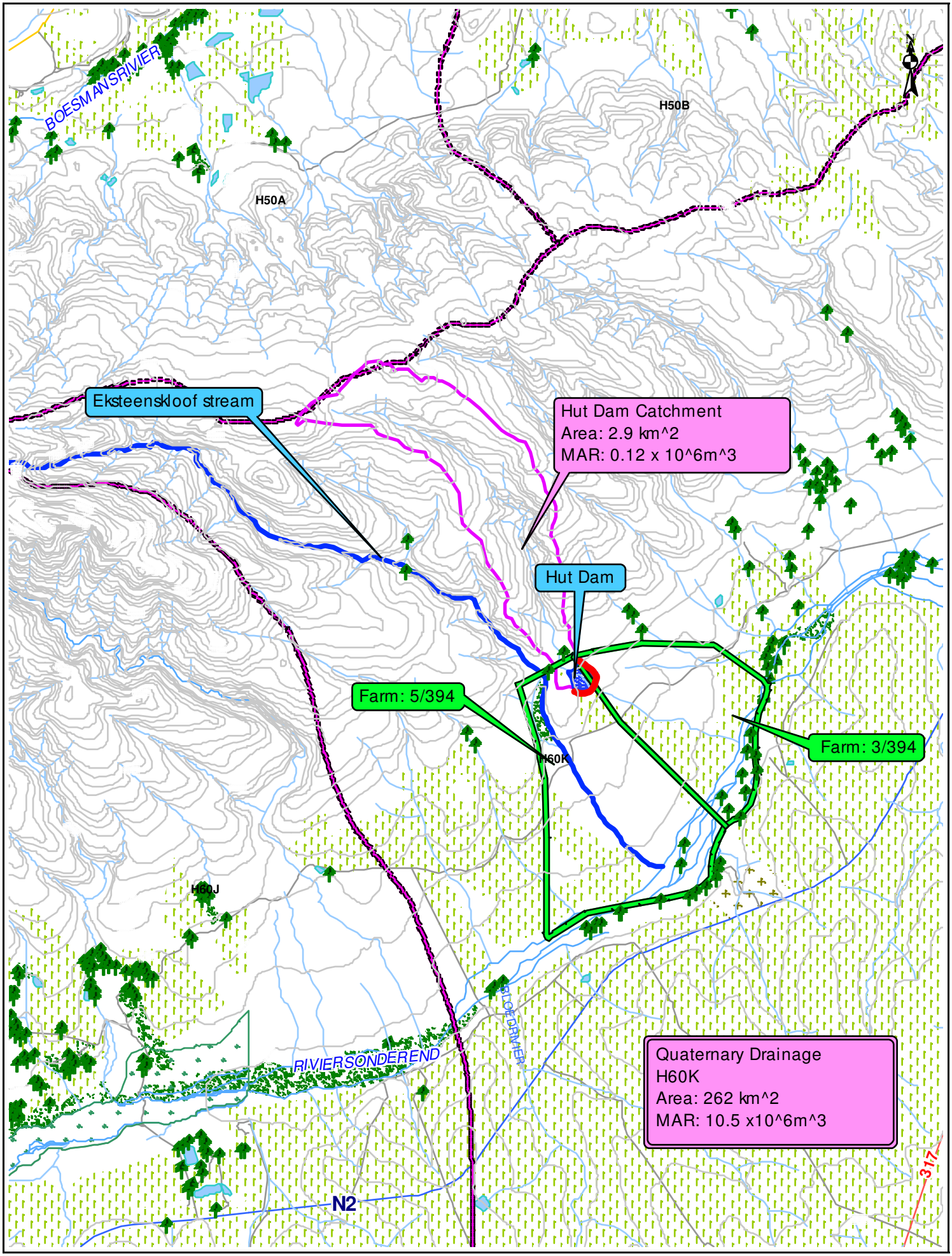
I declare that the information given by me for the classification of the above dam is true and correct.

Signature:  Date: 19 May 2017

***NB! Remember to attach a clear copy of the relevant topographical map (see 2.6)***




| | | | |
|---|---|---|---|
| SAREL BESTER INGENIEURS BK<br>Raadgewende Siviele Ingenieurs / Consulting Civil Engineers<br>Argitektuurdienste / Architectural Services<br>CK1999/083723<br>Bus/Box 21, CERES, 6835<br>T: 023-312 2817<br>F: 023-312 3802<br>E: sbi@telkomsa.net<br>MC BESTER<br>Pr. Ing., LSAISI: 970598, LSACAP: T1218 | Client: Sangasdrift Trust<br>PO Box 15<br>Bonnievale<br>6730 | Eksteenskloof Catchment<br>3420AA Swellendam | Application Taking/Storing<br>Scale 1: 100 000<br>Ref 16109 |

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F: 086-514 3350
E: sbir@telkomsa.net

Verw/Ref:
Datum/Date:

**Client:** Sangasdrift Trust
PO Box 15
Bonnievale
6730

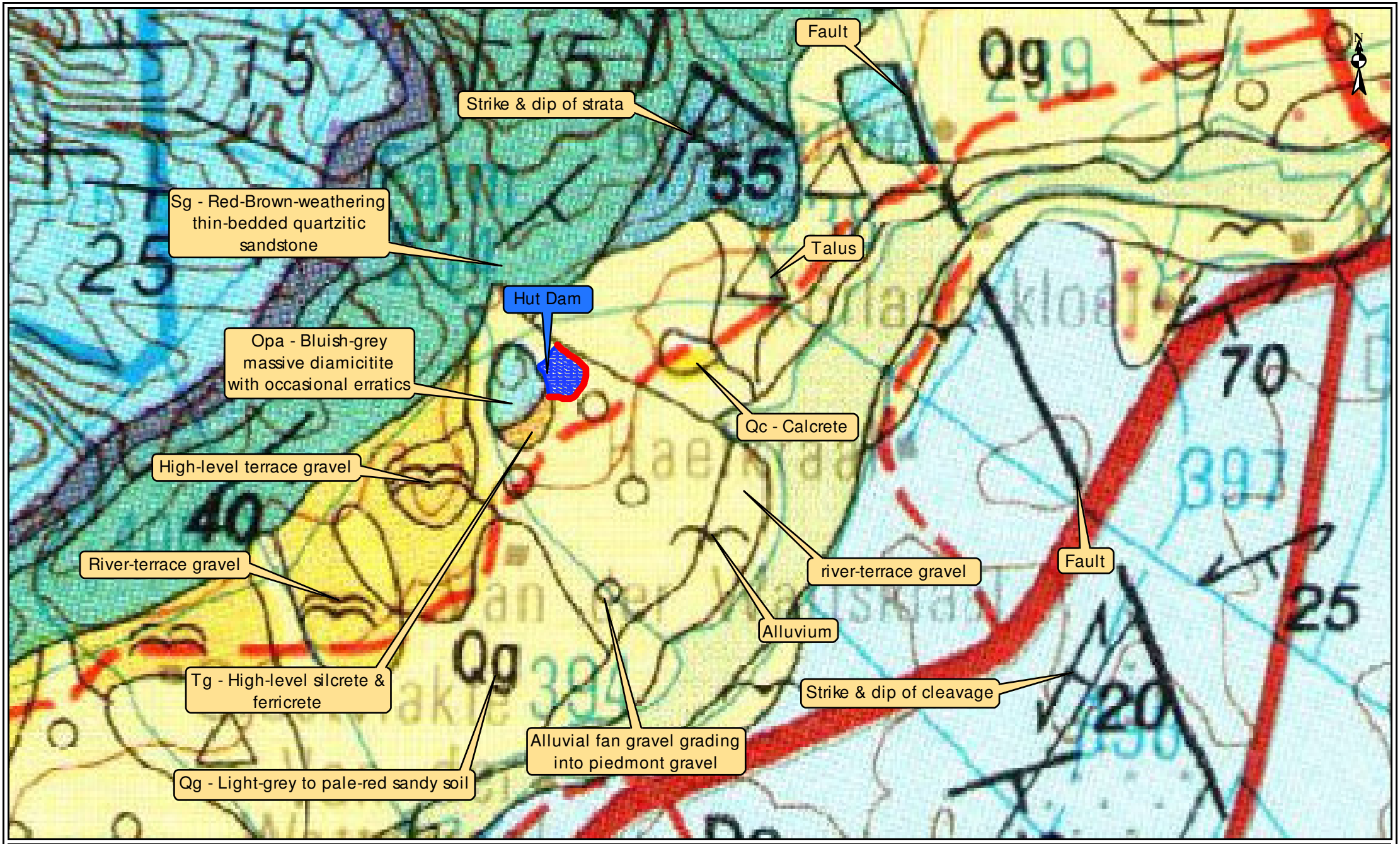
**Project:** Hut Dam
Catchment Map

**Scale:** 1: 50 000

**Ref:** 16109

**Map Ref:** 3420AA Swellendam

Application
Taking Storring

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MC BESTER
Pr. Ing., LSAISI: 970598, LSACAP: T1218

**Client:** Sangasdrift Trust
PO Box 15
Bonnievale
6730

**Scale:** 1: 30 000

**Project:** Proposed Hut Dam

**Map Ref:** 3420AA Riversdale

**Details:** Geology Map

# PRELIMINARY EVALUATION OF THE PROPOSED EARTH DAM: QUANTITIES AND COSTING

***Client:*** **Sangasdrift Trust**
***Address:*** PO Box 15
Bonnievale
***Dam:*** **HUT DAM (Dam 1)**
***Notes:*** 1. VAT EXCL.
2. GIS 5m contours
3

***Project Nr.:*** **1718**
***Annexure:*** **A**
***Date:*** 11-May-16

*Version:* *Mei 2016*

***Report by:*** Charl Bester
SAREL BESTER ENGINEERS
P.O. Box 21, Ceres 6835
Ph: 023-312 2017
Fax: 086-514 3350

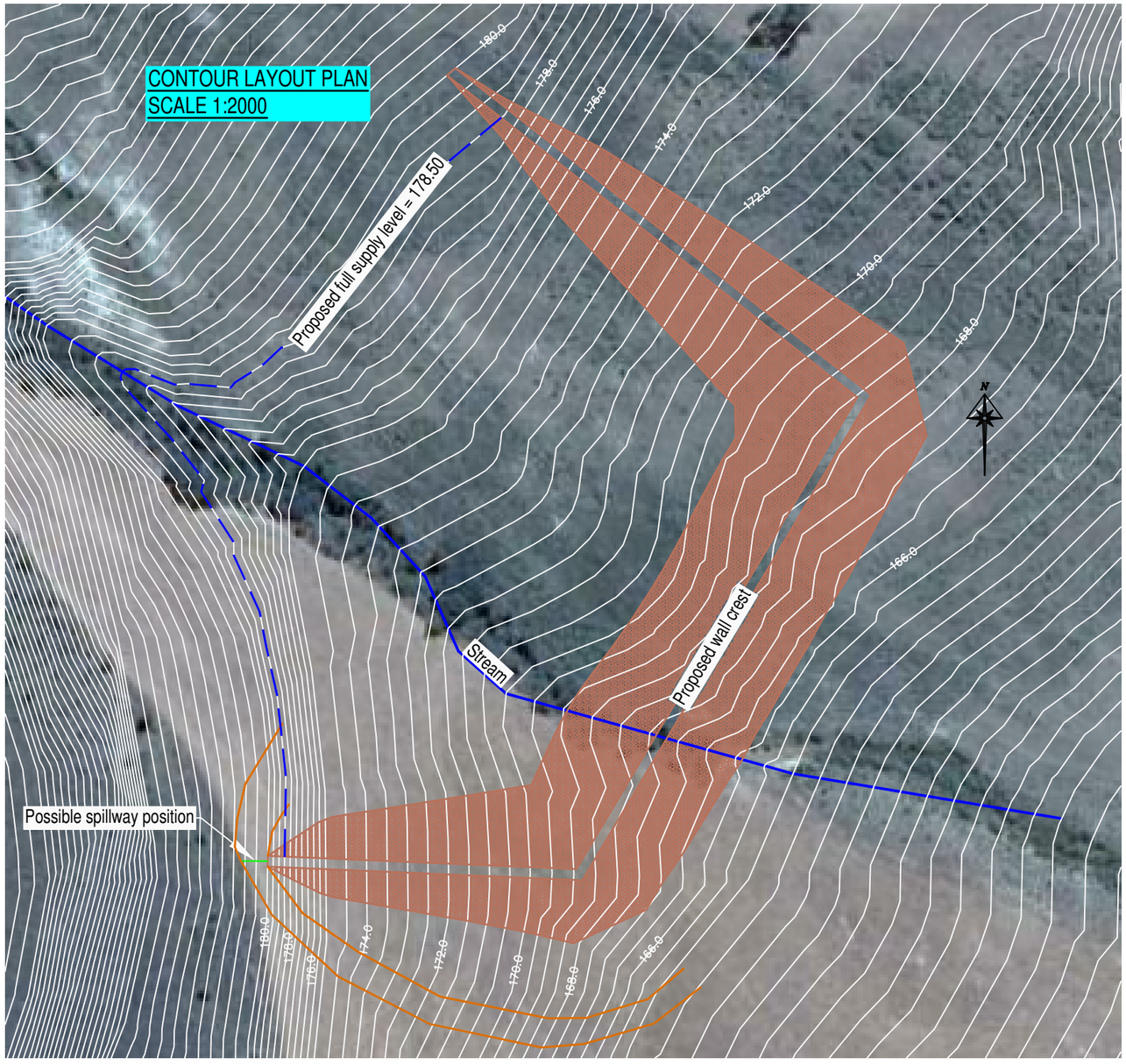
**Design Parameters & Assumptions:**

| | | | | | |
|---|---|---|---|---|---|
| *Crest width (m):* | 4.0 | *Cut-off depth (m):* | 3.50 | | |
| *Upstream slope 1:* | 3.0 | *Cut-off base (m):* | 4.00 | | |
| *Downstream Slope 1:* | 2.0 | *Cut-off slope 1:* | 0.75 | | |
| *Percentage of fill from dam basin:* | 50% | *Application (m³/ha):* | 7,000 | | |

**Financial Assumptions:**

| | |
|---|---|
| *Earthmoving Cost (R/m³):* | 45.00 |
| *Nominal Engineering Fees (%):* | 6.5% |
| *Fees Base Value (R):* | R 11,500,000 |

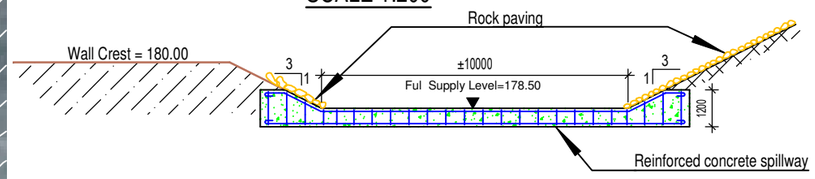
| Item | Description | | Unit | Stadium / Wall position / Terrain | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Stadium 1 | Stadium 2 | Stadium 3 | Stadium 4 | Stadium 5 |
| | **1 EMBANKMENT** | | | >>><<< | | | | |
| 1.1 | Wall crest level | | masl | 180.00 | 180.50 | 181.00 | 181.50 | |
| 1.2 | Lowest ground level below wall | | masl | 166.00 | 166.00 | 166.00 | 166.00 | |
| 1.3 | Maximum wall height | | m | 14.00 | 14.50 | 15.00 | 15.50 | #N/A |
| 1.4 | Wall crest length | | m | 519.0 | 531.0 | 542.0 | 554.0 | |
| 1.5 | Wall volume - excluding cut-off | | m³ | 129,000 | 141,000 | 153,500 | 167,000 | |
| 1.6 | Cut-off trench excavation | | m³ | 12,034 | 12,313 | 12,568 | 12,846 | #N/A |
| **1.7** | **Total earthmoving** | | **m³** | **141,034** | **153,313** | **166,068** | **179,846** | **#N/A** |
| | **2 STORAGE CAPACITY** | | | | | | | |
| 2.1 | Full supply level | | masl | 178.50 | 179.00 | 179.50 | 180.00 | |
| 2.2 | Draw-off level | | masl | 167.00 | 167.00 | 167.00 | 167.00 | |
| 2.3 | Total free-board | | m | 1.50 | 1.50 | 1.50 | 1.50 | 0.00 |
| 2.4 | Maximum depth above draw-off level | | m | 11.50 | 12.00 | 12.50 | 13.00 | 0.00 |
| 2.5 | Nett capacity from contours | | m³ | 267,000 | 290,100 | 314,200 | 339,000 | |
| 2.6 | Capacity gain from excavations | | m³ | 64,500 | 70,500 | 76,750 | 83,500 | 0 |
| **2.7** | **Potential gross capacity** | | **m³** | **331,500** | **360,600** | **390,950** | **422,500** | **0** |
| 2.8 | Water surface | | ha | 4.50 | 4.70 | 4.90 | 5.20 | |
| 2.9 | Potential irrigation | | ha | 47.36 | 51.51 | 55.85 | 60.36 | 0.00 |
| 2.10 | Average water depth | | m | 7.37 | 7.67 | 7.98 | 8.13 | #DIV/0! |
| 2.11 | Ratio Storage : Earthworks | | | 2.35 | 2.35 | 2.35 | 2.35 | #N/A |
| 2.12 | Recommended pipe diameter | | mm | 300 | 300 | 300 | 300 | 150 |
| | **3 COSTING (Excl VAT)** | | | | | | | |
| 3.1 | Overhead & Preparation | 10% | Rand | 976,391 | 1,061,395 | 1,149,699 | 1,245,087 | #N/A |
| 3.2 | Earthworks (excavate & construct) | 65% | Rand | 6,346,544 | 6,899,065 | 7,473,043 | 8,093,064 | #N/A |
| 3.3 | Concrete & Outlet works | 15% | Rand | 1,464,587 | 1,592,092 | 1,724,548 | 1,867,630 | #N/A |
| 3.4 | Diverse & Unforeseen | 10% | Rand | 976,391 | 1,061,395 | 1,149,699 | 1,245,087 | #N/A |
| 3.5 | | | Rand | | | | | |
| **3.6** | **Estimated Construction Cost** | | **Rand** | **9,763,914** | **10,613,947** | **11,496,989** | **12,450,868** | **#N/A** |
| 3.7 | Adjusted Fees percentage | | % | 6.8% | 6.8% | 6.8% | 6.5% | #N/A |
| 3.8 | Engineers costs (ECSA Fees) | | Rand | 667,608 | 716,441 | 776,047 | 806,946 | #N/A |
| 3.9 | Engineers costs (Disbursements) | | Rand | | | | | |
| **3.10** | **Estimated Engineers Costs** | | **Rand** | **667,608** | **716,441** | **776,047** | **806,946** | **#N/A** |
| 3.11 | | | Rand | | | | | |
| 3.12 | | | Rand | | | | | |
| **3.13** | **Total estimated capital cost** | | **Rand** | **10,431,522** | **11,330,388** | **12,273,036** | **13,257,814** | **#N/A** |
| 3.14 | Capital costs per m³ gross capacity | | Rand | 31.47 | 31.42 | 31.39 | 31.38 | #N/A |
| 3.15 | Capital costs per irrigated hectare | | Rand | 220,273 | 219,947 | 219,750 | 219,656 | #N/A |



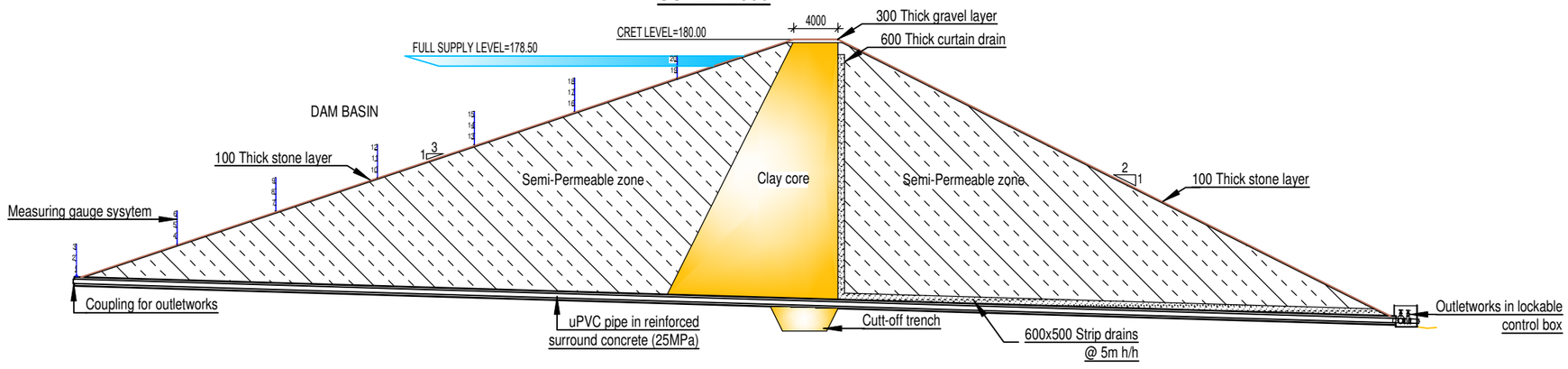

## TECHNICAL INFORMATION: HUT DAM

| | |
|---|---|
| Crest Width (m) | 4.00 |
| Crest Level | 180.00 |
| Crest Length (m) | 519.00 |
| Lowest ground level | 166.00 |
| Max. wall height (m) | 14.00 |
| Upstream slope (1:) | 3.00 |
| Downstream slope (1:) | 2.00 |
| Embankment earthfill: excl. cut-off trench ($m^3$) | 129 000 |
| Total estimated earthfill ($m^3$) | 141 000 |
| Full supply level | 178.50 |
| Total freeboard (m) | 1.50 |
| Gross storage capcity ($m^3$) | ±330 000 |
| Flooded area (ha) | 4.50 |
| Embankment footprint area ($m^3$) | 2.30 |
| Spillway crest length (m) | ±10.00 |

## TYPICAL SECTION THROUGH SPILLWAY
SCALE 1:200




## TYPICAL SECTION THROUGH EMBANKMENT
SCALE 1:500




REVISION


**SAREL BESTER ENGINEERS**
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Sangasdrift Trust
P. O. Box 15
BONNIEVALE

# PROPOSED HUT DAM

Contour Layout Plan (Arial Photo) & Sections

| DRAWN | DATE | SCALE | SHEET |
|---|---|---|---|
| SC Hartzenberg | MAY 2017 | as shown | 1 of 1 |
| SURVEYED | DESIGNED | DWG. NUMBER | REV. |
| N/A | Sarel Bester Engineers | 1718-02 | |

 A3