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Ref: 2114DDR-S2

Date: 2021/09/23

Messrs Cederberg Farming
P.O. Box 50
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Sir,

PRELIMINARY DESIGN REPORT FOR THE PROPOSED NEW WAVE DAM ON MELKBOOM 384 PORTION 101 & 168, VAN RHYNSDORP DISTRICT, CEDERBERG FARMING

Our previous investigation, *ref 2114DDR-S1, dated 4 June 2021*, as well as your subsequent instruction to proceed with and complete the preliminary design for the construction of the above dam, refer.

1. BACKGROUND

The proposed New Wave dam is located on Farm Melkboom 384 portions 101 & 168 within the Van Rhynsdorp area along the lower part of the Olifants River, about 10km south from Klawer, refer ***Appendix B1***.

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 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)"* as well as a *"Water Use License (WUL)"* have to be obtained from the respective authorities. In order to address these two aspects, a preliminary dam design is required containing specific technical information, which also then serve as supportive documentation to the specific applications.

In essence the project entails the application for storing of water under an existing lawful water use (ELU) from the Olifants River, namely a listing under the *'Laer Olifantsrivier' Water User Association* (LOWUA). The proposed New Wave dam would serve a dual purpose, firstly as a storage dam for potting up existing winter water and secondly as a buffer dam during the summer irrigation season. The purpose is to ensure the availability of the existing water use by abstracting and potting up a part of the water use during the surplus winter months for early summer irrigation, also serving as a buffer dam while abstracting the balance of the existing use during the summer months. Hereby the summer water use would be swapped for winter surplus water, benefiting the environmental condition of the river during the drier summer season.

2. ASSIGNMENT

The preliminary design of a dam normally follows after the feasibility stage serving as the basis for the final design and contract specifications in line with dam safety regulations in terms of chapter 12 of the National Water Act, 1998 (Act 36 of 1998).

Sarel Bester Engineers have been appointed as the project engineer and coordinator overseeing the various processes and components regarding legal requirements as well as the design of the dam.

Instruction and appointment was received to continue with the preliminary design stage for licensing purposes for a dam with a storage capacity in the order of ±92 000m³. The Environmental Impact Assessment (EIA) in accordance with the NEMA guidelines, is currently in progress under the care of ***Messrs EnviroAfrica*** whereas the Water Use License Application (WULA) has also kicked off and is in progress under care of our office, ***Sarel Bester Engineers***.

Surveyed data was converted to the WGS84 universal world map grid in order to relate and overlay it onto the world map for referencing purposes.

Part of the preliminary design process include checking, verifying and updating information obtained from other surveys as and where required and applicable with regard to storage capacity, expected earthworks quantities as well as the costing of the project for this purpose.

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

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

3. APPLICATION & MOTIVATION

The Water Use Licence Application (WULA) as such including the motivation and potential impact on downstream users are dealt with in full in a separate report compiled by our offices. The proposed new dam will enable water being abstracted during surplus winter season and be potted up for summer irrigation. Therefore, this project does not entail any new development, only the improved assurance of availability of the existing water use during the dryer summer months. This in itself will ensure long term economic viability as well as sustainability of the farming entity, ensuring permanent jobs within the agricultural industry.

This report covers the preliminary design of the New Wave Dam which will store about ±92 000m³ of the total water use, the balance of the water use will still be pumped directly from the river as is the current situation.

The proposed dam site is located on the southern bank of the Olifants River within the E33G quaternary catchment area. Since the application is solely based on already scheduled water, no downstream water use will be influenced by the application.

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

4. ALTERNATIVES

Cederberg Farming owns nine neighbouring properties in the Van Rhynsdorp district, namely Melkboom 384 portions 72, 101, 126, 127, 128, 129, 130,168 & 205 (refer ***Appendix B4***) and since the properties are adjacent they are farmed as one unit. Since the farm unit is relatively small and developed to the full potential, the available land for dam sites are virtually non-existing except when removing existing development. This report therefore covers the investigation of three possible dam wall positions at one site where the least agricultural and financial impact would occur on both existing plantations and farm infrastructure. For example, the site under investigation is also the site which have the existing pump point and infrastructure to abstract water from the Olifants River. The three dam wall positions were not only evaluated for different dam wall heights, but also environmental triggers, footprint size and storage ratio versus earthworks, refer 2114DDR-S2 for detail. The preferred option is considered the optimum with regard to cost, efficiency and loss of existing orchards. The calculations below are based upon site surveys done by ***Messrs Boland Opmeting*** in Jan 2021.

Table 1 below shows the comparison of key characteristics for the different dam options.

Option:	Preferred – Option 2 (within 32m restriction)	Alternative – Option 1 (outside 32m restriction)	Alternative – Option 3 (outside 32m restriction)
Max wall height (m)	8	7	8
Crest length (m)	440	320	375
Total earthworks (m³)	33,100	24,400	37,700
Storage capacity (m³)	±92 000	±71,000	±93,000
Flooded area (ha)	2.3	2.5	2.6
Storage : Earthworks	2.78	2.91	2.47
Estimated Cost (R)	±R3,42mil	±R2,97mil	±R3,88mil

From the data above, it is indicated that although Option 1 is slightly more economical from a unit cost perspective, Option 2 above does have a smaller footprint with certain advantages.

5. WATER AVAILABILITY

The respective properties have been researched and evaluated with regard to ownership as well as scheduled water with the *Laer Olifants River Water User Association.* Refer to ***Appendices A1 & A2*** for more information.

A) Existing Storage:

- Total Existing Storage 100 000m³ ~ 2x Existing Dams @ ±50 000m³ each

B) Application for Storage: *(Current New Wave WULA)*

- Total Listed water 954 040m³
- Total Allowable Storage 477 020m³ ~ @50% of listing
- Allowable Storage 477 020m³ – 100 000m³ (minus existing storage)
  = **377 020m³**
  => 92 000m³ ~ Proposed new '*New Wave*' Dam

6. DAM SAFETY & CLASSIFICATION

The project entails the proposed New Wave Dam and one of the first steps is to have the dam classified in terms of dam safety regulations. The application was submitted to the Dam Safety Office (DSO) on 20 Aug 2021 and we await the classification, refer attached ***Appendix A3***.

The application for appointment as the *Approved Professional Person (APP)* for the design and construction supervision of the dam will be submitted to DSO prior to or at the time of the submission of the final stage of the WULA.

7. 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 *New Wave dam* does qualify for a full Environmental Impact Assessment which is currently under way and handled by ***Messrs EnviroAfrica.***

8. EMPOWERMENT

The proposed project does not include or entail any particular form of integrated BBBEE component as part of the relevant farming entity. The farming unit is considered small and is economically regarded as an SME (Small / Medium Economic Enterprise). Nevertheless, good and sound operating principles are being applied throughout the year for the benefit of empowerment of previously disadvantaged persons.

9. STATUTORY REQUIREMENTS – OTHER

Since the proposed dam site is located on agricultural developed land, there are no registered roads or servitudes to be accommodated other than farm roads, plantations and farm infrastructure. Apart from the above, the only other aspect is the fact that the dam is within the 32m environmental restriction area from the riverbank which is dealt with elsewhere.

Another statutory process that has recently become a requirement from the Department of Labour is a *Construction Work Permit.* None of the thresholds will however be triggered and such Permit is not required.

10. HYDROLOGY

The proposed dam is located in the E33G quaternary catchment, within the larger Olifants River catchment area, see ***Appendix B2***. The application is solely based on existing listed or scheduled water, hence no official hydrology or run-off study was considered necessary. However, for the sake of completeness a downscaled hydrology study was conducted based on aerial photo and contour maps in order to evaluate the sub-catchment with regard to its potential pro-rata contribution within the larger quaternary drainage area.

The runoff calculations presented below are for information purposes based on figures obtained from the ***Water Resources of South Africa, WR2012,*** *by the Water Research Commission (WRC)* in conjunction with the *Elsenburg Delineation Tool* which has been customised for the Western Cape.

The ***Table*** below summarises the characteristics of the local catchment in relation to that of the larger quaternary drainage area:

Catchment	Quaternary:	PRO-RATA
Name / Description - Catchment	E33G	Local Catchment
Area [km²]	894	2.7
Mean Annual Precipitation (MAP) [mm]	186	195
Mean Annual Runoff (MAR) [mm]	1	1
Gross Average Runoff (MAR) [x10^6 m³]	0.93	0.0028

The above table shows the pro-rata hydrological potential based on the local catchment area of the proposed dam which is negligibly small in relation to the WRC model. For this reason the dam will be filled by listed water from the Olifants River.

11. SPILLWAY DESIGN CRITERIA

The application for classification had been submitted some time ago but we have not received it back yet. However, even-though not received, the expected classification of the proposed New Wave dam is potentially that of a ***Small Category II*** dam with ***Significant*** hazard potential.

Guidelines for the determination of appropriate flood sizes appears in SANCOLD "Guidelines on Safety in Relation to Floods", (Report 4, SANCOLD, December 1991) with reference to *Table 5.4* therein for the Suggested Recommended Design Flood return periods (years) as follows:

Dam Size Class	Hazard Rating		
	Low	Significant	High
Small	20 - 50	100	100
Medium	100	100	200
Large	200	200	200

Note, Based on the expected classification and the table above the spillway system of the proposed New Wave dam should be designed for the RDF equal to the ***1:100 year*** flood peak.

Various methods are normally used based on the SANCOLD guidelines and in this case the proposed *Recommended Design Flood (**RDF)*** is equivalent to the 1:100 flood peak to the value of ***12,2m³/s,*** see ***Appendix C1.*** However, the final design would take this to the next level by means of flood attenuation calculations through the dam basin which normally reduces the flood peak to the so-called *Recommended Design Discharge (**RDD)*** which is the actual flood peak leaving the dam. In this case we expect the reduction to be substantial due to the small catchment.

12. GEOLOGY

According to the Geological Survey of South Africa, the proposed dam site is primarily situated on calcareous and gypsiferous formations adjacent to alluvium all of the Tertiary System of the Table Mountain Series, part of the larger Cape System. Refer to ***Appendix B3*** for more information as summarised below.

Q-r2 ~ Calcareous and gypsiferous soil
Çs ~ Red aeolion sand
Nat ~ Graphitic and sericitic schist; phyllite, greywacke, quarzite, impure dolimite, limestone and marble
Og ~ Thin-bedded red to purple sandstone, siltstone and shale, minor thick-bedded quarzose sandstone and matrix-supported conglomerate, vein-quartz gritstone
Op **~** Light-grey, thick-bedded, quartzose sandstone, minor conglomerate and sandstone
m ~ Alluvium

The basin of the dam would mainly be on calcareous and gypsiferous soils and also sandy alluvial formation within the flood plain of the river with the dam wall very close to the contact between these. The formations and site conditions are not ideal from a sealing perspective and the overall permeability of the basin would most probably be jeopardized when using the conventional or typical clay core method, hence the reason behind a full scale HDPE liner, similar to the other dams on the farm. On the other hand, from a structural perspective, the underlying formation and material available on site for forming the embankment, is considered adequate and sufficient both in volume and strength and suitable for a dam of this nature and magnitude.

Based on the maps there are no other geological features nearby worth mentioning such as strikes & dips of strata or geological fault lines. At this stage we don't foresee any particular risk or interdependency between these features with regard to the dam site. If present, such fault zones or features might impact the seismic requirements and subsequently the design of a dam normally dealt with in the final design.

Soil-testing for purposes of the geotechnical design will be incorporated in the final design stage of a dam as it is a costly exercise normally undertaken once the environmental authorisation and water use licence have been obtained. Apart from many years of experience with the design and construction of earthfill dams built on these type of soils and formations, visual inspection of the site conditions including exposed cut-faces as well as scoured and eroded river banks in the near vicinity from the proposed dam, confidence in the geological and geotechnical conditions is also supported by the number of existing dams constructed within a ±2,5km radius from the proposed dam site as shown on the image and listed in the table below.

Category	Number of nearby Dams	Wall Height
-	15	≤7m
I	1	±12m
II	1	±16m

Most of the western bank of the river is situated on alluvium, quartzitic sandstone and calcareous- and gypsiferous soils according to the geological map. Most of the above dams have been successfully constructed on similar formations as of the proposed dam. However, the intention is to seal the dam with a synthetic liner instead of the traditional clay core while the earthfill structure as such would be built according to the typical earth dam concept.

When it comes to the availability of material, the intention is that all bulk earthfill would come from within the dam basin. The bulk requirement is in the order of ±33 000m³ with the flooded area of the dam in the order of 2.3ha which puts the expected average excavation depth in the order of ±2m which is considered reasonable and achievable under these conditions.

This is however still an overview of the general geology pertaining to the site and it may be that the local soil conditions are such that it might have cost implications on the final design as well as on the intended construction procedures. However, dams in the vicinity is constructed of similar material and their behaviour over time is considered consistent and reasonably stable giving confidence in the proposed works.

13. SITE PROFILE

The Water Research Commission have recently launched their updated study of the Water Resources of South Africa replacing the previous versions thereof dated 1990 & 2005. The updated web-based information system, <*waterresourceswr2012.co.za*> launched in 2016, is well recommended by the Department of Water & Sanitation and also 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	17 ~ Olifants-Doring	
Figure 1	Rainfall: MAR	100-200	[mm]
Figure 2a	Evaporation (WR90 S-pan)	1600-1700	[mm]
Figure 2b	Evaporation (A-pan)	2200 -2600	[mm]
Figure 3	Runoff: MAR	0-2.5	[mm]
Figure 4a	Landcover	Cultivated: Orchards (high)	
Figure 6	Simplified Geology (WR90)	Porous unconsolidated and consolidated sedimentary strata	
Figure 7	Soils (WR90) [Depth / Texture / Relief]	Moderate to deep / Sandy loam / Flat	
Figure 8	Sediment (WR90) [Erodibility Index]	14 ~ Medium	High 1-8 Medium 9-15 Low 16-20
Figure 9	Vegetation (Acocks Veld Types)	Karoo and karroid types/ Tropical bush and savanna type (bushveld)	
Figure 10	EWR Management Class	Class C (Moderately modified)	[A-F]
Figure 11	Surface Water Quality - TDS	0-500	[mg/l]
Figure 12	Population Density	0-100	[People / km²]
DWS GRA2 (2005)	Utilisable Groundwater Exploitation Potential	< 2 500	[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.

14. CONCEPTUAL DESIGN

The proposed project entails the design and construction of the proposed New Wave dam based on *Stage 3 of Option 2* as presented in the scoping report with a target storage capacity in the order of ±92 000m³ presented in ***Appendix D*** as follows:

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

Location	31°52' 02.4"S 18°37' 48.0"E
Option:	**Preferred**
Wall crest level (masl)	31.0
Full supply level (masl)	30.0
Lowest ground level (masl)	23.0
Max wall height (m)	8.0
Crest length (m)	441
Crest width (m)	4.0
Upstream slope	1 : 3
Downstream slope	1 : 2
Free board (m)	1.0
Embankment volume (m³)	33 100
Storage capacity (m³)	±92 000
Water surface area (ha)	±2.3
Embankment footprint (ha)	±1.1

B) Foundation: Preliminary visual inspections show a topsoil layer that vary between ±0,3-0,5m thick on a gravely layer between 1,0 to 3,0m thick. The formation is considered adequate and suitable for this type of structure.

C) Material investigation: No formal or in-depth soil analyses have been done as yet. 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 semi-dense mass fill within the up- and downstream embankment zones while the more clayey material will be incorporated within the central zone. 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. This characteristic will be addressed formally in the final design by means of either or a combination of chemical stabilisation, increased compaction and sand filters.

D) Embankment design: The overall layout is a U-shaped dam with a ±440m crest length. The proposed internal profile will be zoned with more clayey material towards the central core zone with unselected up- and downstream mass earthfill zones towards the outer extend. 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 under the liner. Due to the possibility of dispersiveness certain zones will be compacted to a higher density in the order of 98% Proctor. The planned maximum wall height is in the order of ±8m with the upstream slope provisionally at 1v : 3h, the downstream slope at 1v : 2h and the crest width at 4m.

E) Drainage: Due to the height and the possibility of dispersiveness of materials in the surrounding area and pending the outcome of the soil tests plus using an HDPE liner, the embankment will require a built-in drainage system in order to prevent build-up of water beneath the liner which will include a combination of sand strip drains and drain pipes within the lower basin. Apart from this, drainage will also rely on the normal phreatic movement of moisture through the earthfill structure itself.

F) Stability: This aspect is considered part of the final design exercise when a full 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.

G) Outlet works: The outlet is currently planned as a single ø150mm class 9 PVC or HDPE pipe encased 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.

H) Spillway & Flood management: The dam will be equipped with an open side channel spillway with concrete sill at the right flank leading the overflow safely past and away from the embankment toe and into the river. The erodibility index is 16 on a scale of 1 to 20 with 1 being high and 20 being low, in other words the index is classified as low. Given the off-stream location with almost zero uncontrolled inflow, a pipe overflow alone could also suffice which would be confirmed at final design stage. The dry freeboard is provisionally set at 1,0m because of controlled bulk inflow which is slightly less than the SANCOLD recommendations.

I) Maintenance and Operation: The dam is situated in a winter rainfall area and will be filled during the winter season primarily with surplus winter water being pumped from the Olifants river itself. The operation and supervision of the dam will take place under the direct control of the owners or delegated authority on a seasonal cycle.

J) 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 still 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

15. 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.

16. DOWNSTREAM DEVELOPMENT

The proposed dam site is located less than 200m east from the Olifants River and therefore potential flood water from failure of the dam will confluence with the larger river fairly immediately without too much impact on surrounding developments. There are no dwellings and/or buildings under risk within the primary potential flood zone and thereafter the effect seems to be negligible when joining the larger Olifants River. However, the application for classification was submitted to the Dam Safety Office 20 Aug 2021 whom will determine the hazard rating and subsequent classification.

17. 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 and costing sheet, refer ***Appendix C***, as summarised below.

Description	Preferred
Max Wall Height (m)	8.0
Total Earthmoving (m^3)	33,100
Nett Storage Capacity (m^3)	±92 000
Storage : Earthworks	2.78
Estimated Cost (R)	±R3,420mil

Dam sites are normally considered reasonable when storage ratios are more than 3 and poor when less when looking at it from a direct investment perspective. However, it could be argued favourable if the dam is intended for contributing a relatively small portion of the overall irrigation requirements or if it is intended largely for balancing purposes.

In this case the earthworks costing was calculated at a basic rate of **±R45/m³** accounting for ±70% of the total cost which translates to an estimated project cost in the order of **R3,42mill**, excluding fees etc.

18. SUMMARY

New Wave is an off-stream U-shaped dam within the catchment area of the Olifants River and is located on the river bank of the Olifants River itself. The water use license application (WULA) for storing is entirely based on scheduled water with the *Laer Olifants WUA* and thus no existing and/or downstream water uses will be affected in any way.

The increased storage capacity will make it possible to switch from the existing scheduled summer water use in the dry seasons to a surplus winter water use potted up for summer irrigation, thus ensuring both the sustainability of irrigation water while benefiting the river ecology in dry seasons. Idealistically the assurance of irrigation water during summer time, which is the critical time, will lead to the development of ±8ha, being the full potential of the scheduled water. The construction of New Wave dam will therefore also benefit the long-term agricultural development as well as the improvement of the socio-economical status of the farming community of the area.

The layout of the dam is such that it will not receive any surface runoff from the surrounding area, hence relieving pressure on the spillway requirements. Further to this, the dam will be equipped with a piped outlet and a relatively small open channel spillway.

The application for a licence to store water from DWS as well as the environmental impact study for DEADP are both in process of being revised and submitted 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 considered on the expensive side due to a poor storage ratio plus an HDPE liner for sealing purposes, the site conditions are considered suitable and adequate for a dam of this nature.

19. APPENDIXES

A) **Documentation**
~ Title Deed
~ Existing Water Uses
~ Classification Application
~ Water Use Licence Application (*In process -Available on Request)*

B) **Maps**
~ Locality Map
~ Hydrology
~ Geology
~ Properties

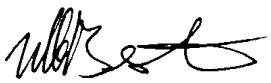
C) **Site Assessment**
~ Flood Peak Calculations
~ Preliminary Design Evaluation: Quantities & Costing

D) **Preliminary Design Drawings**
~ Drawing 2114-S2-01 & 2114-S2-02; Contour Layout Plan & Sections

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 B de Wit, EnviroAfrica, Somerset-West

Appendix A

DOCUMENTATION

- ✔ **A1- Deeds Information**
- ✔ **A2- Existing Water Uses**
- ✔ **A3- Classification**
- ✔ **A4- WULA *(Available on request)***
- ✔ **A5- EIA *(Available on request)***

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MELKBOOM, 384, 101 (CAPE TOWN)

GENERAL INFORMATION

Date Requested	2021/05/28 09:21
Deeds Office	CAPE TOWN
Information Source	WINDEED DATABASE
Reference	-

PROPERTY INFORMATION

Property Type	FARM
Farm Name	MELKBOOM
Farm Number	384
Portion Number	101
Local Authority	CEDERBERG DC
Registration Division	VANRHYNSDORP RD
Province	WESTERN CAPE
Diagram Deed	T2952/1944
Extent	14.8197H
Previous Description	-
LPI Code	C07800000000038400101

OWNER INFORMATION

Owner 1 of 1

Type	COMPANY
Name	CEDERBERG FARMING TRAWAL PTY LTD
ID / Reg. Number	201528723907
Title Deed	T10314/2017
Registration Date	2017/02/28
Purchase Price (R)	4,600,000
Purchase Date	2016/11/19
Share	0.00
Microfilm	-
Multiple Properties	NO
Multiple Owners	NO

ENDORSEMENTS (2)

#	Document	Institution	Amount (R)	Microfilm
1	FARM VR 384/101	-	UNKNOWN	1986 0056 1095
2	B15260/2019	LAND & LANDBOU ONTWIKKELINGSBANK VAN SUID AFRIKA	15,500,000	-

HISTORIC DOCUMENTS (6)

#	Document	Owner	Amount (R)	Microfilm
1	T50938/1990	ZYL PETRUS JOHANNES ADRIAAN VAN	ESTATE	2003 0960 0095
2	T48415/1981	ZYL GIDEON JOHANNES PETRUS VAN	UNKNOWN	1990 1292 0209
3	B22763/2009	-	2,000,000	-
4	B129377/2005	-	5,000,000	2006 0309 2386
5	T97932/2003	PIOEN 1175 PTY LTD	1,100,000	2006 0309 2332
6	B61162/2003	-	3,181,000	2006 0309 2427

Printed: 2021/05/28 09:25

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MELKBOOM, 384, 168 (CAPE TOWN)

GENERAL INFORMATION

Date Requested	2021/05/28 09:25
Deeds Office	CAPE TOWN
Information Source	WINDEED DATABASE
Reference	-

PROPERTY INFORMATION

Property Type	FARM
Farm Name	MELKBOOM
Farm Number	384
Portion Number	168
Local Authority	CEDERBERG DC
Registration Division	VANRHYNSDORP RD
Province	WESTERN CAPE
Diagram Deed	T48416/1981
Extent	13.2793H
Previous Description	-
LPI Code	C07800000000038400168

OWNER INFORMATION

Owner 1 of 1

Type	COMPANY
Name	CEDERBERG FARMING TRAWAL PTY LTD
ID / Reg. Number	201528723907
Title Deed	T10314/2017
Registration Date	2017/02/28
Purchase Price (R)	4,600,000
Purchase Date	2016/11/19
Share	0.00
Microfilm	-
Multiple Properties	NO
Multiple Owners	NO

ENDORSEMENTS (3)

#	Document	Institution	Amount (R)	Microfilm
1	FARM VR 384/168	-	UNKNOWN	1986 0056 1184
2	FROM VR RD 384/125,3	84/105	UNKNOWN	-
3	B15260/2019	LAND & LANDBOU ONTWIKKELINGSBANK VAN SUID AFRIKA	15,500,000	-

HISTORIC DOCUMENTS (6)

#	Document	Owner	Amount (R)	Microfilm
1	B61162/2003	-	3,181,000	2006 0309 2427
2	T97932/2003	PIOEN 1175 PTY LTD	1,100,000	2006 0309 2332
3	T48416/1981	ZYL GIDEON JOHANNES PETRUS VAN	UNKNOWN	1990 1292 0217
4	B129377/2005	-	5,000,000	2006 0309 2386
5	T50938/1990	ZYL PETRUS JOHANNES ADRIAAN VAN	ESTATE	2003 0960 0095
6	B22763/2009	-	2,000,000	-

SERTIFIKAAT VAN INLYSTING

LAER OLIFANTSRIVIER WGV
PRIVAATSAK X1
VREDENDAL
8160
09/02/2021

Tel nr: (027) 2132043/4
Faks nr: (027) 2133519

Eienaar: CEDERBERG FARM TRAWAL EIEND BPK

Sked no	ID	Plaasnaam	Grondbeskrywing	Grootte (ha)	Inlysting (ha)
491	L22A		GED 72 VAN MELKBOOM NO 384	74.4101	42.0000
493	L23		GED 101 VAN MELKBOOM NO 384	14.8197	8.6000
495A	L23/3		168 VAN MELKBOOM 384	13.2793	9.5000
496	L23A		GED 205 VAN MELKBOOM NO 384	27.9000	18.1000
Totaal				**130.4091**	**78.2000**

HOOF BESTUURDER

LORWGV
SKEMA BESTUURDER
PRIVAATSAK / PRIVATE BAG X1

08 FEB 2021

SCHEME MANAGER
VREDENDAL 8160
LORWUA

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: CEDERBERG FARMING TRAWAL PTY (LTD)

1.2. Owner's postal address: PO BOX 50
TRAWAL
Postal code: 8147

1.3. Tel. no. of dam owner: 083 645 5664

1.4. E-mail address of person in control of the dam: j.tredoux@cederbergfarming.com

1.5 Name and postal address of person in control of the dam (*if applicable*)
JACO TREDOUX
PO BOX 50
TRAWAL
Postal code: 8147

1.6. Tel. no. of person in control of the dam: 083 645 5664

1.7. E-mail address of person in control of the dam: j.tredoux@cederbergfarming.com

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

2.1. Property description as per title deed: FARM MELKBOOM 384
PORTION 101 & 168

2.2. Magisterial district: VANRHYNSDORP RD

2.3. Nearest city/town: KLAWER

2.4. Distance to nearest city or town: 10.2 km

2.5. Direction from nearest city or town: SOUTH

2.6. Number of 1:50 000 scale topographical map: * 3118DC

* ***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: 31° 52' 02" Longitude: 18° 37' 48"

2.8. Title deed number: T10314/2017

3. GENERAL INFORMATION

3.1. Name of dam: NEW WAVE DAM

3.2. Name of watercourse or source: Olifantsrivier

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

3.6. Proposed starting date of construction: 2023/01

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

MC BESTER
Lyell Street 62
CERES
Postal code: 6835

3.8. Tel. no. of designer or consultant: 082 732 9851 (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: ** 8,0 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: 440 m

4.4. Gross storage capacity: 92000 m³

4.5. Area of water surface at full supply level: 2,3 ha

4.6. Maximum full supply water depth (*must be provided*): 6,0 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
2.4-2.5	Farm Dwelling and Residential Houses	5-6	190-200	20-30

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				(2) Type of crossing	(3) Visibility distance (m)	Number of vehicles per day
					Width (mm)	Height (mm)	Diameter (mm)	How many?			
4.4km	NRD	Y	10	,0	32000	±8000		Uncer-Tain	B	I 200 Ii 340	±5000
				,						i ii	
				,						i ii	
				,						i ii	
				,						i ii	
				,						i 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

0.25km downstream Joins Olifantsrivier; therefore negligible small impact further downstream
4.4km downstream – N7 – New National Road dimensions uncertain
5.0km downstream – Clainwilliam pipe dimensions uncertain (±1,5-2m diameter; ±5-6m high)

6. DECLARATION BY APPLICANT

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

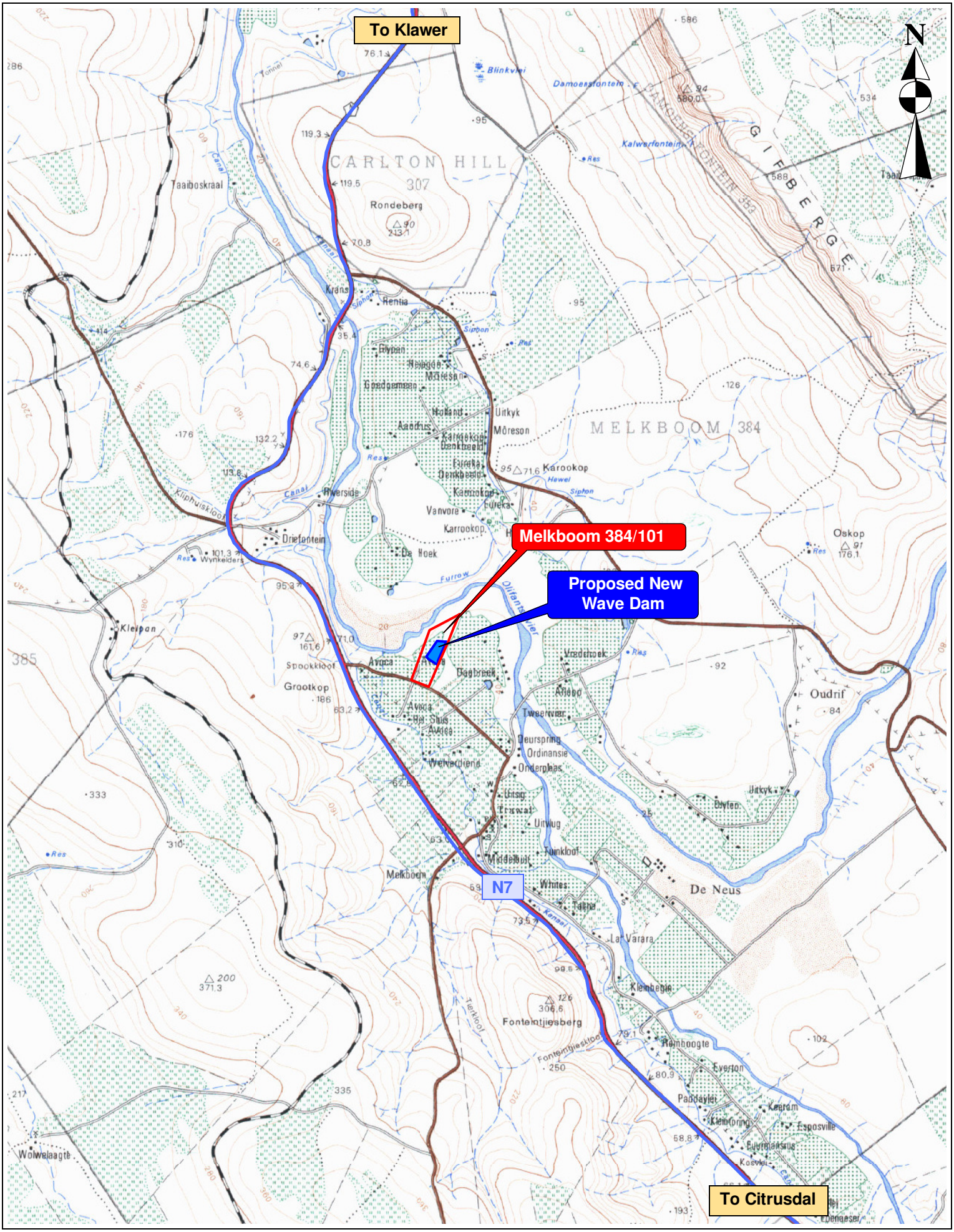
Signature: _____ Date: 20 Aug 2021

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

Appendix B

MAPS

- ✔ B1- Locality Map
- ✔ B2- Hydrological Map
- ✔ B3- Geological Map
- ✔ B4- Properties



SAREL BESTER INGENIEURS BK
Raadgewende Siviele Ingenieurs / Consulting Civil Engineers
Argitekturasdienste / Architectural Services
CK1999/083723
Bus/Box 21, CERES, 6835
T: 023-312 2017
F: 086-514 3350
E: sbri@telkomsa.net
MC BESTER
Pr. Ing., LSAISI: 970598, LSACAP: T1218
Tel 023 312 2017 / Epos sbri@telkomsa.net

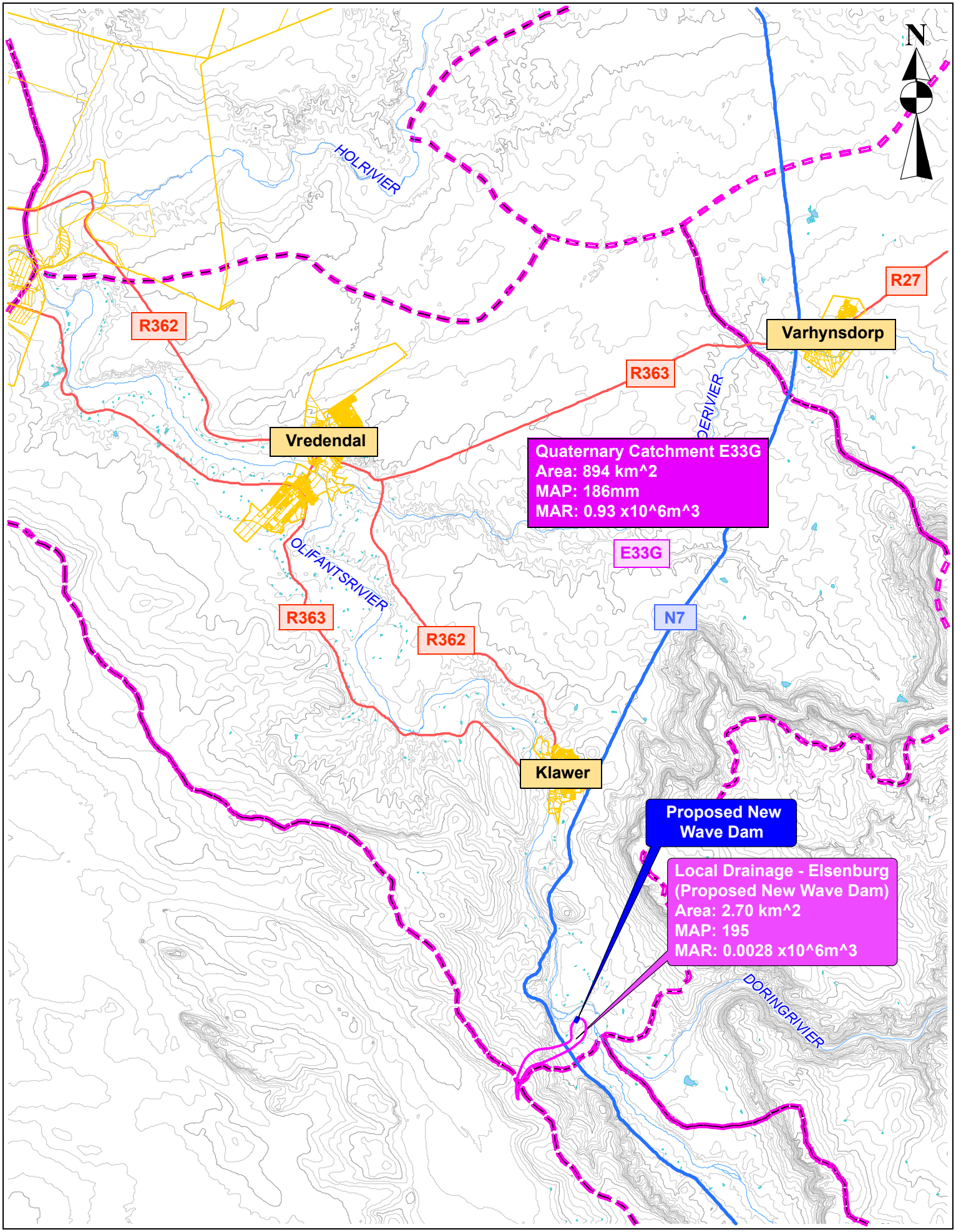
Client: Cederberg Farming
PO Box 50
TRAWEL
8147

Project: Proposed New Wave Dam
LOCALITY MAP

Project Ref: 2114

Map Ref: 3118DC

Scale: 1: 50 000



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MC BESTER
Pr. Ing., LSAISI: 970598, LSACAP: T1218
Tel 023 312 2017 / Epos sbri@telkomsa.net

Client: Cederberg Farming
PO Box 50
TRAWAL
8147

Project: Proposed New Wave Dam
HYDROLOGY MAP

Project Ref: 2114

Map Ref: 3118DC

Scale: 1: 200 000

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Argitekturasdienste / Architectural Services
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MC BESTER
Pr. Ing., LSAISI: 970598, LSACAP: T1218
Tel 023 312 2017 / Epos sbri@telkomsa.net

Client: Cederberg Farming
PO Box 50
TRAWEL
8147

Project: Proposed New Wave Dam
GEOLOGY MAP

Project Ref: 2114

Map Ref: 3118 Calvinia

Scale: 1: 50 000

 A4

SAREL BESTER ENGINEERS CC
Consulting Civil Engineers
Architectural Services

Date: 31/5/2021
MC BESTER
Pr Eng., B. Eng., MSAICE:970598, MSACAP:T1218
P.O.Box 21, CERES,6835
Ph. 023-312 2017
e-mail: admin@sbri.co.za

CLIENT:
Cederberg Farming
P.O. Box 50
TRAWAL
8147

PROJECT:
PROPOSED NEW WAVE DAM ON THE FARM MELKBOOM 384, TRAWAL, CLANWILLIAM RD

DETAIL:
Site Map: Farming Unit Borders

DRAWN	DATE	SCALE	SHEET
R van der Merwe	MAY. 2021	N/A	1 of 2

SURVEYED	DESIGNED	DWG. NUMBER.	REV.
D Willemse MC Bester	Sarel Berster Engineers	2114-SM-01	

Appendix C

SITE ASSESSMENT

- ✔ C1- Flood Peak Calculations
- ✔ C2- Earthworks & Costing

Utility Programs for Drainage
Flood calculations

Sinotech

Project name: 2114
Analysed by: RvdM
Name of river: Tributory of the Olifantsrivier
Description of site: New Wave Dam
Filename: I:\UPD\2114_NewWaveDam_DOV.fld
Date: 23 September 2021

Summary of peak flows (m³/s)

Method	1:2	1:5	1:10	1:20	1:50	1:100	1:200	Design year
Rational	2.524	3.665	4.926	6.436	8.825	11.43		50
Alternative rational	3.049	5.487	7.626	9.976	13.18	15.99	18.10	50
Unit hydrograph	0.316	0.561	0.855	1.233	1.918	2.697		50
Standard design flood	1.367	4.800	7.988	11.60	16.98	21.51	26.31	50
Empirical			3.953	5.390	7.546	9.582		50
Statistical: LN								
Statistical: LEV1								
Statistical: LP3								
Statistical: EV1								

Class of road = Class 1 Primary Distributors

PRELIMINARY EVALUATION OF THE PROPOSED EARTH DAM: QUANTITIES AND COSTING

Client: Cederberg Farming
Address: P.O. Box 50, Trawal, 8147
Dam: New Wave Dam – Opt 2
Notes: 1. Survey from Douw Willemse
2. Within 32m restriction zone
3

Project Nr.: 2114
Annexure:
Date: 31-May-21

Version: Apr 2020

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

Design Parameters & Assumptions:

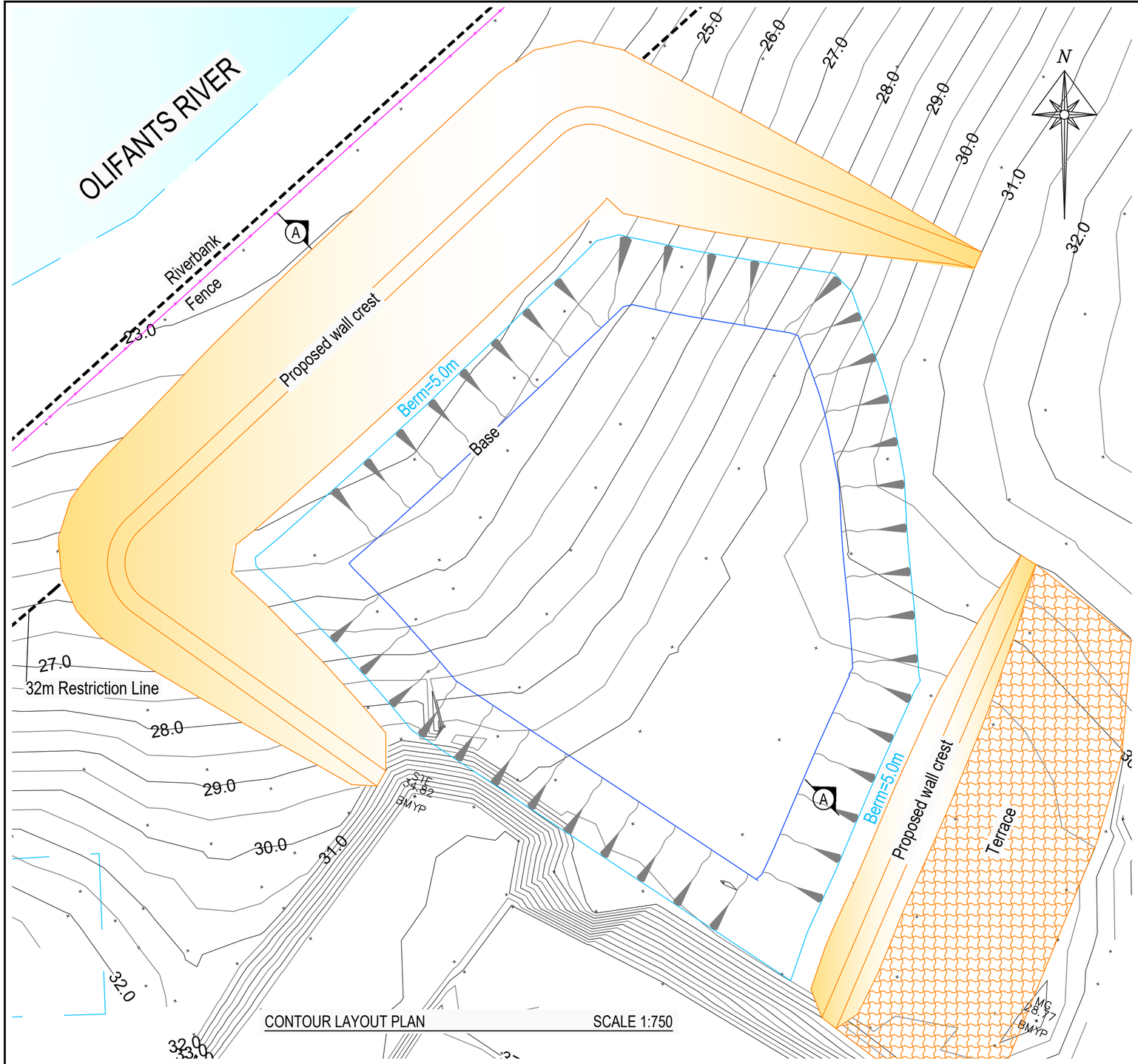
Crest width (m):	4.0	*Cut-off depth (m):*	0.00	*Earthmoving Cost (R/m³):*	45.00
Upstream slope 1:	3.0	*Cut-off base (m):*	0.00	*Basic Fees Scale (%):*	7.5%
Downstream Slope 1:	2.0	*Cut-off slope 1:*	0.00	*Fees Base Value (R):*	R 11,500,000
Percentage of fill gaining capacity:	0%	*Application (m³/ha):*	7,000	*Enlargement (Y/N):*	N
		Capacity Yield Factor:	1.3		

Item	Description		Unit	Stadium / Wall position / Terrain				
				Stadium 1	Stadium 2	Stadium 3	Stadium 4	Stadium 5
1	EARTHWORKS					<< Preferred >>		
1.1	Wall crest level		masl	30.50	30.80	31.00		
1.2	Lowest ground level beneath crest		masl	23.00	23.00	23.00		
1.3	Maximum wall height		m	7.50	7.80	8.00	#N/A	#N/A
1.4	Wall crest length		m	413.0	433.0	441.0		
1.5	Earthworks volume – excl cut-off		m³	27,500	30,400	33,100		
1.6	Cut-off trench excavation volume		m³	*0*	0	0	#N/A	#N/A
1.7	**Gross Earthworks**		**m³**	**27,500**	**30,400**	**33,100**	**#N/A**	**#N/A**
2	STORAGE CAPACITY							
2.1	Full supply level		masl	29.50	29.80	30.00		
2.2	Draw-off / Empty level		masl	25.50	25.50	25.50		
2.3	Total free-board		m	1.00	1.00	1.00	0.00	0.00
2.4	Max depth above draw-off level		m	4.00	4.30	4.50	0.00	0.00
2.5	Nett capacity from contour model		m³	73,000	82,000	92,000		
2.6	Capacity gain from excavations		m³	0	0	0	0	0
2.7	Capacity gain over existing dam		m³	0	0	0	0	0
2.8	**Potential gross capacity**		**m³**	**73,000**	**82,000**	**92,000**	**0**	**0**
2.9	Water surface		ha	2.00	2.10	2.30		
2.10	Potential gross (yield) irrigation		ha	13.56	15.23	17.09	0.00	0.00
2.11	Average water depth		m	3.65	3.90	4.00	#DIV/0!	#DIV/0!
2.13	Recommended pipe diameter		mm	150	150	150	150	150
3	COSTING (Excl VAT)							
3.1	Overhead & Preparation	10%	Rand	176,786	195,429	212,786	#N/A	#N/A
3.2	Earthworks (excavate & construct)	70%	Rand	1,237,500	1,368,000	1,489,500	#N/A	#N/A
3.3	Concrete & Outlet works	10%	Rand	176,786	195,429	212,786	#N/A	#N/A
3.4	Diverse & Unforeseen	10%	Rand	176,786	195,429	212,786	#N/A	#N/A
3.5	HDPE Liner @ ±R51/m²		Rand	1,122,000	1,178,100	1,290,300		
3.6	**Estimated Construction Cost**		**Rand**	**2,889,857**	**3,132,386**	**3,418,157**	**#N/A**	**#N/A**
3.7	Engineering Fees Percentage		%	*9.5%*	9.5%	9.5%	#N/A	#N/A
3.8	Engineers costs (ECSA Fees)		Rand	275,780	298,925	326,196	#N/A	#N/A
3.9	Engineers costs (Disbursements)		Rand					
3.10	**Estimated Engineers Costs**		**Rand**	**275,780**	**298,925**	**326,196**	**#N/A**	**#N/A**
3.11			Rand					
3.12			Rand					
3.13	**Total estimated project cost**		**Rand**	**3,165,637**	**3,431,310**	**3,744,353**	**#N/A**	**#N/A**
4	INDICATORS							
4.1	Ratio (Gained Storage : Earthworks)		>3	*2.65*	2.70	2.78	#N/A	#N/A
4.2	Cost per storage capacity gained		R/m³	*43.36*	41.85	40.70	#N/A	#N/A
4.3	Cost per irrigation hectare gained		R/ha	*233,503*	225,321	219,151	#N/A	#N/A

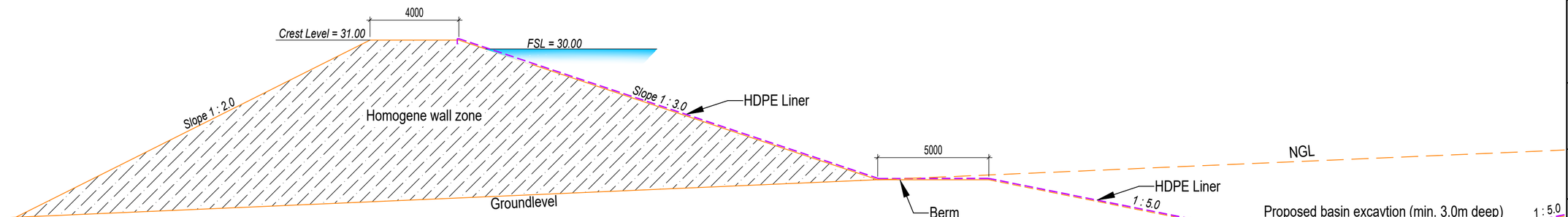
Appendix D

PRELIMINARY DESIGN DRAWINGS

✔ DWG 2114-S2-01
✔ DWG 2114-S2-02



CONTOUR LAYOUT PLAN SCALE 1:750



TYPICAL EMBANKMENT / BASIN CROSS SECTION A-A SCALE 1:150

TECHNICAL INFORMATION: NEW WAVE DAM	
Wall crest level (masl)	: 31.00
Wall crest width (m)	: 4.00
Wall crest length (m)	: 441.00
Lowest ground level downstream (masl)	: 23.00
Maximum wall height (m)	: 8.00
Upstream slope (1 in)	: 3.00
Downstream slope (1 in)	: 2.00
Embankment earthfill (m³)	: 33 100
Full supply level (masl)	: 30.00
Total freeboard (m)	: 1.00
Netto storage capacity (m³)	: 92 000
Flooded area (ha)	: ±2.30

REVISION

SAREL BESTER ENGINEERS
Consulting Civil Engineers
Architectural Services

..... Date: 7/9/2021
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Fax: 023-312 3802
e-mail: admin@sbri.co.za

Cedarberg Farming
P.O. Box 50
TRAWAL
8147

PROJECT:
PROPOSED NEW WAVE DAM ON THE FARM MELKBOOM 384, TRAWAL, CLANWILLIAM RD

DETAIL:
Contour Layout Plan, Typical Cross Section

DRAWN	DATE	SCALE	SHEET
SC Hartzenberg	SEPT. 2021	as shown	1 of 2
SURVEYED: D Willemse, C Bester	DESIGNED: Sarel Bester Engineers	DWG. NUMBER: 2114-S2-01	REV.

 A2

CONTOUR LAYOUT PLAN (AERIAL PHOTO) SCALE 1:1000

REVISION

SAREL BESTER ENGINEERS
Consulting Civil Engineers
Architectural Services

..... Date:7/9/2021
MC BESTER
Pr. Eng., B.Eng., MSAICE:970598, SACAP:T1218
P.O. Box 21
62 Lyell Street
CERES, 6835
Ph: 023-312 2017
Fax: 023-312 3802
e-mail: admin@sbri.co.za

OWNER
Cedarberg Farming
P.O. Box 50
TRAWAL
8147

PROJECT
PROPOSED NEW WAVE DAM ON THE FARM MELKBOOM 384, TRAWAL, CLANWILLIAM RD

DETAIL
Contour Layout Plan (Aerial Photo)

DRAWN	DATE	SCALE	SHEET
SC Hartzenberg	SEPT. 2021	as shown	1 of 2

SURVEYED	DESIGNED	DWG. NUMBER	REV.
D Willemse C Bester	Sarel Bester Engineers	2114-S2-02	

 A3