STORMWATER MANAGEMENT PLAN REPORT

PROJECT NAME: UNIVERSITY OF MPUMALANGA STUDENT RESIDENCE

15 April 2021

PREPARED FOR

AES CONSULTING

PREPARED BY

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RECORD OF REVISIONS

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Annexure A: Geotechnical Report

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1 EXECUTIVE SUMMARY

FIJ Consulting is part of a professional team which was appointed by AES Consulting to design and monitor construction for proposed students' residence for Mpumalanga University. The proposed development will be able to accommodate 3000 students.

The proposed residence is located Portion 33 of the Farm Friedenheim 282 (Bee Eaters Farm) in Mbombela. The total area of the development is 11.7Ha.

The stormwater management plan report wishes to advise the client, professional team and local authorities on how the stormwater discharge from the development will be controlled so that the development complies with conditions listed in the National Water Act.

2 INTRODUCTION AND TERMS OF REFERENCE

2.1 Terms of Reference

The purpose of the Stormwater Management Plan Report is to provide a preliminary layout of stormwater reticulation and associated infrastructure to effectively manage run off from the proposed development in accordance with relevant legislation and engineering practices.

The report also details the design rationale of the stormwater management infrastructure such as attenuation pond and pipe network.

FIJ Consulting Engineers is part of a professional team appointed by AES Consulting to design and monitor construction of civil engineering services for proposed Mpumalanga University students' residence on Bee Eaters Farm in Mpumalanga Province.

3 RELEVANT INFORMATION

3.1 Location of Proposed Development

The total site area is 11.7 Ha and the site is about 6.5 km north east of Mbombela CBD. The geographical coordinates of the site are as follows:

Latitude: 25° 26' 5.02"S,

Longitude: 31° 0' 48.60"E.

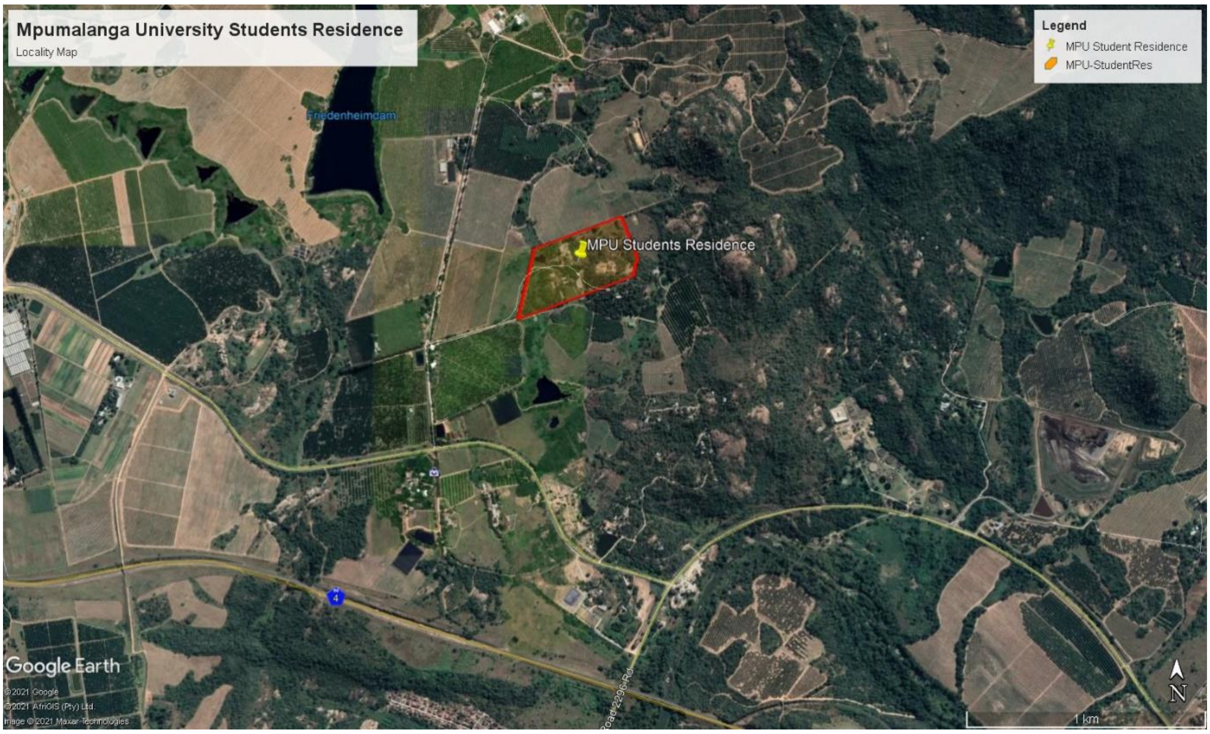

Figure 1: Locality of Proposed Students Residence

3.2 Current Land Use

The site currently consists of single storey structures and these structures are being used as offices and accommodation.

3.3 Proposed Land Use

The proposed development will consist of 15 students' residence blocks. The blocks will be three storeys high. The site development plan for this development is shown in the Annexures.

3.4 Geotechnical Conditions

A geotechnical investigation was conducted by Latavha (Pty) Ltd in February 2021. The following were the main outcomes of the investigation.

- Based on the fieldwork findings there are no geotechnical constraints within the proposed area, therefore the site is suitable for the proposed project.
- No groundwater seepage encountered in any of the trial pits excavated on site
- The site comprises of colluvium horizon at the top underlain by residual granite and granite bedrock.
- The CBR tested classifies as G6 to >G9 according to COLTO classification.
- The in-situ soil found at this site has some poor to good compatibility characteristics and therefore material that classify as G6 on site can be used as backfilling layers during construction stage.
- Material on-site are classified as SC and SM class in accordance to Unified Soil Classification System (USCS).
- According to Van der Merwe (1964) these material layers has a non-plastic to low potential for swell and is not potential expansive.
- Higher quality material will have to be brought to site during construction stage, there is not enough material on site to satisfy the quantities needed for backfilling, therefore material will have to be sourced.
- Control of surface water is essential on this site to protect the proposed development against the ingress of water.
- Heavy duty dump proof membrane must be placed which will not allow water to pass through.
- **For urban planning purpose the site is zoned according to the NHBRC classification systems. The entire site is classified as a Zone R/C1/S1 site.**
- The site is covered by transported material i.e. colluvium soil which is underlain by non to low expansive residual granite. It might be economically feasible to consider **Pad foundation** for the proposed three storey structures. The foundation should be placed on a soft bedrock expected at approximately 0.5m to 1.5m below ground level, compact the floor of excavation to 98% Modified AASHTO density before constructing the foundation. The zonation map attached shows the different depth of the bedrock. Dig up to 300mm and re-compact the in-situ for surface beds, concreate reinforcement mesh may be used. Alternatively, deep strip footing with reinforcement may be considered at the same depth with concreate reinforcement mesh.

The full geotechnical report is attached in the Annexures.

3.5 Site Topography and Vegetation

The site slopes towards the west. The highest elevation is 693m and the lowest elevation is 639m. There site has medium dense vegetation.

The eastern side of the site is dominated by a rock outcrop with steep sides.

4 STORMWATER DESIGN

4.1 Design Standards

The selection of analysis, assessment and design standards was based on the following guidelines:

- Chapter 6, “Stormwater Management” of the **Red Book** (“Guidelines for Human Settlement Planning and Design”, compiled under the patronage of the Department of Housing by the CSIR, Division of Building Technology, dated 2000),
- “**Drainage Manual**” by The South African National Roads Agency Limited (SANRAL) 5th Edition and,

The Recurrence Interval (RI)/Return Period (RP) is the average interval between storm events, and is usually expressed in years. This is equal to the reciprocal of the annual probability of the storm event occurring, e.g., a 1 in 50-year RI storm event has an annual probability of occurrence of 2 %.

Stormwater drainage systems are classified in the **“Red Book”** as follows:

- **Major drainage system** - a stormwater drainage system that caters for severe, infrequent storm events, supported by the minor drainage system.
- **Minor drainage system** - a stormwater drainage system which caters for frequent storms of a minor nature.

The applicable analysis, assessment and design standard will be those given in Tables 6.1 and 6.2 of the “Red Book” and reproduced in Table 2 and Table 3 below:

No.	Land-Use	Design Storm Return Period
1	Residential	50 years
2	Institutional (e.g., schools)	50 years
3	General Commercial and Industrial	50 years
4	High Value Central Business Districts	50 – 100 years

Table 1: Design Flood Frequencies for Major Stormwater Drainage Systems

Source: Table 6.1 of the “Red Book”

No.	Land-Use	Design Storm Return Period
1	Residential	1 - 5 years
2	Institutional (e.g., schools)	2 - 5 years
3	General Commercial and Industrial	5 years
4	High Value Central Business Districts	5 – 10 years

Table 2: Design Flood Frequencies for Minor Stormwater Drainage Systems
Source: Table 6.2 of the "Red Book"

In addition to these standards, Section 144 of the "National Water Act" (Act No. 36 of 1998) requires that the 1 in 100-year RP flood levels be indicated on a layout plan before establishing a township development. Similarly, the "Development Facilitation Act" (Act No 67 of 1995) requires that flood levels of the 1 in 50-year RP flood be indicated on a layout plan. The school is close to a water course. The 1 in 100 RP and 1 in 50 RP floodlines are shown on the layout drawings.

4.2 Stormwater Infrastructure Design Criteria

The school will be served by a conventional stormwater drainage system consisting of surfaced driveways, open channels, and pipe culverts.

The applicable design criteria are shown below in Table 5. These have been extracted and adapted from the **"Red Book"**.

Classification	Internal Roads
Recurrence Interval: Major	1:50 years
Recurrence Interval: Minor	1:5 years
Encroachment: Major	150mm above the crown of the road
Encroachment: Minor	No kerb overtopping
Roadside Channels	Min. gradient 0.5%
	Max. velocity 3 m/s
Channel Lining	Channels to preferably be grassed where possible. Concrete lined channels to be used where required.
Low points	1:25 years

Table 3: Design Criteria for Stormwater Infrastructure
Source: Red Book

Pipes: Minimum Diameter – 450mm diameter

Minimum 0.7 m/s self-cleansing velocity

Minimum Slope of 0.5%

Class 100D and 50D

Minimum Pipe Cover – 600mm under roads

450mm elsewhere in the road reserve

Trenches: Widths to SABS 1200, Class B bedding, backfilling to 90% Mod AASHTO or 93% Mod AASHTO in road reserves.

4.3 Catchment Hydrologic Modelling

The **SCS Hydrology Method** was used for the runoff calculations, as it is widely accepted both internationally and locally for the estimation of storm runoff peak flows and volumes. The model was developed by the United States Department of Agriculture's Soil Conservation Service (SCS). The model has been adapted for South African use, originally by Schulze and Arnold in 1979, and most recently in Water Research Commission Report Nos. TT31/87, TT32/87 and TT33/87, titled "Flood Volume and Peak Discharge from Small Catchments in South Africa based on the SCS Technique" by J C Smithers and R E Schulze, Department of Agricultural Engineering, University of Natal, Pietermaritzburg, dated 1987.

4.3.1 Storm Duration

The design storm duration is selected to exceed the catchment's time of concentration, which is the time required for a water particle to travel from the farthest point of the catchment to the outlet.

The time of concentration was determined using the method prescribed by the Rational method. The time of concentration is derived from the length of the longest watercourse, slope and nature of drainage (Sheet flow vs. Channel flow).

4.3.2 Rainfall Depth

The computer programme "Design Rainfall Estimation in South Africa" which accompanies the Water Research Commission Report titled "Design Rainfall and Flood Estimation in South Africa" by JC Smithers and RE Schulze, School of Bioresources Engineering and Environmental Hydrology, University of Natal, Pietermaritzburg, WRC Project No. K5/1060, dated December 2002 was used to complete a rainfall station locality search and to obtain storm rainfall depth data from the surrounding rainfall stations. The applicable rainfall data is determined by means of weighted average rainfall data from the surrounding rainfall stations. The weighting is based on the distance from the specified locality to the specific rainfall station.

A summary of the rainfall station searches, and related data is summarised in Table 5 on the next page.

Station Name	SAWS Number	Distance from Proposed Dev	Length of Record (Yrs)	Coordinates	Mean Annual Precipitation, MAP (mm)	Altitude (mams)
MAYFERN	0556088_W	4.0 km	69	Lat = 25º 28′ Long = 31º 2′	725	655
NELSPRUIT RES	0555837_A	5.7 km	87	Lat = 25º 27′ Long = 30º 58′	750	648
NELSPRUIT	0555837_W	5.7 km	87	Lat = 25º 27′ Long = 30º 58′	750	648
THE KNOLL	0556143_W	9.0 km	53	Lat = 25º 22′ Long = 31º 4′	772	771
KARINO	0556178_W	9.7 km	39	Lat = 25º 28′ Long = 31º 6′	745	520
UMGENYANA	0556141_W	11.5 km	36	Lat = 25º 21′ Long = 31º 5′	870	860

Table 4: Rainfall Stations Data

The table below summarises the design rainfall depths obtained from the Rainfall Station Data mentioned in the page before.

Storm Recurrence	5 year	10 year	20 year	50 year	100 year
24-hour Storm Duration Rainfall Depth	113.3mm	137.6mm	163.6mm	201.7mm	233.9mm

Table 5: Design Rainfall Depths

4.4 Stormwater Drainage System

The minor stormwater system will consist of a network of pipe culverts sized to accommodate the minor storm event runoff. Runoff from major storm events (flows larger than 1 in 5-year runoff) will be accommodated by a combination of the network of pipe culverts and surface flow in the car park area. The combined stormwater system will be designed to ensure that no flooding of properties occurs in the major flood event (1 in 50-year storm).

On-site attenuation for the development is shown in Annexures. On-site attenuation entails attenuation ponds located within the erf at positions shown in the layout drawing.

4.5 Hydrological Results

The following table shows calculated pre-development flows and post-development unattenuated flows the proposed development.

Catchment No.	Pre-Development Flows (m^3/s)			Post-Development Flows (m^3/s)		
	1:5	1:20	1:50	1:5	1:20	1:50
1	0.21	0.50	0.74	0.86	1.55	2.07
2	0.70	1.44	2.03	1.84	3.35	4.52

Table 6: **Catchment Run-off**

5 STORMWATER DETENTION POND DESIGN

5.1 Stormwater Detention Pond Design Criteria

The detention ponds have been sized and designed based on the following criteria:

Classification	Criteria
Maximum storage time	24 hrs
Side slopes	1:2
Pond Depth	Average Depth 1.5m
Attenuated Capacity	up to 1:25 year
Emergency Overflow	1:50 year and above

Table 7: **Detention Pond Design Criteria**

The detention ponds will incorporate energy dissipation devices and silt removal traps downstream of the inlets. The primary outlet (1:5yr discharge) and secondary outlet details are shown on the engineering drawings. The discharge of flows greater than the 1 in 25-year event up to the 50-year event will flow over the emergency spillway. The emergency spillways will discharge into the public open space areas provided.

5.2 Detention Pond Details

There is a proposed detention pond will be located within the development and the location is as shown on the layout drawing.

The final details of the ponds will be furnished during the detailed design stage.

5.3 Pond Hydraulic Modelling Results

The Detention Storage Design was done in the HydroCAD design software. Table 9 on the next page shows the preliminary modelled results for the ponds. The table indicates the required storage volume. More accurate figures will be determined at detail design stage. Hydrographs for the Pre-development, Post-development hydrographs are shown in the Annexures.

The table below shows capacities of surface attenuation against the required attenuated volumes.

Attenuation Pond No.	Attenuation Volume Required (m^3)
1	6 480m^3
2	4 385m^3

Table 8: **Attenuation Ponds Capacities**

5.4 Pond Outlet Structures

The pond will consist of the following outlet structures:

Pond Name	Outlet Structure	Elevation	Purpose
Attenuation Pond 1	360mm diameter orifice	650.100m	1: 5 RI Flow
	300mm x 150mm orifice	651.600m	1:25 RI Flow
	1 300 mm wide weir	654.300m	1:50 RI Flow
Attenuation Pond 2	360mm diameter orifice	640.300m	1: 5 RI Flow
	300mm X 200mm orifice	641.600m	1:25 RI Flow
	1 200 mm wide weir	642.400m	1:50 RI Flow

Table 9: Pond Outlet Structures

5.5 Hydrographs

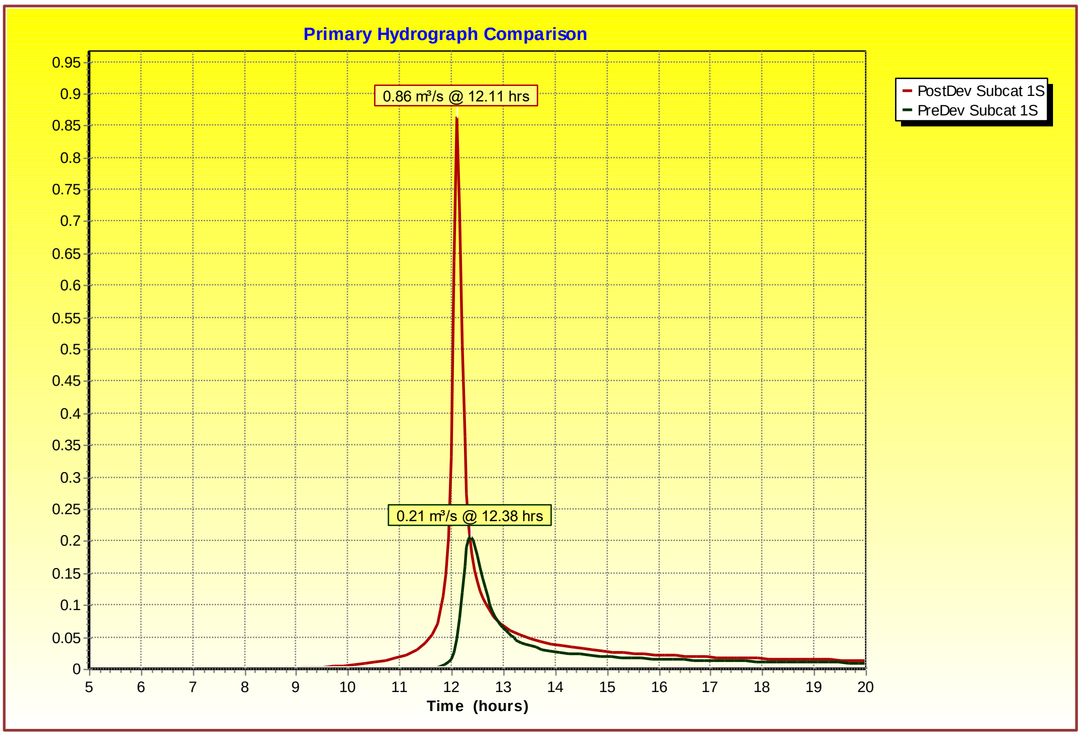

Figure 2: 1: 5 RI Pre and Post Development: Catchment 1

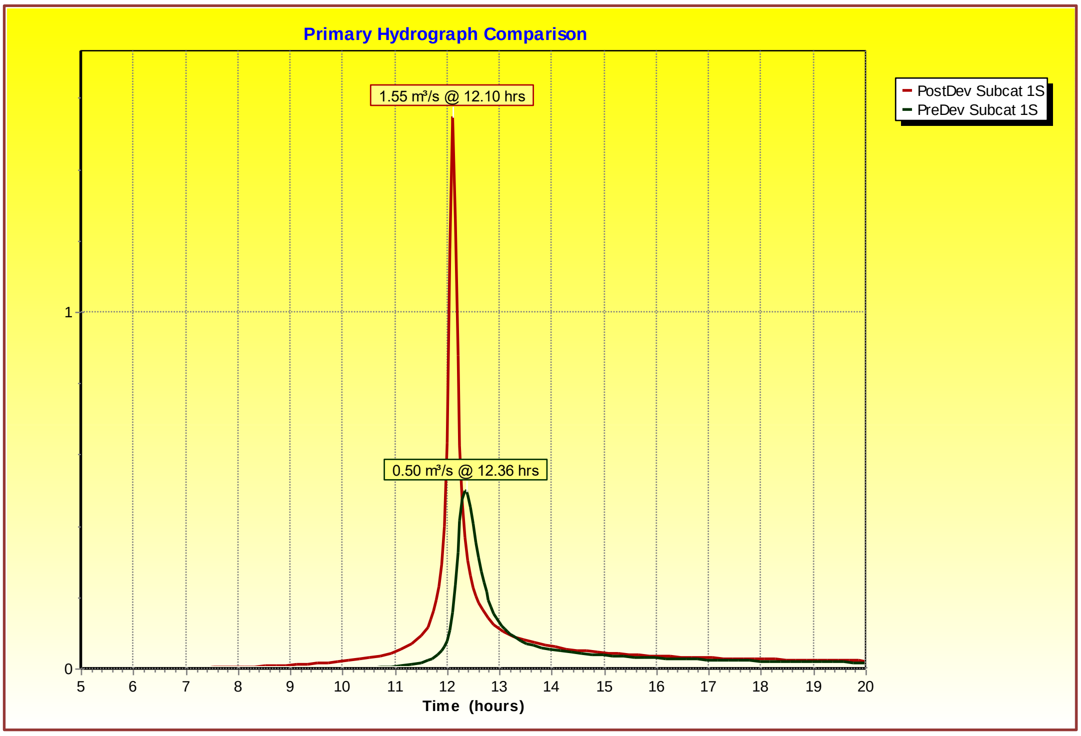

Figure 3: 1:20 RI Pre and Post Development: Catchment 1

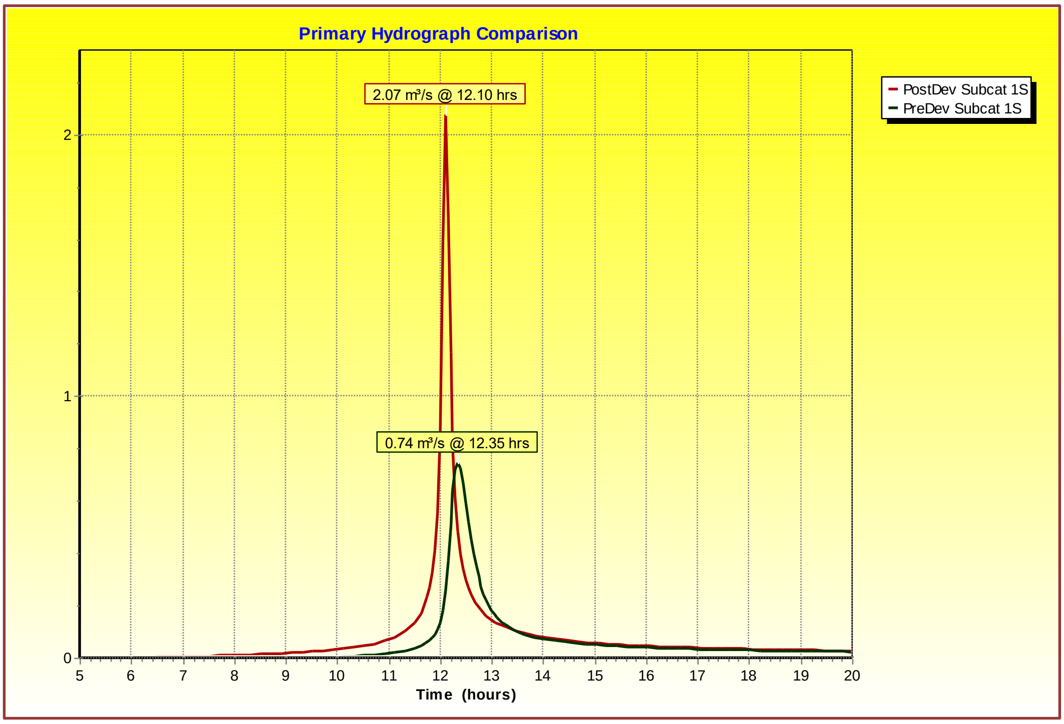

Figure 4: 1:50RI Pre and Post Development: Catchment 1

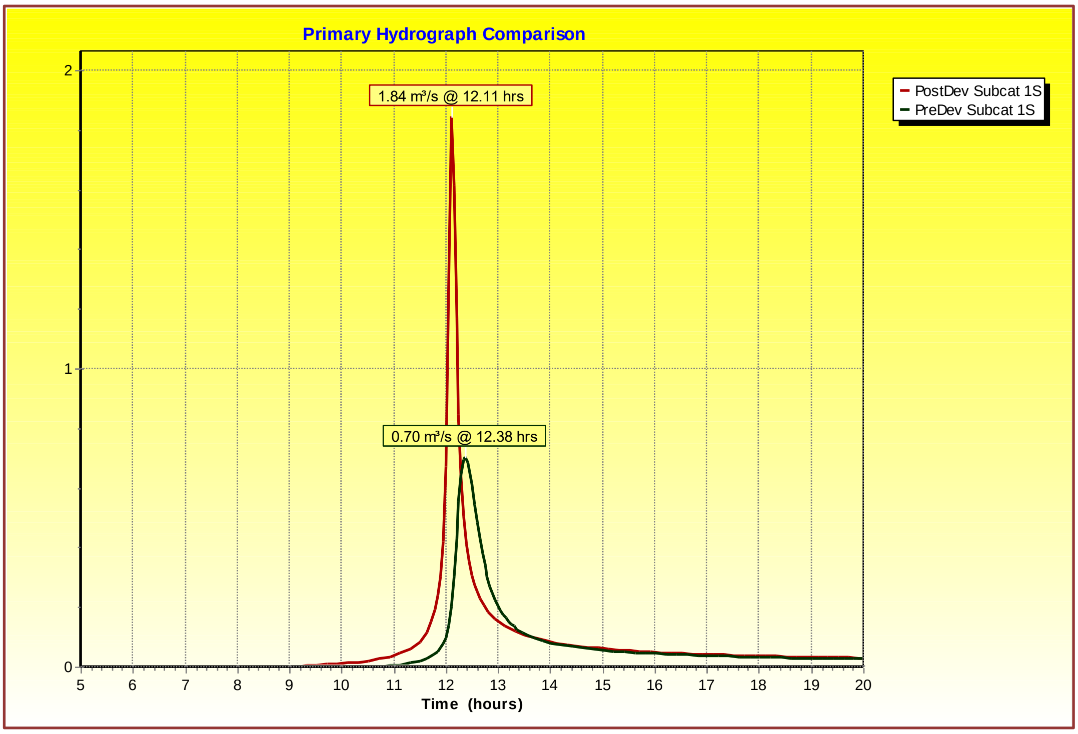

Figure 5: 1:5 RI Pre and Post Development: Catchment 2

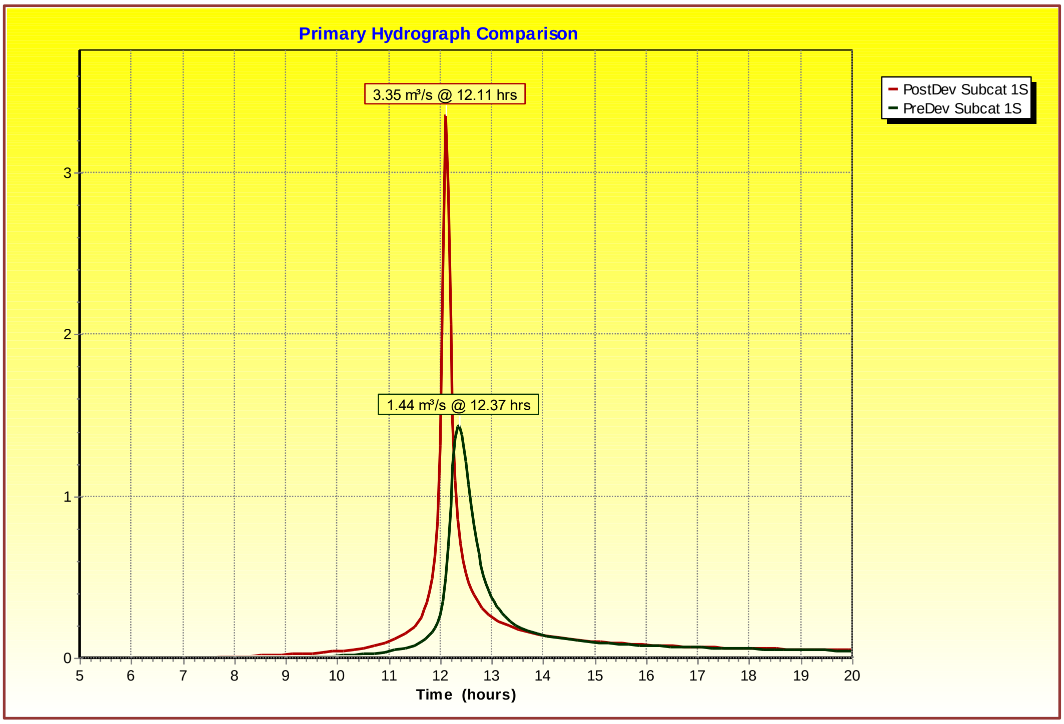

Figure 6: 1:20 RI Pre and Post Development: Catchment 2

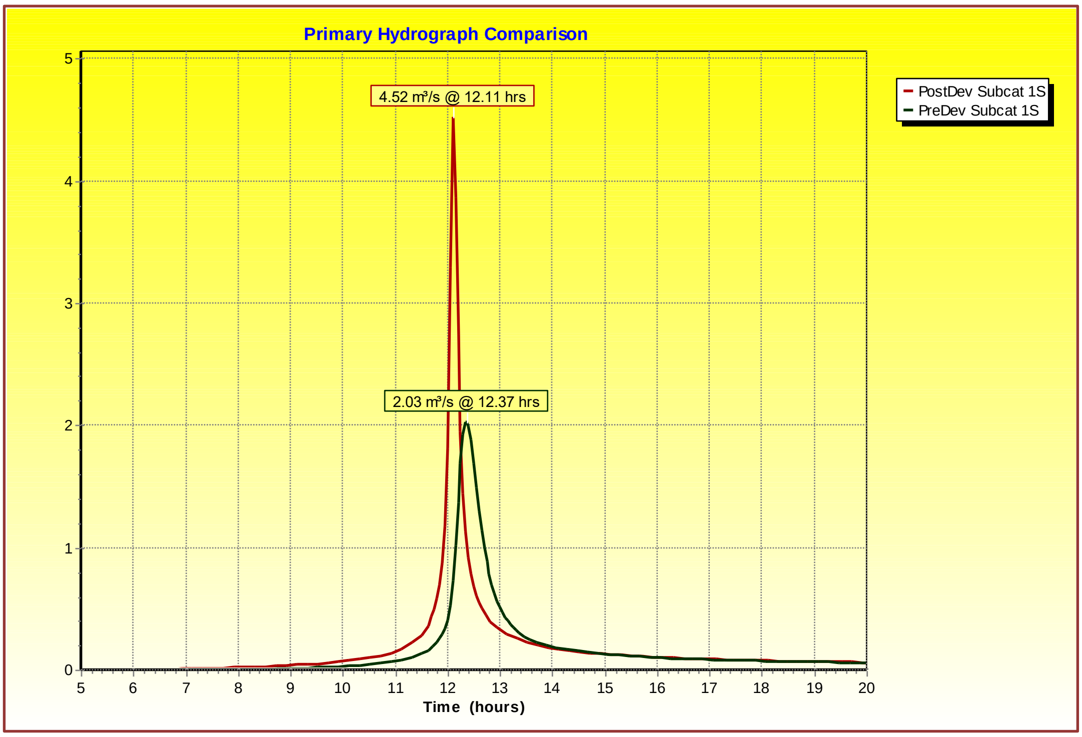

Figure 7: 1:50 RI Pre and Post Development: Catchment 2

6 STORMWATER INFRASTRUCTURE MAINTENANCE ACTIVITIES

A synopsis of the required stormwater infrastructure and detention pond maintenance activities and frequencies are given below:

6.1 Stormwater Channels

- Routine cleaning and de-silting of channels.
- Removal of debris to prevent channel blockage.

6.2 Stormwater Culverts

- Routine cleaning and de-silting of culverts.
- Removal of debris to prevent culverts blockage.
- Repairs of embankment after overtopping of culvert structure.
- Routine inspection and repairs, if required, of approach channels and foundations.

6.3 Detention Ponds

To ensure optimal performance, the detention ponds shall require annual inspection, preferably at the start of the rainy season. The following is a brief list of the maintenance items that require consideration.

- All detention ponds must be accessible from the internal road network.
- Routine mowing and the possible trimming and / or removal of unwanted vegetation – twice per annum.
- The removal of debris and litter from the outlets to prevent clogging and from the basin area to improve aesthetics - three times a year. Firstly, cleaning at the beginning of the summer rainy season (September, October), secondly after the first rains (November) and again towards the end of the rainy season (February).
- The condition of the structures, embankments, inlets and outlets must be inspected annually. This must include checking for animal burrows, cracking, bulging and subsidence of pond walls.
- We envisage that silt will need to be removed at least three times a year. First cleaning at the beginning of the summer rainy season (September, October), secondly after the first rains (November) and again towards the end of the rainy season (February). It is also likely that during the construction period more frequent silt removal will be required. Vehicular access into the pond will be provided to remove silt from the silt trap.
- The emergency spillway should be clear of obstructions at all times.

7 STORMWATER MANAGEMENT DURING CONSTRUCTION

The existing stormwater infrastructure should be maintained during construction activities to prevent the deterioration and subsequent failure of current infrastructure.

Temporary berms should be constructed on the downstream perimeter of the site to channel runoff containing silt to a location where silt is allowed to settle prior to discharging into the existing stormwater infrastructure or natural watercourse.

8 CONCLUSION

The stormwater reticulation for the proposed students' residence will consist of piped network and two stormwater attenuation ponds. The stormwater attenuation ponds will have estimated capacities of **6 480**m^3 and **4 385**m^3.

ANNEXURE

A

GEOTECHNICAL REPORT

ANNEXURE

B

PROPOSED STORMWATER RETICULATION AND DETAILS

STORMWATER LAYOUT
SCALE 1:500

NOTES : STORMWATER RETICULATION

STORMWATER NOTES AND SPECIFICATIONS

1. ALL STORMWATER PIPES AND INVERTS ARE POSITIONED ACCORDING TO AVAILABLE SURVEY INFORMATION AND MAY REQUIRE ADJUSTMENT AS INSTRUCTED BY THE ENGINEER TO SUIT THE CONDITIONS ON SITE.
2. CONNECTION TO EXISTING MUNICIPAL MANHOLES OR ANY DISCHARGE POINTS TO BE CARRIED OUT AS PER THE REQUIREMENTS OF THE LOCAL AUTHORITY.
3. THE LOCAL AUTHORITY'S SPECIFICATIONS SHALL TAKE PREFERENCE SHOULD THEY DIFFER FROM ANY OTHER SPECIFICATIONS.
4. THE INVERT LEVEL OF THE EXISTING PROPOSED CONNECTION OR DISCHARGE POINTS SHALL BE CHECKED TO BE CORRECT BEFORE CONSTRUCTION COMMENCES. CONFIRMATION OF LEVELS SHALL BE FORWARDED TO THE ENGINEER IN WRITING.
5. ALL MANHOLES SHALL BE COORDINATED AS INDICATED ON THE SETTING OUT TABLES.
6. STORMWATER PIPES SHALL BE PREFABRICATED REINFORCED CONCRETE CLASS 100D TO SANS 677, UNLESS OTHERWISE SHOWN.
7. PIPE JOINT TYPE TO BE INTERLOCKING OGEE, UNLESS OTHERWISE SHOWN.
8. INTERLOCKING JOINTS TO BE SEALED ON THE OUTSIDE WITH TWO LAYERS OF BURLAP OF 340g/m2 PRE-IMPREGNANTED WITH A BITUMINOUS EMULSION, OR SIMILAR APPROVED MATERIAL. THE STRIP OF BURLAP SHALL BE AT LEAST 150mm WIDE AND PLACED SYMMETRICALLY OVER THE JOINT.
9. PIPES TO BE LAID WITH A MINIMUM COVER TO PIPE OF 1000mm UNDER TRAFFICKED AREAS AND 800mm ELSEWHERE, U.N.O.
10. ALL PIPE CONNECTIONS EXCLUDING BACKDROP CONNECTIONS SHALL BE CROWN TO CROWN (SOFFIT TO SOFFIT).
11. TRENCHING, BEDDING AND BACKFILLING SHALL CONFORM TO SABS 1200LB , SABS 1200DB AND IN PARTICULAR TO CLASS B BEDDING, BACKFILL COMPACTED TO 93% Mod AASHTO.
12. BEDDING TO BE 0.25xDIA OR MINIMUM 100mm THICK AND COMPACTED TO 90% Mod AASHTO.
13. IN AREAS WHERE THE INSITU MATERIAL IS NOT SUITABLE TO SUPPORT COMPACTION OF BEDDING SUCH AS AREAS WITH A HIGH WATER TABLE, A 200mm THICK PIONEERING LAYER SHALL BE LAID PRIOR TO LAYING OF PIPE BEDDING.
14. BACKFILL OF EXCAVATION AROUND MANHOLES TO BE HAND COMPACTED IN LAYERS OF 300mm TO 93% MOD AASHTO.
15. TRENCH EXCAVATIONS EXCEEDING 1.5m DEPTHS MUST BE SUFFICIENTLY SHORED OR CUT BANKS TO BE PROVIDED AT 1:2 MINIMUM BATTER SLOPE, UNLESS OTHERWISE SHOWN.
16. ALL EXCAVATED TRENCHES TO BE SUFFICIENTLY BARRICADED (AT LEAST 1m IN HEIGHT) AND SHALL NOT BE LEFT OPEN FOR MORE THAN 3 DAYS.
17. NO WATER SHALL BE ALLOWED TO ACCUMULATE IN ANY PORTION OF EXCAVATIONS/ TRENCHES. THE EXCAVATIONS SHALL BE PROTECTED AGAINST ANY WATER ENTERING THEM WHETHER BY SEEPAGE, RAIN OR FLOODS. ANY WATER FOUND IN THE EXCAVATION SHALL IMMEDIATELY BE REMOVED BY PUMPING OR BALING.
18. THE TOP OF MANHOLE COVERS SHALL BE MADE TO FLUSH WITH FINISHED PAVED LEVEL OR PROJECT 200mm ABOVE NATURAL GROUND LEVEL IN ROAD RESERVES AND LANDSCAPED AREAS.

LEGEND

- PROPOSED CONCRETE STORMWATER PIPE
- PROPOSED STORMWATER GRID INLET
- PROPOSED STORMWATER KERB-INLET
- PROPOSED STORMWATER MANHOLE

REVISIONS

REV:	DATE:	DESCRIPTION:
A	17/03/2021	FOR INFORMATION

AES consulting

Kildrummy Office Park
Jameson Building 1st Floor
Cnr. Umhlanga, Avenue & Witkoppen,
Paulshof,
Sandton

Principal Architect: Taurai Chinoruma
SACAP Reg Number: 24748561

CLIENT: GRANTON MERIWELL (Pty) Ltd & KHENKANE TRADING JV
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PO Box 3654, Nelspruit
1200

Email: eaglesuccess.research@gmail.com

PROJECT :
NEW 3000 BED STUDENT ACC.
FOR UNIVERSITY OF MPUMALANGA

ERF NUMBER:
PTN. 33 OF FARM 13 FREDENHEIM JT - 282

DRAWINGS :
STORMWATER LAYOUT

SCALE :	MEASUREMENT :	DATE :	ISSUED FOR :
AS SHOWN	M	19 MAR, 2021	COUNCIL
DRAWN BY : S.CHIONERWA	CHECKED BY : L.FESHETE		CLIENT SIGNATURE : ....

PROJECT NUMBER: AP/2020-036
REVISION NUMBER: A
DRAWING NUMBER: 2100108-C-PDR-300
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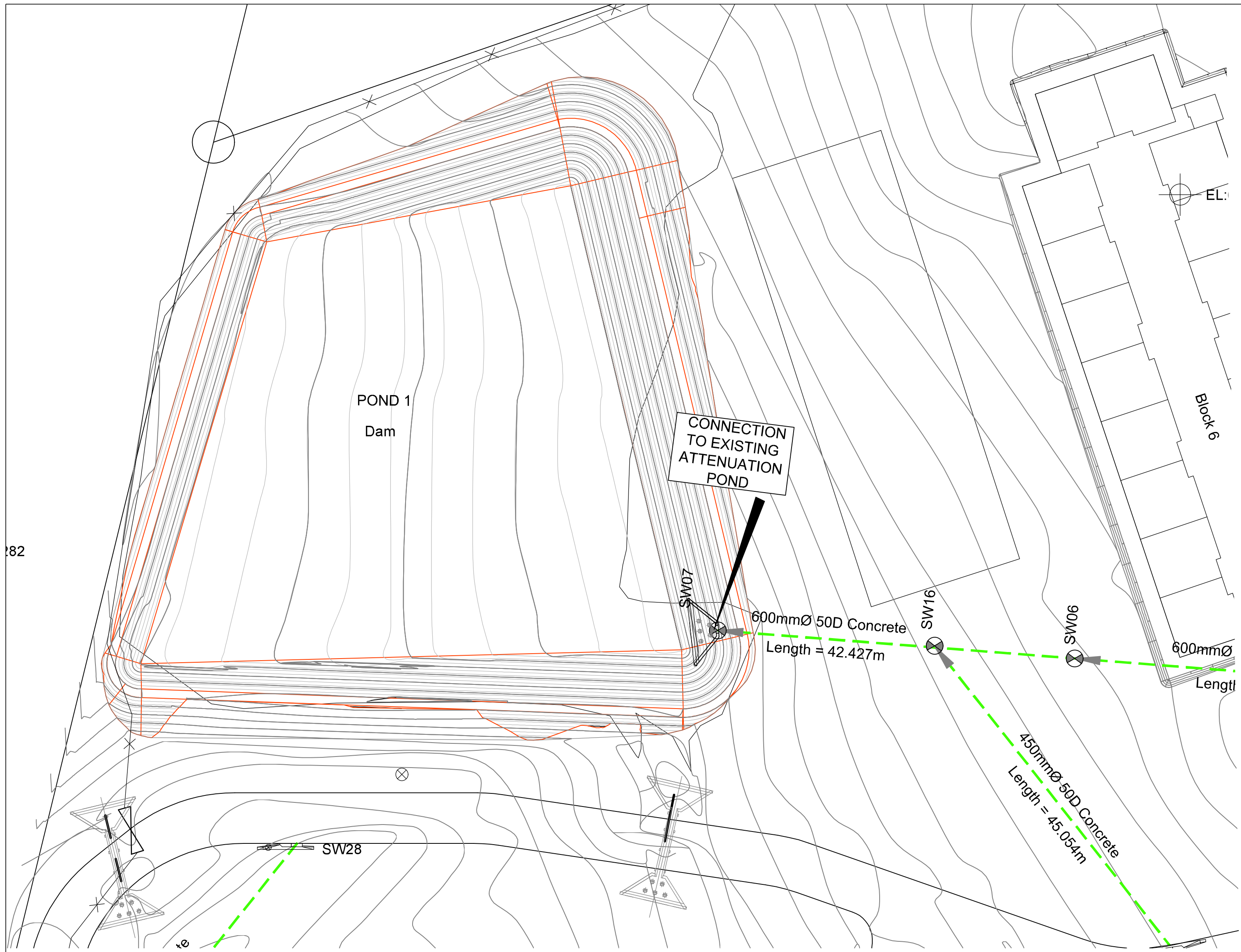
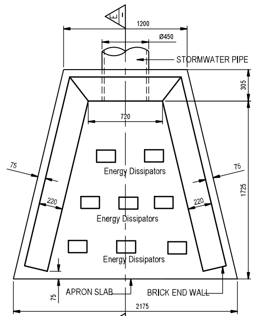


STORMWATER ATTENUATION POND 1 LAYOUT
SCALE 1:250



PLAN
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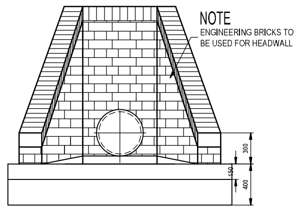
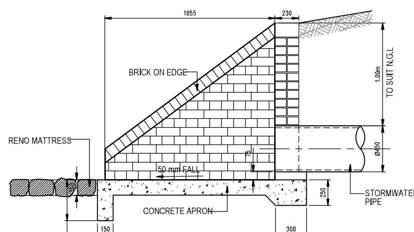


FRONT ELEVATION
HEAD WALL
DETAIL OF POND OUTLET STRUCTURE
SCALE 1:25



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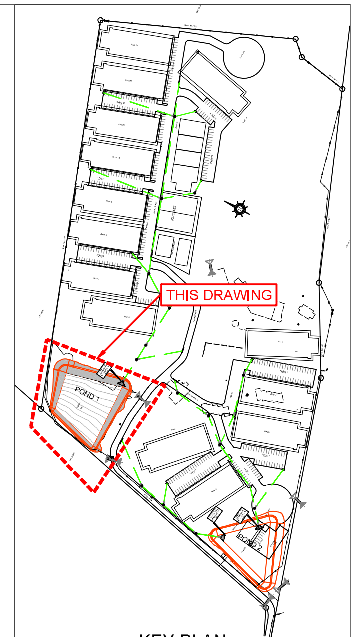
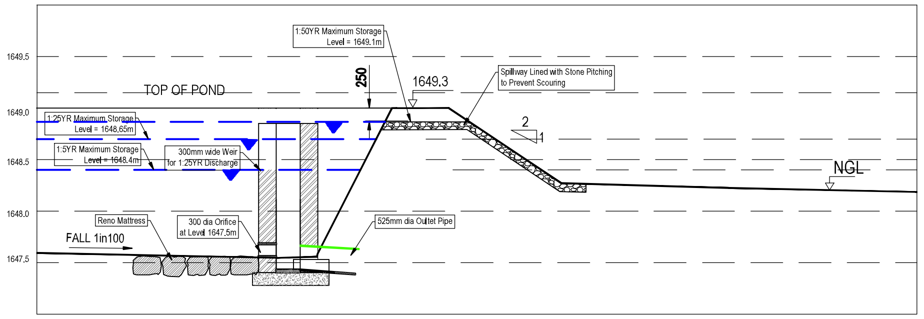


KEY PLAN
SCALE 1:2 500

FOR INFORMATION



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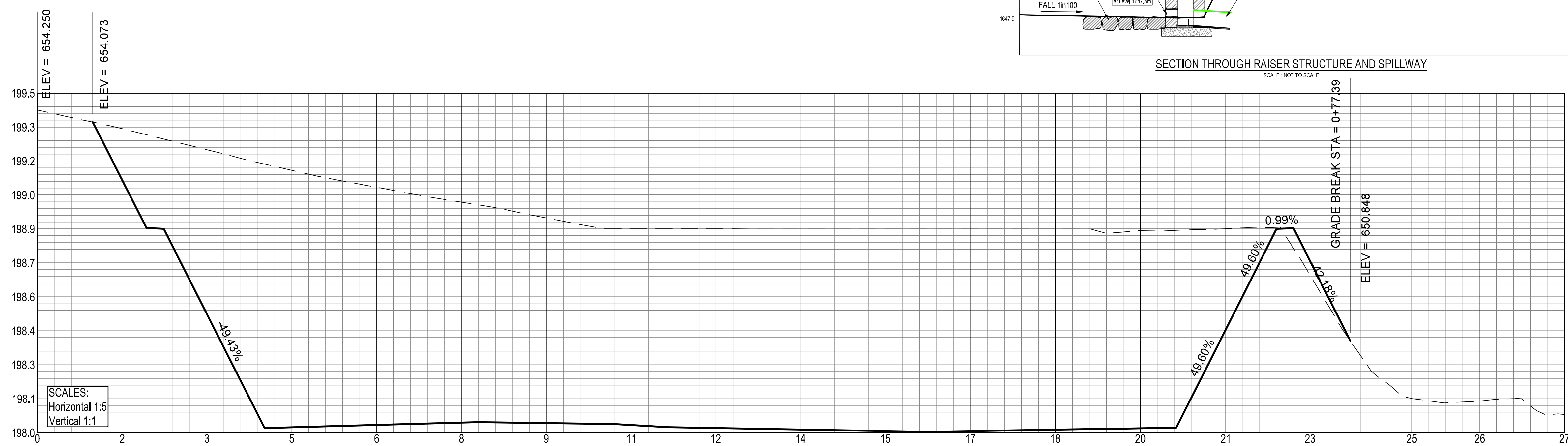

LONG SECTION ALIGNMENT B-B

NORTH :

NOTES

DRAWINGS ARE NOT TO BE SCALED, DIMENSIONS TO BE CHECKED INFORMATION RELATING TO SITE CONDITIONS TO BE VERIFIED & DISCREPENCIES TO BE REPORTED TO THE ARCHITECT BY THE USER WITHOUT DELAY AND PRIOR TO EXECUTION OF WORK.

NOTES : STORMWATER RETICULATION

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3. THE LOCAL AUTHORITY'S SPECIFICATIONS SHALL TAKE PREFERENCE SHOULD THEY DIFFER FROM ANY OTHER SPECIFICATIONS.
4. THE INVERT LEVEL OF THE EXISTING PROPOSED CONNECTION OR DISCHARGE POINTS SHALL BE CHECKED TO BE CORRECT BEFORE CONSTRUCTION COMMENCES. CONFIRMATION OF LEVELS SHALL BE FORWARDED TO THE ENGINEER IN WRITING.
5. ALL MANHOLES SHALL BE COORDINATED AS INDICATED ON THE SETTING OUT TABLES.
6. STORMWATER PIPES SHALL BE PREFABRICATED REINFORCED CONCRETE CLASS 100D TO SANS 677, UNLESS OTHERWISE SHOWN.
7. PIPE JOINT TYPE TO BE INTERLOCKING OGEE, UNLESS OTHERWISE SHOWN.
8. INTERLOCKING JOINTS TO BE SEALED ON THE OUTSIDE WITH TWO LAYERS OF BURLAP OF 340g/m2 PRE-IMPREGNANTED WITH A BITUMINOUS EMULSION, OR SIMILAR APPROVED MATERIAL. THE STRIP OF BURLAP SHALL BE AT LEAST 150mm WIDE AND PLACED SYMMETRICALLY OVER THE JOINT.
9. PIPES TO BE LAID WITH A MINIMUM COVER TO PIPE OF 1000mm UNDER TRAFFICKED AREAS AND 800mm ELSEWHERE, U.N.O.
10. ALL PIPE CONNECTIONS EXCLUDING BACKDROP CONNECTIONS SHALL BE CROWN TO CROWN (SOFFIT TO SOFFIT).
11. TRENCHING, BEDDING AND BACKFILLING SHALL CONFORM TO SABS 1200LB , SABS 1200DB AND IN PARTICULAR TO CLASS B BEDDING, BACKFILL COMPACTED TO 93% Mod AASHTO.
12. BEDDING TO BE 0.25xDIA OR MINIMUM 100mm THICK AND COMPACTED TO 90% Mod AASHTO.
13. IN AREAS WHERE THE INSITU MATERIAL IS NOT SUITABLE TO SUPPORT COMPACTION OF BEDDING SUCH AS AREAS WITH A HIGH WATER TABLE, A 200mm THICK PIONEERING LAYER SHALL BE LAID PRIOR TO LAYING OF PIPE BEDDING.
14. BACKFILL OF EXCAVATION AROUND MANHOLES TO BE HAND COMPACTED IN LAYERS OF 300mm TO 93% MOD AASHTO.
15. TRENCH EXCAVATIONS EXCEEDING 1.5m DEPTHS MUST BE SUFFICIENTLY SHORED OR CUT BANKS TO BE PROVIDED AT 1:2 MINIMUM BATTER SLOPE, UNLESS OTHERWISE SHOWN.
16. ALL EXCAVATED TRENCHES TO BE SUFFICIENTLY BARRICADED (AT LEAST 1m IN HEIGHT) AND SHALL NOT BE LEFT OPEN FOR MORE THAN 3 DAYS.
17. NO WATER SHALL BE ALLOWED TO ACCUMULATE IN ANY PORTION OF EXCAVATIONS/ TRENCHES. THE EXCAVATIONS SHALL BE PROTECTED AGAINST ANY WATER ENTERING THEM WHETHER BY SEEPAGE, RAIN OR FLOODS. ANY WATER FOUND IN THE EXCAVATION SHALL IMMEDIATELY BE REMOVED BY PUMPING OR BALING.
18. THE TOP OF MANHOLE COVERS SHALL BE MADE TO FLUSH WITH FINISHED PAVED LEVEL OR PROJECT 200mm ABOVE NATURAL GROUND LEVEL IN ROAD RESERVES AND LANDSCAPED AREAS.

LEGEND

- PROPOSED CONCRETE STORMWATER PIPE
- PROPOSED STORMWATER GRID INLET
- PROPOSED STORMWATER KERB-INLET
- PROPOSED STORMWATER MANHOLE

REVISIONS

REV:	DATE:	DESCRIPTION:
A	17/03/2021	FOR INFORMATION

AES consulting
Kildrummy Office Park
Jameson Building 1st Floor
Cnr, Umhlanga, Avenue & Witkoppen,
Paulshof,
Sandton
Principal Architect: Taurai Chinoruma
SACAP Reg Number: 24748561

CLIENT: GRANTON MERIWELL (Pty) Ltd & KHENKANE TRADING JV
Portion 33 of Farm 13 Fredenheim Road,
City of Mbombela
PO Box 3654, Nelspruit
1200
Email: eaglesuccess.research@gmail.com

PROJECT :
NEW 3000 BED STUDENT ACC.
FOR UNIVERSITY OF MPUMALANGA

ERF NUMBER:
PTN. 33 OF FARM 13 FREDENHEIM JT - 282

DRAWINGS :
POND 1 LAYOUT SECTIONS AND DETAILS

SCALE :	MEASUREMENT :	DATE :	ISSUED FOR :
AS SHOWN	M	19 MAR. 2021	COUNCIL
DRAWN BY : S.CHIONERWA	CHECKED BY : L.FESHETE		CLIENT SIGNATURE :

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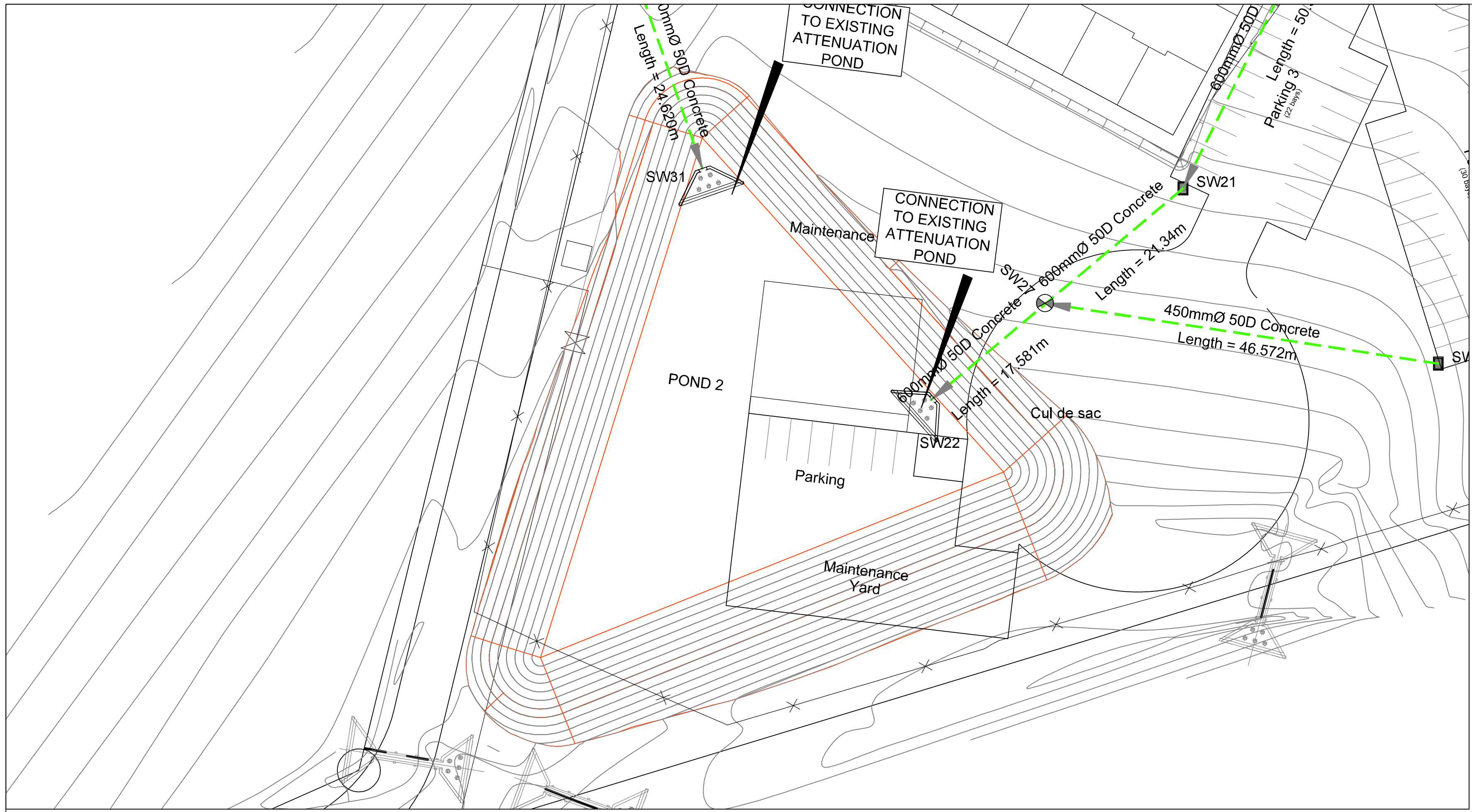
REVISION NUMBER: A
DRAWING NUMBER: 2100108-C-330
PAPER SIZE: A-0



STORMWATER ATTENUATION POND 2 LAYOUT
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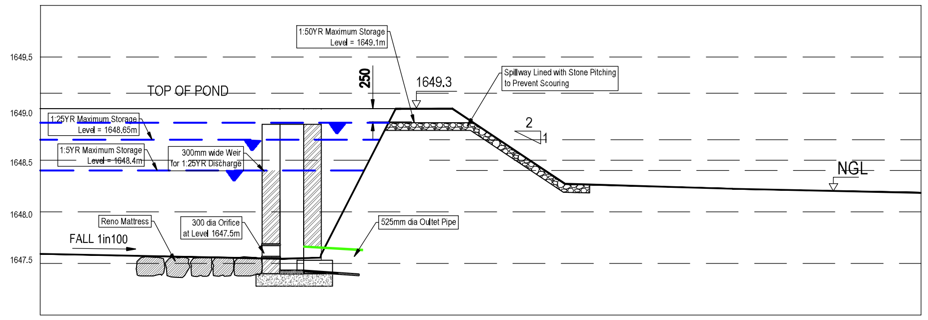

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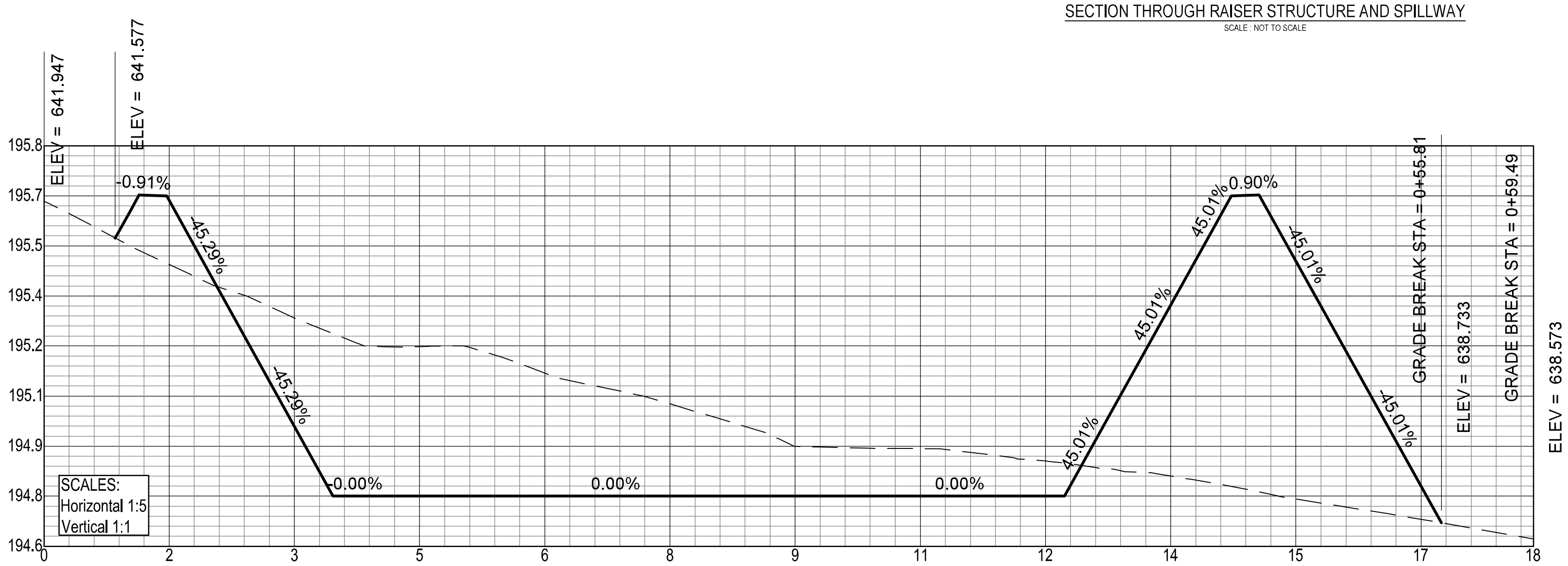
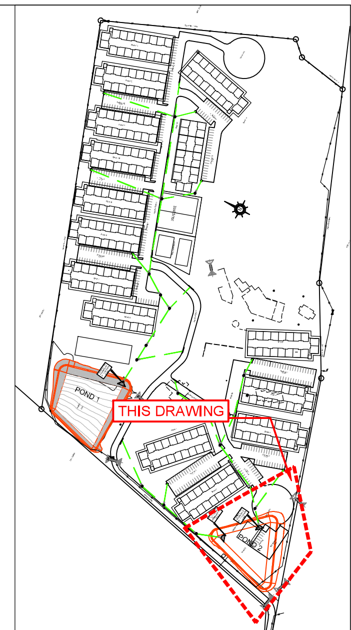
SCALE : NOT TO SCALE



LONG SECTION ALIGNMENT A-A



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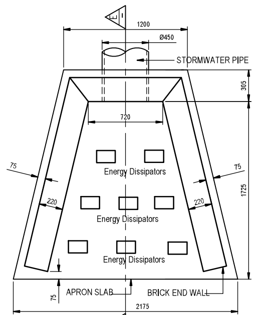
SCALE 1:2 500

FOR INFORMATION



PLAN
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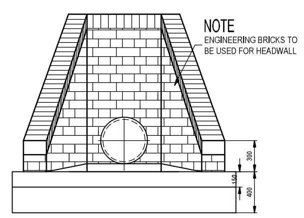
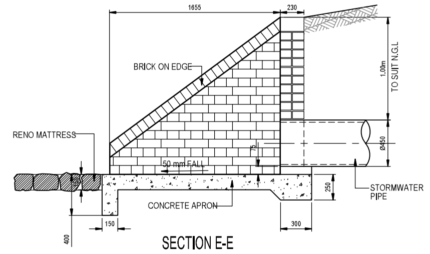


FRONT ELEVATION
HEAD WALL
DETAIL OF POND OUTLET STRUCTURE
SCALE 1:25



SECTION E-E

NOTES : STORMWATER RETICULATION

STORMWATER NOTES AND SPECIFICATIONS

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- PROPOSED STORMWATER GRID INLET
- PROPOSED STORMWATER KERB-INLET
- PROPOSED STORMWATER MANHOLE

REVISIONS

REV:	DATE:	DESCRIPTION:
A	19/03/2021	FOR INFORMATION

AES consulting
Kildrummy Office Park
Jameson Building 1st Floor
Cnr, Umhlanga, Avenue &
Witkoppen,
Paulshof,
Sandton

Principal Architect: Taurai Chinoruma
SACAP Reg Number: 24748561

CLIENT: GRANTON MERIWELL (Pty) Ltd & KHENKANE TRADING JV
Portion 33 of Farm 13 Fredenheim Road,
City of Mbombela
PO Box 3654, Nelspruit
1200

Email: eaglesuccess.research@gmail.com

PROJECT :
NEW 3000 BED STUDENT ACC.
FOR UNIVERSITY OF MPUMALANGA

ERF NUMBER:
PTN. 33 OF FARM 13 FREDENHEIM JT - 282

DRAWINGS :
POND 2 LAYOUT SECTIONS AND DETAILS

SCALE :	MEASUREMENT :	DATE :	ISSUED FOR :
AS SHOWN	M	19 MAR. 2021	COUNCIL
DRAWN BY : S.CHIONERWA	CHECKED BY : L.FESHETE		CLIENT SIGNATURE :

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