Aspire Consulting Engineers
Office 228, Killarney Office Towers, Killarney Mall
Killarney
Tel: 011 486 1082
Email : info@aspireconsulting.joburg

Roads & Stormwater Management Report:

Situated on Portion 437 and Portion 502 Of the Farm Roosboom No. 1102 GS

Date: 20 May 2019
Document: SWMR-1

	Compiled by	Date
1	Joseph Agento	20/05/2019
2	Joseph Agento	20/06/2019
3	Joseph Agento	05/11/2019

STORMWATER MANAGEMENT REPORT
PROPOSED TOWNSHIP ROOSBOOM EXT. 1

1. INTRODUCTION

Aspire Consulting Engineers (Pty) Ltd was requested to prepare a storm water management plan for a proposed new proposed township located on portion 437 and portion 502 of the farm Roosboom 1102 GS, Roosboom.

The development consists of nine hundred and forty-six (946) residential stands, six (6) community facilities stands, one (1) business stand, one (1) educational facility stand and eleven (11) public open spaces and roads servicing the propose ervens. The total area of the site is ± 81,1415 hectares and this area will be developed with semi-permeable surfacing, amounting to approximately 70.96% of the total area.

The management objective is to control the flow of stormwater with the use of an armorflex stormwater channel system that runs around the township and that will discharge into attenuation ponds strategically positioned to suit the topography of the site and then eventually released into nearby river streams adjacent to the site.

This report covers the stormwater management plan required for the proposed development. In addition to this it also addresses groundwater recharge, stormwater quantity, and stormwater quality impacts by incorporating the stormwater design scheme and performance standards for new developments. These are defined as projects that disturb large amounts of land. These standards are intended to minimize the adverse impact of stormwater runoff on water quality, water quantity and the loss of groundwater recharge that provides base flow in receiving water bodies. Any increase in non-permeable areas if there is any increase at all on the proposed development, results in an increase in the discharge of water into the natural watercourse servitudes and nearby river streams and this needs to be planned for and accommodated as far as possible.

A “design layout drawing” has been included in this plan based on the items as discussed in the report. Specific stormwater management measures are identified to lessen the stormwater related impacts on the environment, to lessen the risk of off-site flooding, to lessen localized flooding of development area as well as to minimize erosion of soil and collapse of new structures

Objective of report

The main goals of this SWMP are to understand the impact of developing the land on the existing natural water courses since no formal municipal water systems exist close to the site. These goals are further elaborated below and are as follows:

- To prevent water ingress at foundations

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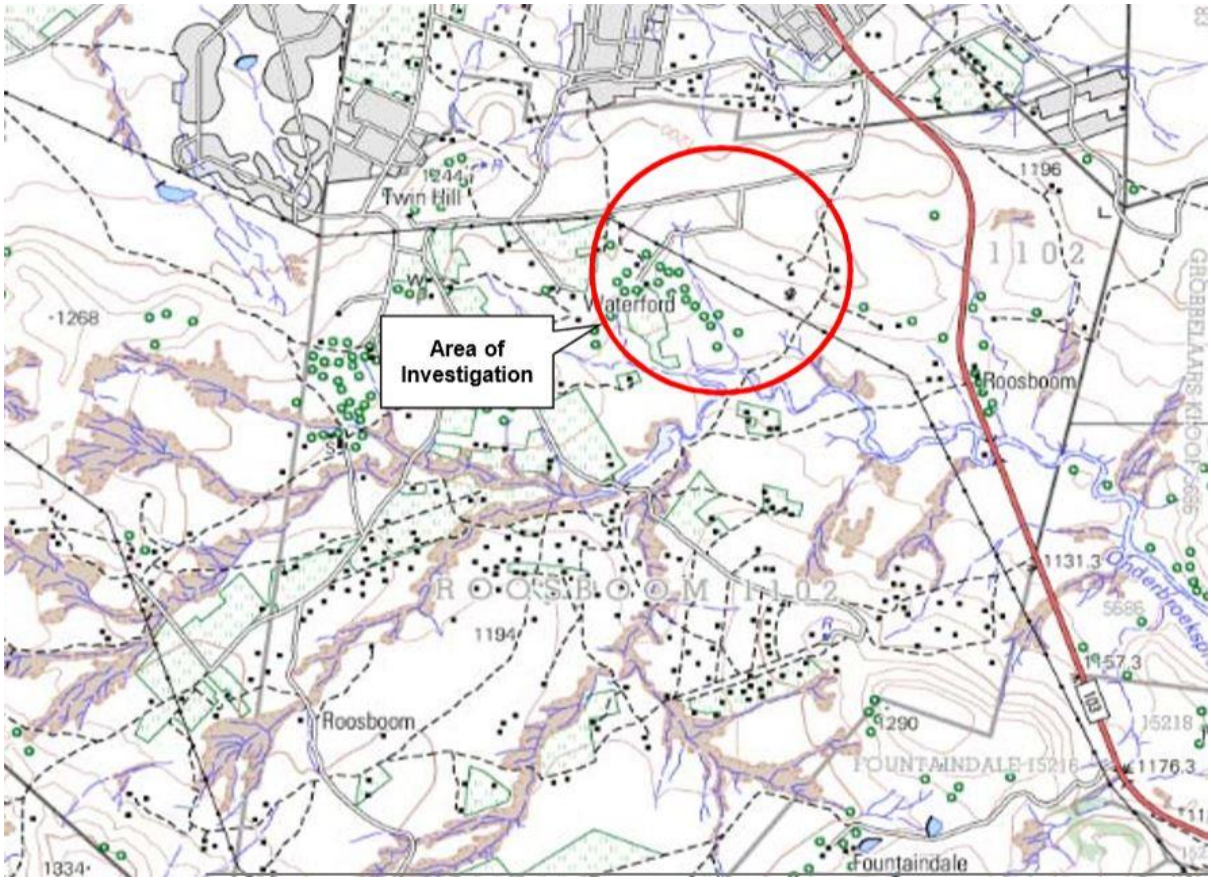
- To reduce the risk of off-site flooding damage and localized flooding of development area;
- To minimize, to the extent practical, any increase in stormwater runoff from this new development;
- To reduce soil erosion from this development or construction project;
- To maintain groundwater recharge;
- To prevent, to the greatest extent feasible, an increase in non-point pollution;
- To maintain the integrity of stream channels for their biological functions, as well as for drainage;
- To protect public safety through the proper design and operation of stormwater facilities on this new development.

To achieve these goals, this plan outlines specific stormwater design and performance standards for this new development. Additionally, the plan proposes stormwater management controls to address impacts from this development.

2. LOCALITY

The site is situated on portion 437 and portion 502 of the Farm, Roosboom 1102 GS Roosboom. See Figure 1 below.

Figure 1: Proposed Development Site



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3. SITE DESCRIPTION

The site is of total area 811 415m^2. The approximate coordinates of the centre of the site is -35 J 765 338.65m E, 6386915.23mS

Topography:
The site falls from north-east to south-west at approximately 3.27 percent. The highest point on the site is the north-east corner at an elevation of approximately 1195m amsl and the lowest point is at the south-west corner at approximately 1140m amsl.

Vegetation:
The site is currently a greenfield which is being utilised as a pasture land. The vegetation forms part of the so-called KwaZulu-Natal Highland Thornveld, which is dominated by grassland and savannoid woodlands. The vegetation is described as least threatened. However, the site also hosted eucalyptus trees which were introduced on the western side of the study area *(reference Geotechnical Report Number: 2017/J026/SSS prepared by Soilkraft cc)*

Flooding:
The average rainfall for the area is approximately 740mm and mostly occurs in isolated rainfalls between November and March, which primarily is in the form of sheetwash towards the southern boundaries of the development.

The post-development run-off for the proposed development will be higher than the pre-development run-off. Downstream flood damage risks will therefore increase unless adequate attenuation of storm water run-off is provided by the development collectively. The design of the stormwater system will ensure that the downstream post-development flood risks are not greater than the pre-development flood risks.

A detailed analysis of the stormwater system has been carried out to establish the extent to which the entire development will drain to the nearby rivers/streams.

Stormwater Management Policy

The following rules are to be observed;

- Designs around the buildings and site development in general will avoid concentration of stormwater run-off both spatially and in time.
- Removal of vegetation cover will be carried out with care and attention to the effect, whether temporary or long term, on the erosion potential and precautions shall be taken at all times on building sites to contain soil erosion and prevent any eroded material from being removed from the site.
- Landscaping and re-vegetation of areas not occupied by buildings or paving shall be programmed to proceed immediately building works have been completed, or have

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reached a stage where newly established ground cover is not at risk from the construction works.

- Earthworks on sites will be kept to a minimum. Where embankments have to be formed, stabilisation and erosion control measures shall be implemented.
- Stormwater will not be allowed to pond in the proximity of building foundations.

4. MODELLING

Pre-Development:

In its pre-developed state, the site is covered with a mix of permeable and partially impermeable areas.

Typical runoff coefficients for the site characteristics are Slope Ch 0.0327, Permeability Cd 0.005 and Vegetation Cp 0.15. Using an adjustment factor of 0.8 would give an overall coefficient of 0.15 for the 5 year and 25 year storm respectively. The pre-development runoffs have been calculated using a runoff coefficient of 0.15.

The time of concentration for the whole site, calculated using the Kerby Formula for overland flow with roughness coefficient 0.4, length of runoff 1483 meters and average slope 3.27 percent, is 61.124 minutes.

Pre-development Hydrographs:

The pre-development peak discharge rates are indicated in Table 1.

Post-development:

The site will be developed with gravel roads, open public spaces, residential stands and public facilities including a creche and a church

Roof water and road surface water will be channelled towards armorflex stormwater channels which reduce erosion on site as well as conveying the water to the attenuation ponds strategically located around the site to attenuate the runoff discharge before it is let out to the nearby streams at a controlled rate

The post development runoff is a combination of 35% of the site with a runoff C = 0.2 and the remaining 65% of the site with a C= 0.369. Accounting for the development, roads and landscaped components the runoff factor is 0.31.

The drainage paths indicate a time of concentration of less than 25 minutes. The post development hydrographs are based on the time of concentration of 25 minutes.

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5. STORMWATER ATTENUATION

The report includes the pre-development and post-development peak discharge calculations for the 1:5yr and 1:25yr storm intervals.

In summary, the discharge characteristics of the total of the whole area being drained is as follows

	5 Year Storm	25 Year Storm
Pre-Development Peak discharge	1.332m^3/s	2.159m^3/s
Post-Development Peak discharge	1.062m^3/s	1.073m^3/s

Post-development:
Taking into consideration the extended size of the site, attenuation ponds have been strategically positioned on site to store a total volume of 12 225m^3 of water to ensure that the 1:25 post-development flow is less than the 1:5 pre-development flow.

6. FINAL DISCHARGE

The 5 and 25 year discharge will be attenuated first before it is discharged into the nearby stream that passes through the site.

Management Scheme:

The attenuated run off will drain into the various water courses that exist across the site. These will drain eastward into the Verbroekspruit that bisects the site in the south of the property. Anti-erosion structures that include riffle beds and headwalls will protect the outlet structure and direct the stormwater at pre-development flow rates into the water course. Ideally, neither the 1:100 nor buffer areas 32m from the edge of the wetland should be located within any sensitivity areas like ridges, wetlands, river courses and areas with graves.

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7. EROSION CONTROL MEASURES

Installing perimeter controls should be one of the first tasks before beginning earthwork operations.
Options Available:

- Silt fence- Consists of partially buried fabric that is supported by posts used to control sediment from small disturbed areas
- Berms- these will slow down sediment-laden water and filters sediment in low-flow areas

The location of these features will be strategically placed in order to maintain proper control.

Stormwater inlet protection will also be critical to prevent sediments from entering the inlets. The options available include making use of fibre roll around all inlet structures and gravel inlet protection.

Stockpiles must be placed far away from water bodies during construction and sediment barriers placed all around the stock pile.

Flotation or silt curtains can also be used as a final barrier to protect all the active water bodies across the site. Flotation curtains are geotextiles with floats and an anchorage system that prevent significant sediment from reaching watercourse. They are available in different lengths and depths to suit site conditions.

8. CONCLUSION

We trust the information provided above will be sufficient for the evaluation of the design philosophy of this proposed stormwater management strategy for decision making purposes.

End of Report.

Signed:

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Zeenat Ghoor for Aspire
Pr Eng 20120007

Aspire Consulting Engineers
Office 228, Killarney Office Towers, Killarney Mall
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9. ATTACHMENTS

Appendix A: Pre-development Hydrographs
Appendix B: Post-development Inflow and Outflow Hydrographs
Storm water Drawing

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APPENDIX A

PRE-DEVELOPMENT HYDROGRAPHS

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APPENDIX B

POST-DEVELOPMENT HYDROGRAPHS

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APPENDIX C

STORMWATER LAYOUT DRAWING AND STORMWATER NETWORK DETAIL

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