STORMWATER MANAGEMENT PLAN REPORT

For

THE PROPOSED HAMMERSDALE INDUSTRIAL DEVELOPMENT

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At

LOT A STERK SPRUIT NO. 2627

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Date:	07 June 2018
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1 Introduction

Undasa Project Partners (Pty) Ltd were appointed by Catchway Properties to undertake a stormwater management plan for the proposed 'Hammersdale Industrial -Lot A, Sterk Spruit No. 2627 Development'. The proposed development comprises approximately 148 519m2 of general industrial companies with 50% coverage.

The implementation of the stormwater management plan will be applied when the following applications are made:

a. Building Plan Approvals (regardless of the nature of the alterations, internal or external)
b. Special Consent Applications
c. Rezoning Applications
d. Subdivision and Consolidation Applications
e. Development Applications

The management of the stormwater runoff within Hammersdale Industrial -Lot A, Sterk Spruit No. 2627 is planned to mitigate against the effects of increased water runoff from hardened areas and to control the movement of sand and silt which may occur particularily during the construction phase.

This report covers the stormwater mangement plan proposed for the development.

2 Site Layout

The proposed site is situated in Lot A, SterkSpruit, just south of the Hammersdale industrial area within in Ethekwini and is approximately 89Ha. The site is bordered by a railway line to the north of the development and the Sterkspruit River to the south, east and west of the site.

The site is a currently brownfields site, located on an irregularly shaped plateau. The plateau sides are steep and covered with light bush.

Refer to Annexure A for a site layout.

Figure 1: Lot A, SterkSpruit Locality plan.

3 Catchments

The catchments influencing the site are delineated in Figure 2; each catchment delineated contributes to a water course.

The catchments were delineated using contours obtained from the topographical survey. The topographical data was combined with aerial photographs and the findings from the site, in order to determine the variables that describe the behaviour of the catchments under rainfall.

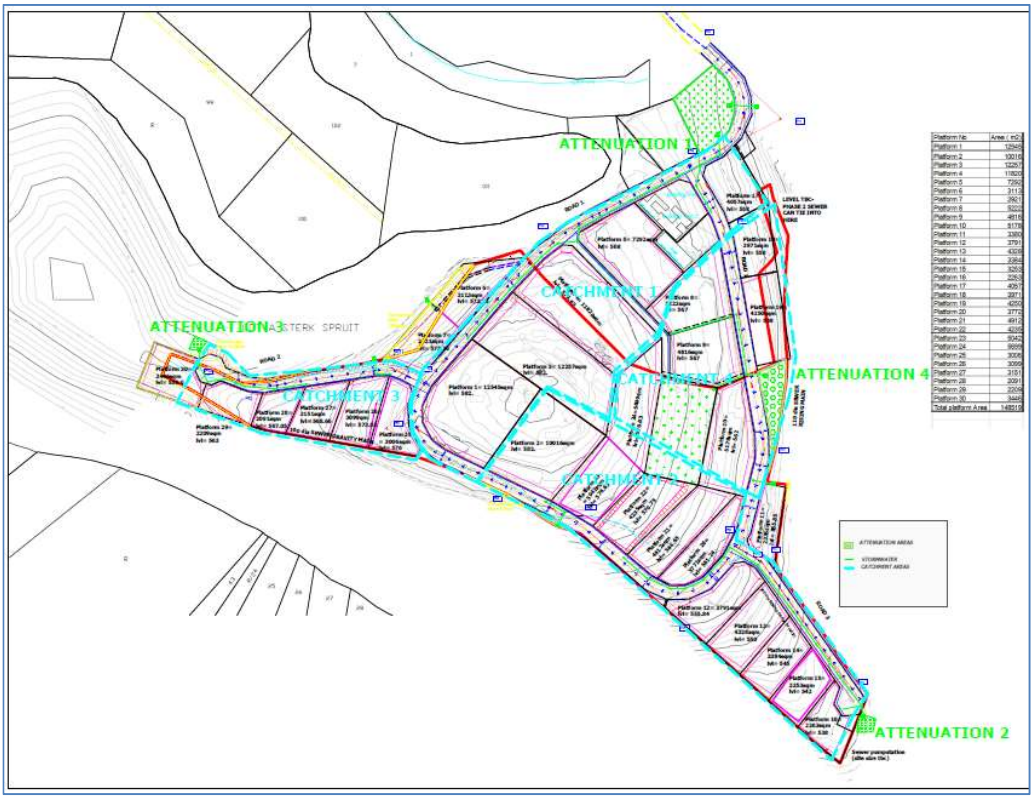

Figure 2: Catchment Layout

4 Control measures

A Figure 8 kerb and channel will be constructed on the drainage side and no kerb on the opposite side. Stormwater will be distributed primarily by means of stormwater culverts and will be attenuated in the stormwater outlet.

The post-development stormwater runoff will be attenuated to achieve pre-development runoff.

On-site Attenuation

On-site attenuation will be inforced through the building code of the development. Individual site developments will also be responsible of constructing an attenuation chamber that will either tie into the stormwater pipe or to the valley depending on the postion of the site.

Off-site Attenuation

Stormwater collected from the roadways and piped to the valleys.

5 Stormwater design parameters and approach

5.1 Design Considerations

- Pre-development and post development flows calculated on a 1:10 and 1:50 year return storm design.
- Intensity applicable – See table 4.
- Difference between pre-development and post development flows to be stored.

The rational method of design is proposed using the following criteria:

Table 1: Rational Method Design Factors

	Return Period
General	3 year storm
Critical points	10 year storm
Cross drainage	**5-10 year storm**
Attenuation	**20 year storm**

Table 2: Proposed runoff co-efficients used

Land Use	C- Factor
Hardened Areas	0.85
Landscaped/grassed Areas	0.45
% Open Space	20%
%Urban Space	80%
C Factor Weighted	0.77

Rainfall Intensity `I`

Rainfall figures were obtained from the eThekwini Municipality website (refer to Table 3 for extract). The nearest rainfall station is at 29 deg 48 min latitude and 31 deg 05 min longitude.

The Figures are presented as point rainfall depth and have been converted to rainfall intensity

Table 3: Rainfall depth (mm)

LATDEG	LATMIN	LONGDEG	LONGMIN	SC	DC	RP	CODE	M5	M10	M15
29	48	31	5	8	18	2	M	9.0	14	18,1
29	48	31	5	8	18	5	M	13.5	21	27,2
29	48	31	5	8	18	10	M	17.0	26,5	34,3
29	48	31	5	8	18	20	M	20.8	32,4	42
29	48	31	5	8	18	50	M	26.6	41,3	53,5
29	48	31	5	8	18	100	M	31.5	49	63,5

Table 4: Rainfall Intensity `I`

Storm Recurrence Interval	Rainfall Depth (mm)	Intensity (mm/hr)	Rainfall Depth (mm)	Intensity (mm/hr)
	10min	10min	15min	15min
10 year	26,5	159,0	34,3	137,2
50 year	41,3	247,8	53,5	214

5.2 Overall Catchment Analysis

The relevant sub-catchments are numbered and shown in Table 5. the approximate sizes of the catchments are tabulated below.

Table 5: Catchment Characteristics

CATCHMENT		AREA (m^2)	POST DEVELOPMENT FLOW (m^3/s)	PRE DEVELOPMENT FLOW (m^3/s)
1	10 year	77758	2,23	1,33
	50 year		3,48	2,08
2	10 year	77883	2,24	1,34
	50 year		3,48	2,08
3	10 year	25077	0,72	0,43
	50 year		1,12	0,67
4	10 year	49811	1,43	0,85
	50 year		2,23	1,33

Annexure A Layout illustrates the proposed stormwater layout and catchment areas.

6 Pre and Post Development Flows and Attenuation

Attenuation consists of the temporary storage of surface water in a suitable chamber below ground level. This chamber needs to be of sufficient size to accommodate the calculated run-off during peak periods of rainfall. The stored water is then gradually released in a controlled manner into a surface water or combined drainage system or watercourse, subsequently effectively reducing the risk of flooding.

Annexure B illustrates the stormwater runoff estimates. The culverts will be sized for a 1:50 pre-development flow for the major systems and 1:10 pre-development flow for the minor systems. The calculations for the time of concentration and peak discharge for the various catchments are tabulated in Annexure B.

All roads will be constructed with a cross fall. Stormwater will be channelled along the kerbs to strategically placed catchpits and kerb inlets draining into concrete pipe culverts. The culverts discharge into the natural water courses and existing stormwater features. Headwalls will be provided at the end of the pipe culverts with erosion protection at these discharge points. The kerb and channels, kerb inlets and pipe culverts have been sized to accommodate a 1: 10 year storm.

6.1 Pre Development Flow

The Rational Design Method was used for all runoff calculations. The pre- development runoff was calculated using the 1:10return period and a runoff co-efficient of 0,45.

6.2 Post Development Flow and Attenuation

The post development flow was calculated using different co-efficients of runoff depending on the area being hardened or landscaped, (co-efficients of 0,85 and 0,45 were used respectively). A 1:50 year return period was used for the post development runoff calculation.

Storage and outlet hydrographs determine the volume required to be attenuated for each catchment. The example depicted below is the proposed attenuation pond. The drawing below is not to scale and is for illustration purpose only.

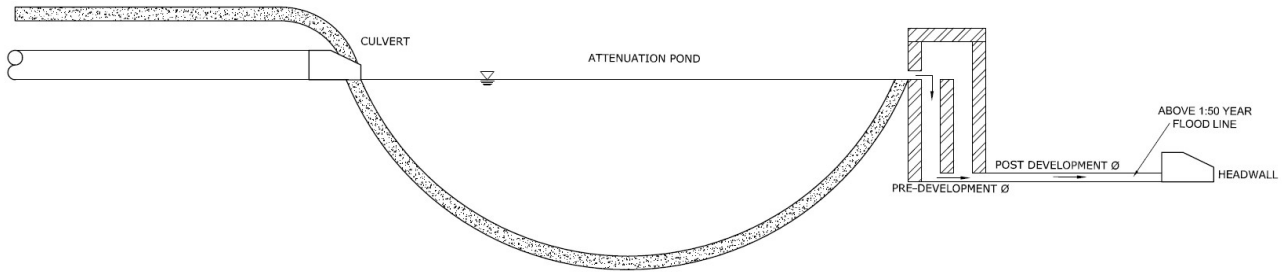

Figure 3: Cross section of attenuation pond

On submission of design/building plan approval the following information must be provided:

1. Schedule of calculations on plan for volumes, as well as for pre and post development pipe sizes.
2. Stormwater reticulation and all pipe sizes for the entire site,
3. Details of mechanism to permit only pre-development flows during 30 minute period.
4. Cross sections of retention dams/storage areas.
5. Detail of stormwater route and connection to the existing bulk stormwater system
6. Long section showing levels of outlet pipes to existing bulk stormwater connection, with details of the connection point.
7. Basic layout of the Stormwater Management Plan will also be shown on the site plan.

7 Conclusion

Suitable landscaping and vegetation will be undertaken to establish a system which will assist in erosion protection.

The stormwater management for this development will attenuate the increased flow due to development from a 1: 50 year post development runoff down to a 1:10 year pre development flow. Erosion control measures will be used at all discharge points to avoid scouring of the earth.

Yours faithfully

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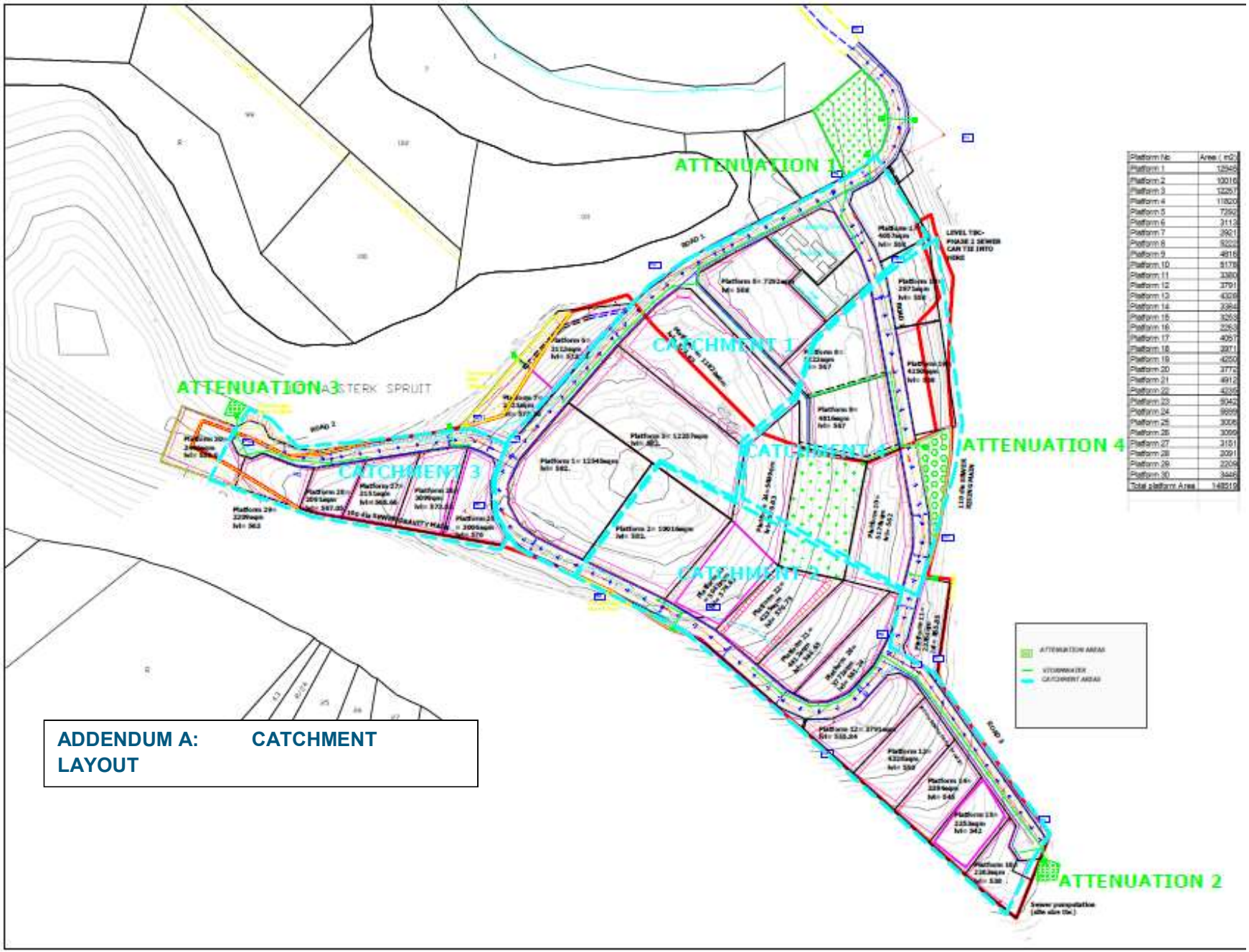


Platform No	Area (m2)
Platform 1	12545
Platform 2	10016
Platform 3	12261
Platform 4	11820
Platform 5	7292
Platform 6	3112
Platform 7	3921
Platform 8	5222
Platform 9	4816
Platform 10	5178
Platform 11	3380
Platform 12	3791
Platform 13	4309
Platform 14	3364
Platform 15	3263
Platform 16	3263
Platform 17	4051
Platform 18	3971
Platform 19	4250
Platform 20	3771
Platform 21	4912
Platform 22	4235
Platform 23	9042
Platform 24	9899
Platform 25	3008
Platform 26	3099
Platform 27	3151
Platform 28	3091
Platform 29	3209
Platform 30	3446
Total platform Area	148519

ADDENDUM A: CATCHMENT LAYOUT

ADDENDUM B: ATTENUATION TANK VOLUMES

Attenuation 1- Catchment 1

Attenuation Calculations

OUTLET CONTROL	
Pre-development	
Area =	77758 m^2
C =	0,45
Tc =	15 min
I_{10} =	137,2 mm/hr
Q =	1,33355 m^3/sec
	1333,55 l/s

STORAGE	
Post-development	
Area =	77758 m^2
C =	0,65
Tc =	10 min
I_{50} =	247,8 mm/hr
Q =	3,479023 m^3/sec
	3479,023 l/s

STORAGE Hydrograph

0	0 m^3
15	1930,926 m^3
60	0 m^3

Outlet Hydrograph

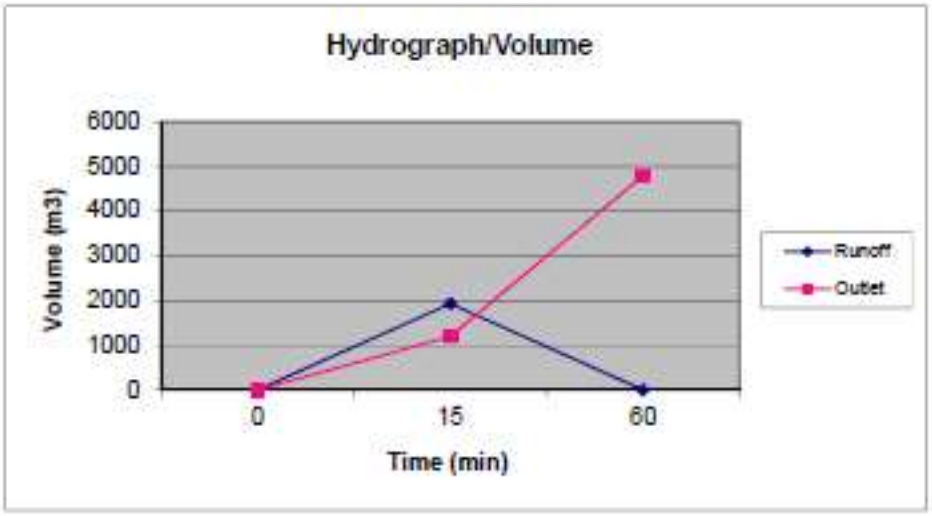
0	0 m^3
15	1200,195 m^3
60	4800,779 m^3

Storage volume = 731 m^3

731m³ in Attenuation Tank

Outlet Pipe

1333,55 l/s capacity
1,33355



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Attenuation 2- - Catchment 2

Attenuation Calculations

OUTLET CONTROL		
Pre-development		
Area =	77883	m^2
C =	0,45	
Tc =	15	min
I_{10} =	137,2	mm/hr
Q =	1,335693	m^3/sec
	1335,693	l/s

STORAGE		
Post-development		
Area =	77883	m^2
C =	0,65	
Tc =	10	min
I_{50} =	247,8	mm/hr
Q =	3,484615	m^3/sec
	3484,615	l/s

STORAGE Hydrograph

0	0 m^3
15	1934,03 m^3
60	0 m^3

Outlet Hydrograph

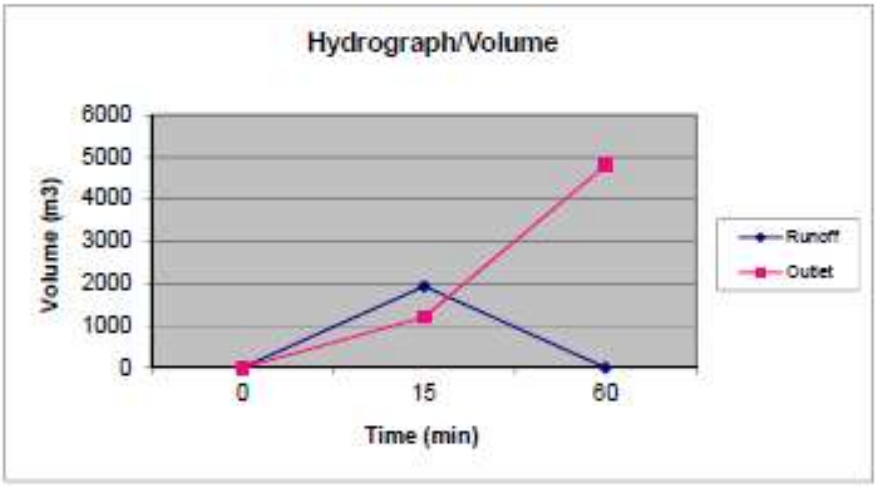
0	0 m^3
15	1202,124 m^3
60	4808,496 m^3

Storage volume = 732 m^3

731m³ in Attenuation Tank

Outlet Pipe

1335,693 l/s capacity
1,335693



Attenuation 3- Catchment 3

Attenuation Calculations

OUTLET CONTROL		
Pre-development		
Area =	25077	m^2
C =	0,45	
Tc =	15	min
I_{10} =	137,2	mm/hr
Q =	0,430071	m^3/sec
	430,0706	l/s

STORAGE		
Post-development		
Area =	25077	m^2
C =	0,65	
Tc =	10	min
I_{50} =	247,8	mm/hr
Q =	1,121987	m^3/sec
	1121,987	l/s

STORAGE Hydrograph

0	0 m^3
15	622,7246 m^3
60	0 m^3

Outlet Hydrograph

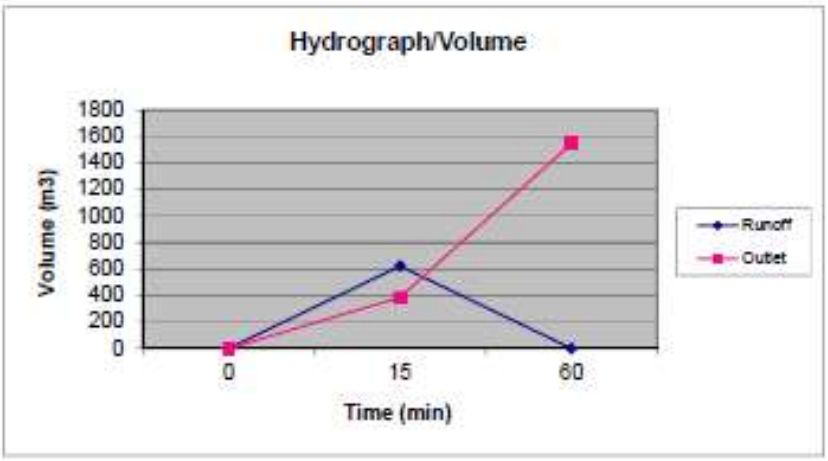
0	0 m^3
15	387,0635 m^3
60	1548,254 m^3

Storage volume = 236 m^3

236m³ in Attenuation Tank

Outlet Pipe

430,0706 l/s capacity
0,430071



Attenuation 4- Catchment 4

Attenuation Calculations

OUTLET CONTROL		
Pre-development		
Area =	49811	m^2
C =	0,45	
Tc =	15	min
I_{10} =	137,2	mm/hr
Q =	0,854259	m^3/sec
	854,2587	l/s

STORAGE		
Post-development		
Area =	49811	m^2
C =	0,65	
Tc =	10	min
I_{50} =	247,8	mm/hr
Q =	2,226627	m^3/sec
	2226,627	l/s

STORAGE Hydrograph

0	0	m^3
15	1236,932	m^3
60	0	m^3

Outlet Hydrograph

0	0	m^3
15	768,8328	m^3
60	3075,331	m^3

Storage volume = 468 m^3

236m³ in Attenuation Tank

Outlet Pipe

854,2587 l/s capacity
0,854259