TUGAS AKHIR - RC18- 4803

PERENCANAAN PENGALIRAN AIR HUJAN DENGAN MENGGUNAKAN WATER LABEL, SALURAN TERBUKA, DAN WADI (BIOSWALE) DI KOTA WEST TERSCHELLING, BELANDA

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Institut Teknologi Sepuluh Nopember
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LEMBAR PENGESAHAN

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TUGAS AKHIR

Diajukan Untuk Memenuhi Salah Satu Syarat
Memperoleh Gelar Sarjana Teknik
Pada
Program Studi S1 Departemen Teknik Sipil
Fakultas Teknik Sipil, Perencanaan, dan Kebumian
Institut Teknologi Sepuluh Nopember

Oleh:
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Disetujui oleh Pembimbing Tugas Akhir:

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Surabaya
Juli, 2020

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RAINWATER DISTRIBUTION PLAN WITH WATER LABEL, ABOVE GROUND DRAINAGE, AND BIOSWALE IN THE CITY OF WEST-TERSCHELLING, THE NETHERLANDS

Student's Name	**:**	**Nashruddin Latif**
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Abstract

West-Terschelling is one of the cities located in the Terschelling island in the province of Friesland, The Netherlands. With the population of 2602 in January 2017, makes it the biggest population city in the Terschelling Island. The city is located between the North Sea and the Wadden sea, makes it the main route for visitors from the mainland to the Terschelling island.

Due to its location, the city is predicted to face a flooding problem coming from the sea and the rainfall. As a result of global warming effect, the sea level around the city will rise every year. Without a good flood defense structure building protecting the city, it could lead to a big problem in the future. On the other hand, the rainfall precipitation is also increasing every year due to the climate change phenomena. A study by WorldWeatherOnline shows that in the year of 2020, West-Terschelling will have the highest total amount of rainwater in the last 20 years.

This final thesis is an analysis of the proposed solutions to encourage the residents of the city to keep their rainwater instead of letting it flow to the sewer system. This will make the sewer system only being used for foul water and minimize the risk of overflow in the city. In total, there area 3 main solutions proposed by author to help solving the problem. First is a water label, this is *a tool to calculate the amount of rainwater storage capacity in each household. Therefore, the municipality can control the progress of each landlord whether it is progressing or regressing. Second is above ground drainage, this solution is set to be an alternative drainage to accommodate the rainwater, hence it does not flow to the existing sewer system. Last solution is wadi (bioswales). It is a water retention area to store the rainwater that is coming from each household and soon it will infiltrate it into the ground. This water can be a stock for the residents to help survive the possible drought in the summer.*

The results of this final thesis show that the high populated area in the city of West-Terschelling does not have a lot of available space to build a wadi. Most of the wadi can be built in the less populated area pf the city which located in the north side of the city. Therefore, the rainwater that falls in the high populated area in the city will flow directly to the sea.

***Keywords*: Rainwater, Water label, Above ground drainage, Wadi**.

ACKNOWLEDGMENT

This report describes the solutions and alternative to prevent a direct access for the rainwater that falls on the streets and on the private resident's property in the city of West-Terschelling to flow into the sewer. This will prevent the city from flooding and encourage the residents to have their own water supply. SDP Group 7 has chosen this city for the main center area for the project.

Author would like to thank as our clients for this project, Mr. Hek from the municipality of West-Terschelling who have helped us providing all the information that we need and welcomed us very well. Student would also like to thank Mr. Kristoff Derveaux as the tutor for this project, who have helped us both morally and materially during the process. Student would also like to thank fellow friends who have given the support so that student can complete this task on time.

Student realizes that this report is far from perfect in terms of composition, language, and writing. Therefore, constructive criticism and suggestions from all readers are expected to be delivered, so that writers can become even better in the future.

The author say the praise and gratitude to God Almighty, for all the graces and blessings that provide health and wisdom to the authors so that we can complete the final report of Final Project entitled Rainwater Plan in the City of West-Terschelling.

Hopefully this report can add insight to the readers and can be useful for the development and improvement of knowledge.

Enschede, June 2020

Nashruddin Latif

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CHAPTER I
INTRODUCTION

1.1. Background Information

During the preliminary research, which was done by the SDP Group 7 earlier before, the group decided to focus on solving the problem that occurs in the city of West-Terschelling. West-Terschelling has a chance of flooding since the precipitation is getting higher each year during the rainy season. The sewer system in the residents are mostly combined sewer system which contain rainwater and fall water. All this water will eventually connect to the main sewer pipe of the city which located under the main road, next to the harbor.

Since the sea level is also raising, and it happens to interrupt the main road, this will cause a problem for the residents. When the main road is filled with sea water, the manholes will be blocked, therefore the gas inside the pipe could not go away. This gas will eventually go back to the previous connection before finally getting out from the resident's toilets.

The goal of this project is to generate an alternative, in order to prevent a direct access for the rainwater that falls on the streets and on the private resident's property in West-Terschelling to flow into the sewer. This will prevent the pipe to get easily filled with water which leads to overflow and encourage the residents to have their own water supply. This report will also describe some other ways to create a green water storage in the public space area to keep the rainwater to prevent shortages.

This main research starts with project assignment. It describes the problem description and definition, and the objectives of this research. In the next chapter student gives information about the details of the project's, water label and wadi, and above ground drainage. Followed by some other solutions to support the water label, calculation, the execution plan on the city. Next student describes the operation and maintenance procedures. Finally, student draws a summary and conclusion of the project.

1.2. Problem Mapping

Some problems that arise from this background include:

1. What are the best solutions to control the rainwater management in West-Terschelling?
2. How long can the solutions last?
3. Are the solutions fit the requirements from the municipality?
4. Are the solutions good for environment?
5. How much rainwater can be impacted with the solutions?

1.3. Objective

The main goal of this project is to give benefit to the city of West-Terschelling, as student mentioned in the previous chapter, the city of West-Terschelling is facing a rainwater management problem. All the rainwater is flowing to the sewer system which is a mix system with the foul water.

For this final project as a student majoring in civil engineering, student will try to provide a solution for a water management problem in the city. These are the following objectives that student will try to accomplish via this final project.

a. Formulate the best solutions to control the rainwater
b. Make the solutions eco-friendly and qualify the stakeholder's requirements
c. Design the solutions with the right standard

1.4. Project Boundary

The project boundaries for this final thesis are:

1. The location for this final thesis takes place in the city of West-Terschelling.
2. Only calculate the design part of each solution.
3. Does not calculate the construction process such as duration, labor, and budget.
4. Data are taken from reputable and reliable sources.
5. Solutions are suggested by the supervisor.

1.5. Advantage

The expected benefits from writing this final thesis is to determine the performance of the proposed solutions for controlling and keeping the rainwater and therefore could be a recommendation for the municipality of West-Terschelling.

1.6. Location

The location for this final thesis takes place in the city of West-Terschelling, The Netherlands. In specific, student focuses in the densely populated area.

Figure 1. The city map of West-Terschelling. (Google Earth, 2020)

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CHAPTER II
LITERATURE REVIEW

2.1. General

Literature review aims to describe the concepts and theories to explain the problem that will be explained in this study, in this case the Rainwater plan for the city of West-Terschelling with Water label, Wadi, and Above Ground Drainage.

2.2. Determination of the label for Water Label

The label used for the water label solution in this final thesis are adopted from the original label designed by STOWA and RIONED Foundation.

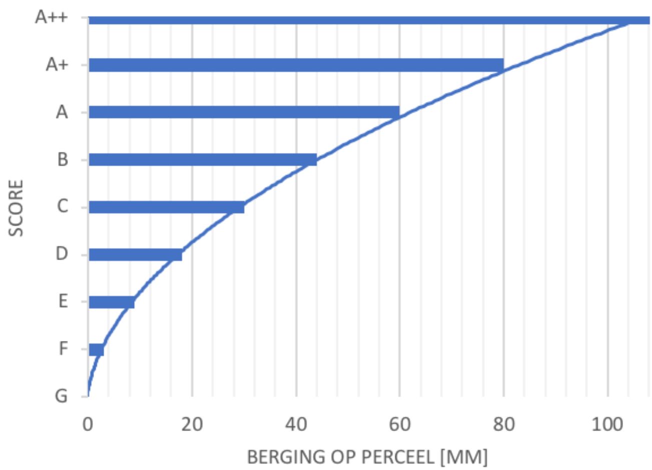

Figure 2. Diagram of the labels between the score and amount of rainwater stored. (Stowa, 2017)

Storage room	Rainwater label
0 mm	G
≥ 2 mm	F
≥ 7 mm	E
≥ 18 mm	D
≥ 30 mm	C
≥ 44 mm	B
≥ 60 mm	a
≥ 80 mm	A +
≥ 110 mm	A ++

Figure 3. Detailed information from the diagram in figure 2.

The scoring method is based on rainwater storage. The score is determined by the amount (in millimetres) of rainfall that a plot can store during a peak shower that falls in one hour. This concerns the average storage over the entire plot. It does not matter whether the owner has realized this storage on the roof, underground or in the garden. That rainwater storage must be available. Rainwater must therefore be able to infiltrate or be used.

The storage in millimeters is translated into a score according to figure A. Each step towards a higher label means that the plot must retain relatively more water. This allows the municipality to encourage people who do not now hold rainwater on their plot to take simple measures.

These labels can facilitate and structure the communication of municipalities and water boards with residents, companies and housing associations.

2.3. Hydrology Analysis

2.3.1. Run-off Coefficient

The runoff coefficient (C) is a dimensionless coefficient relating the amount of runoff to the amount of precipitation received. It is a larger value for areas with low infiltration and high runoff (pavement, steep gradient), and lower for permeable, well vegetated areas (forest, flat land).

Land Use	C	Land Use	C
		Lawns:	
		Sandy soil, flat, 2%	0.05 - 0.10
Business:		Sandy soil, avg., 2-7%	0.10 - 0.15
Downtown areas	0.70 - 0.95	Sandy soil, steep, 7%	0.15 - 0.20
Neighborhood areas	0.50 - 0.70	Heavy soil, flat, 2%	0.13 - 0.17
		Heavy soil, avg., 2-7%	0.18 - 0.22
		Heavy soil, steep, 7%	0.25 - 0.35
		Agricultural land:	
		Bare packed soil	
		*Smooth	0.30 - 0.60
		*Rough	0.20 - 0.50
Residential:		*Cultivated rows*	
Single-family areas	0.30 - 0.50	*Heavy soil, no crop	0.30 - 0.60
Multi units, detached	0.40 - 0.60	*Heavy soil, with crop	0.20 - 0.50
Munti units, attached	0.60 - 0.75	*Sandy soil, no crop	0.20 - 0.40
Suburban	0.25 - 0.40	*Sandy soil, with crop	0.10 - 0.25
		Pasture	
		*Heavy soil	0.15 - 0.45
		*Sandy soil	0.05 - 0.25
		Woodlands	0.05 - 0.25

Table 1. The value of runoff coefficient for business and residential use. (Waterboards California, 2019)

To calculate the value of runoff coefficient, it can be calculated using the following equation:

$$C\ combination = \frac{\Sigma \text{Ci x Ai}}{\Sigma Ai}$$

Where:

C = Runoff Coefficient

Ci = Base runoff coefficient

Ai = Area of each section

2.3.2. Hydrology Discharge

Hydrology discharge is a discharge that is affected by the natural phenomenon such as precipitation, rainfall rate, and the section of the area. To get the value of the discharge, the formula can be formed as:

$$Q\ Hydrology = \frac{1}{3.6}\ x\ C\ x\ I\ x\ A$$

Where:

Q = Flow Rate (m^3/s)

C = Runoff Coefficient

I = Rainfall precipitation (mm/hour)

A = Catchment Area (m^2)

2.4. Hydraulic Analysis

2.4.1. Manning's Equation

The Manning formula is an empirical formula estimating the average velocity of a liquid flowing in a conduit that does not completely enclose the liquid, i.e., open channel flow. However, this equation is also used for calculation of flow variables in case of flow in partially full conduits, as they also possess a free surface like that of open channel flow. The Manning formula states:

$$Q = V\ x\ A = \frac{1}{n}\ x\ R^{\frac{2}{3}}\ x\ S^{\frac{1}{2}}\ x\ A$$

Where:

Q = Flow Rate, (m^3/s)

V = Velocity, (m/s)

n = Manning's Roughness Coefficient

R = Hydraulic Radius, (m)

S = Channel Slope

A = Flow Area, (m^2)

The n value can be found in the table below:

Type of Channel and Description	Minimum	Normal	Maximum
Natural streams - minor streams (top width at floodstage < 100 ft)			
1. Main Channels			
a. clean, straight, full stage, no rifts or deep pools	0.025	0.030	0.033
b. same as above, but more stones and weeds	0.030	0.035	0.040
c. clean, winding, some pools and shoals	0.033	0.040	0.045
d. same as above, but some weeds and stones	0.035	0.045	0.050
e. same as above, lower stages, more ineffective slopes and sections	0.040	0.048	0.055
f. same as "d" with more stones	0.045	0.050	0.060
g. sluggish reaches, weedy, deep pools	0.050	0.070	0.080
h. very weedy reaches, deep pools, or floodways with heavy stand of timber and underbrush	0.075	0.100	0.150

Table 2. The value of manning coefficient (n) for channels. (V.T., 1959)

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CHAPTER III
METHODOLOGY

3.1. General

Methodology serves to describe the methods that will be used in the final project work phase in the hope that this final project works in accordance with what is expected and in order to answer the problem formulation and make the final work process to be directed and systematic, then the author creates a flow chart as in **Figure 4.**

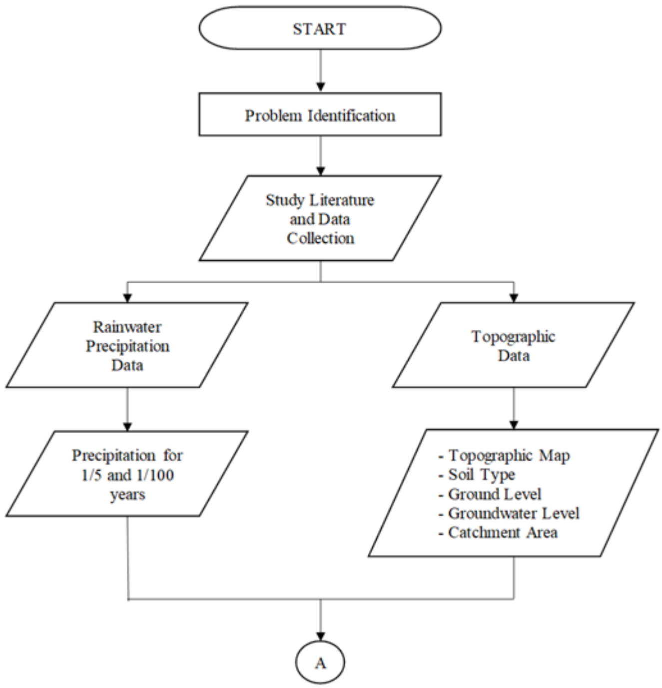

Figure 4. The flowchart diagram for the final thesis.

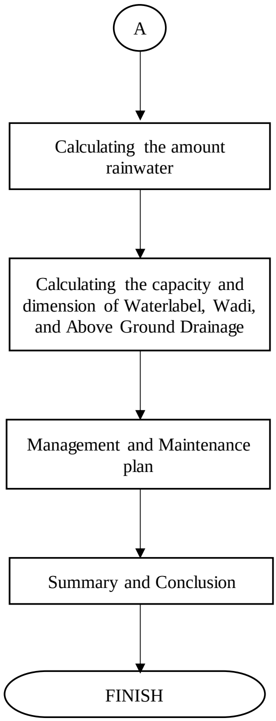

Figure 5. The flowchart diagram for the final thesis (cont.)

3.2. Planning Phase

1. Problem Identification
   Identify problems that arise due to differences in ideal conditions and present conditions
2. Literature Study
   Study and understand the theories that are used as a basis for solving problems that will be encountered later.
3. Data Collection

The data needed for the purposes of preparing this Final Thesis, among others:

a. Rainfall Precipitation
   Precipitation data needed in this thesis is data for years 1/5 years for the Water label application and 1/100 years as a basis for calculating discharge plans for Wadi and Above Ground Drainage
b. Topographic Map
   The Topographic data is used to determine the route of the drainage. Student also collect the data of the soil type to determine the infiltration rate time
c. Catchment Area
   The catchment area data is used to determine the area of the rainfall

4. Calculation Analysis
   a. Calculation of Rainfall Precipitation
      Analyzing rainfall precipitation data from the KNMI website for an event of rainfall during 1/5 and 1/100 years
   b. Specification of Water label
      Determining the specification of the water label based on the ideal condition
   c. Calculation of Above Ground Drainage Dimension
      Calculating the dimension of wadi based on Hydraulics and Hydrology analysis
   d. Calculation of Wadi's dimension
      Calculating the dimension of wadi based on the Hydraulics and Hydrology analysis
5. Management and Maintenance Plan Analysis
   Forming a management and maintenance plan for each solution to maintain the lifetime to be longer

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CHAPTER IV
DATA ANALYSIS

4.1. Data Processing

In this chapter student describe the process of researching the data needed for the further process.

4.1.1. Precipitation

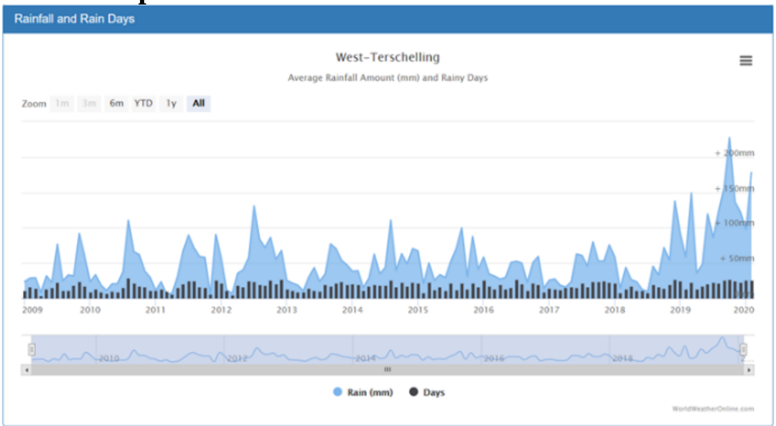

Figure 6. Average amount of rainfall in West-Terschelling. (World weather online corporation, 2019)

Based on the scope area of this project that student have selected, there are approximately 450 properties including houses and shops connected to the sewer, not included the streets and some green areas like parks and forests. Each property has different amount of foul water and rainwater flowing through the sewer system, for foul water it is based on the number of people living inside the property, and for the rainwater it is based on the surface area of the property. The bigger the surface area, the more rainwater will fall in the property.

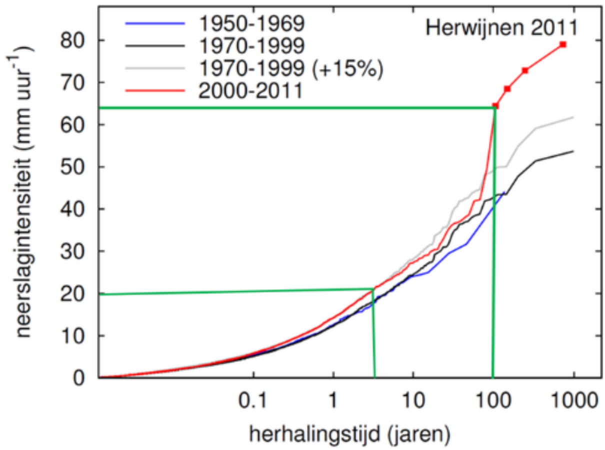

Figure 7. Rainfall precipitation in the Netherlands throughout the years. (Regenintensiteit, 2020)

Based on the data from KNMI, student will use the latest precipitation rate from 2000 – 2011 (red line). For the water label solution, writer will use the precipitation for 1/5 years equals 20 mm/hour, and for the wadi and above ground drainage solution, the precipitation for 1/100 years will be used which equals 65 mm/hour.

4.1.2. Soil Type

From the website *Dinoloket.nl*, student did a research on the condition of the soil in West Terschelling. The government has tested at least 14 spots on the surrounding of West Terschelling, and here is the result for the first 5 m.

Figure 8. The spots chosen to test the soil type. (Dinoloket, 2020)

Number	0 – 1 m	1 – 2 m	2 – 3 m	3 – 4 m	4 – 5 m
1	Sand Medium	Sand Medium	Sand Medium	Clay	Sand Medium
2	Sand Medium	Sand Medium	Sand Medium	Sand Medium	Sand Medium
3	Sand Medium	Sand Medium	Sand Medium	Clay	Sand Medium
4	Sand Fine	Sand Fine	Sand Fine	Sand Fine	Sand Fine
5	Sand Medium	Sand Medium	Sand Medium	Sand Medium	Sand Medium
6	Sand Fine	Sand Fine	Sand Fine	Sand Fine	Sand Fine
7	Sand Fine	Sand Fine	Sand Fine	Sand Fine	Sand Fine
8	Sand Fine	Sand Fine	Sand Fine	Sand Fine	Sand Fine
9	Sand Fine	Sand Fine	Sand Fine	Sand Fine	Sand Fine
10	Sand Medium	Sand Medium	Sand Medium	Sand Medium	Sand Fine
11	Sand Medium	Sand Medium	Sand Medium	Sand Medium	Sand Medium
12	Sand Fine	Sand Fine	Sand Fine	Sand Fine	Sand Fine
13	Peat & SF	Sand Medium	Sand Medium	Sand Medium	Sand Medium
14	Sand Medium	Gyttja & SM	Sand Medium	Sand Medium	Sand Medium

Table 3. Results for the soil type.

As we can see from the results, because of its location on an island and next to the sea, most of the soil types are sand which will be classified as Medium Sand and Fine sand. During the visit to the city, student did not get the chance to do a field test to find the infiltration rate of the sand. Therefore, for this final project student will use the basic infiltration rate for its soil.

4.1.3. Groundwater Level

Figure 9. The spot chosen to test the groundwater level. (Dinoloket, 2020)

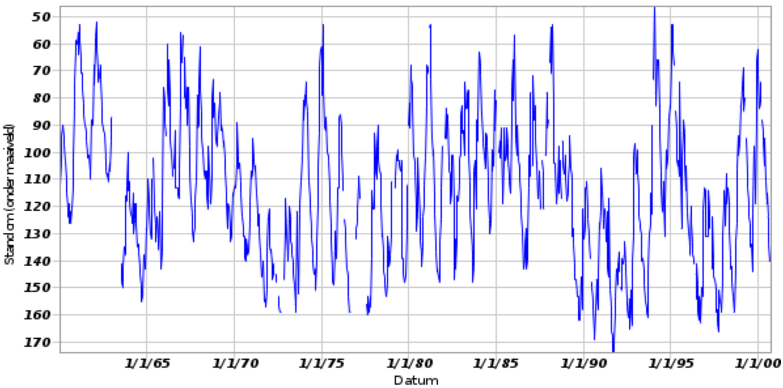

Figure 10. Results for the groundwater level. (Dinoloket, 2020)

For the groundwater level in the city of West-Terschelling, student can only obtain one result from *Dinoloket.nl*. So, student decided to use this spot as a reference for the rest of the area of the city. The data that student has, has been tested since 1965 until 2000. From the graph, it says that the groundwater level can be as low as less than 50 cm under the ground level during January and as many as 170 cm under the ground level during March-April. In average, the groundwater level can be as low as 55 cm and as high as 160 cm.

4.1.4. Catchment Area

The catchment area for this final thesis is located in the city of West-Terschelling, mostly in the populated area. Student decided to group the area into different zones based on the availability of the solutions and the ground level.

Figure 11. The catchment area and its multiple zones. (Google Earth, 2020)

4.2. Water Label Calculation

Figure 12. Example of water label application in real life. (Waterlabel, 2020)

In this sub-chapter, student will explain how to calculate the amount of rainwater and how it is connected to the water label and other supporting solutions.

4.2.1. Calculation of the amount of rainwater

a. Calculate Area of the Properties

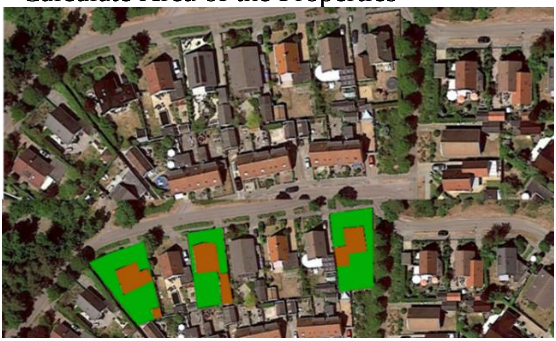

Figure 13. Selected area for the example in the calculation. (Google Earth, 2020)

To calculate the area of the properties, student uses the Google Earth app to help finding the area of it. For example, on the picture above, there are 3 houses that has been calculated with Google Earth, and these are the results.

House	Building Area (m^2)	Garden Area (m^2)
1	139	407
2	174	295
3	140	436

Table 4. Results of the areas for each property.

b. Calculate Precipitation

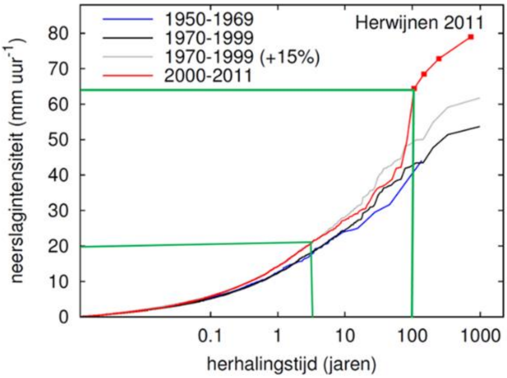

Figure 14. Rainfall precipitation. (Regenintensiteit, 2020)

The graph above display the precipitation in the Netherlands. There are multiple lines with different colors based on its year. For this calculation, student will use the precipitation from the year 2000 – 2011 which has the value of 20 mm/hour for the whole area of West Terschelling. This is a precipitation of a rainfall event of 1/5 years. This data is taken from the website of KNMI.

c. Calculate Total Amount of Rainwater

After student gets the area of the houses and the amount of precipitation, now the next step is to calculate the total rainwater that falling on the property. With the equation of:

$$Total\ Rainwater = Area\ x\ Precipitation\ x\ Time$$

where: Total Rainwater (liter)

Area (m2)

Precipitation (mm/hour)

Time (1 hour)

Therefore, here is the results from the example of properties above.

No	Building Area (m^2)	Rainwater on Building Area (liter)	Garden Area (m^2)	Rainwater on Garden Area (liter)
1	139	2780	407	8140
2	174	3480	295	5900
3	140	2800	436	8720

Table 5. Results of the calculation

4.2.2. Determination of the label

Label	Water Stored (%)
A	86 - 100
B	71 - 85
C	56 – 70
D	41 – 55
E	26 – 40
F	6 – 25
G	0 – 5

Table 6. The classification of each label.

After the total amount of rainwater is achieved, the label of each property can be determined. In case House number 1, the rainwater on the building is 2780 liter and the rainwater on the garden is 8140 liter which makes a total of 10920 liter of rainwater. If the owner just let all the rainwater flows through the sewer system, then the house will get a ‘G’ label. If the owner infiltrate 50% of the total rainwater, which is 5460 liters, the property will get a ‘D’ label. In order to get the best label available, the owner must store at least 9391 liters of rainwater.

4.3. Above Ground Drainage Calculation

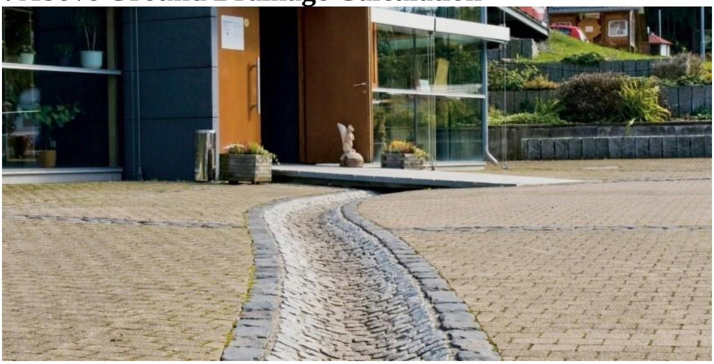

Figure 15. An example of an above ground drainage in the street. (Urban Green-Blue Grids, 2020)

For above ground drainage, student focus on the calculation from the drainage in zone 13. The drainages in this system is all in a trapezoid shape, has a slope of 1:0.5, and student assume that b = h. In specific, there are 4 drainages in zone 13, DBB4 from BB5 to BB7, DBB5 from BB6 to BB7, DBA2 from BA3 to BA4, and DBA3 from BB7 to BA5. In this example, student will calculate drainage DBB4.

Figure 16. Selected area for the example in above ground drainage calculation. (Google Earth, 2020)

ZONE 11											
House	Building Area (m2)	C	Garden Area (m2)	C	Total Area (m2)	Street	Width (m)	width each side	Length (m)	Area (m2)	Area each side (m2)
1	323	0.85	440	0.15	763	1	4.5	2.25	78	351	175.5
2	177	0.85	272	0.15	449	2	4	2	30	120	60
3	149	0.85	258	0.15	407	3	6	3	23	138	69
4	187	0.85	230	0.15	417						
5	304	0.85	393	0.15	697						
Total Area	1140		1593		2733	Total Area				609	304.5

Table 7. The data of the surroundings of the drainage.

4.3.1. Hydrology analysis

a. C Combination (C)

First is to calculate the value of C combination. From the data above, readers can see that there are 3 houses connected to the sewer, house number 1, 2, and 3. The road that is connected to the drainage is half of road number 1. In this calculation, student use 0.85 as the C value for house, 0.15 as the C value for garden, and 0.75 as the C value for roads, therefore:

$$C\ combination = \frac{\Sigma \text{Ci x Ai}}{\Sigma Ai}$$

$$= \frac{(649\ x\ 0.85) + (970\ x\ 0.15) + (175.5\ x\ 0.75)}{1794.5} = 0.46$$

b. Hydrology Discharge (Q)

Second is to calculate the Q hydrology. From figure 17, student can get the precipitation to calculate the Q. for designing the drainage, student uses the precipitation for 1/100 years, which is I = 65 mm/hour. The total area from the previous sub chapter is A = 1794.5 m^2 = 0.0017495 km^2, so:

$$Q\ Hydrology = \frac{1}{3.6}\ x\ C\ x\ I\ x\ A$$
$$= \frac{1}{3.6}\ x\ 0.46\ x\ 65\ x\ 0.0017495$$
$$= 0.0149\ m3/s$$

4.3.2. Hydraulics analysis

a. Velocity Design and Drainage Area Needed (V and A)

Then for the velocity design, student uses 0.5 m/s for this type of drainage. The value of Q we can get from the previous part, Q = 0.0149 m^3/s, therefore:

$$A\ need = \frac{Q}{V} = \frac{0.0149}{0.5} = 0.0299\ m2$$

b. Height of Water (h water)

After that, student will use the Area's formula to calculate to find the height of the water in the drainage by using the Area formula for a trapezoid shape,

$$A = h\ (b + zh) = h(h + 0.5h) = 1.5h^2$$

So, the height of the water can be calculated by,

$$h = \sqrt{\frac{A}{1.5}} = \sqrt{\frac{0.0299}{1.5}} = 0.141\ m$$

c. Height and Width of Drainage (b and h)

Fifth, student will add a safety height to give a space for the water so it will not overflow. The amount of safety height is, w = 0.1 m, so,

$$h = h\, water + w = 0.141 + 0.1 = 0.241\, m \sim 0.3\, m$$

In this design for the above ground drainage, student assume that b = h, therefore

$$b = h = 0.3\, m$$

d. Area of Drainage (A)

Sixth, is to calculate the area of the drainage with the formula for a trapezoid shape drainage, then:

$$A = h\,(b + zh) = 0.3\,(0.3 + 0.5\, x\, 0.3) = 0.135\, m^2$$

e. Wetted Perimeter (P)

Then, student calculate count the wetted perimeter of the drainage with the formula:

$$P = b + 2h\sqrt{z^2 + 1} = 0.3 + 2\, x\, 0.3\sqrt{0.5^2 + 1} = 0.97\, m$$

f. Hydraulic Radius (R)

After that, student calculate the length of the hydraulic radius with the following formula:

$$R = \frac{A}{P} = \frac{0.135}{0.97} = 0.139\, m$$

g. Slope or Gradient (S)

Ninth, student will use the Manning equation to find the slope. For this design, student use n = 0.025 due to the fact that most of its material are sand. So,

$$V = \frac{1}{n} \; x \; R^{\frac{2}{3}} \; x \; S^{\frac{1}{2}}$$

$$S = \left(\frac{V \; x \; n}{R^{\frac{2}{3}}}\right)^2 = \left(\frac{0.5 \; x \; 0.025}{0.139^{\frac{2}{3}}}\right)^2 = 0.0022$$

h. Hydraulic Discharge (Q)

Next, student calculate a discharge, but this time is the hydraulic discharge. The formula that is going to be used is the manning equation, combined with the discharge formula.

$$Q = V \; x \; A = \frac{1}{n} \; x \; R^{\frac{2}{3}} \; x \; S^{\frac{1}{2}} \; x \; A$$

$$= \frac{1}{0.025} \; x \; 0.139^{\frac{2}{3}} \; x \; 0.0022^{\frac{1}{2}} \; x \; 0.135$$

$$= 0.0679 \; {m^3}/{s}$$

i. Discharge Control (Q Control)

Finally, to make sure that the drainage is suitable for the amount of rainwater, the discharge needs to be controlled, so:

$$Q \; hydraulic \geq Q \; hydrology$$

$$0.0679 \; \geq 0.0149 \; (OK)$$

Hence, drainage DBB4 from BB5 to BB7 is adequate for the amount of rainwater that will be flowing through the drainage based on the calculations.

4.4. Wadi (Bioswales) Calculation

Figure 17. A wadi in the village of Elst. (Stad + Groen, 2018)

In this sub-chapter, an explanation on how to calculate the volume of the wadi will be shown. Student will describe the process step by step, including the example. For this calculation, student uses the same zone as the calculation for above ground drainage, zone 11.

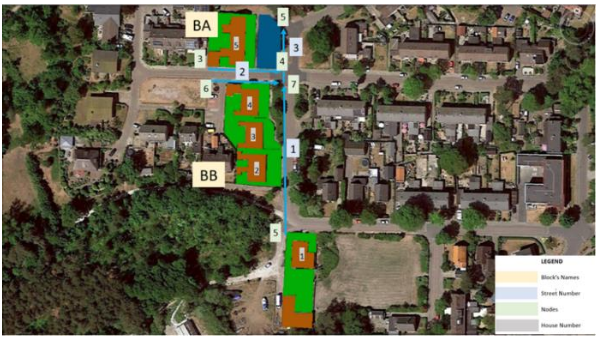

Figure 18. Selected area for the example in wadi calculation. (Google Earth, 2020)

ZONE 11												
House	Building Area (m2)	C	Garden Area (m2)	C	Total Area (m2)	Street	Width (m)	width each side	Length (m)	Area (m2)	Area each side (m2)
1	323	0.85	440	0.15	763	1	4.5	2.25	78	351	175.5
2	177	0.85	272	0.15	449	2	4	2	30	120	60
3	149	0.85	258	0.15	407	3	6	3	23	138	69
4	187	0.85	230	0.15	417						
5	304	0.85	393	0.15	697						
Total Area	1140		1593		2733	Total Area				609	304.5

Table 8. The data of the surroundings of the wadi.

4.4.1. Calculation of wadi dimension

a. Total Area (A)

As shown by the table above, the total area that will go to the wadi is:

$$A = 2733 + 364.5 = 3097.5\, m^2$$

b. Total Rainwater (V)

The total rainwater can be calculated by multiplying it with the precipitation, as follows:

$$V = 3097.5\, x\, 65 = 201337.5\, liter \approx 201.3375\, m^3$$

c. Correlate with available area

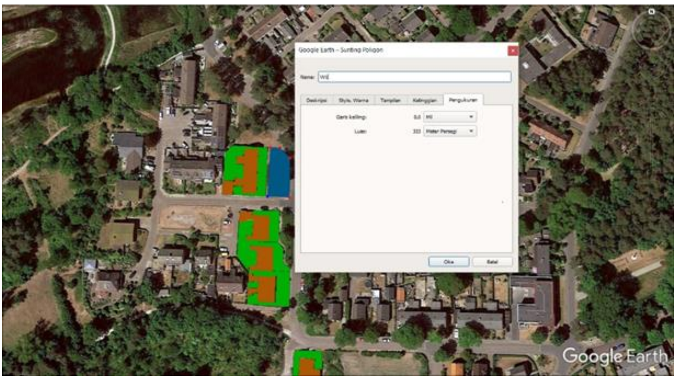

Figure 19. The value of the available area for designing a wadi. (Google Earth, 2020)

From google earth, student found that the area available to build a wadi is 333 m^2.

d. Depth (Y)

Since the volume of rainwater is less than the volume of the wadi if the depth is 1 m, all the rainwater will end up in the wadi and are not going to be transported into another zone. Student has designed a trapezoid cube wadi, with a ratio for the slope is 1:m = 1:1 a surface dimension of 18 m x 18.5 m. Therefore, the depth of the can be calculated as the following formula:

$$V = \left(\frac{b - 2y + b}{2} \; x \; y \right) \; x \; t$$

$$201.3375 = \left(\frac{18 - 2y + 18}{2} \; x \; y \right) \; x \; 18.5$$

$$\frac{201.3375}{18.5} = (18 - y)y$$

$$11 = 18y - \; y^2$$

$$y = 0.633 \; m \; \approx 0.65 \; m$$

4.4.3. Calculation of duration to infiltrate the rainwater

Based on the data from the previous chapter, the soil type in West-Terschelling in mostly sand and it has an infiltration rate of 24 mm/hour. It means that in one hour, sand can infiltrate 24 mm of rainwater, or 24 liter of rainwater in an area of 1 m^2. So, the infiltration rate capacity for the wadi can be calculated as below:

$$Surface\ Area = 2\ x\ \left(\frac{18 + 16.7}{2} x0.65\right) + 2\ x\ \left(\frac{18.5 + 17.2}{2} x0.65\right) + \ (16.7x17.2) = 333\ m^2$$

In 1 hour, the amount of rain infiltrates to the wadi are:

$$V = A\ x\ I\ x\ t = 333\ x\ 65\ x\ 1 = 21645\ liter$$

Hence, the duration to infiltrate all the rainwater is:

$$t = \frac{Vtotal}{Vperhour} = \frac{201337.5}{21645} = \ 9.3\ hours$$

4.5. Management and Maintenance Plan

4.5.1. Execution Plan

To get the maximum results from the water label, it takes a mature strategy when executing it. This includes planning, both medium term and long term, what requirements are needed, both from the owner, municipality, and controller, as well as the duration of the execution, and what results are expected to occur after the execution.

- Test Planning

The planning of the execution will be grouped into 2 parts, manually from the residents and annually from the municipality.

1. Manually

Planning manually means the owner of the property will manually send a report to the municipality related to what he has done to prevent rainwater from flowing into the sewer system. Then after that the municipality will check the house concerned to ensure if what is written is in accordance with the actual conditions. After that, this update will be recorded in the system.

2. Annually form the Authorities

In a certain period of time (1 year), the team from the municipality will visit the houses to check what the house owner has done. This is to ensure compatibility between the data held by the team from the municipality and what is in the field.

a. Water label

- At the start of the application

When the water label is finally being executed in the city, first the municipality must invite the residents to give a socialization about the application of water label. Residents must understand the tools, the method, and the expected results from this solution. Then, the residents must send report to the municipality about their rainwater distribution on their own property. Therefore, it can be a reference as the starting point.

- Annually from the municipality

Every once in a year, the municipality must do an inspection to each owner of the house about their progress compared to last year. An exception can be made if the landlord has reported it 3 months before. The municipality can do an inspection by themselves, door to door, or the municipality can just ask for a report to be sent from the residents. If the owner does not send the report, so it can be assumed that it stays the same since last year.

b. Wadi

- After the first rainstorm event

By the end of the first rainstorm after the wadi has finished constructed, a test must be taken to see if the capacity of the wadi from the design is adequate with the reality. Also, not to forget the duration of the rainwater to infiltrate the soil must be counted as well.

- After a high predicted intensity precipitation or a long rainstorm

Usually, there is a high anticipated rainfall occurs during the years. With the help form weather forecast, the experts and prepare for that situation and inspect the wadi before and after the rainstorm to see if something unwanted happened. A long rainstorm can also be tricky if it comes with a high precipitation.

c. Above Ground Drainage

- After the first rainstorm event

After the first rainstorm after the drainage has finished constructed, a test must be taken to see if the rainwater flows to the direction as planned. The velocity of the rainwater also needs to be audited, is it satisfactory or not.

- After a high predicted intensity precipitation or a long rainstorm

If there is a high precipitation rain with a long intensity is going to occur in the city, a test should be executed to make sure that the drainage is ready for that event at it will not cause any damage.

4.5.2. Monitor Test and Evaluate

a. Water label

- The improvement from the landlords

Annually, municipality will ask for the progress (if any) from the owner of each properties, then it can be monitored if there is a significant chance to be better, or is it just the same as the previous report.

To trigger the residents for keep getting better and improving their rainwater distribution, the municipality could propose to the residents some benefits for the goods of their own. Benefits such as a discount on taxes for owners who have a label C or higher, or a coupon for food and beverages or transportation. For the residents that do not progress, a warning can be given and a time for them to be better.

b. Wadi

- The height of the water inside the wadi

After the experts do the test, the height of the water inside the wadi can be monitored and compared with the other results. The height should be checked if it is corresponding with the design and the real condition.

- Time to infiltrate the rainwater into the soil

Another aspect that is important in the wadi is the rainwater infiltration time. Experts need to make sure that the rainwater does not stay for too long inside the wadi ant not ready for the next rainstorm event.

c. Above Ground Drainage

- Drainage Velocity

From the design, readers know how fast the velocity for each drainage is has been designed. After did some tests on the drainage, the results must be monitored to make sure the drainage is safe for the residents.

- Drainage Capacity

During the event of rainstorm, residents and the people in the city can observe if the rainwater is exceeding the capacity or not. This must be monitored and compared to the other results from another rainfall and it can be an evaluation for the future.

4.5.2. Inspection

a. Water label
   1. Inspect the progress from each landlord
   2. Check for possible error in the system

b. Wadi
   1. Check if the rainwater inside the wadi infiltrate to the soil on time after a rainstorm
   2. Regularly inspect the practice for signs of erosion, obstructions, or unhealthy vegetation.
   3. Remove weeds and invasive plants.
   4. If there is severe erosion, reestablish grass and vegetation

c. Above Ground Drainage
   1. Check if the rainwater flows smoothly to on the drainage
   2. Check to make sure the rainwater does not go over capacity of the drainage

4.5.2. Management

a. Wadi
   1. Communicate with the residents about the wadi
   2. Add attributes to prevent accident (if necessary)
   3. Water new plants during initial establishment of plant growth (first 12 months) and extreme droughts.

Watering should only be needed when it has not rained for more than 10 days.

b. Above Ground Drainage
   1. Give the residents a socialization and education about the drainage
   2. Add rules or signs for parking vehicle near the drainage

4.5.2. Maintenance

a. Wadi
   1. Mow the grass every 3 months to get the best infiltration results
   2. Clean the wadi from dirt such as debris and blockages
   3. Repair undercut, eroded, and bare soil areas
   4. Remove fallen leaves from the area. Leaves may block the flow of rainwater.

b. Above Ground Drainage
   1. Perform a routine check after an event of rainfall
   2. Clean the drainage annually with a high-pressure cleaner
   3. Ensure that the contributing drainage area, inlets, and facility surface are clear of debris.
   4. Remove accumulated sediment and oil/grease from inlets, pretreatment devices, flow diversion structures, and overflow structures.
   5. Examine channel bottom for evidence of erosion, braiding, excessive ponding, or dead grass
   6. Inspect side slopes and grass filter strips for evidence of any rill or gully erosion and repair.

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CHAPTER V
CONCLUSION AND RECOMMENDATION

5.1. Conclusion

In Conclusion, Nashruddin Latif and the other 3 members of the group has agreed to the do their final project in the city of West-Terschelling. Nashruddin is responsible for the water management part. In specific, he is designing the rainwater plan in the city. In order to control the rainwater, 3 main solution have been planned. First is a water label, second is a wadi, and the last one is an above ground drainage.

A water label will be used to calculate the amount of rainwater that falls in the properties on West Terschelling. Then the municipality can monitor the results and give some appreciation for the good residents and some warnings for the bad residents

A wadi is the solution to keep the rainwater in the city. In total, there are 27 proposed places to design a wadi with their own catchment area. The rainwater that falls on the catchment area will be carried by an above ground drainage to the nearest wadi.

Lastly, an above ground drainage is the selected solution to keep the rainwater from flowing to the existing sewer system. This solution is chosen because compared to the other typer of sewer system, this one is relatively the cheapest one, and it is also good for the look of the city. The area that cannot be built a wadi, will have their rainwater carried by this drainage to the sea.

5.2. Recommendation

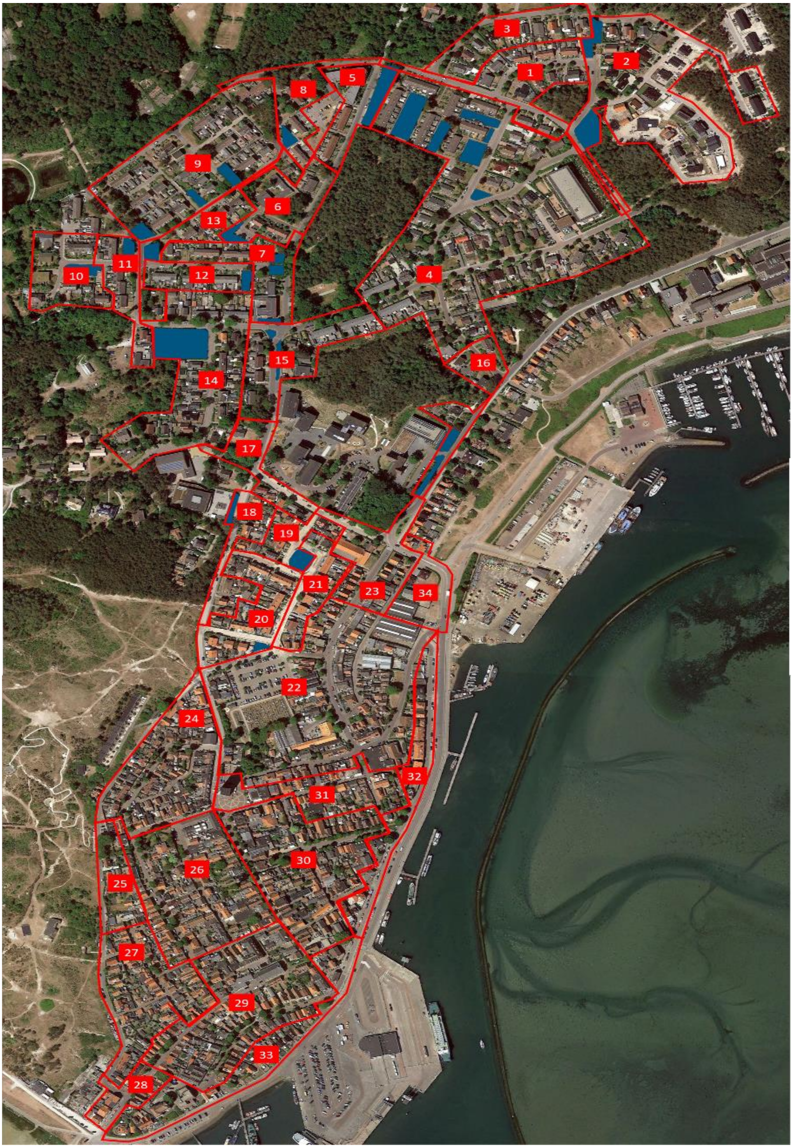
Recommendation that can be given are:

1. The municipality can work together with Non-Governmental Organization to help with the recording of each landlord’s progress.
2. The municipality can offer an advantage for the landlords to motivate them to store the rainwater such as less taxes and other benefits.

3. From student exploration, there are some available green area to build a wadi, but it is under the ownership of the residents. Authorities can negotiate if some of the area can be used as a water retaining structure.
4. The label on the water label can be designed as needed as time goes by,

APPENDIX

Appendix 1. Catchment Area in West-Terschelling with its zones and nodes

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Appendix 2. Hydrology analysis for above ground drainage

ZONE 1														
BLOCK	**Drainage Name**	**Node**		**Predecessor**	**Length (m)**	**Property**				**Roads**		**Σ Ci x Ai**	**Σ Ai**	**C combination**
						House		**Garden**						
		From	**To**			**A (m2)**	**C**	**A (m2)**	**C**	**A (m2)**	**C**			
AF	DAF1	AO4	AF3	0	120	0	0.85	0	0.15	300	0.75	225.00	300.00	0.75
	DAF2	AF1	AF2	0	78	1311.8	0.85	562.2	0.15	175.5	0.75	1330.99	2049.50	0.65
	DAF3	AF2	AF3	DAF2	53	2036.3	0.85	872.7	0.15	294.75	0.75	2082.82	3203.75	0.65
AG	DAG1	AG1	AG2	0	78	1850.8	0.85	793.2	0.15	175.5	0.75	1823.79	2819.50	0.65
	DAG2	AG2	AG4	DAG1	53	1850.8	0.85	793.2	0.15	294.75	0.75	1913.22	2938.75	0.65
	DAG3	AF3	AG3	AF1,DAF3,DA	35	3887.1	0.85	1665.9	0.15	849	0.75	4190.67	6402.00	0.65
AH	DAH1	AI2	AH1	DAI1	35	946.4	0.85	405.6	0.15	378.75	0.75	1149.34	1730.75	0.66
AI	DAI1	AI3	AI2	0	120	0	0.85	0	0.15	300	0.75	225.00	300.00	0.75
AM	DAM1	AG3	AM3	DAG3	11	3887.1	0.85	1665.9	0.15	849	0.75	4190.67	6402.00	0.65
	DAM2	AH1	AM3	DAH1	4.5	946.4	0.85	405.6	0.15	378.75	0.75	1149.34	1730.75	0.66
ZONE 2														
BLOCK	**Drainage Name**	**Node**		**Predecessor**	**Length (m)**	**Property**				**Roads**		**Σ Ci x Ai**	**Σ Ai**	**C combination**
						House		**Garden**						
		From	**To**			**A (m2)**	**C**	**A (m2)**	**C**	**A (m2)**	**C**			
AJ	DAJ1	AJ1	AJ2	0	138	292	0.85	1002	0.15	125	0.75	492.25	1419.00	0.35
	DAJ2	AJ2	AJ3	DAJ1	88	628.4	0.85	2110	0.15	275	0.75	1056.89	3013.40	0.35
	DAJ3	AJ3	AJ4	DAJ2	138	887.4	0.85	2924	0.15	407	0.75	1498.14	4218.40	0.36
	DAJ4	AJ4	AJ5	DAJ3	88	1055.6	0.85	3322	0.15	519.5	0.75	1785.19	4897.10	0.36
	DAJ5	AJ1	AJ6	0	78	413.3	0.85	792	0.15	195	0.75	616.36	1400.30	0.44
	DAJ6	AJ6	AJ7	DAJ5	72	714.3	0.85	1465	0.15	375	0.75	1108.16	2554.30	0.43
	DAJ7	AJ7	AJ5	DAJ6,DAN1	78	1445.5	0.85	3393	0.15	700	0.75	2262.63	5538.50	0.41
AL	DAL1	AL1	AL2	0	72	471.13	0.85	1067	0.15	345	0.75	819.26	1883.13	0.44
AN	DAN1	DAN1	DAN2	0	65	367	0.85	1243	0.15	162.5	0.75	620.28	1772.50	0.35
AK	DAK1	DAK1	DAK3	DAL1	53	1027.13	0.85	2336	0.15	565	0.75	1647.21	3928.13	0.42
	DAK2	DAK1	DAK2	0	65	513.7	0.85	1028	0.15	325	0.75	834.60	1866.70	0.45
	DAK3	DAK2	DAK3	DAK2	53	513.7	0.85	1028	0.15	470.75	0.75	943.91	2012.45	0.47
AM	DAM3	AM1	AM3	DAJ7	35	1445.5	0.85	3393	0.15	778.75	0.75	2321.69	5617.25	0.41
	DAM4	AM2	AM3	0	115	0	0.85	0	0.15	345	0.75	258.75	345.00	0.75
ZONE 3														
BLOCK	**Drainage Name**	**Node**		**Predecessor**	**Length (m)**	**Property**				**Roads**		**Σ Ci x Ai**	**Σ Ai**	**C combination**
						House		**Garden**						
		From	**To**			**A (m2)**	**C**	**A (m2)**	**C**	**A (m2)**	**C**			
AF	DAF4	AF4	AF5	0	118	1108	0.85	2475	0.15	265.5	0.75	1512.18	3848.50	0.39
	DAF5	AF5	AF6	DAF4	70	1381	0.85	3383	0.15	157.5	0.75	1799.43	4921.50	0.37
AO	DAO1	AO1	AO2	0	118	0	0.85	0	0.15	265.5	0.75	199.13	265.50	0.75
	DAO2	AO2	AO3	DAO1	70	0	0.85	0	0.15	423	0.75	317.25	423.00	0.75

ZONE 4

BLOCK	Drainage Name	Node		Predecessor	Length (m)	Property				Roads		Σ Ci x Ai	Σ Ai	C combination
						House		Garden						
		From	To			A (m2)	C	A (m2)	C	A (m2)	C			
AS	DAS1	AS2	AS3	0	84	626	0.85	1404	0.15	210	0.75	900.20	2240.00	0.40
	DAS2	AS1	AQ2	DAS1, DAQ1	66	1702	0.85	4433.5	0.15	568.5	0.75	2538.10	6704.00	0.38
AR	DAR1	AR2	AR3	0	100	936	0.85	2900	0.15	225	0.75	1399.35	4061.00	0.34
	DAR2	AR3	AR4	DAR1	103	1680	0.85	4591	0.15	456.75	0.75	2459.21	6727.75	0.37
	DAR3	AR1	AP2	DAR2, DD1	66	3023	0.85	8428	0.15	1062	0.75	4630.25	12513.00	0.37
AQ	DAQ1	AQ1	AQ2	0	84	718	0.85	1665.5	0.15	210	0.75	1017.63	2593.50	0.39
	DAQ2	AQ2	AQ3	DAS2	55	2270	0.85	7437.5	0.15	692.25	0.75	3564.31	10399.75	0.34
	DAQ3	AQ3	AQ4	DAQ2	103	2865	0.85	9232.5	0.15	924	0.75	4513.13	13021.50	0.35
	DAQ4	AQ4	AQ5	DAQ3	58	3733	0.85	9773.5	0.15	1025.5	0.75	5408.20	14532.00	0.37
AP	DAP1	AP1	AP2	0	203	808	0.85	2517	0.15	456.75	0.75	1406.91	3781.75	0.37
	DAP2	AP2	AP3	DAP1	55	1146	0.85	3729	0.15	580.5	0.75	1968.83	5455.50	0.36
	DAP3	AP4	AP5	0	65	0	0.85	2	0.15	162.5	0.75	122.18	164.50	0.74
	DAP4	AP5	AP3	DAP3	82	768	0.85	2010	0.15	367.5	0.75	1229.93	3145.50	0.39
	DAP5	AP3	AH3	DAP4, DAH2	93	1111	0.85	3443	0.15	944.25	0.75	2168.99	5498.25	0.39
	DAP6	AP1	AP4	0	115	0	0.85	0	0.15	115	0.75	86.25	115.00	0.75
AH	DAH1	AH1	AH3	0	65	149	0.85	743	0.15	162.5	0.75	359.98	1054.50	0.34
	DAH2	AH3	AH4	DAP5	82	149	0.85	743	0.15	367.5	0.75	513.73	1259.50	0.41
	DAH3	AH4	AH2	DAI5	68	1433	0.85	4402	0.15	1097.25	0.75	2701.29	6932.25	0.39
AI	DAI2	AI1	AI2	0	68	0	0.85	2	0.15	153	0.75	115.05	155.00	0.74

ZONE 5

BLOCK	Drainage Name	Node		Predecessor	Length (m)	Property				Roads		Σ Ci x Ai	Σ Ai	C combination
						House		Garden						
		From	To			A (m2)	C	A (m2)	C	A (m2)	C			
AU	DAU1	AU1	AU3	0	57	685	0.85	969	0.15	156.75	0.75	845.16	1810.75	0.47
	DAU2	AU2	AU3	0	85	976	0.85	879	0.15	233.75	0.75	1136.76	2088.75	0.54
	DAU3	AU3	AI4	DAU1,DAU2	5.5	1661	0.85	1848	0.15	390.5	0.75	1981.93	3899.50	0.51
AI	DAI3	AQ7	AI4	0	57	0	0.85	0	0.15	156.75	0.75	117.56	156.75	0.75
	DAI4	AI3	AI4	0	85	0	0.85	0	0.15	233.75	0.75	175.31	233.75	0.75

ZONE 6

BLOCK	Drainage Name	Node		Predecessor	Length (m)	Property				Roads		Σ Ci x Ai	Σ Ai	C combination
						House		Garden						
		From	To			A (m2)	C	A (m2)	C	A (m2)	C			
AU	DAU4	AU1	AU6	0	75	208	0.85	550	0.15	187.5	0.75	399.93	945.50	0.42
	DAU5	AU6	AU5	DAU4	48	848	0.85	1667	0.15	271.5	0.75	1174.48	2786.50	0.42
	DAU6	AU5	AU6	DAU5	35	848	0.85	1667	0.15	332.75	0.75	1220.41	2847.75	0.43
AV	DAV1	AV1	AV2	0	48	264.8	0.85	460	0.15	84	0.75	357.08	808.80	0.44
	DAV2	AV2	AV3	DAV1	35	418.6	0.85	701	0.15	145.25	0.75	569.90	1264.85	0.45
	DAV3	AV3	AV4	DAV2	20	418.6	0.85	701	0.15	190.25	0.75	603.65	1309.85	0.46
	DAV4	AV4	AW4	DAV3	4.5	418.6	0.85	701	0.15	190.25	0.75	603.65	1309.85	0.46

ZONE 7														
BLOCK	**Drainage Name**	**Node**		**Predecessor**	**Length (m)**	**Property**				**Roads**		**Σ Ci x Ai**	**Σ Ai**	**C combination**
						House		**Garden**						
		From	**To**			**A (m2)**	**C**	**A (m2)**	**C**	**A (m2)**	**C**			
AW	DAW1	AV1	AW7	0	18	0	0.85	0	0.15	45	0.75	33.75	45.00	0.75
	DAW2	AW6	AW7	DAW3	17	205	0.85	500	0.15	779	0.75	833.50	1484.00	0.56
	DAW3	AW5	AW6	0	112	823.2	0.85	1665	0.15	728	0.75	1495.47	3216.20	0.46
AX	DAX1	AX1	AX3	0	73	678	0.85	1162	0.15	182.5	0.75	887.48	2022.50	0.44
	DAX2	AX2	AX3	0	17	0	0.85	0	0.15	51	0.75	38.25	51.00	0.75
AQ	DAQ5	AQ6	AQ8	0	73	0	0.85	0	0.15	182.5	0.75	136.88	182.50	0.75
	DAQ6	AQ7	AQ8	0	18	0	0.85	0	0.15	45	0.75	33.75	45.00	0.75
	DAQ7	AQ8	AX3	DAQ5,DAQ6	5	0	0.85	0	0.15	227.5	0.75	170.63	227.50	0.75
ZONE 8														
BLOCK	**Drainage Name**	**Node**		**Predecessor**	**Length (m)**	**Property**				**Roads**		**Σ Ci x Ai**	**Σ Ai**	**C combination**
						House		**Garden**						
		From	**To**			**A (m2)**	**C**	**A (m2)**	**C**	**A (m2)**	**C**			
AU	DAU7	AU2	AU4	0	107	84	0.85	280	0.15	294.25	0.75	334.09	658.25	0.51
	DAU8	AZ3	AU5	7,DAY1,DAZ1,	92	660	0.85	759	0.15	1065.5	0.75	1473.98	2484.50	0.59
AY	DAY1	AY1	AU4	0	60	0	0.85	0	0.15	135	0.75	101.25	135.00	0.75
AZ	DAZ1	AZ1	AZ3	0	107	0	0.85	0	0.15	294.25	0.75	220.69	294.25	0.75
	DAZ2	AZ2	AZ3	0	60	0	0.85	0	0.15	135	0.75	101.25	135.00	0.75

ZONE 9														
BLOCK	Drainage Name	Node		Predecessor	Length (m)	Property				Roads		Σ Ci x Ai	Σ Ai	C combination
						House		Garden						
		From	To			A (m2)	C	A (m2)	C	A (m2)	C			
BE	DBE1	BE1	BE2	0	70	0	0.85	0	0.15	175	0.75	131.25	175.00	0.75
	DBE2	BE1	BE3	0	40	0	0.85	0	0.15	70	0.75	52.50	70.00	0.75
	DBE3	BE3	BE4	0	66	628	0.85	1188	0.15	115.5	0.75	798.63	1931.50	0.41
	DBE4	BE2	BE4	0	30	0	0.85	2	0.15	67.5	0.75	50.93	69.50	0.73
BD	DBD1	BD1	BD2	0	66	569	0.85	911.7	0.15	115.5	0.75	707.03	1596.20	0.44
	DBD2	BD1	BD3	DBE2	68	0	0.85	0	0.15	189	0.75	141.75	189.00	0.75
	DBD3	AY3	BD3	DAY2,DAY3	3.5	357	0.85	859	0.15	396	0.75	729.30	1612.00	0.45
	DBD4	BD3	BD4	DBD2,DBD3	80	892.9	0.85	1785	0.15	785	0.75	1615.47	3462.90	0.47
	DBD5	BD2	BD4	BE3,DBE4, DB	65	1197	0.85	2101.7	0.15	444.75	0.75	1666.27	3743.45	0.45
BF	DBF1	BF1	BF2	DBE1	40	0	0.85	0	0.15	275	0.75	206.25	275.00	0.75
	DBF2	BF1	BF3	0	95	57	0.85	5.1	0.15	213.75	0.75	209.53	275.85	0.76
	DBF3	BF2	BF4	0	92	0	0.85	2	0.15	168	0.75	126.30	170.00	0.74
	DBF4	BF3	BF4	BD3,DBD4,DB	48	1306.9	0.85	2649.1	0.15	1514.75	0.75	2644.29	5470.75	0.48
BG	DBG1	BG1	BG2	DBF1	70	0	0.85	0	0.15	450	0.75	337.50	450.00	0.75
	DBG2	BG1	BG3	0	32	0	0.85	2	0.15	48	0.75	36.30	50.00	0.73
	DBG3	BG2	BG4	DBG1	30	0	0.85	0	0.15	525	0.75	393.75	525.00	0.75
	DBG4	BG4	BG3	0	70	509	0.85	905	0.15	105	0.75	647.15	1519.00	0.43
BH	DBH1	BH2	BH1	0	70	494.2	0.85	930	0.15	105	0.75	638.32	1529.20	0.42
	DBH2	BH1	BH3	BG2,DBG4,DB	60	1003.2	0.85	1837	0.15	378	0.75	1411.77	3218.20	0.44
	DBH3	BH2	BH4	DBG3	52	0	0.85	0	0.15	655	0.75	491.25	655.00	0.75
	DBH4	BH3	BH4	BF3,DBF4,DBH	72	2310.1	0.85	4488.1	0.15	2240.75	0.75	4317.36	9038.95	0.48
	DAY2	AY1	AY3	0	108	0	0.85	2	0.15	189	0.75	142.05	191.00	0.74
AY	DAY3	AY2	AY3	0	92	357	0.85	857	0.15	207	0.75	587.25	1421.00	0.41

ZONE 10														
BLOCK	Drainage Name	Node		Predecessor	Length (m)	Property				Roads		Σ Ci x Ai	Σ Ai	C combination
						House		Garden						
		From	To			A (m2)	C	A (m2)	C	A (m2)	C			
B	DB1	B1	B3	0	40	337.1	0.85	1215	0.15	80	0.75	528.79	1632.10	0.32
	DB2	B2	B3	0	32	438	0.85	1051	0.15	64	0.75	577.95	1553.00	0.37
BB	DBB1	BB1	BB2	0	40	0	0.85	0	0.15	80	0.75	60.00	80.00	0.75
	DBB2	BB2	BB3	DB1,DB2,DBA1	40	1097.1	0.85	2808.7	0.15	80	0.75	1413.84	3985.80	0.35
	DBB3	BB4	BB3	0	25	131.4	0.85	311	0.15	37.5	0.75	186.47	479.90	0.39
BA	DBA1	BA1	BA2	0	32	322	0.85	542.7	0.15	64	0.75	403.11	928.70	0.43

ZONE 11														
BLOCK	**Drainage Name**	**Node**		**Predecessor**	**Length (m)**	**Property**				**Roads**		**Σ Ci x Ai**	**Σ Ai**	**C combination**
						House		**Garden**						
		From	**To**			**A (m2)**	**C**	**A (m2)**	**C**	**A (m2)**	**C**			
BB	DBB4	BB5	BB7	0	175.5	649	0.85	970	0.15	175.5	0.75	828.78	1794.50	0.46
	DBB5	BB3	BB7	0	60	187	0.85	230	0.15	60	0.75	238.45	477.00	0.50
BA	DBA2	BA3	BA4	0	60	304	0.85	393	0.15	60	0.75	362.35	757.00	0.48
	DBA3	BB7	BA5	DBB4,DBB5	69	836	0.85	1593	0.15	304.5	0.75	1177.93	2733.50	0.43
ZONE 12														
BLOCK	**Drainage Name**	**Node**		**Predecessor**	**Length (m)**	**Property**				**Roads**		**Σ Ci x Ai**	**Σ Ai**	**C combination**
						House		**Garden**						
		From	**To**			**A (m2)**	**C**	**A (m2)**	**C**	**A (m2)**	**C**			
AX	DAX3	AX4	AX2	0	112	1010.2	0.85	1479	0.15	364	0.75	1353.52	2853.20	0.47
ZONE 13														
BLOCK	**Drainage Name**	**Node**		**Predecessor**	**Length (m)**	**Property**				**Roads**		**Σ Ci x Ai**	**Σ Ai**	**C combination**
						House		**Garden**						
		From	**To**			**A (m2)**	**C**	**A (m2)**	**C**	**A (m2)**	**C**			
AW	DAW4	AW8	AW9	0	80	86	0.85	0	0.15	200	0.75	223.10	286.00	0.78
	DAW5	AW9	AW10	DAW4	120	772	0.85	0	0.15	500	0.75	1031.20	1272.00	0.81
AX	DAX4	AX5	AW10	0	78	120	0.85	1188	0.15	175.5	0.75	411.83	1483.50	0.28
ZONE 14														
BLOCK	**Drainage Name**	**Node**		**Predecessor**	**Length (m)**	**Property**				**Roads**		**Σ Ci x Ai**	**Σ Ai**	**C combination**
						House		**Garden**						
		From	**To**			**A (m2)**	**C**	**A (m2)**	**C**	**A (m2)**	**C**			
BC	DBC1	DB1	DB2	0	83	129	0.85	393	0.15	207.5	0.75	324.23	729.50	0.44
	DBC2	DB2	DB3	0	83	471.6	0.85	1062	0.15	0	0.75	560.16	1533.60	0.37
	DBC3	DB3	DB4	DBC1,DBC2	50	922	0.85	2066	0.15	320	0.75	1333.60	3308.00	0.40
	DBC4	DB4	DB6	DBC3	92	1507.7	0.85	3200.4	0.15	527	0.75	2156.86	5235.10	0.41
	DBC5	DB5	DB6	0	66	0	0.85	0	0.15	165	0.75	123.75	165.00	0.75
AT	DAT1	AT1	AT2	0	83	0	0.85	0	0.15	207.5	0.75	155.63	207.50	0.75
	DAT2	AT2	AT3	DAT1	50	301.3	0.85	922	0.15	320	0.75	634.41	1543.30	0.41
	DAT3	AT3	AT5	DAT2	92	1029.6	0.85	2165	0.15	527	0.75	1595.16	3721.60	0.43
	DAT4	AT4	BC6	DAT3	37	1244.6	0.85	2657	0.15	610.25	0.75	1914.15	4511.85	0.42
AX	DAX6	AX7	AX6	0	66	315	0.85	749	0.15	165	0.75	503.85	1229.00	0.41
	DAX7	AX5	AX6	0	37	719	0.85	1488	0.15	83.25	0.75	896.79	2290.25	0.39
	DAX8	AX6	BC6	DAX1,DAX2	4.5	1034	0.85	2237	0.15	248.25	0.75	1400.64	3519.25	0.40

ZONE 15														
BLOCK	**Drainage Name**	**Node**		**Predecessor**	**Length (m)**	**Property**				**Roads**		**Σ Ci x Ai**	**Σ Ai**	**C combination**
						House		**Garden**						
		From	**To**			**A (m2)**	**C**	**A (m2)**	**C**	**A (m2)**	**C**			
AT	DAT5	AT7	AT6	0	90	591	0.85	1199	0.15	225	0.75	850.95	2015.00	0.42
	DAT6	AT4	AT6	0	35	211	0.85	609	0.15	78.75	0.75	329.76	898.75	0.37
AS	DAS3	AS4	AS5	0	90	340	0.85	850	0.15	225	0.75	585.25	1415.00	0.41
	DAS4	AS2	AS5	0	103	971	0.85	1771	0.15	257.5	0.75	1284.13	2999.50	0.43
AX	DAX9	AX7	AX1	0	35	0	0.85	0	0.15	78.75	0.75	59.06	78.75	0.75
AQ	DAQ8	AQ1	AX1	0	103	0	0.85	0	0.15	257.5	1.75	450.63	257.50	1.75
ZONE 16														
BLOCK	**Drainage Name**	**Node**		**Predecessor**	**Length (m)**	**Property**				**Roads**		**Σ Ci x Ai**	**Σ Ai**	**C combination**
						House		**Garden**						
		From	**To**			**A (m2)**	**C**	**A (m2)**	**C**	**A (m2)**	**C**			
AR	DAR4	AR1	AR5	0	80	302	0.85	1140	0.15	200	0.75	577.70	1642.00	0.35
AS	DAS5	AS1	AS6	0	80	588	0.85	2217	0.15	200	0.75	982.35	3005.00	0.33
	DAS6	AS6	AS7	DAS5	184	739	0.85	2912	0.15	506	0.75	1444.45	4157.00	0.35
ZONE 17														
BLOCK	**Drainage Name**	**Node**		**Predecessor**	**Length (m)**	**Property**				**Roads**		**Σ Ci x Ai**	**Σ Ai**	**C combination**
						House		**Garden**						
		From	**To**			**A (m2)**	**C**	**A (m2)**	**C**	**A (m2)**	**C**			
AT	DAT7	AT9	AT10	0	53	0	0.85	0	0.15	119.25	0.75	89.44	119.25	0.75
	DAT8	AT7	AT8	0	80	0	0.85	0	0.15	240	0.75	180.00	240.00	0.75
	DAT9	AT2	AT8	0	53	0	0.85	0	0.15	119.25	0.75	89.44	119.25	0.75
AE	DAE1	AE2	AE3	0	80	612.5	0.85	262.5	0.15	180	0.75	695.00	1055.00	0.66
AS	DAS7	AS4	AS9	0	80	0	0.85	0	0.15	240	0.75	180.00	240.00	0.75
	DAS8	AS8	AS9	0	80	0	0.85	0	0.15	180	0.75	135.00	180.00	0.75
ZONE 18														
BLOCK	**Drainage Name**	**Node**		**Predecessor**	**Length (m)**	**Property**				**Roads**		**Σ Ci x Ai**	**Σ Ai**	**C combination**
						House		**Garden**						
		From	**To**			**A (m2)**	**C**	**A (m2)**	**C**	**A (m2)**	**C**			
AD	DAD1	AD1	AD2	0	93	1519	0.85	651	0.15	209.25	0.75	1545.74	2379.25	0.65
AE	DAE2	AD2	AE4	DAD1	90	2657.2	0.85	1138.8	0.15	411.75	0.75	2738.25	4207.75	0.65
	DAE3	AE4	AT13	DAE2	4.5	2657.2	0.85	1138.8	0.15	411.75	0.75	2738.25	4207.75	0.65
AT	DAT10	AT11	AT12	0	93	0	0.85	0	0.15	209.25	0.75	156.94	209.25	0.75
	DAT11	AT12	AT13	0	90	0	0.85	0	0.15	202.5	0.75	151.88	202.50	0.75

ZONE 19														
BLOCK	**Drainage Name**	**Node**		**Predecessor**	**Length (m)**	**Property**				**Roads**		**Σ Ci x Ai**	**Σ Ai**	**C combination**
						House		**Garden**						
		From	**To**			**A (m2)**	**C**	**A (m2)**	**C**	**A (m2)**	**C**			
AE	DAE4	AE1	AE5	0	88	1101	0.85	1677	0.15	154	0.75	1302.90	2932.00	0.44
	DAE5	AE2	AE5	0	74	637	0.85	1135	0.15	66	0.75	761.20	1838.00	0.41
	DAE6	AE5	AE6	DAE4,DAE5	74	1738	0.85	2812	0.15	220	0.75	2064.10	4770.00	0.43
Y	DY1	Y3	Y9	0	21	0	0.85	0	0.15	66	0.75	49.50	66.00	0.75
ZONE 20														
BLOCK	**Drainage Name**	**Node**		**Predecessor**	**Length (m)**	**Property**				**Roads**		**Σ Ci x Ai**	**Σ Ai**	**C combination**
						House		**Garden**						
		From	**To**			**A (m2)**	**C**	**A (m2)**	**C**	**A (m2)**	**C**			
AD	DAD2	AD1	AD4	0	72	445	0.85	550	0.15	162	0.75	582.25	1157.00	0.50
	DAD3	AD2	AD3	0	88	722	0.85	913	0.15	154	0.75	866.15	1789.00	0.48
	DAD4	AD3	AD4	DAD3	88	1329	0.85	1813	0.15	352		1401.60	3494.00	0.40
BI	DBI1	AD4	BI3	DAD2,DAD4	4.5	1774	0.85	2363	0.15	514	0.75	2247.85	4651.00	0.48
	DBI2	BI1	BI3	0	75	289	0.85	493	0.15	162	0.75	441.10	944.00	0.47
	DBI3	BI2	BI3	0	72	164	0.85	125	0.15	198	0.75	306.65	487.00	0.63
ZONE 21														
BLOCK	**Drainage Name**	**Node**		**Predecessor**	**Length (m)**	**Property**				**Roads**		**Σ Ci x Ai**	**Σ Ai**	**C combination**
						House		**Garden**						
		From	**To**			**A (m2)**	**C**	**A (m2)**	**C**	**A (m2)**	**C**			
Y	DY2	Y5	Y6	0	26	476	0.85	204	0.15	52	0.75	474.20	732.00	0.65
	DY3	Y6	Y7	DY2	32	1340.5	0.85	574.5	0.15	116	0.75	1312.60	2031.00	0.65
	DY4	Y7	Y8	DY3	92	2195.9	0.85	941.1	0.15	323	0.75	2249.93	3460.00	0.65
	DY5	BI3	Y8	DB1,DB2,DB3	5	2443	0.85	1047	0.15	934.75	0.75	2934.66	4424.75	0.66
	DY6	Y8	Y2	DY4,DY5	43	4921	0.85	2109	0.15	1257.75	0.75	5442.51	8287.75	0.66
	DY7	Y1	Y2	0	60	1197.7	0.85	513.3	0.15	150	0.75	1207.54	1861.00	0.65

ZONE 22														
BLOCK	**Drainage Name**	**Node**		**Predecessor**	**Length (m)**	**Property**				**Roads**		**Σ Ci x Ai**	**Σ Ai**	**C combination**
						House		**Garden**						
		From	**To**			**A (m2)**	**C**	**A (m2)**	**C**	**A (m2)**	**C**			
U	DU4	U5	U6	0	61	0	0.85	0	0.15	106.75	0.75	80.06	106.75	0.75
	DU5	U6	U3	DU4	56	0	0.85	0	0.15	204.75	0.75	153.56	204.75	0.75
X	DX1	X1	X2	0	73	0	0.85	0	0.15	182.5	0.75	136.88	182.50	0.75
	DX2	X2	X3	DX1	50	0	0.85	0	0.15	320	0.75	240.00	320.00	0.75
	DX3	X3	X9	DY6,DY5,DX2	40	6903.4	0.85	2958.6	0.15	1827.75	0.75	7682.49	11689.75	0.66
	DX4	X9	X10	DX3	30	7803.6	0.85	3344.4	0.15	1902.75	0.75	8561.78	13050.75	0.66
	DX5	X10	X8	DX4	48	8678.6	0.85	3719.4	0.15	2022.75	0.75	9451.78	14420.75	0.66
	DX6	X1	X4	0	88	571.2	0.85	244.8	0.15	176	0.75	654.24	992.00	0.66
	DX7	X4	X5	DX6	42	571.2	0.85	244.8	0.15	260	0.75	717.24	1076.00	0.67
	DX8	X5	X6	DX7	26	919.1	0.85	393.9	0.15	312	0.75	1074.32	1625.00	0.66
	DX9	X6	X7	DX8	61	1647.1	0.85	705.9	0.15	418.75	0.75	1819.98	2771.75	0.66
	DX10	X7	X8	DX9	56	2557.1	0.85	1095.9	0.15	516.75	0.75	2725.48	4169.75	0.65
Z	DZ1	Z1	Z2	0	60	387.1	0.85	165.9	0.15	150	0.75	466.42	703.00	0.66
	DZ2	Z2	Z4	DZ1	40	609	0.85	261	0.15	250	0.75	744.30	1120.00	0.66
	DZ3	Z4	Z3	DZ2		415.8	0.85	178.2	0.15	50	0.75	417.66	644.00	0.65
AA	DAA1	AA1	AA2	0	51	480.9	0.85	206.1	0.15	153	0.75	554.43	840.00	0.66
	DAA2	AA2	AA3	DAA1	55	1045.8	0.85	448.2	0.15	306	0.75	1185.66	1800.00	0.66
	DAA3	AA3	AA4	DAA2	20	1045.8	0.85	448.2	0.15	471	0.75	1309.41	1965.00	0.67
	DAA4	Z3	AA5	DZ2,DAA3	48	1823.5	0.85	781.5	0.15	841	0.75	2297.95	3446.00	0.67
	DAA5	AA5	AA6	X4,DX10,DAA	28	12410.3	0.85	5318.7	0.15	3316.5	0.75	13833.94	21045.50	0.66
	DAA6	AA6	AA7	DAA5	35	12850.6	0.85	5507.4	0.15	3386.5	0.75	14289.00	21744.50	0.66
	DAA7	AA7	AA8	DAA6	115	14326.2	0.85	6139.8	0.15	3616.5	0.75	15810.62	24082.50	0.66
W	DW1	U7	W1	DU5	28	964.6	0.85	413.4	0.15	260.75	0.75	1077.48	1638.75	0.66
	DW2	W1	W2	DW1	35	1447.6	0.85	620.4	0.15	330.75	0.75	1571.58	2398.75	0.66
	DW3	W2	W3	DW2	115	1447.6	0.85	620.4	0.15	560.75	0.75	1744.08	2628.75	0.66

ZONE 23														
BLOCK	**Drainage Name**	**Node**		**Predecessor**	**Length (m)**	**Property**				**Roads**		**Σ Ci x Ai**	**Σ Ai**	**C combination**
						House		**Garden**						
		From	**To**			**A (m2)**	**C**	**A (m2)**	**C**	**A (m2)**	**C**			
Y	DY8	Y1	Y4	0	90	915.6	0.85	392.4	0.15	202.5	0.75	989.00	1510.50	0.65
	DY9	Y3	Y4	0	78	780.5	0.85	334.5	0.15	175.5	0.75	845.23	1290.50	0.65
Z	DZ4	Z1	Z5	0	90	800.8	0.85	343.2	0.15	202.5	0.75	884.04	1346.50	0.66
AA	DAA8	AA1	AA9	0	125	1550.5	0.85	664.5	0.15	437.5	0.75	1745.73	2652.50	0.66
	DAA9	Y4	AA9	DY2,DY3,DZ4	56	2496.9	0.85	1070.1	0.15	734.5	0.75	2833.76	4301.50	0.66
AS	DAC1	AS8	AS10	0	78	0	0.85	0	0.15	175.5	0.75	131.63	175.50	0.75
	DAC2	AS7	AS10	0	60	0	0.85	0	0.15	240	0.75	180.00	240.00	0.75
AB	DAB1	AB4	AB1	DAR4	0	302	0.85	0	0.15	695	0.75	777.95	997.00	0.78
	DAB2	AB1	AB2	DAB1	60	0	0.85	0	0.15	935	0.75	701.25	935.00	0.75
	DAB3	AC3	AB3	AC1,DAC2,DAI	56	0	0.85	0	0.15	1504.5	0.75	1128.38	1504.50	0.75
ZONE 24														
BLOCK	**Drainage Name**	**Node**		**Predecessor**	**Length (m)**	**Property**				**Roads**		**Σ Ci x Ai**	**Σ Ai**	**C combination**
						House		**Garden**						
		From	**To**			**A (m2)**	**C**	**A (m2)**	**C**	**A (m2)**	**C**			
E	DE1	E1	E2	0	104	1274	0.85	546	0.15	156	0.75	1281.80	1976.00	0.65
	DE2	E2	E4	DE1	314	1708.7	0.85	732.3	0.15	261	0.75	1757.99	2702.00	0.65
	DE3	H4	E6	DH2, DH3,DE2	612	2700.6	0.85	1157.4	0.15	812	0.75	3078.12	4670.00	0.66
	DE4	E3	E5	0	93	0	0.85	0	0.15	162.75	0.75	122.06	162.75	0.75
	DE5	E5	E6	DE4	144	630	0.85	270	0.15	264.75	0.75	774.56	1164.75	0.67
F	DF1	F1	F2	0	93	800.8	0.85	343.2	0.15	162.75	0.75	854.22	1306.75	0.65
	DF2	F1	F3	0	98	0	0.85	0	0.15	147	0.75	110.25	147.00	0.75
	DF3	F2	F3	DF1	118	1148.7	0.85	492.3	0.15	212.75	0.75	1209.80	1853.75	0.65
G	DG1	G1	G2	0	98	0	0.85	0	0.15	147	0.75	110.25	147.00	0.75
	DG2	G1	G4	0	26	0	0.85	0	0.15	45.5	0.75	34.13	45.50	0.75
	DG3	G4	G5	DG2	114	1377.6	0.85	590.4	0.15	265.5	0.75	1458.65	2233.50	0.65
	DG4	F3	G3	DF2, DF3, DG1	340	1148.7	0.85	492.3	0.15	558.75	0.75	1469.30	2199.75	0.67
	DG5	E6	G5	DE3, DE5, DG4	1162	5719	0.85	2451	0.15	1784	0.75	6566.80	9954.00	0.66
H	DH1	H1	H2	0	104	0	0.85	0	0.15	156	0.75	117.00	156.00	0.75
	DH2	H2	H4	DH1	174	0	0.85	0	0.15	261	0.75	195.75	261.00	0.75
	DH3	AT11	H4	0	56	0	0.85	0	0.15	154	0.75	115.50	154.00	0.75
ZONE 25														
BLOCK	**Drainage Name**	**Node**		**Predecessor**	**Length (m)**	**Property**				**Roads**		**Σ Ci x Ai**	**Σ Ai**	**C combination**
						House		**Garden**						
		From	**To**			**A (m2)**	**C**	**A (m2)**	**C**	**A (m2)**	**C**			
H	DH4	H1	H5	0	159	0	0.85	0	0.15	238.5	0.75	178.88	238.50	0.75
	DH5	H5	H6	DH4	110	0	0.85	0	0.15	403.5	0.75	302.63	403.50	0.75
	DH6	H6	H7	DH5	43	0	0.85	0	0.15	468	0.75	351.00	468.00	0.75
	DH7	H7	H8	DH6	42	0	0.85	0	0.15	531	0.75	398.25	531.00	0.75
I	DI2	I3	A1	0	159	2090.2	0.85	895.8	0.15	238.5	0.75	2089.92	3224.50	0.65

ZONE 26														
BLOCK	Drainage Name	Node		Predecessor	Length (m)	Property				Roads		Σ Ci x Ai	Σ Ai	C combination
						House		Garden						
		From	To			A (m2)	C	A (m2)	C	A (m2)	C			
D	DD1	D4	D5	DI1	400	2243.5	0.85	961.5	0.15	400	0.75	2351.20	3605.00	0.65
I	DI1	I1	I2	0	220	889	0.85	381	0.15	220	0.75	977.80	1490.00	0.66
	DJ1	J1	J2	0	144	555.1	0.85	237.9	0.15	144	0.75	615.52	937.00	0.66
	DJ2	J2	J3	DJ1	324	1626.8	0.85	697.2	0.15	324	0.75	1730.36	2648.00	0.65
	DJ3	J1	J4	0	85.5	0	0.85	0	0.15	85.5	0.75	64.13	85.50	0.75
J	DJ4	J4	J5	0	120	1647.8	0.85	706.2	0.15	120	0.75	1596.56	2474.00	0.65
	DJ5	J5	J7	DJ4,DK2	284	2661.4	0.85	1140.6	0.15	280	0.75	2643.28	4082.00	0.65
	DJ6	J7	J6	DJ5	432	2661.4	0.85	1140.6	0.15	428	0.75	2754.28	4230.00	0.65
	DJ7	D5	J6	DD3,DJ2,DJ6	1231	6531.7	0.85	2799.3	0.15	1227	0.75	6892.09	10558.00	0.65
	DK1	K1	K2	0	120	0	0.85	0	0.15	120	0.75	90.00	120.00	0.75
	DK2	K2	J5	DK1	124	598.5	0.85	256.5	0.15	120	0.75	637.20	975.00	0.65
	DK3	K3	K4	0	148	1069.6	0.85	458.4	0.15	148	0.75	1088.92	1676.00	0.65
	DK4	K1	K5	DJ3	191.25	0	0.85	0	0.15	191.25	0.75	143.44	191.25	0.75
	DK5	K5	K7	DK4	551.25	1795.5	0.85	769.5	0.15	551.25	0.75	2055.04	3116.25	0.66
	DK6	K7	K6	DK5	726.25	1795.5	0.85	769.5	0.15	726.25	0.75	2186.29	3291.25	0.66
K	DK7	J6	K6	DJ6,DK3,DK6	1388.75	5526.5	0.85	2368.5	0.15	1384.75	0.75	6091.36	9279.75	0.66

ZONE 27														
BLOCK	Drainage Name	Node		Predecessor	Length (m)	Property				Roads		Σ Ci x Ai	Σ Ai	C combination
						House		Garden						
		From	To			A (m2)	C	A (m2)	C	A (m2)	C			
	DA1	A1	A2	0	45	591.5	0.85	253.5	0.15	67.5	0.75	591.43	912.50	0.65
A	DA2	A2	A4	0	32	0	0.85	0	0.15	72	0.75	54.00	72.00	0.75
	DA3	A3	A4	0	23	0	0.85	0	0.15	46	0.75	34.50	46.00	0.75
	DB1	B1	B3	0	32	0	0.85	0	0.15	72	0.75	54.00	72.00	0.75
	DB2	B1	B2	DA1	67	1599.5	0.85	685.5	0.15	168	0.75	1588.40	2453.00	0.65
	DB3	B3	B4	DB1, DA2, DA3	66	1113	0.85	477	0.15	289	0.75	1234.35	1879.00	0.66
B	DB4	B2	B4	0	57	0	0.85	0	0.15	85.5	0.75	64.13	85.50	0.75
	DC3	C1	C2	0	57	0	0.85	0	0.15	85.5	0.75	64.13	85.50	0.75
	DC4	C2	C3	DB3, DB4, DC3	45	1582	0.85	678	0.15	460	0.75	1791.40	2720.00	0.66
	DC1	B2	C7	DA1,DB2	43	3217.2	0.85	1378.8	0.15	474	0.75	3296.94	5070.00	0.65
C	DC2	C7	C5	DC1	42	3633	0.85	1557	0.15	537	0.75	3724.35	5727.00	0.65
	DD2	D1	D2	0	64	714	0.85	306	0.15	128	0.75	748.80	1148.00	0.65
D	DD3	D8	D3	DD2	65	1461.6	0.85	626.4	0.15	258	0.75	1529.82	2346.00	0.65

ZONE 28														
BLOCK	**Drainage Name**	**Node**		**Predecessor**	**Length (m)**	**Property**				**Roads**		**Σ Ci x Ai**	**Σ Ai**	**C combination**
						House		**Garden**						
		From	**To**			**A (m2)**	**C**	**A (m2)**	**C**	**A (m2)**	**C**			
C	DC5	C5	C6	DC2	26	3633	0.85	1557	0.15	552	0.75	3735.60	5742.00	0.65
	DC6	C4	C6	0	40	350	0.85	150	0.15	90	0.75	387.50	590.00	0.66
O	DO1	H8	O1	DH7	26	610.4	0.85	261.6	0.15	285	0.75	771.83	1157.00	0.67
	DO1	O1	O2	DC6,DC7,DO1	52	4593.4	0.85	1968.6	0.15	1044	0.75	4982.68	7606.00	0.66
P	DP1	P1	P2	0	40	610.4	0.85	261.6	0.15	90	0.75	625.58	962.00	0.65
	DP2	P2	P3	DP1	52	610.4	0.85	261.6	0.15	207	0.75	713.33	1079.00	0.66
	DP3	P1	P4	0	92	0	0.85	0	0.15	138	0.75	103.50	138.00	0.75
ZONE 29														
BLOCK	**Drainage Name**	**Node**		**Predecessor**	**Length (m)**	**Property**				**Roads**		**Σ Ci x Ai**	**Σ Ai**	**C combination**
						House		**Garden**						
		From	**To**			**A (m2)**	**C**	**A (m2)**	**C**	**A (m2)**	**C**			
C	DC7	C4	C3	0	65	907.9	0.85	389.1	0.15	130	0.75	927.58	1427.00	0.65
D	DD4	D8	D6	0	57	0	0.85	0	0.15	57	0.75	42.75	57.00	0.75
	DD5	D6	D7	0	57	748.3	0.85	320.7	0.15	85.5	0.75	748.29	1154.50	0.65
	DD6	C3	D7	DC4,DC7,DD3	40	3951.5	0.85	1693.5	0.15	928	0.75	4308.80	6573.00	0.66
L	DL1	L1	L2	DD4	102	560	0.85	240	0.15	57	0.75	554.75	857.00	0.65
	DL2	L1	L3	0	57	1604.4	0.85	687.6	0.15	85.5	0.75	1531.01	2377.50	0.64
	DL3	L3	L4	DD5,DD6,DL2	44	6727.7	0.85	2883.3	0.15	1187	0.75	7041.29	10798.00	0.65
	DL4	L4	M4	DL3	4	6727.7	0.85	2883.3	0.15	1187	0.75	7041.29	10798.00	0.65
	DL5	L2	L5	DK6	52	1795.5	0.85	769.5	0.15	830.25	0.75	2264.29	3395.25	0.67
	DM1	M1	M2	0	65	1046.5	0.85	448.5	0.15	130	0.75	1054.30	1625.00	0.65
	DM2	M2	M3	DM1	40	535.5	0.85	229.5	0.15	210	0.75	647.10	975.00	0.66
	DM3	M3	M4	DM2	44	501.2	0.85	214.8	0.15	298	0.75	681.74	1014.00	0.67
	DM4	M4	M5	DL4,DM3	50	8539.3	0.85	3659.7	0.15	1560	0.75	8977.36	13759.00	0.65
	DM5	M1	M6	DM4	46	0	0.85	0	0.15	1652	0.75	1239.00	1652.00	0.75
	DM6	M7	M6	0	70	728	0.85	312	0.15	122.5	0.75	757.48	1162.50	0.65
	DM7	M7	M8	0	90	1312.5	0.85	562.5	0.15	157.5	0.75	1318.13	2032.50	0.65
M	DM8	M5	M8	DL5,DM4	45	10839.5	0.85	4645.5	0.15	2480.25	0.75	11770.59	17965.25	0.66
	DN1	N1	N4	0	90	478.1	0.85	204.9	0.15	157.5	0.75	555.25	840.50	0.66
	DN2	N1	N2	0	70	536.2	0.85	229.8	0.15	122.5	0.75	582.12	888.50	0.66
N	DN3	M6	N3	DM5,DM6,DN	36	936.6	0.85	401.4	0.15	1969	0.75	2333.07	3307.00	0.71

ZONE 30														
BLOCK	**Drainage Name**	**Node**		**Predecessor**	**Length (m)**	**Property**				**Roads**		**Σ Ci x Ai**	**Σ Ai**	**C combination**
						House		**Garden**						
		From	**To**			**A (m2)**	**C**	**A (m2)**	**C**	**A (m2)**	**C**			
	DQ1	Q1	Q2	0	72	1433.6	0.85	614.4	0.15	306	0.75	1540.22	2354.00	0.65
	DQ2	Q2	Q3	DQ1	88	3080	0.85	1320	0.15	526	0.75	3210.50	4926.00	0.65
Q	DQ3	Q4	Q5	0	70	1020.6	0.85	437.4	0.15	105	0.75	1011.87	1563.00	0.65
	DQ4	Q5	T2	0	60	1774.5	0.85	760.5	0.15	180	0.75	1757.40	2715.00	0.65
	DQ5	Q3	R2	0	62	0	0.85	0	0.15	186	0.75	139.50	186.00	0.75
	DR1	Q3	R1	DQ2	80	3627.4	0.85	1554.6	0.15	726	0.75	3860.98	5908.00	0.65
	DR2	R2	R3	DQ5	46	399	0.85	171	0.15	324	0.75	607.80	894.00	0.68
R	DR3	R5	R4	0		2861.6	0.85	1226.4	0.15	270	0.75	2818.82	4358.00	0.65
	DS1	S1	S2	0	70	512.4	0.85	219.6	0.15	105	0.75	547.23	837.00	0.65
S	DS2	S2	S3	DS1	100	1869	0.85	801	0.15	430	0.75	2031.30	3100.00	0.66
T	DT1	T1	T3	0	100	938.7	0.85	402.3	0.15	325	0.75	1101.99	1666.00	0.66
ZONE 31														
BLOCK	**Drainage Name**	**Node**		**Predecessor**	**Length (m)**	**Property**				**Roads**		**Σ Ci x Ai**	**Σ Ai**	**C combination**
						House		**Garden**						
		From	**To**			**A (m2)**	**C**	**A (m2)**	**C**	**A (m2)**	**C**			
Q	DQ6	Q1	Q4	0	34	276.5	0.85	118.5	0.15	667.5	0.75	753.43	1062.50	0.71
	DS3	Q4	S4	DQ6	38	837.9	0.85	359.1	0.15	800.5	0.75	1366.46	1997.50	0.68
S	DS4	S4	S5	DS3	52	1724.1	0.85	738.9	0.15	982.5	0.75	2313.20	3445.50	0.67
	DS5	S5	S3	DS4	64	1943.9	0.85	833.1	0.15	1206.5	0.75	2682.16	3983.50	0.67
	DU1	U1	U2	0	72	1352.4	0.85	579.6	0.15	800.5	0.75	1836.86	2732.50	0.67
U	DU2	U2	U4	DU1	52	2034.2	0.85	871.8	0.15	982.5	0.75	2596.72	3888.50	0.67
	DU3	U3	U4	0	24	116.2	0.85	49.8	0.15	144	0.75	214.24	310.00	0.69
	DV1	V1	V2	0	64	252.7	0.85	108.3	0.15	252	0.75	420.04	613.00	0.69
	DV2	S6	V3	DS2,DS5,DV1	17	4065.6	0.85	1742.4	0.15	238.5	0.75	3896.00	6046.50	0.64
	DV3	S5	V4	DS4	22	1724.1	0.85	738.9	0.15	424	0.75	1894.32	2887.00	0.66
	DV4	U4	V4	DU1	22	1352.4	0.85	579.6	0.15	1097	0.75	2059.23	3029.00	0.68
V	DV5	V4	V5	DV3,DV4	53	3418.1	0.85	1464.9	0.15	1645.5	0.75	4359.25	6528.50	0.67
ZONE 32														
BLOCK	**Drainage Name**	**Node**		**Predecessor**	**Length (m)**	**Property**				**Roads**		**Σ Ci x Ai**	**Σ Ai**	**C combination**
						House		**Garden**						
		From	**To**			**A (m2)**	**C**	**A (m2)**	**C**	**A (m2)**	**C**			
W	DW4	W3	W4	DW2	115	2679.6	0.85	1148.4	0.15	790.75	0.75	3042.98	4618.75	0.66
V	DV6	W4	V5	DW4	98	3498.6	0.85	1499.4	0.15	1182.75	0.75	4085.78	6180.75	0.66
T	DT2	V5	T3	DT1,DV2,DV5	38	8800.4	0.85	3771.6	0.15	2361	0.75	9816.83	14933.00	0.66
R	DR4	T3	R3	DT2	58	9402.4	0.85	4029.6	0.15	2477	0.75	10454.23	15909.00	0.66
	DR5	R3	R4	DR2,DR4	68	1022	0.85	438	0.15	596	0.75	1381.40	2056.00	0.67

ZONE 33														
BLOCK	**Drainage Name**	**Node**		**Predecessor**	**Length (m)**	**Property**				**Roads**		**Σ Ci x Ai**	**Σ Ai**	**C combination**
						House		**Garden**						
		From	**To**			**A (m2)**	**C**	**A (m2)**	**C**	**A (m2)**	**C**			
P	DP4	P3	P4	DP2	148	3425.1	0.85	1467.9	0.15	577	0.75	3564.27	5470.00	0.65
R	DR6	R4	R1	DR3,DR5	130	4274.9	0.85	1832.1	0.15	1126	0.75	4752.98	7233.00	0.66
N	DN4	R1	N4	DR1,DR6	82.5	8031.1	0.85	3441.9	0.15	1478.5	0.75	8451.60	12951.50	0.65
	DN5	P4	N5	DP3,DP1,DN3	2402.5	2632.7	0.85	1128.3	0.15	2389.5	0.75	4199.17	6150.50	0.68
	DN6	N4	N5	7,DM8,DN1,D	198	21746.9	1.85	9320.1	1.15	4471.75	0.75	54303.69	35538.75	1.53
BE	DBE1	BE1	BE2	0	370	0	0.85	0	0.15	370	0.75	277.50	370.00	0.75
	DBE2	BE2	BE3	DBE1	192.5	0	0.85	0	0.15	562.5	0.75	421.88	562.50	0.75
	DBE3	BE4	BE5	0	192.5	0	0.85	0	0.15	192.5	0.75	144.38	192.50	0.75
	DBE4	BE5	BE6	DBE3	82.5	0	0.85	0	0.15	275	0.75	206.25	275.00	0.75
	DBE5	BE6	BE7	DBE4	198	0	0.85	0	0.15	467.5	0.75	350.63	467.50	0.75
	DBE6	N5	BE8	,DN6,DBE2,D	5.5	24379.6	1.85	10448.4	1.15	3121.5	0.75	59459.05	37949.50	1.57
ZONE 34														
BLOCK	**Drainage Name**	**Node**		**Predecessor**	**Length (m)**	**Property**				**Roads**		**Σ Ci x Ai**	**Σ Ai**	**C combination**
						House		**Garden**						
		From	**To**			**A (m2)**	**C**	**A (m2)**	**C**	**A (m2)**	**C**			
AA	DAA10	AA9	AA10	DAA6	35	12850.6	0.85	5507.4	0.15	3500.25	0.75	14374.31	21858.25	0.66
	DAA11	AA10	W3	DAA8,DAA10	98	17721.2	0.85	7594.8	0.15	4207.25	0.75	19357.68	29523.25	0.66
BE	DBE7	AB3	BE9	DAB2	35	0	0.85	0	0.15	1048.75	0.75	786.56	1048.75	0.75
	DBE8	BE9	BE10	DBE7	98	0	0.85	0	0.15	1318.25	0.75	988.69	1318.25	0.75
	DBE9	W3	BE10	DAA11	5.5	17721.2	0.85	7594.8	0.15	4207.25	0.75	19357.6775	29523.25	0.66

Appendix 3. Hydraulic analysis for above ground drainage

ZONE 1

I (mm/hour)	Drainage Name	Node		A (km2)	Q Hidrology (m3/s)	Drainage Name	Node		Q Hidrology (m3/s)	V Design (m/s)	A Drainage Needed (m2)	h Water (m)	W (m)	h total (m)	h use (m)	B (m)	b Use (m)	A Drainage Use (m2)	P (m)	n	R (m)	S	Q hydraulics (m3/s)	ΔQ	Control
		Dari	Ke				Dari	Ke																	
65	DAF1	AO4	AF3	0.0003	0.0041	DAF1	AO4	AF3	0.004	0.5	0.008	0.074	0.1	0.174	0.2	0.17	0.2	0.06	0.65	0.025	0.093	0.0038	0.030	0.026	OK
65	DAF2	AF1	AF2	0.0020	0.0240	DAF2	AF1	AF2	0.024	0.5	0.048	0.179	0.1	0.279	0.3	0.28	0.3	0.135	0.97	0.025	0.139	0.0022	0.068	0.044	OK
65	DAF3	AF2	AF3	0.0032	0.0376	DAF3	AF2	AF3	0.038	0.5	0.075	0.224	0.1	0.324	0.4	0.32	0.4	0.24	1.29	0.025	0.185	0.0015	0.121	0.083	OK
65	DAG1	AG1	AG2	0.0028	0.0329	DAG2	AG1	AG2	0.033	0.5	0.066	0.210	0.1	0.310	0.4	0.31	0.4	0.24	1.29	0.025	0.185	0.0015	0.121	0.088	OK
65	DAG2	AG2	AG4	0.0029	0.0345	DAG2	AG2	AG4	0.035	0.5	0.069	0.215	0.1	0.315	0.4	0.31	0.4	0.24	1.29	0.025	0.185	0.0015	0.121	0.086	OK
65	DAG3	AF3	AG3	0.0064	0.0757	DAH1	AF3	AG3	0.076	0.5	0.151	0.318	0.1	0.418	0.5	0.42	0.5	0.375	1.62	0.025	0.232	0.0011	0.188	0.112	OK
65	DAH1	AI2	AH1	0.0017	0.0208	DAH1	AI2	AH1	0.021	0.5	0.042	0.166	0.1	0.266	0.3	0.27	0.3	0.135	0.97	0.025	0.139	0.0022	0.068	0.047	OK
65	DAI1	AI3	AI2	0.0003	0.0041	DAI1	AI3	AI2	0.004	0.5	0.008	0.074	0.1	0.174	0.2	0.17	0.2	0.06	0.65	0.025	0.093	0.0038	0.030	0.026	OK
65	DAM1	AG3	AM3	0.0064	0.0757	DAM2	AG3	AM3	0.076	0.5	0.151	0.318	0.1	0.418	0.5	0.42	0.5	0.375	1.62	0.025	0.232	0.0011	0.188	0.112	OK
65	DAM2	AH1	AM3	0.0017	0.0208	DAM2	AH1	AM3	0.021	0.5	0.042	0.166	0.1	0.266	0.3	0.27	0.3	0.135	0.97	0.025	0.139	0.0022	0.068	0.047	OK

ZONE 2

I (mm/hour)	Drainage Name	Node		A (km2)	Q Hidrology (m3/s)	Drainage Name	Node		Q Hidrology (m3/s)	V Design (m/s)	A Drainage Needed (m2)	h Water (m)	W (m)	h total (m)	h use (m)	B (m)	b Use (m)	A Drainage Use (m2)	P (m)	n	R (m)	S	Q hydraulics (m3/s)	ΔQ	Control
		Dari	Ke				Dari	Ke																	
65	DAJ1	AJ1	AJ2	0.0014	0.0089	DAJ1	AJ1	AJ2	0.009	0.5	0.018	0.109	0.1	0.209	0.3	0.21	0.3	0.135	0.97	0.025	0.139	0.0022	0.068	0.059	OK
65	DAJ2	AJ2	AJ3	0.0030	0.0191	DAJ2	AJ2	AJ3	0.019	0.5	0.038	0.160	0.1	0.260	0.3	0.26	0.3	0.135	0.97	0.025	0.139	0.0022	0.068	0.049	OK
65	DAJ3	AJ3	AJ4	0.0042	0.0270	DAJ3	AJ3	AJ4	0.027	0.5	0.054	0.190	0.1	0.290	0.3	0.29	0.3	0.135	0.97	0.025	0.139	0.0022	0.068	0.041	OK
65	DAJ4	AJ4	AJ5	0.0049	0.0322	DAJ4	AJ4	AJ5	0.032	0.5	0.064	0.207	0.1	0.307	0.4	0.31	0.4	0.24	1.29	0.025	0.185	0.0015	0.121	0.089	OK
65	DAJ5	AJ1	AJ6	0.0014	0.0111	DAJ5	AJ1	AJ6	0.011	0.5	0.022	0.122	0.1	0.222	0.3	0.22	0.3	0.135	0.97	0.025	0.139	0.0022	0.068	0.057	OK
65	DAJ6	AJ6	AJ7	0.0026	0.0200	DAJ6	AJ6	AJ7	0.020	0.5	0.040	0.163	0.1	0.263	0.3	0.26	0.3	0.135	0.97	0.025	0.139	0.0022	0.068	0.048	OK
65	DAJ7	AJ7	AJ5	0.0055	0.0409	DAJ7	AJ7	AJ5	0.041	0.5	0.082	0.233	0.1	0.333	0.4	0.33	0.4	0.24	1.29	0.025	0.185	0.0015	0.121	0.080	OK
65	DAL1	AL1	AL2	0.0019	0.0148	DAL1	AL1	AL2	0.015	0.5	0.030	0.140	0.1	0.240	0.3	0.24	0.3	0.135	0.97	0.025	0.139	0.0022	0.068	0.053	OK
65	DAN1	DAN1	DAN2	0.0018	0.0112	DAN1	DAN1	DAN2	0.011	0.5	0.022	0.122	0.1	0.222	0.3	0.22	0.3	0.135	0.97	0.025	0.139	0.0022	0.068	0.057	OK
65	DAK1	DAK1	DAK3	0.0039	0.0297	DAK1	DAK1	DAK3	0.030	0.5	0.059	0.199	0.1	0.299	0.3	0.30	0.3	0.135	0.97	0.025	0.139	0.0022	0.068	0.038	OK
65	DAK2	DAK1	DAK2	0.0019	0.0151	DAK2	DAK1	DAK2	0.015	0.5	0.030	0.142	0.1	0.242	0.3	0.24	0.3	0.135	0.97	0.025	0.139	0.0022	0.068	0.053	OK
65	DAK3	DAK2	DAK3	0.0020	0.0170	DAK3	DAK2	DAK3	0.017	0.5	0.034	0.151	0.1	0.251	0.3	0.25	0.3	0.135	0.97	0.025	0.139	0.0022	0.068	0.051	OK
65	DAM3	AM1	AM3	0.0056	0.0419	DAM3	AM1	AM3	0.042	0.5	0.084	0.236	0.1	0.336	0.4	0.34	0.4	0.24	1.29	0.025	0.185	0.0015	0.121	0.079	OK
65	DAM4	AM2	AM3	0.0003	0.0047	DAM4	AM2	AM3	0.005	0.5	0.009	0.079	0.1	0.179	0.2	0.18	0.2	0.06	0.65	0.025	0.093	0.0038	0.030	0.026	OK

ZONE 3

I (mm/hour)	Drainage Name	Node		A (km2)	Q Hidrology (m3/s)	Drainage Name	Node		Q Hidrology (m3/s)	V Design (m/s)	A Drainage Needed (m2)	h Water (m)	W (m)	h total (m)	h use (m)	B (m)	b Use (m)	A Drainage Use (m2)	P (m)	n	R (m)	S	Q hydraulics (m3/s)	ΔQ	Control
		Dari	Ke				Dari	Ke																	
65	DAF4	AF4	AF5	0.0038	0.0273	DAF4	A12	A11	0.027	0.5	0.055	0.191	0.1	0.291	0.3	0.29	0.3	0.135	0.97	0.025	0.139	0.0022	0.068	0.041	OK
65	DAF5	AF5	AF6	0.0049	0.0325	DAF5	A11	A1	0.032	0.5	0.065	0.208	0.1	0.308	0.4	0.31	0.4	0.24	1.29	0.025	0.185	0.0015	0.121	0.088	OK
65	DAO1	AO1	AO2	0.0003	0.0036	DAO1	A1	A2	0.004	0.5	0.007	0.069	0.1	0.169	0.2	0.17	0.2	0.06	0.65	0.025	0.093	0.0038	0.030	0.027	OK
65	DAO2	AO2	AO3	0.0004	0.0057	DAO2	A21	A2	0.006	0.5	0.011	0.087	0.1	0.187	0.2	0.19	0.2	0.06	0.65	0.025	0.093	0.0038	0.030	0.025	OK

ZONE 4																									
I (mm/hour)	Drainage Name	Node		A (km2)	Q Hidrology (m3/s)	Drainage Name	Node		Q Hidrology (m3/s)	V Design (m/s)	A Drainage Needed (m2)	h Water (m)	W (m)	h total (m)	h use (m)	B (m)	b Use (m)	A Drainage Use (m2)	P (m)	n	R (m)	S	Q hydraulics (m3/s)	ΔQ	Control
		Dari	Ke				Dari	Ke																	
65	DAS1	**AS2**	**AS3**	0.0022	**0.0163**	DAS1	A12	A11	0.016	0.5	0.033	0.147	0.1	0.247	0.3	0.25	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.052	OK
65	DAS2	**AS1**	**AQ2**	0.0067	**0.0458**	DAS2	A11	A1	0.046	0.5	0.092	0.247	0.1	0.347	0.4	0.35	0.4	0.24	1.29	0.025	0.185	0.0015	**0.121**	0.075	OK
65	DAR1	**AR2**	**AR3**	0.0041	**0.0253**	DAR1	A1	A2	0.025	0.5	0.051	0.184	0.1	0.284	0.3	0.28	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.043	OK
65	DAR2	**AR3**	**AR4**	0.0067	**0.0444**	DAR2	A21	A2	0.044	0.5	0.089	0.243	0.1	0.343	0.4	0.34	0.4	0.24	1.29	0.025	0.185	0.0015	**0.121**	0.076	OK
65	DAR3	**AR1**	**AP2**	0.0125	**0.0836**	DAR3	A12	A11	0.084	0.5	0.167	0.334	0.1	0.434	0.5	0.43	0.5	0.375	1.62	0.025	0.232	0.0011	**0.188**	0.104	OK
65	DAQ1	**AQ1**	**AQ2**	0.0026	**0.0184**	DAQ1	A11	A1	0.018	0.5	0.037	0.157	0.1	0.257	0.3	0.26	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.050	OK
65	DAQ2	**AQ2**	**AQ3**	0.0104	**0.0644**	DAQ2	A1	A2	0.064	0.5	0.129	0.293	0.1	0.393	0.4	0.39	0.4	0.24	1.29	0.025	0.185	0.0015	**0.121**	0.057	OK
65	DAQ3	**AQ3**	**AQ4**	0.0130	**0.0815**	DAQ3	A21	A2	0.081	0.5	0.163	0.330	0.1	0.430	0.5	0.43	0.5	0.375	1.62	0.025	0.232	0.0011	**0.188**	0.106	OK
65	DAQ4	**AQ4**	**AQ5**	0.0145	**0.0976**	DAQ4	A12	A11	0.098	0.5	0.195	0.361	0.1	0.461	0.5	0.46	0.5	0.375	1.62	0.025	0.232	0.0011	**0.188**	0.090	OK
65	DAP1	**AP1**	**AP2**	0.0038	**0.0254**	DAP1	A12	A11	0.025	0.5	0.051	0.184	0.1	0.284	0.3	0.28	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.043	OK
65	DAP2	**AP2**	**AP3**	0.0055	**0.0355**	DAP2	A12	A11	0.036	0.5	0.071	0.218	0.1	0.318	0.4	0.32	0.4	0.24	1.29	0.025	0.185	0.0015	**0.121**	0.085	OK
65	DAP3	**AP4**	**AP5**	0.0002	**0.0022**	DAP3	A12	A11	0.002	0.5	0.004	0.054	0.1	0.154	0.2	0.15	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.028	OK
65	DAP4	**AP5**	**AP3**	0.0031	**0.0222**	DAP4	A12	A11	0.022	0.5	0.044	0.172	0.1	0.272	0.3	0.27	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.046	OK
65	DAP5	**AP3**	**AH3**	0.0055	**0.0392**	DAP5	A12	A11	0.039	0.5	0.078	0.229	0.1	0.329	0.4	0.33	0.4	0.24	1.29	0.025	0.185	0.0015	**0.121**	0.082	OK
65	DAP6	**AP1**	**AP4**	0.0001	**0.0016**	DAP6	A12	A11	0.002	0.5	0.003	0.046	0.1	0.146	0.2	0.15	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.029	OK
65	DAH1	**AH1**	**AH3**	0.0011	**0.0065**	DAH1	A12	A11	0.006	0.5	0.013	0.093	0.1	0.193	0.2	0.19	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.024	OK
65	DAH2	**AH3**	**AH4**	0.0013	**0.0093**	DAH2	A12	A11	0.009	0.5	0.019	0.111	0.1	0.211	0.3	0.21	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.059	OK
65	DAH3	**AH4**	**AH2**	0.0069	**0.0488**	DAH3	A12	A11	0.049	0.5	0.098	0.255	0.1	0.355	0.4	0.36	0.4	0.24	1.29	0.025	0.185	0.0015	**0.121**	0.072	OK
65	DAI2	**AI1**	**AI2**	0.0002	**0.0021**	DAI2	A12	A11	0.002	0.5	0.004	0.053	0.1	0.153	0.2	0.15	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.028	OK
ZONE 5																									
I (mm/hour)	Drainage Name	Node		A (km2)	Q Hidrology (m3/s)	Drainage Name	Node		Q Hidrology (m3/s)	V Design (m/s)	A Drainage Needed (m2)	h Water (m)	W (m)	h total (m)	h use (m)	B (m)	b Use (m)	A Drainage Use (m2)	P (m)	n	R (m)	S	Q hydraulics (m3/s)	ΔQ	Control
		Dari	Ke				Dari	Ke																	
65	DAU1	**AU1**	**AU3**	0.0018	**0.0153**	DAU1	A12	A11	0.015	0.5	0.031	0.143	0.1	0.243	0.3	0.24	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.053	OK
65	DAU2	**AU2**	**AU3**	0.0021	**0.0205**	DAU2	A13	A12	0.021	0.5	0.041	0.165	0.1	0.265	0.3	0.27	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.047	OK
67	DAU3	**AU3**	**AI4**	0.0039	**0.0369**	DAU3	A14	A13	0.037	0.5	0.074	0.222	0.1	0.322	0.4	0.32	0.4	0.24	1.29	0.025	0.185	0.0015	**0.121**	0.084	OK
65	DAI3	**AQ7**	**AI4**	0.0002	**0.0021**	DAI3	A15	A14	0.002	0.5	0.004	0.053	0.1	0.153	0.2	0.15	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.028	OK
65	DAI4	**AI3**	**AI4**	0.0002	**0.0032**	DAI4	A16	A15	0.003	0.5	0.006	0.065	0.1	0.165	0.2	0.16	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.027	OK
ZONE 6																									
I (mm/hour)	Drainage Name	Node		A (km2)	Q Hidrology (m3/s)	Drainage Name	Node		Q Hidrology (m3/s)	V Design (m/s)	A Drainage Needed (m2)	h Water (m)	W (m)	h total (m)	h use (m)	B (m)	b Use (m)	A Drainage Use (m2)	P (m)	n	R (m)	S	Q hydraulics (m3/s)	ΔQ	Control
		Dari	Ke				Dari	Ke																	
65	DAU4	**AU1**	**AU6**	0.0009	**0.0072**	DAU4	A12	A11	0.007	0.5	0.014	0.098	0.1	0.198	0.2	0.20	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.023	OK
65	DAU5	**AU6**	**AU5**	0.0028	**0.0212**	DAU5	A11	A1	0.021	0.5	0.042	0.168	0.1	0.268	0.3	0.27	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.047	OK
65	DAU6	**AU5**	**AU6**	0.0028	**0.0220**	DAU6	A1	A2	0.022	0.5	0.044	0.171	0.1	0.271	0.3	0.27	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.046	OK
65	DAV1	**AV1**	**AV2**	0.0008	**0.0064**	DAV1	A21	A2	0.006	0.5	0.013	0.093	0.1	0.193	0.2	0.19	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.024	OK
65	DAV2	**AV2**	**AV3**	0.0013	**0.0103**	DAV2	A12	A11	0.010	0.5	0.021	0.117	0.1	0.217	0.3	0.22	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.058	OK
65	DAV3	**AV3**	**AV4**	0.0013	**0.0109**	DAV3	A11	A1	0.011	0.5	0.022	0.121	0.1	0.221	0.3	0.22	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.057	OK
65	DAV4	**AV4**	**AW4**	0.0013	**0.0109**	DAV4	A1	A2	0.011	0.5	0.022	0.121	0.1	0.221	0.3	0.22	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.057	OK

ZONE 7																									
I (mm/hour)	Drainage Name	Node		A (km2)	Q Hidrology (m3/s)	Drainage Name	Node		Q Hidrology (m3/s)	V Design (m/s)	A Drainage Needed (m2)	h Water (m)	W (m)	h total (m)	h use (m)	B (m)	b Use (m)	A Drainage Use (m2)	P (m)	n	R (m)	S	Q hydraulics (m3/s)	ΔQ	Control
		Dari	Ke				Dari	Ke																	
65	DAW1	**AV1**	**AW7**	0.0000	**0.0006**	DAW1	A12	A11	0.001	0.5	0.001	0.029	0.1	0.129	0.2	0.13	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.030	OK
65	DAW2	**AW6**	**AW7**	0.0015	**0.0150**	DAW2	A13	A12	0.015	0.5	0.030	0.142	0.1	0.242	0.3	0.24	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.053	OK
65	DAW3	**AW5**	**AW6**	0.0032	**0.0270**	DAW3	A14	A13	0.027	0.5	0.054	0.190	0.1	0.290	0.3	0.29	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.041	OK
67	DAX1	**AX1**	**AX3**	0.0020	**0.0165**	DAX1	A14	A13	0.017	0.5	0.033	0.148	0.1	0.248	0.3	0.25	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.051	OK
65	DAX2	**AX2**	**AX3**	0.0001	**0.0007**	DAX2	A15	A14	0.001	0.5	0.001	0.030	0.1	0.130	0.2	0.13	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.030	OK
65	DAQ5	**AQ6**	**AQ8**	0.0002	**0.0025**	DAQ5	A15	A14	0.002	0.5	0.005	0.057	0.1	0.157	0.2	0.16	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.028	OK
65	DAQ6	**AQ7**	**AQ8**	0.0000	**0.0006**	DAQ6	A15	A14	0.001	0.5	0.001	0.029	0.1	0.129	0.2	0.13	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.030	OK
65	DAQ7	**AQ8**	**AX3**	0.0002	**0.0031**	DAQ7	A15	A14	0.003	0.5	0.006	0.064	0.1	0.164	0.2	0.16	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.027	OK

ZONE 8																									
I (mm/hour)	Drainage Name	Node		A (km2)	Q Hidrology (m3/s)	Drainage Name	Node		Q Hidrology (m3/s)	V Design (m/s)	A Drainage Needed (m2)	h Water (m)	W (m)	h total (m)	h use (m)	B (m)	b Use (m)	A Drainage Use (m2)	P (m)	n	R (m)	S	Q hydraulics (m3/s)	ΔQ	Control
		Dari	Ke				Dari	Ke																	
65	DAU7	**AU2**	**AU4**	0.0007	**0.0060**	DAU7	A12	A11	0.006	0.5	0.012	0.090	0.1	0.190	0.2	0.19	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.024	OK
65	DAU8	**AZ3**	**AU5**	0.0025	**0.0266**	DAU8	A11	A1	0.027	0.5	0.053	0.188	0.1	0.288	0.3	0.29	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.041	OK
65	DAY1	**AY1**	**AU4**	0.0001	**0.0018**	DAY1	A2	C1	0.002	0.5	0.004	0.049	0.1	0.149	0.2	0.15	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.028	OK
65	DAZ1	**AZ1**	**AZ3**	0.0003	**0.0040**	DAZ1	B21	B22	0.004	0.5	0.008	0.073	0.1	0.173	0.2	0.17	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.026	OK
65	DAZ2	**AZ2**	**AZ3**	0.0001	**0.0018**	DAZ2	B21	B22	0.002	0.5	0.004	0.049	0.1	0.149	0.2	0.15	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.028	OK

ZONE 9																									
I (mm/hour)	Drainage Name	Node		A (km2)	Q Hidrology (m3/s)	Drainage Name	Node		Q Hidrology (m3/s)	V Design (m/s)	A Drainage Needed (m2)	h Water (m)	W (m)	h total (m)	h use (m)	B (m)	b Use (m)	A Drainage Use (m2)	P (m)	n	R (m)	S	Q hydraulics (m3/s)	ΔQ	Control
		Dari	Ke				Dari	Ke																	
65	DBE1	**BE1**	**BE2**	0.0002	**0.0024**	DBE1	A12	A11	0.002	0.5	0.005	0.056	0.1	0.156	0.2	0.16	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.028	OK
65	DBE2	**BE1**	**BE3**	0.0001	**0.0009**	DBE2	A11	A1	0.001	0.5	0.002	0.036	0.1	0.136	0.2	0.14	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.029	OK
65	DBE3	**BE3**	**BE4**	0.0019	**0.0144**	DBE3	A1	A2	0.014	0.5	0.029	0.139	0.1	0.239	0.3	0.24	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.054	OK
65	DBE4	**BE2**	**BE4**	0.0001	**0.0009**	DBE4	A21	A2	0.001	0.5	0.002	0.035	0.1	0.135	0.2	0.14	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.029	OK
65	DBD1	**BD1**	**BD2**	0.0016	**0.0128**	DBD1	A2	C1	0.013	0.5	0.026	0.130	0.1	0.230	0.3	0.23	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.055	OK
65	DBD2	**BD1**	**BD3**	0.0002	**0.0026**	DBD2	B21	B22	0.003	0.5	0.005	0.058	0.1	0.158	0.2	0.16	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.028	OK
65	DBD3	**AY3**	**BD3**	0.0016	**0.0132**	DBD3	A3	C2	0.013	0.5	0.026	0.133	0.1	0.233	0.3	0.23	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.055	OK
65	DBD4	**BD3**	**BD4**	0.0035	**0.0292**	DBD4	B11	B1	0.029	0.5	0.058	0.197	0.1	0.297	0.3	0.30	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.039	OK
65	DBD5	**BD2**	**BD4**	0.0037	**0.0301**	DBD5	B22	B2	0.030	0.5	0.060	0.200	0.1	0.300	0.4	0.30	0.4	0.24	1.29	0.025	0.185	0.0015	**0.121**	0.091	OK
65	DBF1	**BF1**	**BF2**	0.0003	**0.0037**	DBF1	B1	B2	0.004	0.5	0.007	0.070	0.1	0.170	0.2	0.17	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.027	OK
65	DBF2	**BF1**	**BF3**	0.0003	**0.0038**	DBF2	B2	D1	0.004	0.5	0.008	0.071	0.1	0.171	0.2	0.17	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.027	OK
65	DBF3	**BF2**	**BF4**	0.0002	**0.0023**	DBF3	C11	C1	0.002	0.5	0.005	0.055	0.1	0.155	0.2	0.16	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.028	OK
65	DBF4	**BF3**	**BF4**	0.0055	**0.0477**	DBF4	C21	C22	0.048	0.5	0.095	0.252	0.1	0.352	0.4	0.35	0.4	0.24	1.29	0.025	0.185	0.0015	**0.121**	0.073	OK
65	DBG1	**BG1**	**BG2**	0.0005	**0.0061**	DBG1	C22	C2	0.006	0.5	0.012	0.090	0.1	0.190	0.2	0.19	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.024	OK
65	DBG2	**BG1**	**BG3**	0.0001	**0.0007**	DBG2	C1	C2	0.001	0.5	0.001	0.030	0.1	0.130	0.2	0.13	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.030	OK
65	DBG3	**BG2**	**BG4**	0.0005	**0.0071**	DBG3	C2	J3	0.007	0.5	0.014	0.097	0.1	0.197	0.2	0.20	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.023	OK
65	DBG4	**BG4**	**BG3**	0.0015	**0.0117**	DBG4	D11	D1	0.012	0.5	0.023	0.125	0.1	0.225	0.3	0.22	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.056	OK
65	DBH1	**BH2**	**BH1**	0.0015	**0.0115**	DBH1	D21	D22	0.012	0.5	0.023	0.124	0.1	0.224	0.3	0.22	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.056	OK
65	DBH2	**BH1**	**BH3**	0.0032	**0.0255**	DBH2	D22	D2	0.025	0.5	0.051	0.184	0.1	0.284	0.3	0.28	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.042	OK
65	DBH3	**BH2**	**BH4**	0.0007	**0.0089**	DBH3	D1	D2	0.009	0.5	0.018	0.109	0.1	0.209	0.3	0.21	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.059	OK
65	DBH4	**BH3**	**BH4**	0.0090	**0.0780**	DBH4	D2	K1	0.078	0.5	0.156	0.322	0.1	0.422	0.5	0.42	0.5	0.375	1.62	0.025	0.232	0.0011	**0.188**	0.110	OK
65	DAY2	**AY1**	**AY3**	0.0002	**0.0026**	DAY2	D22	D2	0.003	0.5	0.005	0.058	0.1	0.158	0.2	0.16	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.028	OK
65	DAY3	**AY2**	**AY3**	0.0014	**0.0106**	DAY3	D1	D2	0.011	0.5	0.021	0.119	0.1	0.219	0.3	0.22	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.057	OK
ZONE 10																									
I (mm/hour)	Drainage Name	Node		A (km2)	Q Hidrology (m3/s)	Drainage Name	Node		Q Hidrology (m3/s)	V Design (m/s)	A Drainage Needed (m2)	h Water (m)	W (m)	h total (m)	h use (m)	B (m)	b Use (m)	A Drainage Use (m2)	P (m)	n	R (m)	S	Q hydraulics (m3/s)	ΔQ	Control
		Dari	Ke				Dari	Ke																	
65	DB1	**B1**	**B3**	0.0016	**0.0095**	DB1	A12	A11	0.010	0.5	0.019	0.113	0.1	0.213	0.3	0.21	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.058	OK
65	DB2	**B2**	**B3**	0.0016	**0.0104**	DB2	A11	A1	0.010	0.5	0.021	0.118	0.1	0.218	0.3	0.22	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.058	OK
65	DBB1	**BB1**	**BB2**	0.0001	**0.0011**	DBB1	A1	A2	0.001	0.5	0.002	0.038	0.1	0.138	0.2	0.14	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.029	OK
65	DBB2	**BB2**	**BB3**	0.0040	**0.0255**	DBB2	A21	A2	0.026	0.5	0.051	0.184	0.1	0.284	0.3	0.28	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.042	OK
66	DBB3	**BB4**	**BB3**	0.0005	**0.0034**	DBB3	A12	A11	0.003	0.5	0.007	0.068	0.1	0.168	0.2	0.17	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.027	OK
67	DBA1	**BA1**	**BA2**	0.0009	**0.0075**	DBA1	A11	A1	0.008	0.5	0.015	0.100	0.1	0.200	0.3	0.20	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.060	OK

I (mm/hour)	Drainage Name	Node		A (km2)	Q Hidrology (m3/s)	Drainage Name	Node		Q Hidrology (m3/s)	V Design (m/s)	A Drainage Needed (m2)	h Water (m)	W (m)	h total (m)	h use (m)	B (m)	b Use (m)	A Drainage Use (m2)	P (m)	n	R (m)	S	Q hydraulics (m3/s)	ΔQ	Control
ZONE 11																									
		Dari	Ke				Dari	Ke																	
65	DBB4	**BB5**	**BB7**	0.0018	**0.0150**	DBB4	A12	A11	0.015	0.5	0.030	0.141	0.1	0.241	0.3	0.24	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.053	OK
65	DBB5	**BB3**	**BB7**	0.0005	**0.0043**	DBB5	A11	A1	0.004	0.5	0.009	0.076	0.1	0.176	0.2	0.18	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.026	OK
65	DBA2	**BA3**	**BA4**	0.0008	**0.0065**	DBA2	A21	A2	0.007	0.5	0.013	0.093	0.1	0.193	0.2	0.19	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.024	OK
66	DBA3	**BB7**	**BA5**	0.0027	**0.0216**	DBA3	A12	A11	0.022	0.5	0.043	0.170	0.1	0.270	0.3	0.27	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.046	OK
ZONE 12																									
I (mm/hour)	Drainage Name	Node		A (km2)	Q Hidrology (m3/s)	Drainage Name	Node		Q Hidrology (m3/s)	V Design (m/s)	A Drainage Needed (m2)	h Water (m)	W (m)	h total (m)	h use (m)	B (m)	b Use (m)	A Drainage Use (m2)	P (m)	n	R (m)	S	Q hydraulics (m3/s)	ΔQ	Control
		Dari	Ke				Dari	Ke																	
65	DAX3	**AX4**	**AX2**	0.0029	**0.0244**	DAX3	A12	A11	0.024	0.5	0.049	0.181	0.1	0.281	0.3	0.28	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.044	OK
ZONE 13																									
I (mm/hour)	Drainage Name	Node		A (km2)	Q Hidrology (m3/s)	Drainage Name	Node		Q Hidrology (m3/s)	V Design (m/s)	A Drainage Needed (m2)	h Water (m)	W (m)	h total (m)	h use (m)	B (m)	b Use (m)	A Drainage Use (m2)	P (m)	n	R (m)	S	Q hydraulics (m3/s)	ΔQ	Control
		Dari	Ke				Dari	Ke																	
65	DAW4	**AW8**	**AW9**	0.0003	**0.0040**	DAW4	A12	A11	0.004	0.5	0.008	0.073	0.1	0.173	0.2	0.17	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.026	OK
65	DAW5	**AW9**	**AW10**	0.0013	**0.0186**	DAW5	A11	A1	0.019	0.5	0.037	0.158	0.1	0.258	0.3	0.26	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.049	OK
65	DAX4	**AX5**	**AW10**	0.0015	**0.0074**	DAX4	A1	A2	0.007	0.5	0.015	0.100	0.1	0.200	0.2	0.20	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.023	OK
ZONE 14																									
I (mm/hour)	Drainage Name	Node		A (km2)	Q Hidrology (m3/s)	Drainage Name	Node		Q Hidrology (m3/s)	V Design (m/s)	A Drainage Needed (m2)	h Water (m)	W (m)	h total (m)	h use (m)	B (m)	b Use (m)	A Drainage Use (m2)	P (m)	n	R (m)	S	Q hydraulics (m3/s)	ΔQ	Control
		Dari	Ke				Dari	Ke																	
65	DBC1	**DB1**	**DB2**	0.0007	**0.0059**	DBC1	A12	A11	0.006	0.5	0.012	0.088	0.1	0.188	0.2	0.19	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.024	OK
65	DBC2	**DB2**	**DB3**	0.0015	**0.0101**	DBC2	A11	A1	0.010	0.5	0.020	0.116	0.1	0.216	0.3	0.22	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.058	OK
65	DBC3	**DB3**	**DB4**	0.0033	**0.0241**	DBC3	A1	A2	0.024	0.5	0.048	0.179	0.1	0.279	0.3	0.28	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.044	OK
65	DBC4	**DB4**	**DB6**	0.0052	**0.0389**	DBC4	A21	A2	0.039	0.5	0.078	0.228	0.1	0.328	0.4	0.33	0.4	0.24	1.29	0.025	0.185	0.0015	**0.121**	0.082	OK
65	DBC5	**DB5**	**DB6**	0.0002	**0.0022**	DBC5	A12	A11	0.002	0.5	0.004	0.055	0.1	0.155	0.2	0.15	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.028	OK
65	DAT1	**AT1**	**AT2**	0.0002	**0.0028**	DAT1	A11	A1	0.003	0.5	0.006	0.061	0.1	0.161	0.2	0.16	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.027	OK
65	DAT2	**AT2**	**AT3**	0.0015	**0.0115**	DAT2	A1	A2	0.011	0.5	0.023	0.124	0.1	0.224	0.3	0.22	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.057	OK
65	DAT3	**AT3**	**AT5**	0.0037	**0.0288**	DAT3	A21	A2	0.029	0.5	0.058	0.196	0.1	0.296	0.3	0.30	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.039	OK
65	DAT4	**AT4**	**BC6**	0.0045	**0.0346**	DAT4	A12	A11	0.035	0.5	0.069	0.215	0.1	0.315	0.4	0.31	0.4	0.24	1.29	0.025	0.185	0.0015	**0.121**	0.086	OK
65	DAX6	**AX7**	**AX6**	0.0012	**0.0091**	#REF!	A11	A1	0.009	0.5	0.018	0.110	0.1	0.210	0.3	0.21	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.059	OK
65	DAX7	**AX5**	**AX6**	0.0023	**0.0162**	#REF!	A1	A2	0.016	0.5	0.032	0.147	0.1	0.247	0.3	0.25	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.052	OK
65	DAX8	**AX6**	**BC6**	0.0035	**0.0253**	DAX6	A21	A2	0.025	0.5	0.051	0.184	0.1	0.284	0.3	0.28	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.043	OK

ZONE 15

I (mm/hour)	Drainage Name	Node		A (km2)	Q Hidrology (m3/s)	Drainage Name	Node		Q Hidrology (m3/s)	V Design (m/s)	A Drainage Needed (m2)	h Water (m)	W (m)	h total (m)	h use (m)	B (m)	b Use (m)	A Drainage Use (m2)	P (m)	n	R (m)	S	Q hydraulics (m3/s)	ΔQ	Control
		Dari	Ke				Dari	Ke																	
65	DAT5	**AT7**	**AT6**	0.0020	**0.0154**	DAT5	A12	A11	0.015	0.5	0.031	0.143	0.1	0.243	0.3	0.24	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.053	OK
65	DAT6	**AT4**	**AT6**	0.0009	**0.0060**	DAT6	A11	A1	0.006	0.5	0.012	0.089	0.1	0.189	0.2	0.19	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.024	OK
65	DAS3	**AS4**	**AS5**	0.0014	**0.0106**	DAS3	A1	A2	0.011	0.5	0.021	0.119	0.1	0.219	0.3	0.22	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.057	OK
65	DAS4	**AS2**	**AS5**	0.0030	**0.0232**	DAS4	A21	A2	0.023	0.5	0.046	0.176	0.1	0.276	0.3	0.28	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.045	OK
66	DAX9	**AX7**	**AX1**	0.0001	**0.0011**	DAX9	A12	A11	0.001	0.5	0.002	0.038	0.1	0.138	0.2	0.14	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.029	OK
66	DAQ8	**AQ1**	**AX1**	0.0003	**0.0083**	DAQ8	A12	A11	0.008	0.5	0.017	0.105	0.1	0.205	0.3	0.20	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.060	OK

ZONE 16

I (mm/hour)	Drainage Name	Node		A (km2)	Q Hidrology (m3/s)	Drainage Name	Node		Q Hidrology (m3/s)	V Design (m/s)	A Drainage Needed (m2)	h Water (m)	W (m)	h total (m)	h use (m)	B (m)	b Use (m)	A Drainage Use (m2)	P (m)	n	R (m)	S	Q hydraulics (m3/s)	ΔQ	Control
		Dari	Ke				Dari	Ke																	
65	DAR4	**AR1**	**AR5**	0.0016	**0.0104**	DAR4	A12	A11	0.010	0.5	0.021	0.118	0.1	0.218	0.3	0.22	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.058	OK
65	DAS5	**AS1**	**AS6**	0.0030	**0.0177**	DAS5	A1	A2	0.018	0.5	0.035	0.154	0.1	0.254	0.3	0.25	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.050	OK
65	DAS6	**AS6**	**AS7**	0.0042	**0.0261**	DAS6	A21	A2	0.026	0.5	0.052	0.186	0.1	0.286	0.3	0.29	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.042	OK

ZONE 17

I (mm/hour)	Drainage Name	Node		A (km2)	Q Hidrology (m3/s)	Drainage Name	Node		Q Hidrology (m3/s)	V Design (m/s)	A Drainage Needed (m2)	h Water (m)	W (m)	h total (m)	h use (m)	B (m)	b Use (m)	A Drainage Use (m2)	P (m)	n	R (m)	S	Q hydraulics (m3/s)	ΔQ	Control
		Dari	Ke				Dari	Ke																	
65	DAT7	**AT9**	**AT10**	0.0001	**0.0016**	DAT7	AT9	AT10	0.002	0.5	0.003	0.046	0.1	0.146	0.2	0.15	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.029	OK
65	DAT8	**AT7**	**AT8**	0.0002	**0.0033**	DAT8	AT7	AT8	0.003	0.5	0.007	0.066	0.1	0.166	0.2	0.17	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.027	OK
65	DAT9	**AT2**	**AT8**	0.0001	**0.0016**	DAT9	AT2	AT8	0.002	0.5	0.003	0.046	0.1	0.146	0.2	0.15	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.029	OK
65	DAE1	**AE2**	**AE3**	0.0011	**0.0125**	DAE1	AE2	AE3	0.013	0.5	0.025	0.129	0.1	0.229	0.3	0.23	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.055	OK
65	DAS8	**AS8**	**AS9**	0.0002	**0.0033**	DAS8	AS8	AS9	0.003	0.5	0.007	0.066	0.1	0.166	0.2	0.17	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.027	OK
65	DAS8	**AS8**	**AS9**	0.0002	**0.0024**	DAS8	AS8	AS9	0.002	0.5	0.005	0.057	0.1	0.157	0.2	0.16	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.028	OK

ZONE 18

I (mm/hour)	Drainage Name	Node		A (km2)	Q Hidrology (m3/s)	Drainage Name	Node		Q Hidrology (m3/s)	V Design (m/s)	A Drainage Needed (m2)	h Water (m)	W (m)	h total (m)	h use (m)	B (m)	b Use (m)	A Drainage Use (m2)	P (m)	n	R (m)	S	Q hydraulics (m3/s)	ΔQ	Control
		Dari	Ke				Dari	Ke																	
65	DAD1	**AD1**	**AD2**	0.0024	**0.0279**	DAD1	A12	A11	0.028	0.5	0.056	0.193	0.1	0.293	0.3	0.29	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.040	OK
65	DAE2	**AD2**	**AE4**	0.0042	**0.0494**	DAE2	A11	A1	0.049	0.5	0.099	0.257	0.1	0.357	0.4	0.36	0.4	0.24	1.29	0.025	0.185	0.0015	**0.121**	0.071	OK
65	DAE3	**AE4**	**AT13**	0.0042	**0.0494**	DAE3	A1	A2	0.049	0.5	0.099	0.257	0.1	0.357	0.4	0.36	0.4	0.24	1.29	0.025	0.185	0.0015	**0.121**	0.071	OK
65	DAT10	**AT11**	**AT12**	0.0002	**0.0028**	DAT10	A21	A2	0.003	0.5	0.006	0.061	0.1	0.161	0.2	0.16	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.027	OK
65	DAT11	**AT12**	**AT13**	0.0002	**0.0027**	DAT11	A12	A11	0.003	0.5	0.005	0.060	0.1	0.160	0.2	0.16	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.028	OK

ZONE 19																									
I (mm/hour)	Drainage Name	Node		A (km2)	Q Hidrology (m3/s)	Drainage Name	Node		Q Hidrology (m3/s)	V Design (m/s)	A Drainage Needed (m2)	h Water (m)	W (m)	h total (m)	h use (m)	B (m)	b Use (m)	A Drainage Use (m2)	P (m)	n	R (m)	S	Q hydraulics (m3/s)	ΔQ	Control
		Dari	Ke				Dari	Ke																	
65	DAE4	**AE1**	**AE5**	0.0029	**0.0235**	DAE4	A12	A11	0.024	0.5	0.047	0.177	0.1	0.277	0.3	0.28	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.044	OK
65	DAE5	**AE2**	**AE5**	0.0018	**0.0137**	DAE5	A11	A1	0.014	0.5	0.027	0.135	0.1	0.235	0.3	0.24	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.054	OK
65	DY1	**Y3**	**Y9**	0.0048	**0.0373**	DY1	A1	A2	0.037	0.5	0.075	0.223	0.1	0.323	0.4	0.32	0.4	0.24	1.29	0.025	0.185	0.0015	**0.121**	0.084	OK
65	DY1	**Y3**	**Y9**	0.0001	**0.0009**	DY1	A21	A2	0.001	0.5	0.002	0.035	0.1	0.135	0.2	0.13	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.029	OK
ZONE 20																									
I (mm/hour)	Drainage Name	Node		A (km2)	Q Hidrology (m3/s)	Drainage Name	Node		Q Hidrology (m3/s)	V Design (m/s)	A Drainage Needed (m2)	h Water (m)	W (m)	h total (m)	h use (m)	B (m)	b Use (m)	A Drainage Use (m2)	P (m)	n	R (m)	S	Q hydraulics (m3/s)	ΔQ	Control
		Dari	Ke				Dari	Ke																	
65	DAD2	**AD1**	**AD4**	0.0012	**0.0105**	DAD2	AD1	AD4	0.011	0.5	0.021	0.118	0.1	0.218	0.3	0.22	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.057	OK
65	DAD3	**AD2**	**AD3**	0.0018	**0.0156**	DAD3	AD2	AD3	0.016	0.5	0.031	0.144	0.1	0.244	0.3	0.24	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.052	OK
65	DAD4	**AD3**	**AD4**	0.0035	**0.0253**	DAD4	AD3	AD4	0.025	0.5	0.051	0.184	0.1	0.284	0.3	0.28	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.043	OK
65	DBI1	**AD4**	**BI3**	0.0047	**0.0406**	DBI1	AD4	BI3	0.041	0.5	0.081	0.233	0.1	0.333	0.4	0.33	0.4	0.24	1.29	0.025	0.185	0.0015	**0.121**	0.080	OK
65	DBI2	**BI1**	**BI3**	0.0009	**0.0080**	DBI2	BI1	BI3	0.008	0.5	0.016	0.103	0.1	0.203	0.3	0.20	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.060	OK
65	DBI3	**BI2**	**BI3**	0.0005	**0.0055**	DBI3	BI2	BI3	0.006	0.5	0.011	0.086	0.1	0.186	0.2	0.19	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.025	OK
ZONE 21																									
I (mm/hour)	Drainage Name	Node		A (km2)	Q Hidrology (m3/s)	Drainage Name	Node		Q Hidrology (m3/s)	V Design (m/s)	A Drainage Needed (m2)	h Water (m)	W (m)	h total (m)	h use (m)	B (m)	b Use (m)	A Drainage Use (m2)	P (m)	n	R (m)	S	Q hydraulics (m3/s)	ΔQ	Control
		Dari	Ke				Dari	Ke																	
65	DY2	**Y5**	**Y6**	0.0007	**0.0086**	DY2	Y5	Y6	0.009	0.5	0.017	0.107	0.1	0.207	0.3	0.21	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.059	OK
65	DY3	**Y6**	**Y7**	0.0020	**0.0237**	DY3	Y6	Y7	0.024	0.5	0.047	0.178	0.1	0.278	0.3	0.28	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.044	OK
65	DY4	**Y7**	**Y8**	0.0035	**0.0406**	DY4	Y7	Y8	0.041	0.5	0.081	0.233	0.1	0.333	0.4	0.33	0.4	0.24	1.29	0.025	0.185	0.0015	**0.121**	0.080	OK
65	DY5	**BI3**	**Y8**	0.0044	**0.0530**	DY5	BI3	Y8	0.053	0.5	0.106	0.266	0.1	0.366	0.4	0.37	0.4	0.24	1.29	0.025	0.185	0.0015	**0.121**	0.068	OK
65	DY6	**Y8**	**Y2**	0.0083	**0.0983**	DY6	Y8	Y2	0.098	0.5	0.197	0.362	0.1	0.462	0.5	0.46	0.5	0.375	1.62	0.025	0.232	0.0011	**0.188**	0.089	OK
65	DY7	**Y1**	**Y2**	0.0019	**0.0218**	DY7	Y1	Y2	0.022	0.5	0.044	0.171	0.1	0.271	0.3	0.27	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.046	OK

ZONE 22																									
I (mm/hour)	Drainage Name	Node		A (km2)	Q Hidrology (m3/s)	Drainage Name	Node		Q Hidrology (m3/s)	V Design (m/s)	A Drainage Needed (m2)	h Water (m)	W (m)	h total (m)	h use (m)	B (m)	b Use (m)	A Drainage Use (m2)	P (m)	n	R (m)	S	Q hydraulics (m3/s)	ΔQ	Control
		Dari	Ke				Dari	Ke																	
65	DU4	**U5**	**U6**	0.0001	**0.0014**	DU4	U5	U6	0.001	0.5	0.003	0.044	0.1	0.144	0.2	0.14	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.029	OK
65	DU5	**U6**	**U3**	0.0002	**0.0028**	DU5	U6	U3	0.003	0.5	0.006	0.061	0.1	0.161	0.2	0.16	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.028	OK
65	DX1	**X1**	**X2**	0.0002	**0.0025**	DX1	X1	X2	0.002	0.5	0.005	0.057	0.1	0.157	0.2	0.16	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.028	OK
65	DX2	**X2**	**X3**	0.0003	**0.0043**	DX2	X2	X3	0.004	0.5	0.009	0.076	0.1	0.176	0.2	0.18	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.026	OK
65	DX3	**X3**	**X9**	0.0117	**0.1387**	DX3	X3	X9	0.139	0.5	0.277	0.430	0.1	0.530	0.6	0.53	0.6	0.54	1.94	0.025	0.278	0.0009	**0.276**	0.137	OK
65	DX4	**X9**	**X10**	0.0131	**0.1546**	DX4	X9	X10	0.155	0.5	0.309	0.454	0.1	0.554	0.6	0.55	0.6	0.54	1.94	0.025	0.278	0.0009	**0.276**	0.122	OK
65	DX5	**X10**	**X8**	0.0144	**0.1707**	DX5	X10	X8	0.171	0.5	0.341	0.477	0.1	0.577	0.6	0.58	0.6	0.54	1.94	0.025	0.278	0.0009	**0.276**	0.105	OK
65	DX6	**X1**	**X4**	0.0010	**0.0118**	DX6	X1	X4	0.012	0.5	0.024	0.125	0.1	0.225	0.3	0.23	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.056	OK
65	DX7	**X4**	**X5**	0.0011	**0.0130**	DX7	X4	X5	0.013	0.5	0.026	0.131	0.1	0.231	0.3	0.23	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.055	OK
65	DX8	**X5**	**X6**	0.0016	**0.0194**	DX8	X5	X6	0.019	0.5	0.039	0.161	0.1	0.261	0.3	0.26	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.049	OK
65	DX9	**X6**	**X7**	0.0028	**0.0329**	DX9	X6	X7	0.033	0.5	0.066	0.209	0.1	0.309	0.4	0.31	0.4	0.24	1.29	0.025	0.185	0.0015	**0.121**	0.088	OK
65	DX10	**X7**	**X8**	0.0042	**0.0492**	DX10	X7	X8	0.049	0.5	0.098	0.256	0.1	0.356	0.4	0.36	0.4	0.24	1.29	0.025	0.185	0.0015	**0.121**	0.072	OK
65	DZ1	**Z1**	**Z2**	0.0007	**0.0084**	DZ1	Z1	Z2	0.008	0.5	0.017	0.106	0.1	0.206	0.3	0.21	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.060	OK
65	DZ2	**Z2**	**Z3**	0.0011	**0.0134**	DZ2	Z2	Z3	0.013	0.5	0.027	0.134	0.1	0.234	0.3	0.23	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.055	OK
65	DZ3	**Z4**	**Z3**	0.0006	**0.0075**	DZ3	Z4	Z3	0.008	0.5	0.015	0.100	0.1	0.200	0.3	0.20	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.060	OK
65	DAA1	**AA1**	**AA2**	0.0008	**0.0100**	DAA1	AA1	AA2	0.010	0.5	0.020	0.116	0.1	0.216	0.3	0.22	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.058	OK
65	DAA2	**AA2**	**AA3**	0.0018	**0.0214**	DAA2	AA2	AA3	0.021	0.5	0.043	0.169	0.1	0.269	0.3	0.27	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.047	OK
65	DAA3	**AA3**	**AA4**	0.0020	**0.0236**	DAA3	AA3	AA4	0.024	0.5	0.047	0.178	0.1	0.278	0.3	0.28	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.044	OK
65	DAA4	**Z3**	**AA5**	0.0034	**0.0415**	DAA4	Z3	AA5	0.041	0.5	0.083	0.235	0.1	0.335	0.4	0.34	0.4	0.24	1.29	0.025	0.185	0.0015	**0.121**	0.079	OK
65	DAA5	**AA5**	**AA6**	0.0210	**0.2498**	DAA5	AA5	AA6	0.250	0.5	0.500	0.577	0.1	0.677	0.7	0.68	0.7	0.735	2.27	0.025	0.324	0.0008	**0.393**	0.143	OK
65	DAA6	**AA6**	**AA7**	0.0217	**0.2580**	DAA6	AA6	AA7	0.258	0.5	0.516	0.587	0.1	0.687	0.7	0.69	0.7	0.735	2.27	0.025	0.324	0.0008	**0.393**	0.135	OK
65	DAA7	**AA7**	**AA8**	0.0241	**0.2855**	DAA7	AA7	AA8	0.285	0.5	0.571	0.617	0.1	0.717	0.8	0.72	0.8	0.96	2.59	0.025	0.371	0.0006	**0.485**	0.200	OK
65	DW1	**U7**	**W1**	0.0016	**0.0195**	DW1	U7	W1	0.019	0.5	0.039	0.161	0.1	0.261	0.3	0.26	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.049	OK
65	DW2	**W1**	**W2**	0.0024	**0.0284**	DW2	W1	W2	0.028	0.5	0.057	0.195	0.1	0.295	0.3	0.29	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.040	OK
65	DW3	**W2**	**W3**	0.0026	**0.0315**	DW3	W2	W3	0.031	0.5	0.063	0.205	0.1	0.305	0.4	0.30	0.4	0.24	1.29	0.025	0.185	0.0015	**0.121**	0.089	OK

ZONE 23																									
I (mm/hour)	Drainage Name	Node		A (km2)	Q Hidrology (m3/s)	Drainage Name	Node		Q Hidrology (m3/s)	V Design (m/s)	A Drainage Needed (m2)	h Water (m)	W (m)	h total (m)	h use (m)	B (m)	b Use (m)	A Drainage Use (m2)	P (m)	n	R (m)	S	Q hydraulics (m3/s)	ΔQ	Control
		Dari	Ke				Dari	Ke																	
65	DY8	**Y1**	**Y4**	0.0015	**0.0179**	DY8	Y1	Y4	0.018	0.5	0.036	0.154	0.1	0.254	0.3	0.25	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.050	OK
65	DY9	**Y3**	**Y4**	0.0013	**0.0153**	DY9	Y3	Y4	0.015	0.5	0.031	0.143	0.1	0.243	0.3	0.24	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.053	OK
65	DZ4	**Z1**	**Z5**	0.0013	**0.0160**	DZ4	Z1	Z5	0.016	0.5	0.032	0.146	0.1	0.246	0.3	0.25	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.052	OK
65	DAA8	**AA1**	**AA9**	0.0027	**0.0315**	DAA8	AA1	AA9	0.032	0.5	0.063	0.205	0.1	0.305	0.4	0.31	0.4	0.24	1.29	0.025	0.185	0.0015	**0.121**	0.089	OK
65	DAC1	**AS8**	**AS10**	0.0043	**0.0512**	DAC1	AS8	AS10	0.051	0.5	0.102	0.261	0.1	0.361	0.4	0.36	0.4	0.24	1.29	0.025	0.185	0.0015	**0.121**	0.070	OK
65	DAC1	**AS7**	**AS10**	0.0002	**0.0024**	DAC1	AS7	AS10	0.002	0.5	0.005	0.056	0.1	0.156	0.2	0.16	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.028	OK
65	DAB1	**AB4**	**AB1**	0.0002	**0.0033**	DAC2	AB4	AB1	0.003	0.5	0.007	0.066	0.1	0.166	0.2	0.17	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.027	OK
65	DAB1	**AB1**	**AB2**	0.0010	**0.0140**	DAB1	AB1	AB2	0.014	0.5	0.028	0.137	0.1	0.237	0.3	0.24	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.054	OK
65	DAB1	**AC3**	**AB3**	0.0009	**0.0127**	DAB2	AC3	AB3	0.013	0.5	0.025	0.130	0.1	0.230	0.3	0.23	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.055	OK
65	DAB3	**AC3**	**AB3**	0.0015	**0.0204**	DAB3	AC3	AB3	0.020	0.5	0.041	0.165	0.1	0.265	0.3	0.26	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.048	OK
ZONE 24																									
I (mm/hour)	Drainage Name	Node		A (km2)	Q Hidrology (m3/s)	Drainage Name	Node		Q Hidrology (m3/s)	V Design (m/s)	A Drainage Needed (m2)	h Water (m)	W (m)	h total (m)	h use (m)	B (m)	b Use (m)	A Drainage Use (m2)	P (m)	n	R (m)	S	Q hydraulics (m3/s)	ΔQ	Control
		Dari	Ke				Dari	Ke																	
65	DE1	**E1**	**E2**	0.0020	**0.0231**	DE1	E1	E2	0.023	0.5	0.046	0.176	0.1	0.276	0.3	0.28	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.045	OK
65	DE2	**E2**	**E4**	0.0027	**0.0317**	DE2	E2	E4	0.032	0.5	0.063	0.206	0.1	0.306	0.4	0.31	0.4	0.24	1.29	0.025	0.185	0.0015	**0.121**	0.089	OK
65	DE3	**H4**	**E6**	0.0047	**0.0556**	DE3	H4	E6	0.056	0.5	0.111	0.272	0.1	0.372	0.4	0.37	0.4	0.24	1.29	0.025	0.185	0.0015	**0.121**	0.065	OK
65	DE4	**E3**	**E5**	0.0002	**0.0022**	DE4	E3	E5	0.002	0.5	0.004	0.054	0.1	0.154	0.2	0.15	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.028	OK
65	DE5	**E5**	**E6**	0.0012	**0.0140**	DE5	E5	E6	0.014	0.5	0.028	0.137	0.1	0.237	0.3	0.24	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.054	OK
65	DF1	**F1**	**F2**	0.0013	**0.0154**	DF1	F1	F2	0.015	0.5	0.031	0.143	0.1	0.243	0.3	0.24	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.053	OK
65	DF2	**F1**	**F3**	0.0001	**0.0020**	DF2	F1	F3	0.002	0.5	0.004	0.052	0.1	0.152	0.2	0.15	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.028	OK
65	DF3	**F2**	**F3**	0.0019	**0.0218**	DF3	F2	F3	0.022	0.5	0.044	0.171	0.1	0.271	0.3	0.27	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.046	OK
65	DG1	**G1**	**G2**	0.0001	**0.0020**	DG1	G1	G2	0.002	0.5	0.004	0.052	0.1	0.152	0.2	0.15	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.028	OK
65	DG2	**G1**	**G4**	0.0000	**0.0006**	DG2	G1	G4	0.001	0.5	0.001	0.029	0.1	0.129	0.2	0.13	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.030	OK
65	DG3	**G4**	**G5**	0.0022	**0.0263**	DG3	G4	G5	0.026	0.5	0.053	0.187	0.1	0.287	0.3	0.29	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.042	OK
65	DG4	**F3**	**G3**	0.0022	**0.0265**	DG4	F3	G3	0.027	0.5	0.053	0.188	0.1	0.288	0.3	0.29	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.041	OK
65	DG5	**E6**	**G5**	0.0100	**0.1186**	DG5	E6	G5	0.119	0.5	0.237	0.398	0.1	0.498	0.5	0.50	0.5	0.375	1.62	0.025	0.232	0.0011	**0.188**	0.069	OK
65	DH1	**H1**	**H2**	0.0002	**0.0021**	DH1	H1	H2	0.002	0.5	0.004	0.053	0.1	0.153	0.2	0.15	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.028	OK
65	DH2	**H2**	**H4**	0.0003	**0.0035**	DH2	H2	H4	0.004	0.5	0.007	0.069	0.1	0.169	0.2	0.17	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.027	OK
65	DH3	**AT11**	**H4**	0.0002	**0.0021**	DH3	AT11	H4	0.002	0.5	0.004	0.053	0.1	0.153	0.2	0.15	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.028	OK
ZONE 25																									
I (mm/hour)	Drainage Name	Node		A (km2)	Q Hidrology (m3/s)	Drainage Name	Node		Q Hidrology (m3/s)	V Design (m/s)	A Drainage Needed (m2)	h Water (m)	W (m)	h total (m)	h use (m)	B (m)	b Use (m)	A Drainage Use (m2)	P (m)	n	R (m)	S	Q hydraulics (m3/s)	ΔQ	Control
		Dari	Ke				Dari	Ke																	
65	DH4	**H1**	**H5**	0.0002	**0.0032**	DH4	H1	H5	0.003	0.5	0.006	0.066	0.1	0.166	0.2	0.17	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.027	OK
65	DH5	**H5**	**H6**	0.0004	**0.0055**	DH5	H5	H6	0.005	0.5	0.011	0.085	0.1	0.185	0.2	0.19	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.025	OK
65	DH6	**H6**	**H7**	0.0005	**0.0063**	DH6	H6	H7	0.006	0.5	0.013	0.092	0.1	0.192	0.2	0.19	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.024	OK
65	DH7	**H7**	**H8**	0.0005	**0.0072**	DH7	H7	H8	0.007	0.5	0.014	0.098	0.1	0.198	0.2	0.20	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.023	OK
65	DI2	**I3**	**A1**	0.0032	**0.0377**	DI2	I3	A1	0.038	0.5	0.075	0.224	0.1	0.324	0.4	0.32	0.4	0.24	1.29	0.025	0.185	0.0015	**0.121**	0.083	OK

ZONE 26																									
I (mm/hour)	Drainage Name	Node		A (km2)	Q Hidrology (m3/s)	Drainage Name	Node		Q Hidrology (m3/s)	V Design (m/s)	A Drainage Needed (m2)	h Water (m)	W (m)	h total (m)	h use (m)	B (m)	b Use (m)	A Drainage Use (m2)	P (m)	n	R (m)	S	Q hydraulics (m3/s)	ΔQ	Control
		Dari	Ke				Dari	Ke																	
65	DD1	**D4**	**D5**	0.0036	**0.0425**	DD1	D4	D5	0.042	0.5	0.085	0.238	0.1	0.338	0.4	0.34	0.4	0.24	1.29	0.025	0.185	0.0015	**0.121**	0.078	OK
65	DI1	**I1**	**I2**	0.0015	**0.0177**	DI1	I1	I2	0.018	0.5	0.035	0.153	0.1	0.253	0.3	0.25	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.050	OK
65	DJ1	**J1**	**J2**	0.0009	**0.0111**	DJ1	J1	J2	0.011	0.5	0.022	0.122	0.1	0.222	0.3	0.22	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.057	OK
65	DJ2	**J2**	**J3**	0.0026	**0.0312**	DJ2	J2	J3	0.031	0.5	0.062	0.204	0.1	0.304	0.4	0.30	0.4	0.24	1.29	0.025	0.185	0.0015	**0.121**	0.090	OK
65	DJ3	**J1**	**J4**	0.0001	**0.0012**	DJ3	J1	J4	0.001	0.5	0.002	0.039	0.1	0.139	0.2	0.14	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.029	OK
65	DJ4	**J4**	**J5**	0.0025	**0.0288**	DJ4	J4	J5	0.029	0.5	0.058	0.196	0.1	0.296	0.3	0.30	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.039	OK
65	DJ5	**J5**	**J7**	0.0041	**0.0477**	DJ5	J5	J7	0.048	0.5	0.095	0.252	0.1	0.352	0.4	0.35	0.4	0.24	1.29	0.025	0.185	0.0015	**0.121**	0.073	OK
65	DJ6	**J7**	**J6**	0.0042	**0.0497**	DJ6	J7	J6	0.050	0.5	0.099	0.258	0.1	0.358	0.4	0.36	0.4	0.24	1.29	0.025	0.185	0.0015	**0.121**	0.071	OK
65	DJ7	**D5**	**J6**	0.0106	**0.1244**	DJ7	D5	J6	0.124	0.5	0.249	0.407	0.1	0.507	0.6	0.51	0.6	0.54	1.94	0.025	0.278	0.0009	**0.276**	0.152	OK
65	DK1	**K1**	**K2**	0.0001	**0.0016**	DK1	K1	K2	0.002	0.5	0.003	0.047	0.1	0.147	0.2	0.15	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.029	OK
65	DK2	**K2**	**J5**	0.0010	**0.0115**	DK2	K2	J5	0.012	0.5	0.023	0.124	0.1	0.224	0.3	0.22	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.056	OK
65	DK3	**K3**	**K4**	0.0017	**0.0197**	DK3	K3	K4	0.020	0.5	0.039	0.162	0.1	0.262	0.3	0.26	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.048	OK
65	DK4	**K1**	**K5**	0.0002	**0.0026**	DK4	K1	K5	0.003	0.5	0.005	0.059	0.1	0.159	0.2	0.16	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.028	OK
65	DK5	**K5**	**K7**	0.0031	**0.0371**	DK5	K5	K7	0.037	0.5	0.074	0.222	0.1	0.322	0.4	0.32	0.4	0.24	1.29	0.025	0.185	0.0015	**0.121**	0.084	OK
65	DK6	**K7**	**K6**	0.0033	**0.0395**	DK6	K7	K6	0.039	0.5	0.079	0.229	0.1	0.329	0.4	0.33	0.4	0.24	1.29	0.025	0.185	0.0015	**0.121**	0.081	OK
65	DK7	**J6**	**K6**	0.0093	**0.1100**	DK7	J6	K6	0.110	0.5	0.220	0.383	0.1	0.483	0.5	0.48	0.5	0.375	1.62	0.025	0.232	0.0011	**0.188**	0.078	OK

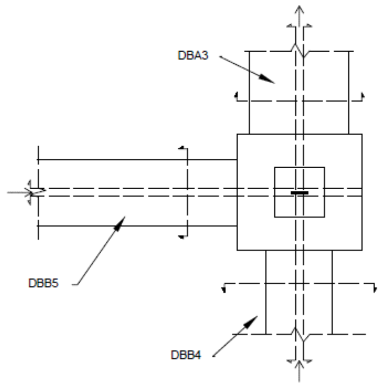
ZONE 27																									
I (mm/hour)	Drainage Name	Node		A (km2)	Q Hidrology (m3/s)	Drainage Name	Node		Q Hidrology (m3/s)	V Design (m/s)	A Drainage Needed (m2)	h Water (m)	W (m)	h total (m)	h use (m)	B (m)	b Use (m)	A Drainage Use (m2)	P (m)	n	R (m)	S	Q hydraulics (m3/s)	ΔQ	Control
		Dari	Ke				Dari	Ke																	
65	DA1	**A1**	**A2**	0.0009	**0.0107**	DA1	A1	A2	0.011	0.5	0.021	0.119	0.1	0.219	0.3	0.22	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.057	OK
65	DA2	**A2**	**A4**	0.0001	**0.0010**	DA2	A2	A4	0.001	0.5	0.002	0.036	0.1	0.136	0.2	0.14	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.029	OK
65	DA3	**A3**	**A4**	0.0000	**0.0006**	DA3	A3	A4	0.001	0.5	0.001	0.029	0.1	0.129	0.2	0.13	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.030	OK
65	DB1	**B1**	**B3**	0.0001	**0.0010**	DB1	B1	B3	0.001	0.5	0.002	0.036	0.1	0.136	0.2	0.14	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.029	OK
65	DB2	**B1**	**B2**	0.0025	**0.0287**	DB2	B1	B2	0.029	0.5	0.057	0.196	0.1	0.296	0.3	0.30	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.039	OK
65	DB3	**B3**	**B4**	0.0019	**0.0223**	DB3	B3	B4	0.022	0.5	0.045	0.172	0.1	0.272	0.3	0.27	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.046	OK
65	DB4	**B2**	**B4**	0.0001	**0.0012**	DB4	B2	B4	0.001	0.5	0.002	0.039	0.1	0.139	0.2	0.14	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.029	OK
65	DC3	**C1**	**C2**	0.0001	**0.0012**	DC3	C1	C2	0.001	0.5	0.002	0.039	0.1	0.139	0.2	0.14	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.029	OK
65	DC4	**C2**	**C3**	0.0027	**0.0323**	DC4	C2	C3	0.032	0.5	0.065	0.208	0.1	0.308	0.4	0.31	0.4	0.24	1.29	0.025	0.185	0.0015	**0.121**	0.089	OK
65	DC1	**B2**	**C7**	0.0051	**0.0595**	DC1	B2	C7	0.060	0.5	0.119	0.282	0.1	0.382	0.4	0.38	0.4	0.24	1.29	0.025	0.185	0.0015	**0.121**	0.061	OK
65	DC2	**C7**	**C5**	0.0057	**0.0672**	DC2	C7	C5	0.067	0.5	0.134	0.299	0.1	0.399	0.4	0.40	0.4	0.24	1.29	0.025	0.185	0.0015	**0.121**	0.054	OK
65	DD2	**D1**	**D2**	0.0011	**0.0135**	DD2	D1	D2	0.014	0.5	0.027	0.134	0.1	0.234	0.3	0.23	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.054	OK
65	DD3	**D8**	**D3**	0.0023	**0.0276**	DD3	D8	D3	0.028	0.5	0.055	0.192	0.1	0.292	0.3	0.29	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.040	OK

ZONE 28																									
I (mm/hour)	Drainage Name	Node		A (km2)	Q Hidrology (m3/s)	Drainage Name	Node		Q Hidrology (m3/s)	V Design (m/s)	A Drainage Needed (m2)	h Water (m)	W (m)	h total (m)	h use (m)	B (m)	b Use (m)	A Drainage Use (m2)	P (m)	n	R (m)	S	Q hydraulics (m3/s)	ΔQ	Control
		Dari	Ke				Dari	Ke																	
65	DC5	**C5**	**C6**	0.0057	**0.0674**	DC5	C5	C6	0.067	0.5	0.135	0.300	0.1	0.400	0.4	0.40	0.4	0.24	1.29	0.025	0.185	0.0015	**0.121**	0.053	OK
65	DC6	**C4**	**C6**	0.0006	**0.0070**	DC6	C4	C6	0.007	0.5	0.014	0.097	0.1	0.197	0.2	0.20	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.023	OK
65	DO1	**H8**	**O1**	0.0012	**0.0139**	DO1	H8	O1	0.014	0.5	0.028	0.136	0.1	0.236	0.3	0.24	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.054	OK
65	DO1	**O1**	**O2**	0.0076	**0.0900**	DO1	O1	O2	0.090	0.5	0.180	0.346	0.1	0.446	0.5	0.45	0.5	0.375	1.62	0.025	0.232	0.0011	**0.188**	0.098	OK
65	DP1	**P1**	**P2**	0.0010	**0.0113**	DP1	P1	P2	0.011	0.5	0.023	0.123	0.1	0.223	0.3	0.22	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.057	OK
65	DP2	**P2**	**P3**	0.0011	**0.0129**	DP2	P2	P3	0.013	0.5	0.026	0.131	0.1	0.231	0.3	0.23	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.055	OK
65	DP3	**P1**	**P4**	0.0001	**0.0019**	DP3	P1	P4	0.002	0.5	0.004	0.050	0.1	0.150	0.2	0.15	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.028	OK
ZONE 29																									
I (mm/hour)	Drainage Name	Node		A (km2)	Q Hidrology (m3/s)	Drainage Name	Node		Q Hidrology (m3/s)	V Design (m/s)	A Drainage Needed (m2)	h Water (m)	W (m)	h total (m)	h use (m)	B (m)	b Use (m)	A Drainage Use (m2)	P (m)	n	R (m)	S	Q hydraulics (m3/s)	ΔQ	Control
		Dari	Ke				Dari	Ke																	
65	DC7	**C4**	**C3**	0.0014	**0.0167**	DC7	C4	C3	0.017	0.5	0.033	0.149	0.1	0.249	0.3	0.25	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.051	OK
65	DD4	**D8**	**D6**	0.0001	**0.0008**	DD4	D8	D6	0.001	0.5	0.002	0.032	0.1	0.132	0.2	0.13	0.2	0.06	0.65	0.025	0.093	0.0038	**0.030**	0.030	OK
65	DD5	**D6**	**D7**	0.0012	**0.0135**	DD5	D6	D7	0.014	0.5	0.027	0.134	0.1	0.234	0.3	0.23	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.054	OK
65	DD6	**C3**	**D7**	0.0066	**0.0778**	DD6	C3	D7	0.078	0.5	0.156	0.322	0.1	0.422	0.5	0.42	0.5	0.375	1.62	0.025	0.232	0.0011	**0.188**	0.110	OK
65	DL1	**L1**	**L2**	0.0009	**0.0100**	DL1	L1	L2	0.010	0.5	0.020	0.116	0.1	0.216	0.3	0.22	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.058	OK
65	DL2	**L1**	**L3**	0.0024	**0.0276**	DL2	L1	L3	0.028	0.5	0.055	0.192	0.1	0.292	0.3	0.29	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.040	OK
65	DL3	**L3**	**L4**	0.0108	**0.1271**	DL3	L3	L4	0.127	0.5	0.254	0.412	0.1	0.512	0.6	0.51	0.6	0.54	1.94	0.025	0.278	0.0009	**0.276**	0.149	OK
65	DL4	**L4**	**M4**	0.0108	**0.1271**	DL4	L4	M4	0.127	0.5	0.254	0.412	0.1	0.512	0.6	0.51	0.6	0.54	1.94	0.025	0.278	0.0009	**0.276**	0.149	OK
65	DL5	**L2**	**L5**	0.0034	**0.0409**	DL5	L2	L5	0.041	0.5	0.082	0.233	0.1	0.333	0.4	0.33	0.4	0.24	1.29	0.025	0.185	0.0015	**0.121**	0.080	OK
65	DM1	**M1**	**M2**	0.0016	**0.0190**	DM1	M1	M2	0.019	0.5	0.038	0.159	0.1	0.259	0.3	0.26	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.049	OK
65	DM2	**M2**	**M3**	0.0010	**0.0117**	DM2	M2	M3	0.012	0.5	0.023	0.125	0.1	0.225	0.3	0.22	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.056	OK
65	DM3	**M3**	**M4**	0.0010	**0.0123**	DM3	M3	M4	0.012	0.5	0.025	0.128	0.1	0.228	0.3	0.23	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.056	OK
65	DM4	**M4**	**M5**	0.0138	**0.1621**	DM4	M4	M5	0.162	0.5	0.324	0.465	0.1	0.565	0.6	0.56	0.6	0.54	1.94	0.025	0.278	0.0009	**0.276**	0.114	OK
65	DM5	**M1**	**M6**	0.0017	**0.0224**	DM5	M1	M6	0.022	0.5	0.045	0.173	0.1	0.273	0.3	0.27	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.046	OK
65	DM6	**M7**	**M6**	0.0012	**0.0137**	DM6	M7	M6	0.014	0.5	0.027	0.135	0.1	0.235	0.3	0.24	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.054	OK
65	DM7	**M7**	**M8**	0.0020	**0.0238**	DM7	M7	M8	0.024	0.5	0.048	0.178	0.1	0.278	0.3	0.28	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.044	OK
65	DM8	**M5**	**M8**	0.0180	**0.2125**	DM8	M5	M8	0.213	0.5	0.425	0.532	0.1	0.632	0.7	0.63	0.7	0.735	2.27	0.025	0.324	0.0008	**0.393**	0.180	OK
65	DN1	**N1**	**N4**	0.0008	**0.0100**	DN1	N1	N4	0.010	0.5	0.020	0.116	0.1	0.216	0.3	0.22	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.058	OK
65	DN2	**N1**	**N2**	0.0009	**0.0105**	DN2	N1	N2	0.011	0.5	0.021	0.118	0.1	0.218	0.3	0.22	0.3	0.135	0.97	0.025	0.139	0.0022	**0.068**	0.057	OK
65	DN3	**M6**	**N3**	0.0033	**0.0421**	DN3	M6	N3	0.042	0.5	0.084	0.237	0.1	0.337	0.4	0.34	0.4	0.24	1.29	0.025	0.185	0.0015	**0.121**	0.079	OK

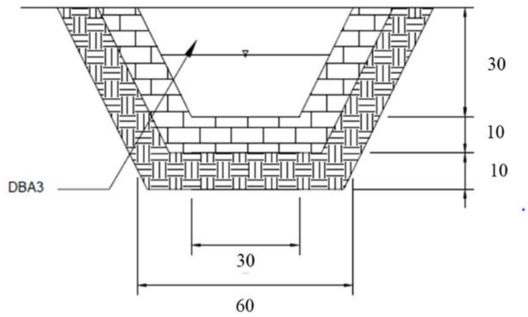
ZONE 30																									
I (mm/hour)	Drainage Name	Node		A (km2)	Q Hidrology (m3/s)	Drainage Name	Node		Q Hidrology (m3/s)	V Design (m/s)	A Drainage Needed (m2)	h Water (m)	W (m)	h total (m)	h use (m)	B (m)	b Use (m)	A Drainage Use (m2)	P (m)	n	R (m)	S	Q hydraulics (m3/s)	ΔQ	Control
		Dari	Ke				Dari	Ke																	
65	DQ1	Q1	Q2	0.0024	0.0278	DQ1	Q1	Q2	0.028	0.5	0.056	0.193	0.1	0.293	0.3	0.29	0.3	0.135	0.97	0.025	0.139	0.0022	0.068	0.040	OK
65	DQ2	Q2	Q3	0.0049	0.0580	DQ2	Q2	Q3	0.058	0.5	0.116	0.278	0.1	0.378	0.4	0.38	0.4	0.24	1.29	0.025	0.185	0.0015	0.121	0.063	OK
65	DQ3	Q4	Q5	0.0016	0.0183	DQ3	Q4	Q5	0.018	0.5	0.037	0.156	0.1	0.256	0.3	0.26	0.3	0.135	0.97	0.025	0.139	0.0022	0.068	0.050	OK
65	DQ4	Q5	T2	0.0027	0.0317	DQ4	Q5	T2	0.032	0.5	0.063	0.206	0.1	0.306	0.4	0.31	0.4	0.24	1.29	0.025	0.185	0.0015	0.121	0.089	OK
65	DQ5	Q3	R2	0.0002	0.0025	DQ5	Q3	R2	0.003	0.5	0.005	0.058	0.1	0.158	0.2	0.16	0.2	0.06	0.65	0.025	0.093	0.0038	0.030	0.028	OK
65	DR1	Q3	R1	0.0059	0.0697	DR1	Q3	R1	0.070	0.5	0.139	0.305	0.1	0.405	0.5	0.40	0.5	0.375	1.62	0.025	0.232	0.0011	0.188	0.118	OK
65	DR2	R2	R3	0.0009	0.0110	DR2	R2	R3	0.011	0.5	0.022	0.121	0.1	0.221	0.3	0.22	0.3	0.135	0.97	0.025	0.139	0.0022	0.068	0.057	OK
65	DR3	R5	R4	0.0044	0.0509	DR3	R5	R4	0.051	0.5	0.102	0.261	0.1	0.361	0.4	0.36	0.4	0.24	1.29	0.025	0.185	0.0015	0.121	0.070	OK
65	DS1	S1	S2	0.0008	0.0099	DS1	S1	S2	0.010	0.5	0.020	0.115	0.1	0.215	0.3	0.21	0.3	0.135	0.97	0.025	0.139	0.0022	0.068	0.058	OK
65	DS2	S2	S3	0.0031	0.0367	DS2	S2	S3	0.037	0.5	0.073	0.221	0.1	0.321	0.4	0.32	0.4	0.24	1.29	0.025	0.185	0.0015	0.121	0.084	OK
65	DT1	T1	T3	0.0017	0.0199	DT1	T1	T3	0.020	0.5	0.040	0.163	0.1	0.263	0.3	0.26	0.3	0.135	0.97	0.025	0.139	0.0022	0.068	0.048	OK
ZONE 31																									
I (mm/hour)	Drainage Name	Node		A (km2)	Q Hidrology (m3/s)	Drainage Name	Node		Q Hidrology (m3/s)	V Design (m/s)	A Drainage Needed (m2)	h Water (m)	W (m)	h total (m)	h use (m)	B (m)	b Use (m)	A Drainage Use (m2)	P (m)	n	R (m)	S	Q hydraulics (m3/s)	ΔQ	Control
		Dari	Ke				Dari	Ke																	
65	DQ6	Q1	Q4	0.0011	0.0136	DQ6	Q1	Q4	0.014	0.5	0.027	0.135	0.1	0.235	0.3	0.23	0.3	0.135	0.97	0.025	0.139	0.0022	0.068	0.054	OK
65	DS3	Q4	S4	0.0020	0.0247	DS3	Q4	S4	0.025	0.5	0.049	0.181	0.1	0.281	0.3	0.28	0.3	0.135	0.97	0.025	0.139	0.0022	0.068	0.043	OK
65	DS4	S4	S5	0.0034	0.0418	DS4	S4	S5	0.042	0.5	0.084	0.236	0.1	0.336	0.4	0.34	0.4	0.24	1.29	0.025	0.185	0.0015	0.121	0.079	OK
65	DS5	S5	S3	0.0040	0.0484	DS5	S5	S3	0.048	0.5	0.097	0.254	0.1	0.354	0.4	0.35	0.4	0.24	1.29	0.025	0.185	0.0015	0.121	0.072	OK
65	DU1	U1	U2	0.0027	0.0332	DU1	U1	U2	0.033	0.5	0.066	0.210	0.1	0.310	0.4	0.31	0.4	0.24	1.29	0.025	0.185	0.0015	0.121	0.088	OK
65	DU2	U2	U4	0.0039	0.0469	DU2	U2	U4	0.047	0.5	0.094	0.250	0.1	0.350	0.4	0.35	0.4	0.24	1.29	0.025	0.185	0.0015	0.121	0.074	OK
65	DU3	U3	U4	0.0003	0.0039	DU3	U3	U4	0.004	0.5	0.008	0.072	0.1	0.172	0.2	0.17	0.2	0.06	0.65	0.025	0.093	0.0038	0.030	0.026	OK
65	DV1	V1	V2	0.0006	0.0076	DV1	V1	V2	0.008	0.5	0.015	0.101	0.1	0.201	0.3	0.20	0.3	0.135	0.97	0.025	0.139	0.0022	0.068	0.060	OK
65	DV2	S6	V3	0.0060	0.0703	DV2	S6	V3	0.070	0.5	0.141	0.306	0.1	0.406	0.5	0.41	0.5	0.375	1.62	0.025	0.232	0.0011	0.188	0.117	OK
65	DV3	S5	V4	0.0029	0.0342	DV3	S5	V4	0.034	0.5	0.068	0.214	0.1	0.314	0.4	0.31	0.4	0.24	1.29	0.025	0.185	0.0015	0.121	0.087	OK
65	DV4	U4	V4	0.0030	0.0372	DV4	U4	V4	0.037	0.5	0.074	0.223	0.1	0.323	0.4	0.32	0.4	0.24	1.29	0.025	0.185	0.0015	0.121	0.084	OK
65	DV5	V4	V5	0.0065	0.0787	DV5	V4	V5	0.079	0.5	0.157	0.324	0.1	0.424	0.5	0.42	0.5	0.375	1.62	0.025	0.232	0.0011	0.188	0.109	OK
ZONE 32																									
I (mm/hour)	Drainage Name	Node		A (km2)	Q Hidrology (m3/s)	Drainage Name	Node		Q Hidrology (m3/s)	V Design (m/s)	A Drainage Needed (m2)	h Water (m)	W (m)	h total (m)	h use (m)	B (m)	b Use (m)	A Drainage Use (m2)	P (m)	n	R (m)	S	Q hydraulics (m3/s)	ΔQ	Control
		Dari	Ke				Dari	Ke																	
65	DW4	W3	W4	0.0046	0.0549	DW4	W3	W4	0.055	0.5	0.110	0.271	0.1	0.371	0.4	0.37	0.4	0.24	1.29	0.025	0.185	0.0015	0.121	0.066	OK
65	DV6	W4	V5	0.0062	0.0738	DV6	W4	V5	0.074	0.5	0.148	0.314	0.1	0.414	0.5	0.41	0.5	0.375	1.62	0.025	0.232	0.0011	0.188	0.114	OK
65	DT2	V5	T3	0.0149	0.1772	DT2	V5	T3	0.177	0.5	0.354	0.486	0.1	0.586	0.6	0.59	0.6	0.54	1.94	0.025	0.278	0.0009	0.276	0.099	OK
65	DR4	T3	R3	0.0159	0.1888	DR4	T3	R3	0.189	0.5	0.378	0.502	0.1	0.602	0.7	0.60	0.7	0.735	2.27	0.025	0.324	0.0008	0.393	0.204	OK
65	DR5	R3	R4	0.0021	0.0249	DR5	R3	R4	0.025	0.5	0.050	0.182	0.1	0.282	0.3	0.28	0.3	0.135	0.97	0.025	0.139	0.0022	0.068	0.043	OK

ZONE 33																									
I (mm/hour)	**Drainage Name**	**Node**		**A (km2)**	**Q Hidrology (m3/s)**	**Drainage Name**	**Node**		**Q Hidrology (m3/s)**	**V Design (m/s)**	**A Drainage Needed (m2)**	**h Water (m)**	**W (m)**	**h total (m)**	**h use (m)**	**B (m)**	**b Use (m)**	**A Drainage Use (m2)**	**P (m)**	**n**	**R (m)**	**S**	**Q hydraulics (m3/s)**	**ΔQ**	**Control**
		Dari	**Ke**				**Dari**	**Ke**																	
65	DN4	**P3**	**P4**	0.0055	**0.0644**	DN4	P3	P4	0.064	1	0.064	0.207	0.1	0.307	0.4	0.31	0.4	0.24	1.29	0.025	0.185	0.0060	**0.242**	0.177	OK
65	DN5	**P4**	**N5**	0.0072	**0.0858**	DN5	P4	N5	0.086	1	0.086	0.239	0.1	0.339	0.4	0.34	0.4	0.24	1.29	0.025	0.185	0.0060	**0.242**	0.156	OK
65	DBE1	**BE1**	**BE2**	0.0130	**0.1526**	DBE1	BE1	BE2	0.153	1	0.153	0.319	0.1	0.419	0.5	0.42	0.5	0.375	1.62	0.025	0.232	0.0044	**0.375**	0.223	OK
65	DR6	**R4**	**R1**	0.0062	**0.0758**	DR6	R4	R1	0.076	1	0.076	0.225	0.1	0.325	0.4	0.32	0.4	0.24	1.29	0.025	0.185	0.0060	**0.242**	0.166	OK
65	DBE3	**BE4**	**BE5**	0.0355	**0.9805**	DBE3	BE4	BE5	0.980	1	0.980	0.808	0.1	0.908	1	0.91	1	1.5	3.24	0.025	0.464	0.0018	**1.525**	0.544	OK
65	DN5	**P4**	**N5**	0.0004	**0.0050**	DN5	P4	N5	0.005	1	0.005	0.058	0.1	0.158	0.2	0.16	0.2	0.06	0.65	0.025	0.093	0.0149	**0.060**	0.055	OK
65	DBE5	**BE6**	**BE7**	0.0006	**0.0076**	DBE5	BE6	BE7	0.008	1	0.008	0.071	0.1	0.171	0.2	0.17	0.2	0.06	0.65	0.025	0.093	0.0149	**0.060**	0.052	OK
65	DBE1	**BE1**	**BE2**	0.0002	**0.0026**	DBE1	BE1	BE2	0.003	1	0.003	0.042	0.1	0.142	0.2	0.14	0.2	0.06	0.65	0.025	0.093	0.0149	**0.060**	0.057	OK
65	DBE4	**BE5**	**BE6**	0.0003	**0.0037**	DBE4	BE5	BE6	0.004	1	0.004	0.050	0.1	0.150	0.2	0.15	0.2	0.06	0.65	0.025	0.093	0.0149	**0.060**	0.056	OK
65	DBE5	**BE6**	**BE7**	0.0005	**0.0063**	DBE5	BE6	BE7	0.006	1	0.006	0.065	0.1	0.165	0.2	0.16	0.2	0.06	0.65	0.025	0.093	0.0149	**0.060**	0.054	OK
65	DBE6	**N5**	**BE8**	0.0379	**1.0736**	DBE6	N5	BE8	1.074	1	1.074	0.846	0.1	0.946	1	0.95	1	1.5	3.24	0.025	0.464	0.0018	**1.525**	0.451	OK
ZONE 34																									
I (mm/hour)	**Drainage Name**	**Node**		**A (km2)**	**Q Hidrology (m3/s)**	**Drainage Name**	**Node**		**Q Hidrology (m3/s)**	**V Design (m/s)**	**A Drainage Needed (m2)**	**h Water (m)**	**W (m)**	**h total (m)**	**h use (m)**	**B (m)**	**b Use (m)**	**A Drainage Use (m2)**	**P (m)**	**n**	**R (m)**	**S**	**Q hydraulics (m3/s)**	**ΔQ**	**Control**
		Dari	**Ke**				**Dari**	**Ke**																	
65	DAA10	**AA9**	**AA10**	0.0219	**0.2595**	DAA10	AA9	AA10	0.260	1	0.260	0.416	0.1	0.516	0.6	0.52	0.6	0.54	1.94	0.025	0.278	0.0035	**0.544**	0.285	OK
65	DAA11	**AA10**	**W3**	0.0295	**0.3495**	DAA11	AA10	W3	0.350	1	0.350	0.483	0.1	0.583	0.6	0.58	0.6	0.54	1.94	0.025	0.278	0.0035	**0.544**	0.195	OK
65	DBE7	**AB3**	**BE9**	0.0010	**0.0142**	DBE7	AB3	BE9	0.014	1	0.014	0.097	0.1	0.197	0.2	0.20	0.2	0.06	0.65	0.025	0.093	0.0149	**0.060**	0.046	OK
65	DBE8	**BE9**	**BE10**	0.0013	**0.0179**	DBE8	BE9	BE10	0.018	1	0.018	0.109	0.1	0.209	0.3	0.21	0.3	0.135	0.97	0.025	0.139	0.0087	**0.135**	0.117	OK
65	DBE9	**W3**	**BE10**	0.0295	**0.3495**	DBE9	W3	BE10	0.350	1	0.350	0.483	0.1	0.583	0.6	0.58	0.6	0.54	1.94	0.025	0.278	0.0035	**0.544**	0.195	OK

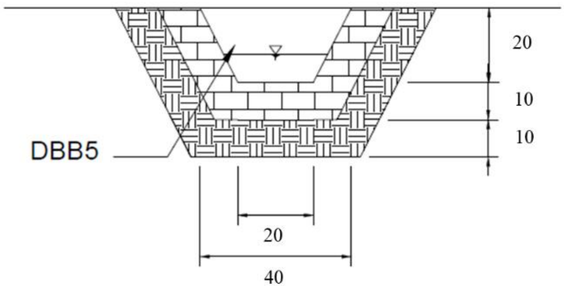
Appendix 4. Above ground drainage drawings



Departement of Civil Engineering	Subject	Drawing Name	Supervisor	Student	Scale
Business, Building, & Technology Saxion University of Applied Sciences, Enschede	Final Project	Top view intersection	Kristoff Derveaux Msc.	Nashruddin Latif 474850	1 : 10 (cm)



Departement of Civil Engineering	Subject	Drawing Name	Supervisor	Student	Scale
Business, Building, & Technology Saxion University of Applied Sciences, Enschede	Final Project	Front View DBA3	Kristoff Derveaux Msc.	Nashruddin Latif 474850	1 : 10 (cm)



Departement of Civil Engineering	Subject	Drawing Name	Supervisor	Student	Scale
Business, Building, & Technology Saxion University of Applied Sciences, Enschede	Final Project	Front View DBB5	Kristoff Derveaux Msc.	Nashruddin Latif 474850	1 : 10

Appendix 5. Wadi calculation

ZONE 2														
House Area (m2)	Road Area (m2)	Total Area (m2)	Precipitation (mm/hour)	Total Rainwater (liter)	Total Rainwater (m3)	Rainwater after (m3)	Area Available (m2)	Dimension (m x m)	Dimension (m x m)	Rainwater Use (m3)	Rainwater Left (m3)	Slope	Depth (m)	Depth (m)
6078.93	1035.75	7114.68	65	462454.2	462.4542	462.4542	621	23	27	462.4542	0	1:1	0.7705048	0.78
23814.83	3849.75	27664.58	65	1798197.7	1798.1977	1798.1977	1911	42	45.5	1798.1977	0	1:1	0.9630548	0.97
ZONE 3														
House Area (m2)	Road Area (m2)	Total Area (m2)	Precipitation (mm/hour)	Total Rainwater (liter)	Total Rainwater (m3)	Rainwater after (m3)	Area Available (m2)	Dimension (m x m)	Dimension (m x m)	Rainwater Use (m3)	Rainwater Left (m3)	Slope	Depth (m)	Depth (m)
4764	846	5610	65	364650	364.65	364.65	340	17	20	340	24.65	1:1	1.0669656	1.07
548	0	548	65	35620	35.62	60.27	132	11	12	60.27	0	1:1	0.4773015	0.48
ZONE 4														
House Area (m2)	Road Area (m2)	Total Area (m2)	Precipitation (mm/hour)	Total Rainwater (liter)	Total Rainwater (m3)	Rainwater after (m3)	Area Available (m2)	Dimension (m x m)	Dimension (m x m)	Rainwater Use (m3)	Rainwater Left (m3)	Slope	Depth (m)	Depth (m)
3704	367.5	4071.5	65	264647.5	264.6475	264.6475	195	13	15	195	69.6475	1:1	1.0916731	1.1
23513.5	1358.25	24871.75	65	1616663.75	1616.66375	1686.31125	648	24	27	648	1038.31125	1:1	1.0455488	1.05
610	0	610	65	39650	39.65	1077.96125	472.5	21	22.5	472.5	605.46125	1:1	1.0527782	1.06
799	203	1002	65	65130	65.13	670.59125	1200	32	37.5	670.59125	0	1:1	0.5689415	0.57
586	153	739	65	48035	48.035	48.035	100	10	10	48.035	0	1:1	0.5059484	0.51
3924	0	3924	65	255060	255.06	255.06	445	20	22.5	255.06	0	1:1	0.5838437	0.59
ZONE 5														
House Area (m2)	Road Area (m2)	Total Area (m2)	Precipitation (mm/hour)	Total Rainwater (liter)	Total Rainwater (m3)	Rainwater after (m3)	Area Available (m2)	Dimension (m x m)	Dimension (m x m)	Rainwater Use (m3)	Rainwater Left (m3)	Slope	Depth (m)	Depth (m)
5402	313.5	5715.5	65	371507.5	371.5075	371.5075	1122	33	34	371.5075	0	1:1	0.3345025	0.34

ZONE 6														
House Area (m2)	Road Area (m2)	Total Area (m2)	Precipitation (mm/hour)	Total Rainwater (liter)	Total Rainwater (m3)	Rainwater after (m3)	Area Available (m2)	Dimension (m x m)	Dimension (m x m)	Rainwater Use (m3)	Rainwater Left (m3)	Slope	Depth (m)	Depth (m)
3634.6	422.75	4057.35	65	263727.75	263.72775	263.72775	380	19	20	263.72775	0	1:1	0.7214117	0.73
ZONE 7														
House Area (m2)	Road Area (m2)	Total Area (m2)	Precipitation (mm/hour)	Total Rainwater (liter)	Total Rainwater (m3)	Rainwater after (m3)	Area Available (m2)	Dimension (m x m)	Dimension (m x m)	Rainwater Use (m3)	Rainwater Left (m3)	Slope	Depth (m)	Depth (m)
3193.2	415	3608.2	65	234533	234.533	234.533	162.5	12.5	13	162.5	72.033	1:1	1.096118	1.1
678	693.5	1371.5	65	89147.5	89.1475	89.1475	189	13.5	14	203.373	0	1:1	1.1790165	1.18
ZONE 8														
House Area (m2)	Road Area (m2)	Total Area (m2)	Precipitation (mm/hour)	Total Rainwater (liter)	Total Rainwater (m3)	Rainwater after (m3)	Area Available (m2)	Dimension (m x m)	Dimension (m x m)	Rainwater Use (m3)	Rainwater Left (m3)	Slope	Depth (m)	Depth (m)
2384	636.25	3020.25	65	196316	196	196.31625	289	17	17	196.31625	0	1:1	0.7088521	0.71
ZONE 9														
House Area (m2)	Road Area (m2)	Total Area (m2)	Precipitation (mm/hour)	Total Rainwater (liter)	Total Rainwater (m3)	Rainwater after (m3)	Area Available (m2)	Dimension (m x m)	Dimension (m x m)	Rainwater Use (m3)	Rainwater Left (m3)	Slope	Depth (m)	Depth (m)
5972.6	1643.5	7616.1	65	495046.5	495.0465	495.0465	351	18	19.5	351	144.0465	1:1	1.0627461	1.07
1623.2	786	2409.2	65	156598	156.598	300.6445	210	14	15	210	90.6445	1:1	1.0839202	1.09
1502	530	2032	65	132080	132.08	222.7245	324	18	18	222.7245	0	1:1	0.7158937	0.72
ZONE 10														
House Area (m2)	Road Area (m2)	Total Area (m2)	Precipitation (mm/hour)	Total Rainwater (liter)	Total Rainwater (m3)	Rainwater after (m3)	Area Available (m2)	Dimension (m x m)	Dimension (m x m)	Rainwater Use (m3)	Rainwater Left (m3)	Slope	Depth (m)	Depth (m)
5553.2	405.5	5958.7	65	387315.5	387.3155	387.3155	529	23	23	387.3155	0	1:1	0.7570863	0.76
ZONE 11														
House Area (m2)	Road Area (m2)	Total Area (m2)	Precipitation (mm/hour)	Total Rainwater (liter)	Total Rainwater (m3)	Rainwater after (m3)	Area Available (m2)	Dimension (m x m)	Dimension (m x m)	Rainwater Use (m3)	Rainwater Left (m3)	Slope	Depth (m)	Depth (m)
2733	364.5	3097.5	65	201337.5	201.3375	201.3375	333	18	18.5	201.3375	0	1:1	0.626417	0.63

ZONE 12														
House Area (m2)	Road Area (m2)	Total Area (m2)	Precipitation (mm/hour)	Total Rainwater (liter)	Total Rainwater (m3)	Rainwater after (m3)	Area Available (m2)	Dimension (m x m)	Dimension (m x m)	Rainwater Use (m3)	Rainwater Left (m3)	Slope	Depth (m)	Depth (m)
2489.2	364	2853.2	65	185458	185.458	185.458	529	23	23	185.458	0	1:1	0.3560954	0.36

ZONE 13														
House Area (m2)	Road Area (m2)	Total Area (m2)	Precipitation (mm/hour)	Total Rainwater (liter)	Total Rainwater (m3)	Rainwater after (m3)	Area Available (m2)	Dimension (m x m)	Dimension (m x m)	Rainwater Use (m3)	Rainwater Left (m3)	Slope	Depth (m)	Depth (m)
2184	675.5	2859.5	65	185867.5	185.8675	185.8675	333	18	18.5	185.8675	0	1:1	0.5766332	0.58

ZONE 14														
House Area (m2)	Road Area (m2)	Total Area (m2)	Precipitation (mm/hour)	Total Rainwater (liter)	Total Rainwater (m3)	Rainwater after (m3)	Area Available (m2)	Dimension (m x m)	Dimension (m x m)	Rainwater Use (m3)	Rainwater Left (m3)	Slope	Depth (m)	Depth (m)
11880.7	1550.5	13431.2	65	873028	873.028	873.028	625	25	25	873.028	0	1:1	1.4850611	1.49

ZONE 15														
House Area (m2)	Road Area (m2)	Total Area (m2)	Precipitation (mm/hour)	Total Rainwater (liter)	Total Rainwater (m3)	Rainwater after (m3)	Area Available (m2)	Dimension (m x m)	Dimension (m x m)	Rainwater Use (m3)	Rainwater Left (m3)	Slope	Depth (m)	Depth (m)
3932	482.5	4414.5	65	286942.5	286.9425	286.9425	210	14	15	210	76.9425	1:1	1.0839202	1.09
2610	303.75	2913.75	65	189393.75	189.39375	266.33625	90	9	10	90	176.33625	1:1	1.145898	1.15
0	336.25	336.25	65	21856.25	21.85625	198.1925	156	12	13	156	42.1925	1:1	1.1010205	1.11

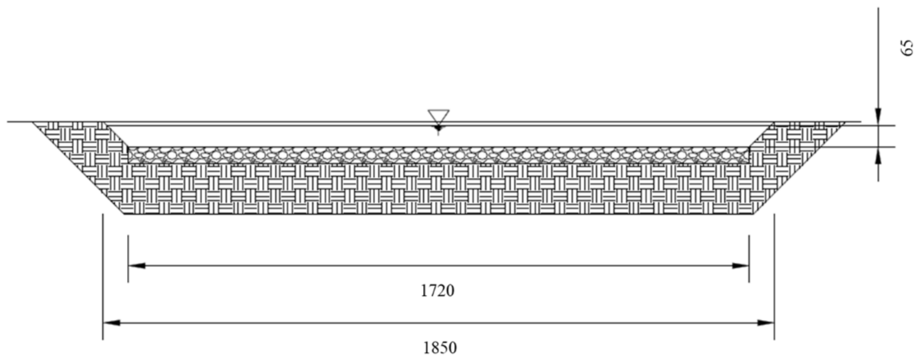
ZONE 16														
House Area (m2)	Road Area (m2)	Total Area (m2)	Precipitation (mm/hour)	Total Rainwater (liter)	Total Rainwater (m3)	Rainwater after (m3)	Area Available (m2)	Dimension (m x m)	Dimension (m x m)	Rainwater Use (m3)	Rainwater Left (m3)	Slope	Depth (m)	Depth (m)
5093	706	5799	65	376935	376.935	376.935	342	18	19	376.935	0	1:1	1.17943	1.18

ZONE 18														
House Area (m2)	Road Area (m2)	Total Area (m2)	Precipitation (mm/hour)	Total Rainwater (liter)	Total Rainwater (m3)	Rainwater after (m3)	Area Available (m2)	Dimension (m x m)	Dimension (m x m)	Rainwater Use (m3)	Rainwater Left (m3)	Slope	Depth (m)	Depth (m)
3796	823.5	4619.5	65	300267.5	300.2675	300.2675	296	16	18.5	300.2675	0	1:1	1.0884644	1.09

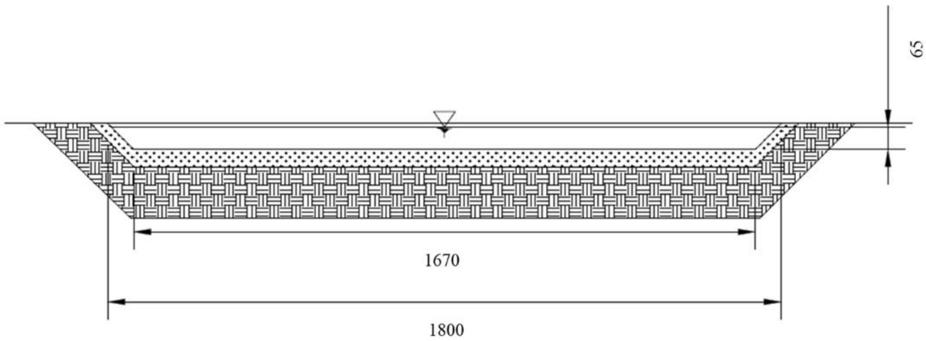
ZONE 19														
House Area (m2)	Road Area (m2)	Total Area (m2)	Precipitation (mm/hour)	Total Rainwater (liter)	Total Rainwater (m3)	Rainwater after (m3)	Area Available (m2)	Dimension (m x m)	Dimension (m x m)	Rainwater Use (m3)	Rainwater Left (m3)	Slope	Depth (m)	Depth (m)
2778	558	3336	65	216840	216.84	216.84	588	24	24.5	216.84	0	1:1	0.3746231	0.38

ZONE 20														
House Area (m2)	Road Area (m2)	Total Area (m2)	Precipitation (mm/hour)	Total Rainwater (liter)	Total Rainwater (m3)	Rainwater after (m3)	Area Available (m2)	Dimension (m x m)	Dimension (m x m)	Rainwater Use (m3)	Rainwater Left (m3)	Slope	Depth (m)	Depth (m)
5583	934.75	6517.75	65	423653.75	423.65375	423.65375	132	11	12	132	291.65375	1:1	1.1125178	1.12

Appendix 6. Wadi drawings



Departement of Civil Engineering	Subject	Drawing Name	Supervisor	Student	Scale
Business, Building, & Technology Saxion University of Applied Sciences, Enschede	Final Project	Top view intersection	Kristoff Derveaux Msc.	Nashruddin Latif 474850	1 : 10 (cm)



Departement of Civil Engineering	Subject	Drawing Name	Supervisor	Student	Scale
Business, Building, & Technology Saxion University of Applied Sciences, Enschede	Final Project	Side view wadi zone 11	Kristoff Derveaux Msc.	Nashruddin Latif 474850	1 : 10 (cm)

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The author, whose full name is Nashruddin Latif and commonly called Latif, was born in Surabaya, May 18, 1998 as an only child. The author has taken formal education starting from Al-Hikmah Kindergarten Surabaya, Al-Hikmah Surabaya Elementary School, Surabaya State Junior High School 1, and Surabaya State High School 5. The author continues his studies at the Department of Civil Engineering Sepuluh November Institute of Technology, Surabaya. The writer was active in various committees and organizations while being a student. Committees that have been participated in such as the 2017 Young Education Scientists Summit for Logistics Staff and the 2018 Civil Expo as Public Relations staff. Organizations that have been followed by the Writer are the Civil Student Association (HMS) for the 2017/2018 period as the External Relations Department Staff and the Civil Student Association (HMS) for the 2018/2019 period as the head of the external relations department. At the end of semester six, the author had the opportunity to do practical work on a project owned by PT. Jasa Marga (Persero), namely the Kunciran - Cengkareng Toll Road Construction Project, Tangerang. The following is the contact person of the author latifnashruddin16@gmail.com.