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EVALUATION OF DRAINAGE CHANNEL PERFORMANCE ON CLOVE FLOWER STREET

(*Evaluasi Kinerja Saluran Drainase pada Jalan Bunga Clove*)

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Abstract

Namlea Village is one of the villages in Maluku Province, Buru Regency, currently developing in terms of economy and population growth. Land-use changes have an impact on soil infiltration, with the amount of surface runoff which has the potential for flooding at several points to become a problem in Namlea Village, significant surface runoff on the clove flower road causes the drainage channel on the road to be unable accommodate the discharge of water that enters the drain. This research was conducted by referring to primary data and secondary data. Primary data, data obtained by conducting field surveys (research places/locations), while secondary data, data obtained directly from related agencies as supporting data in the final project writing. This. The planning analysis results with rainfall data taken from the BMKG (Meteorology, Climatology and Geophysics Agency). By paying attention to the hydrological design criteria table for the urban drainage planning system, appendix 8 and the data on water users in table 4.12 and population density projection data for 2015 taken from the statistical agency. Then the results of our planning analysis take a maximum plan age of 2 years with a maximum rainfall = 410,907 mm, with a planned discharge due to rainwater runoff Qp = 1,167 m3 / s and release due to household waste Qlimbah = 0.0025 m3 / s, then the total discharge Qtotal = 1.1695 m3 / s, with the results of the above analysis, the existing channel capacity is unable to accommodate water discharge due to rainfall or burst due to household waste because the current channel discharge is only able to accommodate a release of Q = 0.44 m3 / s with a volume capacity of V = 209,375 m3, while the volume capacity of the channel on Jalan Bunga Cengkeh is following the current population density and must be able to accommodate a discharge of Qtotal = 1.1695 m3 / s. With an average annual volume capacity of V = 25612.05 m3. The existing channel dimensions must be rehabilitated according to the planning analysis results that the author had planned with a trapezoidal channel cross-section.
Keywords: *Evaluation, drainage, Namlea*

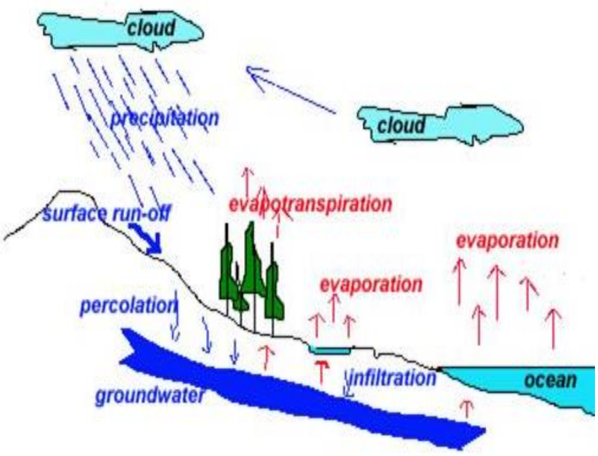
Abstrak

Desa Namlea merupakan salah satu desa di Provinsi Maluku, Kabupaten Buru yang saat ini sedang berkembang secara ekonomi dan pertumbuhan penduduk. Perubahan tata guna lahan berdampak pada infiltrasi tanah, dengan banyaknya limpasan permukaan yang berpotensi banjir di beberapa titik menjadi masalah di Desa Namlea, limpasan permukaan yang besar pada jalan bunga cengkeh menyebabkan saluran drainase di jalan tersebut menjadi tidak dapat menampung keluarnya air yang masuk ke saluran. Penelitian ini dilakukan dengan mengacu pada data primer dan data sekunder. Data primer, data diperoleh dengan melakukan survei lapangan (tempat / lokasi penelitian), sedangkan data sekunder, data diperoleh langsung dari instansi terkait sebagai data pendukung dalam penulisan tugas akhir. ini. Berdasarkan hasil analisis perencanaan dengan data curah hujan yang diambil dari BMKG (Badan Meteorologi Klimatologi dan Geofisika). Dengan memperhatikan luas pada tabel kriteria desain hidrologi sistem perencanaan drainase perkotaan, lampiran 8 dan data

pengguna air pada tabel 4.12 dan data proyeksi kepadatan penduduk tahun 2015 diambil dari badan statistik. Kemudian dari hasil analisa perencanaan kami mengambil umur rencana maksimal 2 tahun dengan curah hujan maksimum = 410.907 mm, dengan debit rencana akibat limpasan air hujan Qp = 1.167 m3 / s dan debit akibat limbah rumah tangga Qlimbah = 0.0025 m3 / s, maka total debit Qtotal = 1.1695 m3 / dt, dengan hasil analisis diatas kapasitas saluran eksisting tidak mampu menampung debit air akibat curah hujan atau debit akibat limbah rumah tangga karena debit saluran eksisting hanya mampu menampung debit dari Q = 0.44 m3 / s dengan kapasitas volume V = 209.375 m3, sedangkan kapasitas volume saluran di Jalan Bunga Cengkeh mengikuti kepadatan penduduk saat ini dan harus mampu menampung debit Qtotal = 1.1695 m3 / s. Dengan kapasitas volume tahunan rata-rata V = 25612,05 m3. Dimensi saluran yang ada harus direhabilitasi sesuai dengan hasil analisis perencanaan yang telah penulis rencanakan dengan penampang saluran trapesium.
***Kata kunci**: Evaluasi, drainase, Namlea*

INTRODUCTION

Namlea Village is one of the villages in Maluku Province, located in Buru Regency, which is currently developing both in terms of economy and population growth. The increasing population in Namlea Village automatically increases the variety of activities and needs. One of them is the designation of settlements, where these settlements require a large enough area. Besides being quite large, the land must also be changed from the original according to the needs. It has a significant enough impact on the hydrological cycle and has a substantial effect on drainage. Land-use change affects soil infiltration. So that if it rains, then in some areas in Namlea village whose surface has been covered by buildings and asphalt with a trim infiltration level can become floods and puddles. The amount of runoff that can cause flooding at some points becomes a problem in Namlea village. The government, especially the Namlea City Planning Agency, Buru Regency, must receive attention from the government in reducing the danger of inundation due to surface runoff. One of the points that often experiences surface runoff every time it rains is the Clove Flower Road in Namlea Village. A significant surface runoff on the clove flower road causes the drainage channel to be unable to accommodate the water discharge that enters the drain (Rito, 2017).



The water cycle or hydrological cycle is the never-ending circulation of water from the atmosphere to the earth and back into the atmosphere through condensation, precipitation, evaporation, and transpiration (Azizah, 2019).

Initially, sea air experiences evaporation or evaporation then condenses to form clouds (Tanuwidjaja et al., 2013). After that, the clouds are blown towards the land, and under certain conditions, they will fall as a deposition in the form of rain, drizzle, snow, and others. Well, on the way to the ground, overcoming can experience evaporation again, but it can also be intercepted (what does this mean?) By plants before it reaches the ground. After getting to the bottom, the hydrological cycle continues to move continuously in three different ways:

1) Evaporation/transpiration, water in the sea, land, rivers, plants, etc. then it will then evaporate into space (atmosphere) and then become a cloud. In a saturated state of water vapor (shadows), it will become air spots that will fall (precipitation) in the form of rain, snow, and ice.

2) Infiltration / Percolation into the soil, displacement of air into the cracks and pores of the earth, and rocks to the groundwater level. Water can move due to capillary action or the atmosphere moving vertically or horizontally until it re-enters the surface water system.

3) Air Surface, the air moves above the ground surface close to the mainstream and the lake. The more land area and the more soil pores, the bigger the surface flow. Ground-level flow can usually be seen in urban areas. The rivers join each other and form the main river, which carries all the air around the watershed towards the sea.

Surface water, both flowing and stagnant (lakes, reservoirs, swamps), and some subsurface water will collect and flow to form rivers and end into the sea. The process of water travel on land occurs in the hydrological cycle components that make up the watershed system (DAS).

A hydrological analysis is an essential thing in planning a water structure, including flood control structures. The hydrological analysis here is intended to obtain the design flood discharge, which will be used as the basis for planning the channel's dimensions. Hydrological analysis has a significant contribution to the type and capacity of these flood control structures.

Failure to calculate a flood control building will result in substantial losses. These losses can be calculated as well as losses that cannot be calculated. For urban areas, the water catchment boundary is determined based on a topographic map equipped with elevation. From this map, it can be seen the drainage network pattern. The drainage network pattern obtained from the map needs to be followed up with a search in the field to check its accuracy and determine the flow pattern (Suripin, 2003: 355).

After the drainage network pattern is determined, the sub-catchment area for each channel segment can be described on a map, then the location of each catchment area is calculated. The type of land use in each sub-catchment area is identified to determine the surface runoff's coefficient (Suripin, 2003: 356).

Rainfall intensity is rainfall that occurs at a one-time unit. Rainfall intensity is calculated against the duration of rain (period) and its frequency, known as the Frequency Duration Intensity Curve (IDF Curve). Rainfall intensity is needed to determine runoff.

In calculating the intensity of rainfall, short-term (5 - 60 minutes) rainfall data is needed. The short-term rainfall data is only obtained from automatic rainfall observation data from the diagram paper on the recording equipment.

If the available rainfall data is only the daily maximum average rainfall (R24) recording data, then the Bell formula can be used.

$Pi = (0.21 \text{ Ln } T - 0.52)(0.54\ t^{0.25} - 0.50)\ P60\ (T)$

Calculation of Rainfall Intensity (I)

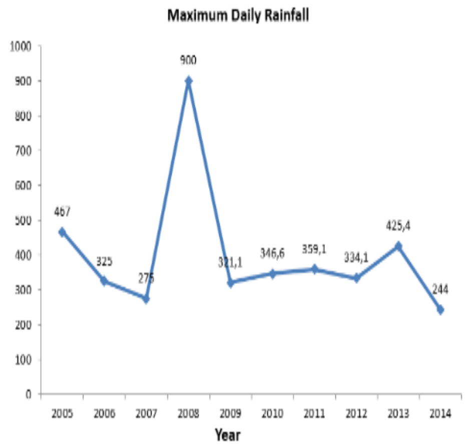
Rain intensity is the amount of rain expressed in the height of rain or the rain volume per unit of time. The amount of rain intensity varies depending on the length of rainfall and the frequency of its occurrence. Rain intensity is obtained by analyzing rainfall data both statistically and empirically. Rain intensity is the height of rain that occurs during a period of concentrated rainwater. Usually, the intensity of precipitation is associated with short-term rain duration, for example, 5 minutes, 30 minutes, 60 minutes, and hours. This short-term rainfall data can only be obtained using automatic recording devices.

To calculate the amount of rainfall intensity, it is obtained from the rainfall data shown in table 2 below, where the data used is the maximum rainfall data at the rain station each year. The amount of rainfall intensity can be calculated from the rainfall data by changing the amount of rainfall into units of mm/hour. The maximum rainfall intensity is shown in table 2.

In table 2 Below, the average and standard deviation values are displayed. Where this result is a parameter to analyze the frequency distribution, in this case, the Gumbell distribution is used.

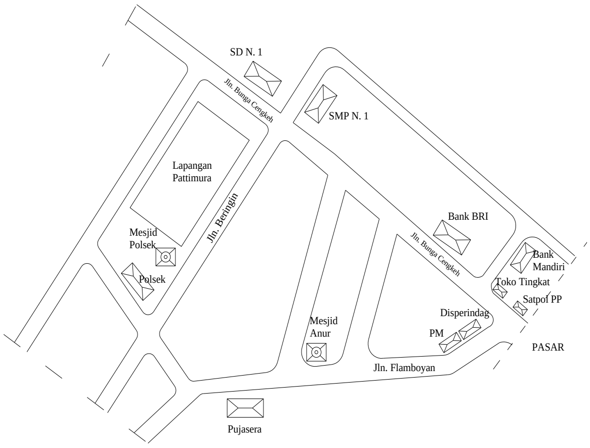
Year	Maximum Daily Rainfall
2005	467.0
2006	325.0
2007	275.0
2008	900.0
2009	321.1
2010	346.6
2011	359.1
2012	334.1
2013	425.4
2014	244.0

Source: Namlea Meteorological Station 2015



RESEARCH METHOD

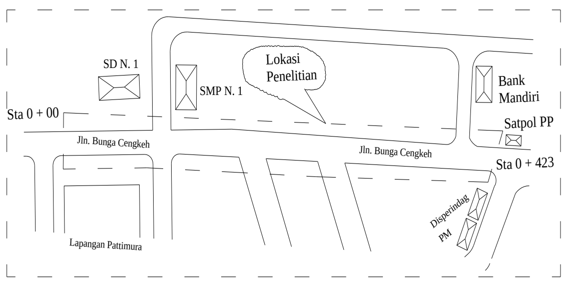
This research was carried out within a period of 1 month with the research location is on Jalan Bunga Cengkeh, Namlea Village.



The data used to achieve the objectives of this study are primary and secondary data. Primary data is data obtained by conducting field surveys (research places / locations) and Secondary data is data obtained by contacting directly related agencies so that data correct to support the writing of the final project (Kubangun, 2020). Based on the objectives and scope of research, the data collection method used in the preparation of this final project is to conduct a survey or direct observation to the research location. The equipment used in this research are: Camera, used to take pictures of documentation, Roller Meter, used to measure the length and dimensions of the channel, Stationery, to record data in the field. Data Analysis After collecting and collecting data in the field and at the BMKG office, then the data will be analyzed and calculated.

DISCUSSION

To see a clearer picture of the drainage channel in the review area, please see the study location plan below:



In Indonesia, a tool commonly used to measure rainfall is an ordinary rain recorder that measures 24-hour rain or what is called daily rain. And in the preparation of this thesis the author uses daily rainfall data. The following will show the maximum rainfall data that the author obtained from the Namlea Village rainfall recording station from 2005 - 2014.

Tabel 1. Data of Maximum Daily Rainfall at Namlea Station, Buru Regency

Month	YEAR									
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
1	467	325	275	118	198.3	319	164.3	197	258	197
2	428	186	273.3	396	321.1	343.8	192.2	184.4	195	244
3	316	211	207	165	119.3	128	132.8	334.1	54.7	128
4	253	166	102	124	22.4	160.1	190.5	102.7	85.6	225
5	45	87	38	59	61.2	210.2	238.5	124.7	122.7	107
6	21	202	248	200	30.8	348.6	133.7	125	42.3	330
7	152	15	38	157	118.1	153	38.9	0	425.4	53
8	5	4	15	478	19.6	146.6	30.5	23.3	56.5	48
9	3	9	37	65	8.5	109.9	31.1	23	28.5	2
10	135	0	86	61	11.8	100.3	49	14	7	1
11	118	12	60	33	67.6	126.2	85.6	18	116.4	27
12	213	44	184	900	173.4	239.2	359.1	109	101.7	129
MAX.	467	325	275	900	321.1	346.6	359.1	334.1	425.4	244

Source: Namlea Meteorological Station 2015

Source: Namlea Meteorological Station 2015

Rainfall intensity calculation (I)

Rain intensity is the amount of rain expressed in the height of rain or the volume of rain per unit time. The amount of rain intensity varies, depending on the length of rainfall and the frequency of its occurrence. Rain intensity is obtained by analyzing rainfall data both statistically and empirically. Rain intensity is the height of rain that occurs during a period of concentrated rainwater. Usually the intensity of rain is associated with short-term rain duration, for example 5 minutes, 30 minutes, 60 minutes and hours. This short-term rainfall data can only be obtained using automatic recording devices.

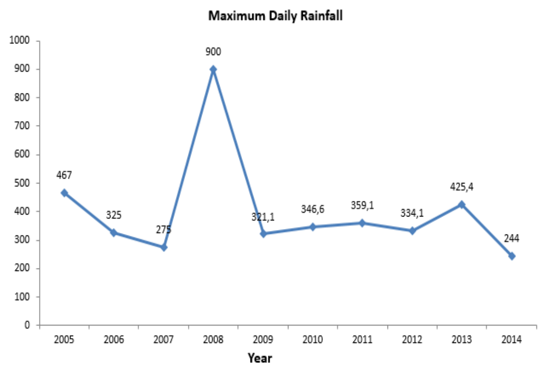
To calculate the amount of rainfall intensity, it is obtained from the rainfall data shown in table 4.2 below where the data used is the maximum rainfall data at the rain station each year. From the rainfall data, the amount of rainfall intensity can be calculated by changing the amount of rainfall into units of mm / hour. The maximum rainfall intensity is shown in table 4.2.

In table 4.2. Below, the average and standard deviation values are displayed. Where this result is a parameter to analyze the frequency distribution, in this case the Gumbell distribution is used.

Table 4.2. Namlea Station Rainfall Data

Year	Maximum Daily Rainfall
2005	467.0
2006	325.0
2007	275.0
2008	900.0
2009	321.1
2010	346.6
2011	359.1
2012	334.1
2013	425.4
2014	244.0

Source: Namlea Meteorological Station 2015



The picture above is a description of Namlea Station's Rainfall in the Last 10 Years.

The following is the calculation of how to calculate the intensity of rain in 2005.

$$I = \frac{R_{24}}{24} x \left(\frac{24}{t}\right)^{m}$$

$$I = \frac{467}{24} x \left(\frac{24}{60}\right)^{2/3}$$

$$= 10,56 \text{ mm/hours}$$

The results of the calculation of rain intensity for the years 2005 to 2014 are shown in table 4.3 below.

Table 4.3. Rain Intensity

Year	Maximum Daily Rainfall	Rain Intensity
2005	467.0	10.56
2006	325.0	7.35
2007	275.0	6.22
2008	900.0	20.36
2009	321.1	7.26
2010	346.6	7.84
2011	359.1	8.12
2012	334.1	7.56
2013	425.4	9.62
2014	244.0	5.52
∑ Rain Intensity (mm/hari)		90.42

Source: Data Analysis for Civil Engineering Study Program, FT.Uniqbu

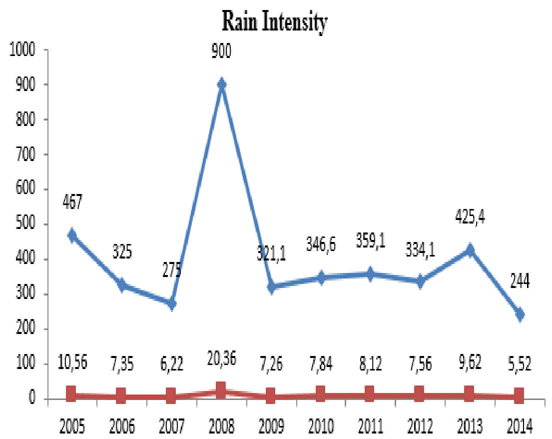


Figure 4.3 Rain Intensity

CONCLUSION

Based on the description of the discussion above, several conclusions can be drawn in the writing of this Final Project as follows: 1. Based on the area of the rainwater catchment area in the table in appendix 8, for urban drainage hydrological design planning criteria and table 2.2 return period for small town standards on page 14, then we take the maximum rainfall R2 year = 410,907 with the peak factor = 2 so that the magnitude the planned discharge due to runoff Qp = 1,167 m3 / s and discharge due to household waste Q waste = 0.0025 m3 / s so that the design discharge for the design of the channel cross-section with a design life of 2 years is Qtotal = 1.1695 m3 / sec. 2. Based on the results of the analysis between the planned section and the existing channel section, the existing channel section does not meet the requirements so that if the runoff is with high rainfall intensity, the existing section is unable to accommodate the discharge due to rainwater runoff and discharge. due to household waste. Where the planned discharge is Qtotal = 1.1695 m3 / s, while the existing channel discharge is Q = 0.44 m3 / s. 3. Whereas based on Q analysis of household plan waste at 2-year return loss is = 0.0025 m3 / s <Qlash in existing channels = 0.0039 m3 / s. 4. The capacity of the channel capacity = 209,375 m3 / s is smaller than the volume of annual rainfall = 25612.05 m3 / s, so runoff occurs during maximum rainfall. 5. Existing channel cross-section must be enlarged so that it can accommodate discharge due to rainwater runoff and discharge due to household waste in accordance with the total area of 2,125 ha and population density in the area.

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