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Analysis of Bekasi River to Flood in Pondok Gede Permai Housing

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Abstract

The Bekasi River flow that crosses Pondok Gede Permai Housing is a river network that flows in the housing of Pondok Gede Permai. With a good river flow system, economical and as needed from housing, the passing water flow is expected to flow smoothly according to the dimensions that have been taken into account. The methodology done in this research is a descriptive analysis of evaluative is a method that evaluates the objective conditions in a situation that becomes the object of research and the object of the study, the flow of rivers surrounding the housing Pondok Gede Permai. From the results of this research can be concluded that the cause of flooding in Pondok Gede Permai housing is caused by the confluence of two currents between the Cikeas river flow and the Cileungsi River. And also because of the widespread water from the river Cikeas to the Bekasi River, and because the meeting between the two rivers of Bekasi and Sunagi Cikeas are very small.

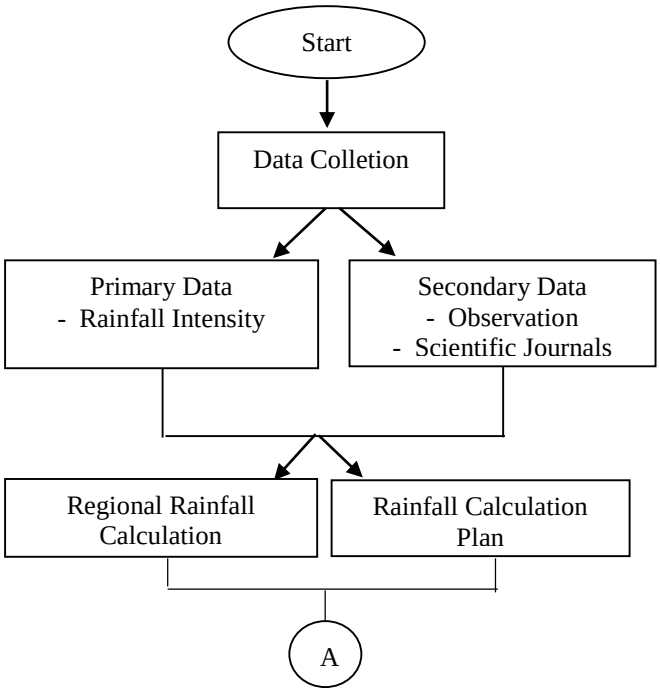
Keywords
Floods, Hydrology, River Flow

1. Introduction

The change in soil form into housing in one residential area leads to increased soil coefficient and decreased recation rate, because water that does not sink into the ground properly will go to ground level and flood. The Bekasi River flow that crosses the house of Pondok Gede Permai is a river network that flows in the housing of Pondok Gede Permai. With a good river flow system, economical and as needed from housing, the passing water flow is expected to flow smoothly according to the dimensions that have been taken into account (Azwarman, 2017).

2. Methodology

In this research methodology is used in literature study methodology which is a series of activities related to data collection methods, reading and recording. And the processing of research materials.



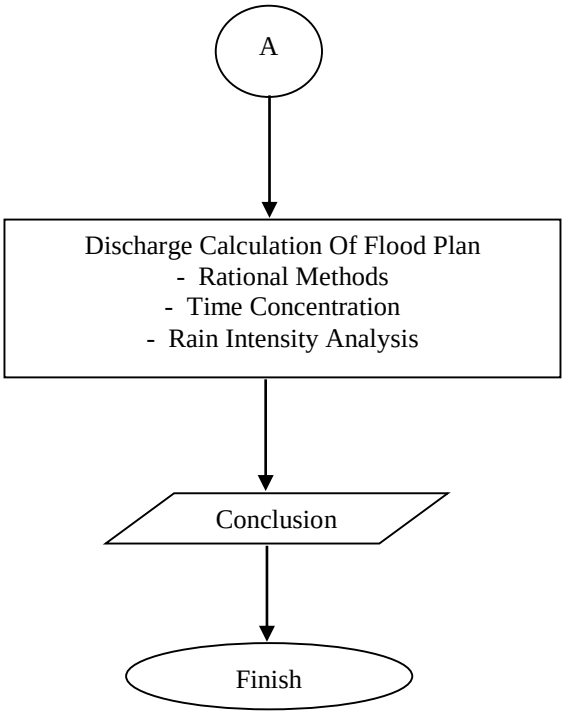


Figure 1. Flowchart

3. Result and Analysis

The intensity of rainfall is the magnitude of the amount of rain that is expressed in high rainfall or the volume of rain per unit of tim (Novatrianto, Anwar and Prasetyo, 2020). The amount of rain intensity is different, depending on the length of rainfall and frequency of occurrence. This research uses Dr. Mononobe's method to calculate the intesity of rainfall.

Table 1. Calculate The Intesity of Rainfall

t(jam)	R2	R5	R10	R25	R50	R100
	214,07	277,25	319,08	371,66	411,15	450,08
1	74,21	96,12	110,62	128,85	142,54	156,03
2	46,75	60,55	69,69	81,17	89,79	98,29
3	35,68	46,21	53,18	61,94	68,53	75,01
4	29,45	38,14	43,90	51,13	56,57	61,92
5	25,38	32,87	37,83	44,07	48,75	53,36
6	22,48	29,11	33,50	39,02	43,17	47,26
7	20,28	26,27	30,23	35,21	38,95	42,64
8	18,55	24,03	27,65	32,21	35,63	39,01
9	17,15	22,21	25,57	29,78	32,94	36,06
10	15,99	20,71	23,83	27,76	30,71	33,62
11	15,00	19,43	22,36	26,05	28,82	31,55
12	14,16	18,34	21,10	24,58	27,19	29,77
13	13,42	17,38	20,01	23,31	25,78	28,22
14	12,78	16,55	19,04	22,18	24,54	26,86
15	12,20	15,80	18,19	21,18	23,44	25,65
16	11,69	15,14	17,42	20,29	22,45	24,57
17	11,22	14,54	16,73	19,49	21,56	23,60
18	10,81	13,99	16,11	18,76	20,75	22,72
19	10,42	13,50	15,54	18,10	20,02	21,91
20	10,07	13,05	15,01	17,49	19,35	21,18
21	9,75	12,63	14,53	16,93	18,73	20,50
22	9,45	12,24	14,09	16,41	18,15	19,87
23	9,18	11,88	13,68	15,93	17,62	19,29
24	8,92	11,55	13,29	15,49	17,13	18,75

3.1 Calculation Method Nakayasu

One method that authors use in the calculation of flood discharge is the method Nekayasu. To get a flood discharge plan need to be searched for the charateristic or parameter on the stream area. The characteristic are :

1. Time period from the beginning of rain to the top of the hydrogaf
2. Time period of the heavy rain point until the heavy point of hydrogaf
3. Time period of hydrogaf
4. Area of the flush

5. Main river groove length

The Hydrogaf equation of the sinetic :

$$Q_p \frac{A.R_0}{3{,}6\ (0{,}3\ t_p + T_{0,3})}$$

Qp = discharge peak flood
R0 = rainy unit
Tp = time from the beginning of rain to the peak of floding
T0,3 = time required by the decrease in discharge, from the peak discharge to 30% of the peak debit.

The required parameters in the calculation are :

Characteristic DAS :	
Spacious DAS (A)	= 39.2 km2
Main river length (L)	= 20.6 km2
Coefficient characteristic DAS (α)	= 2
Effective Rainfall (Re)	= 1 mm/hour
Hydrograph parameters :	
Time concentration (Tg)	= 1.595 hour
The duration of rain standart (Tr)	= 1.196
Flood start time (Tp)	= 2.552
Flood reduction time (T0,3)	= 3.190
Top Debit (Qp)	= 2.753
Base Stream (Qp)	= 2.753

The calculation of Nakayasu Hydrograph unit

A. On the UP curve (0 < t < Tp)

Table 3.1. UP curve

t(jam)	Q (m3/s)
0	0,000
1	0,291
2	1,534
2,552	2,753

Source : Calculation Data

B. On the Down Curve (Tp < t < Tp + T0,3)

Tabel 3.2. Down Curve

t(jam)	Q (m3/s)
3	2,325
4	1,594
5	1,093
5,741	0,826

Source : Calculation Data

C. On the Down Curve (Tp+T0,3 < t < Tp + T0,3 + 1,5T0,3)

Tabel 3.3 Down curve (Tp+T0,3)

t(jam)	Q (m3/s)
6	0,7739
7	0,6017
8	0,4678
9	0,3638
10	0,2828
10,52568	0,2478

Source : calculation data

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D. On the Down curve (t > Tp + T0,3 + 1,5T0,3)

Table 3.4. Down Curve (t>Tp)

t(jam)	Q (m3/s)
11	0,226564
12	0,187596
13	0,155331
14	0,128615
15	0,106494
16	0,088178
17	0,073012
18	0,060454
19	0,050056
20	0,041447
21	0,034318
22	0,028416
23	0,023529
24	0,019482

Source : Calculation Data

Figure 4. Hidrograf Satuan Sintetik Metode Nakayasu

3.2 Hec-Ras Modeling from The Above Calculations

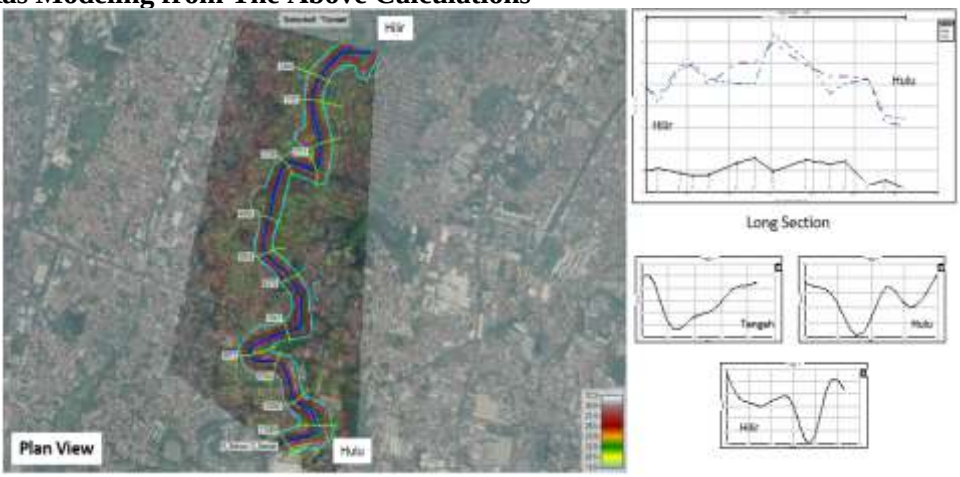

Figure 5. Plan View

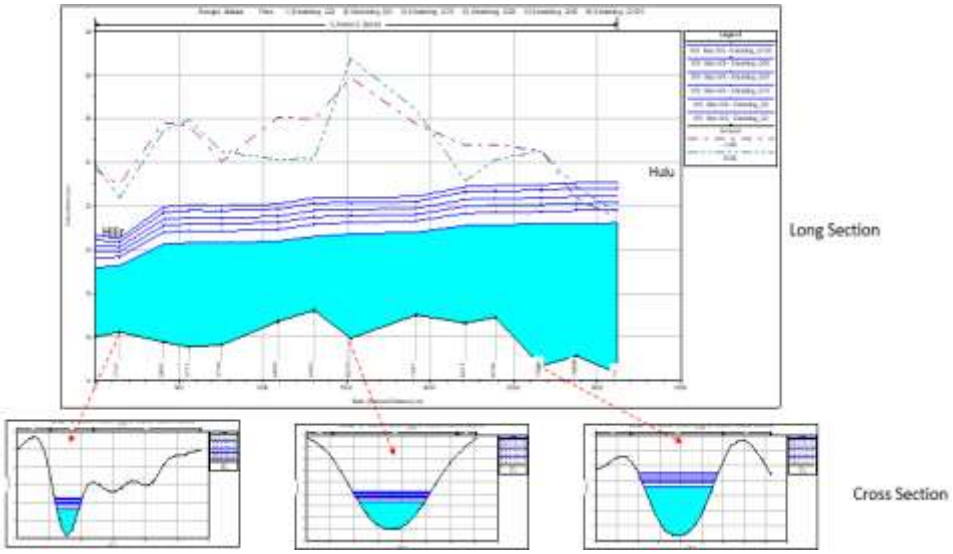

Figure 6. Long Section and Cross Section

4. Discussion and Conclusions

From the results of the analysis and discussion in the previous chapter, the following conclusions can be taken:

1. The cause of flooding in Pondok Gede Permai housing is caused by the confluence of two currents between the Cikeas river flow and the Cileungsi River. And also because of the widespread water from the river Cikeas to the Bekasi River.
2. Because the meeting between both Cikeas rivers and Bekasi River is very small.
3. To recapitulation the flood plan. Can be seen from the following table:

Table 4. Debit Maksimum

Periode T tahun	Debit Maksimum (m3/det)			
	Sub DAS Sungai Bekasi (Q3)		Sub DAS Sungai Cileungsi (Q3)	
	Nakayasu	ITB	Nakayasu	ITB
2	175,191	134,131	62,938	54,544
5	226,086	172,908	96,610	81,113
10	259,779	198,577	118,900	98,702
25	302,138	230,850	132,226	120,816
50	333,949	255,086	167,971	137,422
100	365,301	278,974	188,713	153,790

It can be concluded that the flood discharge period of 2 to 100 years is calculated using Nakayasu method is greater than count using the ITB method.

Advice:

1. The need for land acquisition efforts around the Bekasi River so there is no current barrier to the meeting of the Three rivers.
2. Need efforts from the government and local communities to realize times that are clean and environmentally friendly.

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Biography

Fakhri Jauhar Akbar Bima Putra is a student from Mercu Buana University in Bekasi with a Civil Engineering Studies program. Prior to majoring in civil engineering, at the previous level of high school, he majored in Natural Sciences at a private school in Bekasi, Sandikta. The writer graduated from high school in 2016 and then immediately continued his studies at Mercu Buana University in 2016. During his lectures, writers were active at various campus events such as creative evening events committees, Cultural seminar committees. For the smoothness in the department, as the committee of Civil Expo General 2019, as the organizer of the national transportation seminar event.