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ALTERNATIVE ANALYSIS OF FLOOD CONTROL DOWNSTREAM OF WAY SEKAMPUNG RIVER

Sugito, Maulana Febramsyah
Master of Civil Engineering, Graduate School, University of Bandar Lampung, Jl. Zaenal Abidin Pagar Alam 26 Bandar Lampung, 35142, Indonesia

Abstract-*Downstream part of the watershed is an area of lowland Sekampung with +3.00 to +4.00 elevation above sea level. Area located between the border regions of South Lampung regency and East Lampung. Originally this area was flooded reservoir area, the Swamp Sragi and surrounding areas, but along with the development of this area is used as a residential area, pertaniandan pond area for the people around the area. Padatahun 2002 River Way Sekampung experience overflow caused flooding in downstream areas which suffered losses of up to 38 billion rupiah. In this study analyzed the incidence of flooding that may occur based on rainfall data available. Based on the results of the input stream and cross sectional design flood discharge is seen that when the flood began when the river reaches flood discharge Q50-year anniversary.*

In this study flood control analysis performed on the three methods are: the construction of levees, making retention ponds and dredge rivers. The third input method results in HEC RAS 3.1.3 shows that building levees to reduce flooding by 32%, on a flood retention pond can be reduced up to 45% and normalization of the river is only able to reduce flooding by 20%. Most effective flood management recommendation is to build two retention ponds and technical cost reduction by flooding.

Keywords*: Floods, Levees, Retention Pool, Normalization River, Investment Costs*

INTRODUCTION

Way Sekampung is the largest river in the province of Lampung flow region covers three districts namely: East Lampung and South Lampung regency Tanggamus. With high intensity rainfall River Way Sekampung often cause flooding to the area - the area through which the flow. Natural conditions that cause decreased function Way Sekampung is the main factor for the flood event. Where the River Way Sekampung no longer have the capacity to normal reservoir, the decrease in the capacity of certain moments when the rain came down with a high intensity and a very long time the incident was unavoidable flooding occurred in the area around the river.

RESEARCH OBJECTIVES

The study objectives are:

a. Minimize flood inundation that occurred in River Way Sekampung with river flow regulation.
b. Recommend technical handling a proposal / concept in river flood Way Sekampung Downstream.

LITERATURE REVIEW

1. Steady flow

Components in the model used to calculate the water surface profile in steady flow conditions (steady). This system can be used on a channel, network or a large network of small channels including channels and other. Steady component of the flow can be modeled on the condition of subcritical flow, supercritical, and the combined system water level profile.

Basic computer calculations based on the solution of one-dimensional energy. Energy lost due to friction (Manning equation) and the constriction and dilation (additional coefficients of the change in speed). Momentum equations useful in situations where the water surface profile changes abruptly. These situations include the combined flow calculation system (example: water jump) or flow on the bridge and changes in water level at the confluence of the channel (the flow at the intersection).

2. Unsteady flow

Components to be developed for the flow is not steady subcritical flow calculations. Hydraulic calculations for cross-sections, bridges, culverts and other hydraulic structures that were developed for the steady flow component coupled with no steady flow calculations. Components for steady flow is not used to model the hydraulic reservoir and relationship with catch.

3. Water Front profile on Steady Flow

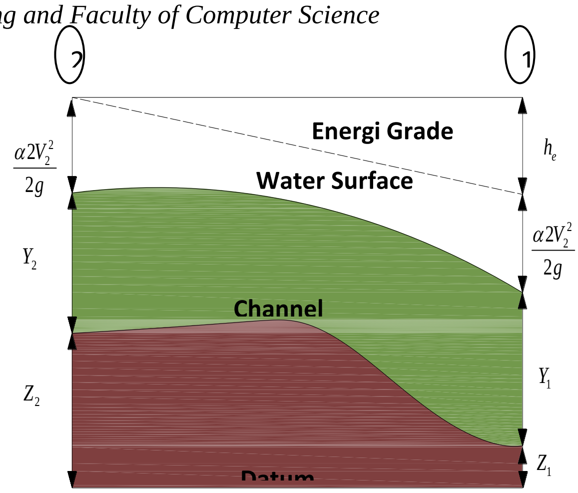
HEC - RAS can calculate water surface profiles for one-dimensional flow gradually lasting change on natural and artificial channels. Subcritical flow, supercritical, and the combined system flow water surface profiles can be analyzed

4. Basic equations

5.

Water surface profiles are computed from a cross-section to the next cross-section energy equation solved by the so-called

Metode Step Standar



Gambar 1. Parameter Penyusunan Persamaan Energi

Figur 1. Energy lines

Energy equation can be seen as follows:

$$Y_2 + Z_2 + \frac{\alpha_2 v_2^2}{2g} = Y_1 + Z_1 + \frac{\alpha_1 v_1^2}{2g} + h_e \quad (1)$$

Information :

Y_1 , Y_2 = high depth on cross-section 1 and 2 (m)

Z_1, z_2 = channel base elevation at cross-section 1 and 2 (m)

α_1, α_2 = speed coefficient

v_1 ,v_2 = speed (m/dt)

g = gravitasi (m/det^2)

h_e = loss of energy (m)

Head loss(h_e) between 2 cross section due to friction caused by the loss and loss due to narrowing or widening.

Head loss equation is as follows:

$$h_e = L + \bar{S}_f \left[\frac{\alpha_2 v_2^2}{2g} - \frac{\alpha_1 v_1^2}{2g} \right] \quad (2)$$

Information :

He = Head loss (m)

L = friction length field of 2 points observation (m)

C = Loss coefficient due constriction and dilation

α_1,α_2= speed coefficient

V_1,V_2= speed (m/det)

G = gravitasi (m/det2)

Calculation of the discharge cross-section in each stream section

Determination of total discharge and velocity coefficients for a cross section requires the division of the flow into the units because the flow velocity is not distributed evenly. In the HEC-RAS approach used is the division of the area on the levee area using constraints n values that exist in the cross-section (location where the value of n changes) as the basis for the division. Discharge is calculated within each sub-area in the levee Manning formula is used (in metric units) are as follows:

$$Q = k.S_f^{1/2} \quad (3)$$

$$k = \frac{1{,}486}{n} AR^{2/3} \quad (4)$$

Keterangan :

Q = discharge

K = drainage coefficient for the sub-area

S_f = slope of the riverbed

n = Manning roughness coefficient for sub area

A = wet cross-sectional area (cross section) sub area

R = hydraulic radius for the sub area

METHODOLOGY

1. Data Collection

Data obtained from secondary data in the form of daily rainfall data and data on river elevation. Detailed data required in this study are as follows:

a. Rainfall Data
Rainfall data obtained from local observation stations obtained from Dinas PU Lampung Province Irrigation Station Unit One Village Seputih River Region, namely Argoguruh Station, Gedong Tataan, Jabung, Pagelaran and Palas Jaya. These data taken 13 years to determine the rainfall observations and debit plan in accordance with the plan of the steps in the flow chart scrutiny.
b. Map Location of Study
Maps used in this study is a map of the location and area of flood inundation maps that occurred in the area of the River Way Sekampung area of sub-watershed particularly Way Sekampung Downstream.
c. River Elevation Data
River elevation data specific to the needs of the use of HEC-RAS 3.1.3 software in simulation of flood events based on discharge plan with the elevation of the river can be seen the river flow profiles used in this study.

2. Data analysis

The data has been collected and then transferred into a spreadsheet for easy

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classification and code data, to facilitate data analysis stages.

Data analysis includes the presentation of the data into tables, graphs and pictures, then do the calculations to describe the data obtained. This analysis includes the calculation of hydrology, hydraulics, and economic analysis of levee stability.

RESULTS OF RESEARCH

In thisstudyconductedananalysis of theplannedfloodmitigationmethodswill be used. Themethodisplannedto be analyzedisthemethod of construction of thelevee, makingretentionponds and dredgeriversdredgingtheriverbed.

3. FloodPreventionwithLevee

Surveillanceembankmentheightisdeterminedbytheprovisionscontained in table 2.6 are basedonthevalue of flooddischarge. Basedontheresults of runningHec Ras 3.1.3 forflooddischargewhenrepeated 2, 5, 10,50 and 100 years has a maximumflow and minimumflow m3/sec 2208.99 1138.83 m3/sec.

Basedonthevalue of dischargebetween 500-2000 m3/sec adalah1 m highleveesurveillance and todischarge 2000-5000 m3/secused 1.2 m highleveesurveillance.

As forthesubsequentcalculations, thewidth of thedikelighthouseisdeterminedbythewidth of thetable 3.7 mercuembankmenttodischargebetween 500-2000 m3/secplannedabout 4 m and todischargebetween 2000-5000 m3/secsummitplannedleveewidth 5 m.

Leveesto be builtontheriverside of therunoffoccurs. Basedontheresults of runningtheprogram HEC RAS 3.1.3 overflowingriverhadbegun at the time of theflooddischarge Q50 yearstocross 23-11. 4, whilethecrossunder 11.4 despiterelativelysafefromfloodingfor up to Q100 yearflooddischarge.

Planningresults back leveeheightenteredintotheprogram HEC RAS 3.1.3 to determine thewatersurfaceprofileafterbeingaddedtotheleveeontheright and left of thecliff and theriverleveeknowthesecuritygiventothedangers of flooding.

leveeconditions are safefromthedanger of floodingiftheelevationleveeisgreaterthanthewaterlevel. Graphicscapabilitiesusingtheleveeontheriverafter 23 to Q50-year cross can be seen in thepicturebelow.

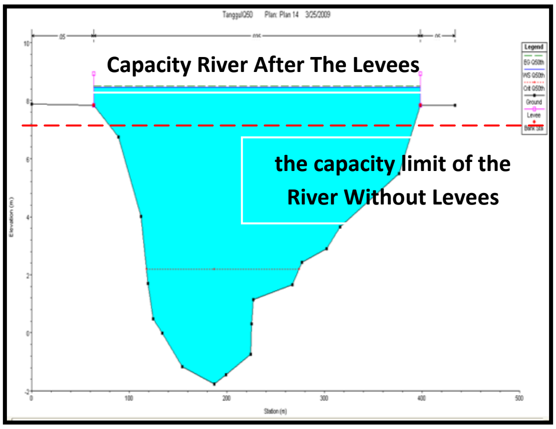

Figure2.theconditioncross-section in Afterlevee

4. FloodPreventionWithRetentionPool

A retention pool is able to reduce up to 45 901% flood to flood the Q50 and 45 894% for the flooding that occurred in Q100. Retention Pool B has the ability to reduce up to 37 945% and 29.27% for Q50 on Q100.Hal This occurs because the area around the pool Retention B has a greater volume of flood pool is designed so that only reduce flooding and up to 37 945% 29 277% only

CONCLUSION

Based on the results of our study on the incidence of flooding in the lower reaches of the River Way Sekampung we can conclude the following:

1. Method of handling the flood levee could reduce flooding by 32% maximum. Manufacture of Retention pool is able to reduce up to 45% while the River Normalization only reduce flooding with a maximum value of 20% reduction.

2. Based on the results of the simulation with the program HEC RAS 3.1.3 handling most have economic value and be able to provide optimum value reduction of 45% is to create a retention pool.

3. Having made retention pool and streams in the planned percentage reduction normalize flooding able to reach 65%

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