International Journal of Civil and Structural Engineering Research ISSN 2348-7607 (Online)
Vol. 4, Issue 2, pp: (52-56), Month: October 2016 - March 2017, Available at: www.researchpublish.com

Analysis of Characteristics Soil to Drainage Capacity

Acep Hidayat

Mercu Buana University, Jakarta, Indonesia

Abstract: **The development of urban growth has increased so phenomena that occurs in the environment related to water resources is increasing. Population growth every year growings to accompany urban growth, make to use of groundwater is increasing. The phenomenon that occurs is that the availability of land for the process is the infiltration of water into the soil decreases where hectarage that there was insufficient absorption of water into the ground, in addition to the absorption of water into the soil influence levels of permeability of the soil type on the local environment surrounding catchment. As a result of the amount of water infiltration into the soil that is not balance so the surface flow is greater that needs to be taken into account the capacity of the drainage channel that can accommodate the runoff water.**

To anticipate its happened so in this research of permeability of the water absorbing power for different types of soil to perform tests soil, so that can know the capacity of the drainage channel is needed. Calculation of rainfall can be substantial rainfall in one year amounted to 54.56 m3 / sec and pervasive only 5:37 m3 / sec or 9.84% .This shows that the type of soil around the various research areas of silt and clay so that the small pores that lead to runoff is greater. Under these conditions the necessary dimensions of the drainage channel that can accommodate runoff and combined with additional create folders reservoirs, recharge wells, pits and other biopori. So with rainfall there can be accommodated by a drainage channel.

Keywords: **Soil permeability, drainage.**

I. INTRODUCTION

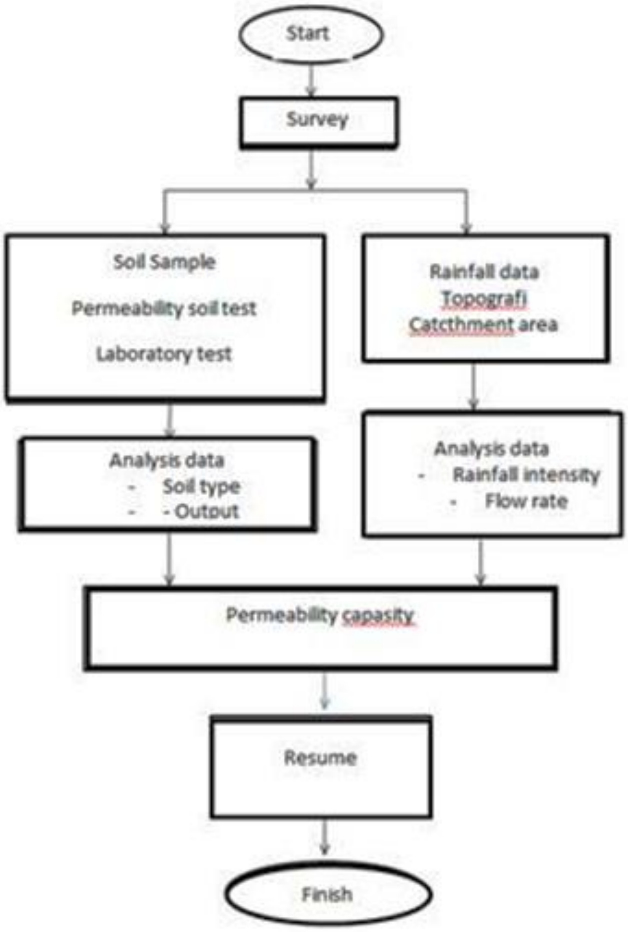
With the availability of land dwindling catchment makes the process of water into the soil the less, if this happens constantly in the long term I will result in reducing groundwater levels, reduction in ground elevation, easy going intrusion of sea water. (3)

Background of this research to determine the level of absorption that occurs from various soil types with different levels of permeability, so that I can know the magnitude of cubication levels of infiltration that occurs. Objective is defined permeability characteristics of the different types of soil connected with the drainage capacity. In the field of science contributions generated which is a method that can balance between the level of absorption by the soil permeability models.

II. METHODE

A. Analysis:

This research was conducted with the early stages of implementing a field survey in advance by looking at the general contours of the region, as well as seeing that the surface soil texture as the original assumption in making predication potential water infiltration that occurs as well as an initial assessment of the level of permeability that occurs.



The model used in the form of infiltration wells and data collection techniques derive from field surveys, laboratory tests in which the test is so performed data analysis using rurmus-formula that suits the purpose of research.

Based on the above map, the area of green open spaces and green line for South Meruya Village area of 18617.92 m2 (1.8 ha) or 0.63% of the total area. In this study, the research area is 285 hectares, with the majority of the land cover is a settlement. Price runoff coefficient (C) is 0.6 to residential areas. Values of rain intensity (I) amounted to 114.778 mm / day, the value of Kc is 0.00278. The flow rate was calculated surface use calculation of flood discharge Rational Method, by the following equation.

Q rain = Kc x C x I x A

Q rain = 54.563 m3 / sec

Pore material properties are properties that define flow rate of fluid in the form of water or oil through porous cavity. For land, described as the permeability of the material properties of soil that drains water through soil pore cavity. In soil, the flow properties may Laminar or turbulent.

The resistance to flow depends on soil type, grain size, grain shape, density and pore cavity geometries.

To compute the hydrostatic pressure that occurs in the soil can be used Bernoulli equation namely:

$$h = \frac{p}{\gamma w} + \frac{v^2}{2g} + z$$

by:

h = higher total energy (total head) (m)

p / w = high pressure energy (pressure head) (m) p = water pressure (t / m2, kN / m2)

v2 / 2g = high velocity energy (velocity head) (m)

v = water velocity (m / s)

w = weight of the water volume (t / m3, kN / m3)

g = acceleration due to gravity (m / dt2)

z = high energy elavasi (m)

Because the speed of water infiltration in the soil is very small, the high-energy pace of the tribe of the Bernoulli equation can be. So high total energy equation becomes:

$$h = \frac{p}{\gamma w} + z$$

To the extent open space area covering an area of 18.62 hectares. So rainfall and the water can get into the soil, calculated as follows:

Darcy's law

Darcy (1956), proposed a relationship between velocity and hydraulic gradient as follows:

$$v = ki$$

by:

v = water velocity (cm / sec)

i = hydraulic gradient

k = permeability coefficient (cm / sec)

Seepage discharge (q) is expressed in the equation:

$$q = kiA$$

Permeability coefficient (k) has the same units as speed cm / sec or mm / sec. That indicates the size of the prisoners soil to water, when the influence of nature-it's character included,

then :

$$k\ (cm/det) = \frac{k \rho_w g}{\mu}$$

with :

K = coefficient absolute (cm), depend on the nature of the soil grains

ρ_w = the mass of water (g / cm)

μ = Coefficient of viscosity of water (g / cm.det)

g = acceleration due to gravity (cm / sec)

3 samples of soil testing at three locations can result in the following:

From the results of three samples tested in water breakouts can coefficient is:

k average = (k1 + k2 + k3) / 3

= (0.00633+0.002794+ 0.00324) / 3

= 0.00412

To get the seepage velocity calculation:

V = k.i,

Where

i = 7 of the laboratory results.

V = 0.00412 x 7 = 0.02884 cm / sec

So that discharge into the soil to the extent of the open areas in the territory of the South Meruya

Q = V.A

= 0.02884 cm / sec x 186 170 000 cm2

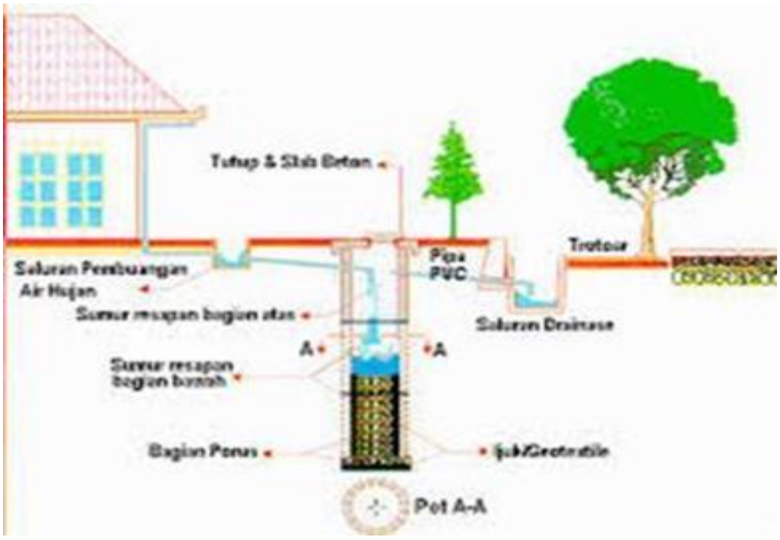
= 5369142 cm3 / sec

= 5.37 m3 / sec

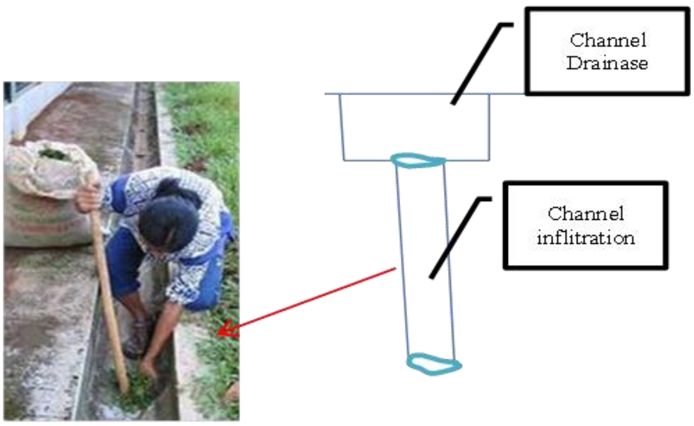
From these results we see that for the region is classified as soil types with very small pore type or types of soil clay so that water can get into the ground only 9.84%.

With the above analysis require capacity of drainage channels with various types to accommodate storm water runoff. -type Types include:

1.



2.



III. CONCLUSION

[1] Based on the analysis that it has been done, conclusions can be drawn as follows:

[2] The type of soil in the study based on permeability test results are known in the category of low permeability soil types silt that is not solid.

[3] The flow rate of water absorption 0.02884 cm / sec so that the discharge can go into the ground at 5:37 m3 / sec, or 9.84%

[4] With seepage discharge is very small, needed adequate drainage channel capacity and the addition of absorption

REFERENCES

[1] D. Fredlund, D. Sheng dan J. Zhao, "Estimation of soil suction from the soil-water characteristic curve," Canadian Geotechnical Journal, 2011.

[2] Q. Zhai dan H. Rahardjo, "Determination of soil-water characteristic curve variables," Computers and Geotechnics, p. 37–43, 2012.

[3] H. Shahir, A. Pak, M. Taiebat dan B. Jeremić, "Evaluation of variation of permeability in liquefiable soil under earthquake loading," Computers and Geotechnics, p. 74–88, 2012.

[4] T. Gleeson, L. Smith, N. Moosdorf, J. Hartmann, H. H. Dürr, A. H. Manning dan A. M. Jellinek, "Mapping permeability over the surface of the Earth," Geophysical Research Letters, 2011.

[5] C. Q. LaMarche, J. S. Curtis dan P. T. Metzger, "Permeability of JSC-1A: A lunar soil simulant," Icarus, p. 383–389, 2011.

[6] J. H. Li, L. M. Zhang dan X. Li, "Soil-water characteristic curve and permeability function for unsaturated cracked soil," Canadian Geotechnical Journal, 2011.

[7] A. Cihan, J. S. Tyner dan E. Perfect, "Predicting relative permeability from water retention: A direct approach based on fractal geometry," Water Resources Research, 2009.

[8] L. Hopp dan J. J. McDonnell, "(). Connectivity at the hillslope scale: Identifying interactions between storm size, bedrock permeability, slope angle and soil depth," Journal of Hydrology, 2009.

[9] J. H. Z. Li, L. M., Y. Wang dan D. G. Fredlund, "Permeability tensor and representative elementary volume of saturated cracked soil," Canadian Geotechnical Journal, 2009.

[10] A. Tuli, J. W. Hopmans, D. E. Rolston dan P. Moldrup, "Comparison of Air and Water Permeability between Disturbed and Undisturbed Soils," Soil Science Society of America Journal, 2005.

[11] P. Moldrup, S. Yoshikawa, T. Olesen, T. Komatsu dan D. E. Rolston, "Air permeability in undisturbed volcanic ash soils: Predictive model test and soil structure fingerprint," Soil Science Society of America Journal, p. 32–40, 2003.

[12] D. Rangeard, P. Y. Hicher dan R. Zentar, "Determining soil permeability from pressuremeter tests," International Journal for Numerical and Analytical Methods in Geomechanics, p. 1–24, 2003.

[13] T. Vogel, H. H. Gerke, R. Zhang dan M. T. Van Genuchten, "Modeling flow and transport in a two-dimensional dual-permeability system with spatially variable hydraulic properties," Journal of Hydrology, p. 78–89, 2000.