INFILTRATION STUDY FOR URBAN SOIL: CASE STUDIES – BUTTERWORTH AND ENGINEERING CAMPUS, UNIVERSITI SAINS MALAYSIA

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The Department of Irrigation and Drainage Malaysia has produced on Urban Stromwater Management Manual for Malaysia or better known as Manual Mesra Alam (MSMA) that includes suggestions on implementing the infiltration method for controlling the quantity and quality of surface runoff. With this method, the volume of surface runoff can be reduced and flood problems in major cities can be eliminated. The study areas, Butterworth and Universiti Sains Malaysia (USM) Engineering Campus are located in the middle and south part of Seberang Perai, Pulau Pinang in the northwest corner of Peninsular Malaysia. Both areas have different states of development, where Butterworth is undergoing with rapid development and the USM Engineering Campus is a completed development with control at source drainage system. This paper will describe the analyses of the infiltration curves for both Butterworth and USM Engineering Campus. The resulting infiltration maps have developed based on the infiltration capacities.

Undeveloped land has very little surface runoff, most of the rainfall soaks into the topsoil and evapotranspirates or migrates slowly through the soil mantle, as interflow to the stream, lakes or estuary (Roesner. et., 2001) As a result of this process, rainfall effects are averaged out over a long period of time (Figure 1). However, as the watershed develops and the land is covered over with an impervious surface (e.g. roads, parking lots, roofs, driveways and sidewalks) most of the rainfall is transformed into surface runoff. This will results in change of hydrological cycle. This makes the proportion of evapo-transpiration, runoff and infiltration of rainfall change. The control at source approach, as been mention in MSMA is used to try to restore this balance by either slowing down or storing the water in balancing chambers or detention ponds or by enhanced infiltration of the water into the ground. For a soil to be suitable for accepting enhanced infiltration it

must, in particular, be permeable and unsaturated (CIRIA,1996). This study proceeds at Butterworth and USM Engineering Campus of to determine the infiltration curve and to produce infiltration map as a comparisons.

To make control at source approach agreeable to all designer or engineers to be more specific, the soil infiltration and permeability capacity must be well known. By developing the infiltration map, designer could make a proper decision in applying control at source approach. In this study, results shows that Butterworth areas have a high permeability soil type especially for the undeveloped area. With this information, designer could make a right choice in designing urban stromwater drainage for future development for those undeveloped area. For USM Engineering Campus in the other hand, the backfilling and compaction process during the construction period makes the area moderately permeability although the soil type of this study area are the same as the Butterworth area. With having the control at source drainage system in the campus, the capacity of the infiltration and permeability of the area can be improved.

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