THE RELATIONSHIP BETWEEN RAINFALL CHARACTERISTIC AND TOTAL SUSPENDED SOLID (TSS) OF STORMWATER IN UMP GAMBANG.

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I hereby declare that the work in this thesis is my own except for quotations and summaries which have been duly acknowledged. The thesis has not been accepted for any degree and is not concurrently submitted for award for other degree.

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To my beloved family, lecturers and friends who have always supported me.
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ABSTRACT

Stormwater runoff is a leading contributor to pollution in streams, rivers, and lakes in nationwide. It is because stormwater runoff contains pollutants from many different sources, decreasing pollution from stormwater runoff is a challenging task. It requires cooperation from residents, businesses, and municipalities. An important step in protecting streams from stormwater pollution is understanding watershed processes, stormwater characteristics, and their combined effects on streams and water quality. The objective of the study was analysis relationship between rainfall characteristic and Total Suspended Solid (TSS) at UMP Gambang. The data was collected in September until November 2016.The Portable Water Sample used to collect data of Total Suspended Solid (TSS), meanwhile equipment Rain Gauge was collected rainfall depth. The result in September has three events, October has eight events and in November has three events. The stormwater runoff relationship between rainfall intensities can be characterized in period out of rainless cause the lowest sedimentation

ABSTRAK

Larian air hujan merupakan faktor utama kepada pencemaran di dalam anak sungai, sungai , dan tasik di seluruh negara. Hal ini, kerana larian air hujan mengandungi bahan pencemar dari pelbagai sumber lain, untuk mengurangkan pencemaran dari larian air hujan adalah sesuatu tugasan yang mencabar kerana ia memerlukan kerjasama daripada pihak pemastautin, perniagaan , dan majlis perbandaran, Antara langkah penting dalam melindungi sungai dari pencemaran larian air hujan ialah proses-proses titik perubahan, ciri-ciri air hujan, dan kesan gabungan daripada aliran sungai dan kualiti air. Objektif kajian ialah hubungan analisis antara hujan biasa dan Jumlah Pepejal Terampai di UMP Gambang. Kajian ini dijalankan untuk mengngangar pemendapan yang terjadi sewaktu hujan. Data dikumpulkan pada September hingga November 2016. Alatan seperti *Portable Water Sample* digunakan untuk mengutip data Jumlah Pepejal Terampai ,sementara itu peralatan *Rain Gauge* digunakan untuk mengetahui kedalaman hujan. Di samping itu, pada bulan September mempunyai tiga peristiwa, manakala bulan Oktober mempunyai lapan peristiwa dan pada bulan November mempunyai tiga peristiwa. Data yang diperolehi kemudian dibandingkan dengan data hujan seperti, jumlah hujan dan kedalaman air hujan. Kesimpulannya, semakin lebat hujan semakin tinggi pemendapan yang berlaku, tambahan jika tidak berlaku hujan dalam beberapa hari , pemendapan juga akan meningkat.

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TSS	Total Suspended Solid
INWQS	Interim National Water Quality Standard for Malaysia

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Stormwater runoff is a leading contributor to pollution in streams, rivers, and lakes in nationwide. It is because stormwater runoff contains pollutants from many different sources, decreasing pollution from stormwater runoff is a challenging task. It requires cooperation from residents, businesses, and municipalities. An important step in protecting streams from stormwater pollution is understanding watershed processes, stormwater characteristics, and their combined effects on streams and water quality (Teresa J. Rasmussen et all, 2009). Stormwater is also a resource and ever growing in importance as the world's human population demand exceeds the availability of readily available water. Techniques of stormwater harvesting with point source water management and purification can potentially make urban environments self-sustaining in terms of water

The primary controlling factor is the rate (intensity) of rainfall. This controls the amount of water available at the ground surface, and is closely related to measures of energy that are used in many mathematical formulations to calculate soil detachment by rain drops. Soil detachment makes soil particles available for sediment runoff. During rainfall, part of the precipitation is captured by plants or infiltrates into the ground, and the remainder flows over the land surface as stormwater runoff to the nearest ditch or creek.

In urban areas the percentage of precipitation that becomes stormwater runoff is much larger than in non-urban areas. Natural land cover that once absorbed rainfall has been replaced with impervious surfaces including streets, parking lots, and rooftops that prevent stormwater from soaking into the ground, and instead forces more water to flow at a faster

rate into the storm drainage system . It is flows over the land surface, stormwater picks up potential pollutants that may include sediment, nutrients (from lawn fertilizers), bacteria (from animal and human waste), pesticides (from lawn and garden chemicals), metals (from rooftops and roadways), and petroleum by-products (from leaking vehicles).

Pollution originating over a large land area without a single point of origin and generally carried by stormwater is considered non-point pollution. In contrast, point sources of pollution originate from a single point, such as a municipal or industrial discharge pipe. Polluted stormwater runoff can be harmful to plants, animals, and people (Heather C. Schmidt et al, 2009).

The contaminants like nutrients and bacteria. Sediment can enter streams from surface erosion and streambank erosion. Surface erosion occurs when soil is disturbed and left exposed, which is common during construction of roads and buildings. A study of sediment in the Mill Creek watershed indicated that areas with the most construction activity contributed substantially more sediment to streams than established urban areas (Lee et al, 2009).

Impervious surfaces increase the amount and rate of water flowing in a stream after intense rainfall and can cause stream banks to erode and the stream bed to shift. In 2005–06, about 90 percent of the total suspended sediment in streams was transported in less than 2 percent of the time, or about 7 days per year, and occurred during large storms that generated substantial runoff (Rasmussen et al, 2008).

1.2 PROBLEM STATEMENT

Pollutants entering surface waters during precipitation events are termed polluted runoff. Daily human activities result in deposition of pollutants on roads, lawns, roofs, farm fields, etc. When it rains or there is irrigation, water runs off and ultimately makes its way to a river, lake, or the ocean. While there is some attenuation of these pollutants before entering the receiving waters, the quantity of human activity results in large enough quantities of pollutants to impair these receiving waters.

High levels of sedimentation in drain leads to physical disruption of the hydraulic characteristics of the channel. This can lead to increased flooding because of reductions in capacity of the drainage channel to efficiently route water through the drainage basin. When storm drains become clogged with trash and debris, it can result in street and neighborhood flooding during the rainy season. This water backup can lead to closed roads and increased traffic, and create an unhealthy environment of smelly and unsanitary conditions in communities, worsening local aesthetics and lowering property values.

The cleanliness of communities has a further impact on the financial and personal investment residents make in their property, and contributes to the overall sense of community pride and civic engagement. Storm water pollution also poses public health threats in our neighborhoods, trash and animal waste left on the ground carry harmful disease-spreading bacteria, putting children and their families at risk in their local communities. In addition when not manage stormwater properly, for instance is flooding of transportation corridors and damage to properties.

1.3 OBJECTIVES OF STUDY

The objectives of this study are:

i. To collect and analyze the rainfall pattern in UMP Gambang campus.
ii. To develop relationship between rainfall characteristic and Total Suspended Solid (TSS).

1.4 SCOPE OF STUDY

The scope of study that involves :

i. The area of study consists in UMP Gambang.
ii. The equipments used were portable water sampler and rain gauge to measurement sediment and collect the rainfall depth data.
iii. The experiment for Total Suspended Solid (TSS) were conducted in Environmental Laboratory UMP Gambang campus.
iv. The test was conducted in September until November 2016.

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