CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Inflow is the average volume of excess water, (rain water) per unit time that enters the sanitary sewer through improper plumbing outside residences connection, hoses, manhole covers and catch basins. Infiltration is the process of ground water that slips into the sanitary sewer through cracks or bad joints on the sewer pipe. Unwanted rain water or ground water will become inflow and infiltration when they enter sanitary sewers, which may cause sewage overflows and overwhelming of wastewater treatment plants.

Malaysia is a country that has copious rainfall with varied seasonal rainfall. During the monsoon seasons, the exposed area of Peninsular Malaysia will experience heavy rain. Heavy rain will cause the increase of flow in sewerage pipes and sometimes may result in flooding. Therefore, a good design and maintenance in sewerage systems is important to assist the collection and transportation of wastewater from community and industrial areas as well as excess water from runoff to wastewater treatment plant.
Basically, in wastewater collection and transport system, Malaysia widely practices the separate sewerage system where the storm water drainage is separate from the sanitary sewerage system. This is to ensure the safety of residences and the environment. Besides that, it is also to avoid the combine sewer overflow (CSOs) problem that obviously can be found in combined sewer system.

Even though there is a separation systems between the sanitary sewer and storm sewer, some problems such as leakage of pipe, manhole and manhole covers which allow ground water into the sewer or unwanted street water into the sewer and street drain connected to sewer system which result in excess sewage flow will still occur in the sewerage system during heavy rain. The increased flow consume the capacity needed for future growth in a region and can damage the environment as well as sensitive ecosystems besides increasing also the cost of wastewater infrastructure. Therefore, a research is carried out in University Malaysia Pahang (UMP) Gambang Campus to investigate and collect inflow and infiltration data in sewerage system within the UMP area. In addition, this research is also conducted to detect the existence of leakage in sewer line by determining the equality of discharge between inflow and outflow in sewer line. The flow rate and flow velocity data in selected sewers are measured and collected using area velocity flow-meter and rainfall data is collected using rain gauge to achieve the objectives of the research.
1.2 PROBLEM STATEMENT

There are several problems that often occur during heavy rain. When it rains, public infrastructure defects will allow unwanted water to enter the sewer system. The public property defects such as street drain connected to sewer, leaky pipes and manholes, leaky manhole covers, leaky pipe connections, and manhole cross connections will allow ground water as well as unwanted street water to enter the sewer and this will lead to increase of sewage flow with high flow rate that can cause sewer manhole overflow and floods on the road. Additionally, the sewer pipes system that didn’t undergo any inspection or repair for a long time are likely to be cracked or broken and may cause the excess water from inflow and infiltration to enter the sewer system through open joints, cracks, and breaks in pipes. Sometimes the sewer pipe is unable to transport the capacity of overflow wastewater due to the overwhelmed sewer transport capability. The leakage of sewer pipes will also affect the flow rate of wastewater inside the sewer pipe.

1.3 OBJECTIVES OF STUDY

The main purpose is to study inflow and infiltration in sewerage system by collecting data from field runs into UMP area. The more precise objectives of this study are:

1. To study the relationship of rainfall intensity with inflow and infiltration rate in sewerage system.

2. To detect whether there are any leakage present in the sewer lines studied which may affect the flow rate in sewer.

3. To reduce the potential problems that may arise due to inflow and infiltration in sewerage system by providing the feedback of the results obtained to the relevant authority.