

## Instructions for using LIFE CYCLE COST MODEL

When starting the LCC model it may ask to enable macros. Please enable macros and then proceed:

### Major Components:

#### 1) INPUT SHEET:



Values for all the parameters are to be entered in this sheet. The columns colored Red are the entry column. Default values of each parameter are provided next to the entry column. The user can enter values as per their system requirements.

- ◆ **Total Population:** The population at the beginning of the design study.
- ◆ **Percent of Population:** Percentage of total population working with or directly associated with various types of associations. This data is needed to generate the base flow in the model.
- ◆ **Establishments:** Number of housing, industrial, business, educational and recreational establishments in the study area. The numbers of units are based on population of the city/wastewater district. Note that the number of persons is an important parameter and can be obtained from the U.S. census data.
- ◆ **Length of sewer per Unit:** Length of sewer line added by each unit to the total length of the main lines. Trunk sewer will be a percentage of main sewer pipeline length.
- ◆ **Sewer pipe classification:** Pipe sizes are classified in standard sizes. For laterals pipe sizes ranges from 4,6 and 8 inch diameter while Main lines ranges from 8, 10 and 12 inch diameter pipes and trunk sewer are 24,30,36,42 and 48-inch diameter.◆ The laterals, main and trunk are equally divided among the sizes. User can change the percentage of various sewer pipe sizes according to the system to be designed.
- ◆ **Pipe Joint spacing:** The joints in pipeline are classified in three categories. Lateral-Main joints (joints at the intersection of lateral with main line sewer), Mainline joints (joints between the pipes of the mainline sewer) trunk line joints (joints between the pipes of

the trunk sewer). The default spacing is 20 feet. User can change the spacing as per their system.

- ◆ **Manhole spacing:** Manholes at mainlines and trunk sewers are placed at a default distance of 300 feet and 400 feet apart respectively.
- ◆ **Manhole sizes:** Manhole sizes vary from 4 to 8 feet diameter based on the diameter of the pipe where the manhole is placed.
- ◆ **Infiltration:** Infiltration considered in the model is rain induced infiltration and ground water infiltration. Infiltration takes place through manholes, pipeline (cracks in main line and trunk line) and pipe joints (main-lateral joints, main line joints, trunk line joints). The intensity of infiltration varies from day to day; the user can determine the intensity of infiltration and number of days associated with it. The default value is 0% infiltration for 250 days, 10% for 100 days and 30 % for 15 days. The percent infiltration and number of days are on a sliding scale; infiltration increases every year with no maintenance performed, so do the number of days associated with the infiltration.
- ◆ **Per capita Flow:** Per capita flow is the individual discharge made by per person per day on an average associated with various establishments. Default values are provided.
- ◆ **Transportation cost:** Transportation cost is the cost associated with the collection and conveyance of waste water this includes the cost of minor sewer repair, sewer maintenance, pumping station, Operation and  
 ◆◆◆◆◆ Maintenance and other miscellaneous expenses.
- ◆ **Treatment cost:** Treatment cost is the cost of treating per gallon of wastewater. Treatment cost depends on the capacity of the treatment plant and the capacity utilized. Treatment plants are classified into three sizes small, mid size and large treatment plants.

## 2) **BASIC MODEL SHEET:**

This sheet provides the data for a single event (one day) of occurrence of infiltration in the system. Various parameters can be verified from this sheet; the length of the sewer system, number of manholes, per day sewer flow, treatment cost per 1000 gallons etc; of the city/wastewater district under consideration. The model can be further

calibrated for a particular city by making corresponding changes in the input sheet to achieve city specifications.

### 3) **CAPITAL COST:**

The capital cost sheet shows the cost associated with laying out a wastewater system of the size obtained in the basic model sheet.

### 4) **MODEL SHEET 5, 10, 15, 20, 25, 30:**



These model sheets incorporate the change in population every 5 years. Infiltration in the system is increased by one percent every year. Default Model values are provided in the Input sheet. ◆

### 5) **CHECK FOR SSO (Sanitary Sewer Overflow):**

This sheet helps to check when the system flow exceeds the treatment plant capacity and the prescribed regulations of EPA for excessive infiltration (average dry weather flow not exceeding 120 gpcd-gallons per capita per day). Rehabilitation is performed at the end of every 10 years period, when rehabilitation is performed the infiltration is dropped by 50%.

### 6) **REHABILITATION COST :**

Rehabilitation is performed every 10 years cycle. Rehabilitation is performed on 10% of the system. The cost calculation is done as per rehabilitation costs provided by the user (default values are also provided). 30 years rehabilitation cost is calculated based on two rehabilitation cycles.

### 7) **LIFE CYCLE COST:**

The Life Cycle Cost sheet gives us the cost of Wastewater treatment for 30 years period when rehabilitation is performed every 10 years on the system.

### 8) **LIFE CYCLE COST(NO MAINTENANCE):**



◆ Alternate Life Cycle Cost is achieved for no rehabilitation on the system. The difference in the life cycle cost with maintenance and no maintenance is obtained.

