

6. SEWERAGE SYSTEM

6.1 Introduction

- 6.1.1.1 This section describes the design methodology adopted in developing the preliminary designs for the proposed South East Kowloon development (SEKD) sewerage system.
- 6.1.1.2 The first part of this section describes the design parameters that have been used to estimate the projected sewage flows based on the SEKD employment and population figures. The design parameters have been used to develop hydraulic models of the system, to establish pipe size and pipe gradient requirements to satisfy the requirements of the DSD Sewerage Design Manual¹. The second part of this section presents the design criteria used as a basis for the preliminary sewerage designs.

6.2 Part 1 - Design Parameters for Flow Estimation

6.2.1 Residential Flow Factors

- 6.2.1.1 The relevant factors for use in estimation of residential sewage flows are presented in Table 6.1.

Table 6.1 Residential Flow Factors (L/resident/day)

Living Quarter Type	2005	2011 and Later
Low cost rental	240	240
Private R1	240	240
Private R2	291	300
HOS Residential Development	240	240
PSPS Residential Development	240	240

Source: DSD Sewerage Manual

- 6.2.1.2 The proposed unit flow factors and peaking factors are mainly based on the values defined in the DSD Sewerage Manual. Where flow factors other than those indicated in the DSD Sewerage Manual have been adopted, the rationale for adopting these flow factors is also given. For this study, private permanent population has been split into categories relevant to sewage flow projections (R1 and R2 etc) for each planning area, whilst public population includes rental, HOS and PSPS types.

6.2.2 Employment Flow Factors

- 6.2.2.1 The unit flow factor for employees for their own use while at their place of work is 60 L/employee per day for all the relevant study years. The flow factor for school children/students according to Table 2 of the Sewerage Manual is 25 L/person/day.

6.2.3 Commercial Activities

- 6.2.3.1 Flows from commercial developments including restaurants, hotels and laundries are calculated by assigning an additional factor to the general employment in each sub-catchment. The factor in the DSD Sewerage Manual increases with time from 273 L/employee/day in 2004 to 290 L/employee/day in 2011 and thereafter.
- 6.2.3.2 According to the Drainage Services Department, the above factors should be applied to all employment in the E2 – E5 categories (i.e. all employment other than manufacturing).

¹ Drainage Services Department Sewerage Manual Part 1 "Key Planning Issues and Gravity Collection System" - 1995

- 6.2.3.3 The commercial employment factor includes for the discharges from hotels on a catchment-wide basis. However, it should be noted that the overall factor masks large potential local flow-per-employee variations. Individual hotels actually discharge considerably higher volumes than would be predicted using this overall factor, whereas an office block would discharge considerably less. Therefore, specific factors for hotels (such as the factor derived in the N&S Kowloon SMP study, where a figure of 690 L/employee/day was used) will be used in this study if it is necessary to assess the capacity of local, upstream sewers.

6.2.4 **Peaking Factors**

- 6.2.4.1 Flow peaking factors allow for diurnal flow variations, seasonal variations in dry weather and variations due to wet weather inflows. For populations > 50,000, design peaking factors will be calculated in accordance with the DSD Sewerage Manual as follows:

$$P_{(\text{sewers})} = 7.3 / N^{0.165} \quad \text{where } N \text{ is the population equivalent [p.e.] in thousands;}$$

p.e. = Average Dry Weather Flow (m³/day) / 0.25.

In general, all flows collected by sewers should receive preliminary treatment and be conveyed to the preliminary treatment works without excessive surcharging/overflow. Hence the peaking factors for sewers [$P_{(\text{sewers})} = 7.3 / N^{0.165}$] are applied for establishing peak flows to pumping stations and preliminary treatment.

This approach has also been used for sewerage master plans carried out for and accepted by EPD in the past, for example the Outlying Islands SMP Review. However, it is acknowledged that EPD have opined that the peaking factors for Sewage Treatment Plants and Pumping Stations as stated in Table 3 of the Sewerage Manual may be more appropriate this Study. This will be investigated and considered in the detailed design stage.

- 6.2.4.2 The above formula, which includes a significant component for storm runoff allowance, has been used for the assessment of sewer pipelines, pumping stations and preliminary treatment works. It should be noted that these factors do not include for excessive storm runoff into foul sewers. It is assumed that an inflow and infiltration control strategy will be implemented to eliminate excessive inflows where these occur.

6.3 **Sewage Flow Assessment**

6.3.1 **SEKD Population Estimates**

- 6.3.1.1 Sewage from SEKD will be directed to either the To Kwa Wan Preliminary Treatment Works (TKWPTW) or the Kwun Tong Preliminary Treatment Works (KTPTW). Residential population and employment projections for the SEKD are shown on **Tables 6.2 and 6.3**. Assessments of the projected sewage flows generated from the SEKD, based on the residential population and employment projections are shown on **Table 6.4**.