Environmental Protection Department

環　境　保　護　署

Technical Paper

Report No.: EPD/TP 1/05

Guidelines for Estimating Sewage Flows
for Sewage Infrastructure Planning
Version 1.0

技　術　文　件

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF APPENDICES

1. INTRODUCTION

1.1 This set of Guidelines for Estimating Sewage Flows (GESF) is issued for EPD's initial internal sewage infrastructure planning use in accordance with the agreement between Environmental Protection Department (EPD) and Drainage Services Department (DSD) in the second and the third Steering Meetings on Review of Sewerage Manual. The recommendations in this GESF take into account EPD's past experience gained in sewerage infrastructure planning, findings in reviewed sewerage master plans and relevant DSD's technical reports.

1.2 This GESF provides guidance on good practice for estimating sewage flows for planning catchment level and sub-catchment level sewage infrastructure. The guidelines and recommendations are by no means exhaustive. The application of this GESF to planning sub-catchment local sewage infrastructure would involve deliberation of the worse case scenarios of usages and populations of the existing and proposed developments. During the initial internal implementation period of this GESF, the methodology in DSD Sewerage Manual – Part 1 (SM1) is an acceptable alternative for planning sewage infrastructure by external parties although EPD would carry out additional planning assessments using this GESF. EPD welcomes feedback and comments on the guidelines and methodology for estimating sewage flows in this GESF to facilitate improvements for the future general use of these Guidelines.

1.3 Unless specific information in SM1 are stated to be valid and adopted for use in this GESF, the approach of estimating sewage flows essentially in Chapter 4 of the SM1 will be replaced by that of GESF for sewage infrastructure planning purposes.

1.4 Findings in DSD's Research and Development Report No. RD 1011 and DSD's previous comments on the initial draft of these Guidelines have been taken into account in this GESF.

2. FLOW COMPONENTS

2.1 The average flow (AF) comprises domestic, commercial, institutional, industrial and inflow/infiltration components. The domestic component consists of flows from residential and institutional premises. The commercial component is made up of flows from offices, shops and restaurants. The institutional component includes flows mainly from schools and universities. The industrial component includes those flows from various manufacturing processes.

2.2 Inflow/infiltration is the flow due to ingress of ground/storm water and due to seepage and connections to the stormwater drainage system. In practice, it is difficult to determine accurately the amount of local inflow and infiltration. Despite every effort has been employed to reduce the amount of inflow and infiltration, the dry weather flow components have included infiltration and a certain amount of inflow. The inflow quantities in some catchments are considerable and cannot be wholly taken into account in the dry weather flow components. The contribution of this excessive inflow to the total sewage flow of a catchment is further addressed by the catchment inflow factor (P_{CIF}). This factor accounts for the average quantity of the excessive inflow of a catchment as a factor on the total component flows. The equation for average flow, $Q_{AVERAGE}$, is as follows:

$$Q_{AVERAGE} = (Q_{DOMESTIC} + Q_{COMMERCIAL} + Q_{INSTITUTIONAL} + Q_{INDUSTRIAL}) \times P_{CIF} ,$$

where $Q_{DOMESTIC}$ is the average dry weather domestic flow,
$Q_{COMMERCIAL}$ is the average dry weather commercial flow,
$Q_{INSTITUTIONAL}$ is the average dry weather institutional flow,
$Q_{INDUSTRIAL}$ is the average dry weather industrial flow, and
P_{CIF} is the catchment inflow factor.

3. FLOW DATA

3.1 Flow data for existing sewage treatment works are available from Sewage Treatment Division of Drainage Services Department. Flow survey data are also available from the following sources:

(a) Sewerage Master Plan Review Studies

-Yuen Long and Kam Tin
-Outlying Islands
-Hong Kong Island
-Central and East Kowloon
-Tuen Mun and Tsing Yi
-North District and Tolo Harbour

(b) Sewerage Master Plan Studies

-Port Shelter
-Tseung Kwan O
-Tsuen Wan, Kwai Chung and Tsing Yi
-North West Kowloon

(c) Other studies:

-Pilot Study for Inflow and Infiltration Reduction Strategy
-Sewage Flow Measurement for the North and South West Hong Kong Island (final results to be available by year 2007)

3.2 Flow surveys are recommended for obtaining the latest flow data for analysing flow components. Flow survey data should be carefully logged and the results should be interpreted by experienced professionals.

4. POPULATION AND EMPLOYMENT DATA

4.1 Population projections based on Working Group on Population Distribution (WGPD) papers, Outline Zoning Plans and Development Permission Area Plans issued by the Planning Department are good sources of reference of existing and projected population figures for sewerage planning. Census data are also useful in providing the baseline information. Employment projections and Quarterly Survey on Employment and Vacancies of Census and Statistics Department are sources of employment data.

4.2 Each Sewerage Master Plan or reviewed Sewerage Master Plan (both known as SMP) has taken into account the latest planning data available during the study period. As planning projections will be updated over time, users of SMP data should take account of all updated planning and development projections of the concerned catchment in planning sewage infrastructure.

4.3 New development plans are available from Government planning and engineering feasibility studies which are carried out from time to time for the continued development of Hong Kong. The results and recommendations of these studies play an important role in projecting the most likely development scenarios in terms of population and employment distribution. In formulating population and employment forecasts, latest findings of these studies should also be taken into account.

4.4 Available population data of the following categories for various planning horizons should be obtained for estimating sewage flows. Mobile residents are required to be considered while transient residents or visitors are not. The sewage flow of the latter are deemed to be taken into account in the related domestic sewage flows and sewage flows of commercial activities.

(a) Residential Permanent Housing Type

- Public rental housing
- Subsidised sales flat
- Private permanent housing

(b) Other Housing Type

- Non-domestic housing
- Institutional and special class building
- Temporary housing

(c) Mobile Residents

- Residents with indefinite periods of residence in Hong Kong

(d) Employment (**E**mployment categories and **J**ob types are shown in brackets)

- Manufacturing (E1) (J1)
- Electricity, Gas and Water (E2) (J2)
- Transport, Storage and Communication (E2) (J3)
- Wholesale and Retail Trades (E3) (J4)
- Import/Export Trades (E3) (J5)
- Financing, Insurance, Real Estate and Business Services (E4) (J6)
- Agriculture and Fishing (E5) (J7)
- Mining and Quarrying (E5) (J8)
- Construction (E5) (J9)
- Hotels, Restaurants and Boarding Houses (E5) (J10)
- Community, Social and Personal Services (E5) (J11)
- Public Administration (E5) (J12)

(e) School Places

- Students attending primary, secondary and tertiary education establishments

4.5 There are different systems of basic planning unit areas. The common ones include the Tertiary Planning Unit - Street Block (TPU-SB) system and the Planning Vision and Strategy (PVS) zoning. These basic planning unit areas have to be correlated to the sewerage catchment areas.

5. METHODOLOGY OF FLOW ESTIMATION

5.1 The methodology of flow estimation is shown diagrammatically in **Figure F-1**. In estimating flows arising from the existing sewered areas, field data should be taken into account as far as possible in order to identify industrial and ground water infiltration components which may not have adequately taken into account in flow parameters. Measured flow data can also be used for checking the calculated flows. Estimation of flows for new development will be more straightforward as it can be based on flow parameters in this GESF. In both cases, reference to the appropriate SMPs for particular catchment characteristics such as local inflow data should be made.

5.2 The methodology in **Figure F-1** shows a comprehensive picture of flow estimation and is by no means compulsory. Variations to this methodology and other acceptable methods with good justifications may also be considered.

5.3 Flows in Existing Sewerage System

5.3.1 The first step is to refer to the latest appropriate SMP to identify available field data and previous flow estimates. The requirements of carrying out flow survey to collect additional field data should then be established.

5.3.2 In conjunction with appropriate data on the contributing population, the field data will be used to identify various flow components, in particular, the ground water infiltration and industrial flow component.

5.3.3 The domestic, commercial and institutional flow components should be correlated against the flow parameters as a cross-check and adjusted as necessary. This can be achieved by comparing the measured flows against flows estimated from the contributing population and the per capita flow factors presented in Sections 7 to 9 of this GESF. Any discrepancy found may help to identify errors in assumption made or the omission of industrial discharges. The adjustment will also take account of any adjustment in per-capita sewage discharge up to the planning horizon. Water consumption data and reports from Water Supplies Department should also be made reference to in determining the right per-capita adjustment. Analysis of sewage load data will help verify the assumptions made as per-capita loads are generally less variable and independent of infiltration.

5.4 Flows in Sewerage for New Developments

5.4.1 The estimation of flows from new developments will simply be based on unit flow factors, peaking factors and the planning population figures. Recognized available flow data of similar development categories could also be used for reference in determining the average flow and peak flow, in particular for developments with specialized usage.

5.4.2 In estimating the existing and planning flows from a development for industrial or commercial uses, the worse case usage scenario of this development will need to be carefully considered.

5.5 Hydraulic Assessment Tools

5.5.1 Computer hydraulic modelling software packages have been developed for planning existing and new sewerage systems. The use of hydraulic modelling software in association with other database management systems and geographical information systems facilitates planning and asset management of the existing sewerage system.

5.5.2 In using computer hydraulic software packages, one must pay attention to the background theories, assumptions and limitations of the modelling software. An appropriate software package should be capable of correctly modelling backwater effects, tidal effects, bifurcations and looped sewer networks in addition to modelling conventional sewerage facilities such as pumps, storage tanks and overflow devices. Care must be taken in choosing the right software.

5.5.3 Sewerage systems are planned to accommodate peak flows. A correctly verified and validated hydraulic model which makes use of simulation techniques is a good means of assessing the hydraulic performance of the sewerage system for planning purposes. They are useful in particular in determining the requirement of mitigation works for the existing sewerage system. Hydraulic modelling requires expertise. Appropriate local and overseas hydraulic modelling guidelines, practice notes and standards should be observed in building and verifying hydraulic modelling.

5.6 Calculation Spreadsheets

5.6.1 If carrying out hydraulic modelling is proved to be unjustified or if new sewerage is planned, peak flows could be calculated as follows:

(a) Domestic/commercial/institutional:- using appropriate flow factors, peaking factors and flows specific to the local developments;

(b) Industrial:- using flow survey data, findings in SMPs and appropriate flow factors and peaking factors;

(c) Stormwater infiltration:- from flow survey data, recommendations and hydraulic models of SMP, the findings in relevant inflow/infiltration studies and the catchment inflow factors in this GESF.

5.7 Engineering Parameters

5.7.1 For engineering equations and parameters, such as, roughness values and head loss coefficients, for calculating capacities and flows in gravity sewers, reference to other engineering design manuals, literature on hydraulics and BS EN standards could be made.

6. SEWAGE FLOW PARAMETERS - GENERAL

6.1 Sewage flow parameters include unit flow factors (UFF), peaking factors (P) and catchment inflow factors (P_{CIF}). They were formulated based on data of Year 2002, which is known as the base year of planning parameters. Similar available data of years 2001 and 2003 were used for cross-reference purposes.

6.2 Sewage flow parameters were formulated based on the following information:

(a) unit flow surveys and verification results in reviewed sewerage master plans (as summary is presented in **Appendix I** together with other available reference figures),

(b) water consumption records at street block levels of years 2001, 2002 and 2003 and the general water consumption trend of the past 15 years,

(c) flow records of 28 selected major treatment works (with design flow >1000 m^3/day) of years 2001, 2002 and 2003

(d) the following PlanD's Territorial Population and Employment Data Matrices (TPEDM):

- TPEDM 2001 Base-year Estimates by PVS Zone (complied in March 2002)
- TPEDM 2002 Base-year Estimates by PVS Zone (complied in April 2003)
- TPEDM 2003 Base-year Estimates by PVS Zone (complied in April 2004)
- 2016 TPEDM by PVS Zone, Scenario II (complied in September 2002)
- Year X TPEDM by PVS Zone (updated in October 2001, residential updated in August 2002)

(e) licensed discharge quantities of different trades of Hong Kong of year 2003,

(f) the latest categorization of housing types and planning areas (338 PVS zones) adopted in TPEDM, and

(g) WSD's Departmental Instruction No. 1309 and Resource Planning Report No. 4/2000

(h) DSD's Research and Development Report No. RD 1011, May 2004

6.3 Unless specified, flow parameters are for general application to all areas of Hong Kong for estimating sewage flows for residents, students and employees on a per-capita basis. Catchment specific UFFs can be applied to catchments other than those 28 catchments considered in this GESF if similarity in catchment characteristics

can be established.

6.4 Industrial flows vary significantly from one industry type to another. These flows are best estimated by flow surveys in particular during planning for local sewerage. The catchment-dependent UFFs for industrial employees included in this GESF are provided to facilitate planning at the catchment level. These UFFs should be applied with caution. Some extraordinary UFFs of local industrial areas are also included for reference.

6.5 Sewage flow parameters are directly applicable to major sewerage facilities and catchment level sewage infrastructure planning. At the local sewerage level, the worse case scenario of every new development and its neighbouring premises will need to be carefully considered on a case by case basis in particular in using the more specific proposed UFFs for commercial activities.

6.6 From the per-capita consumption (PCC) rate analyses in WSD's and DSD's reports, the recorded PCC rates of public rental and R1 residents show that the rates have only been varying in a narrow range during the past decade. There is no apparent increasing trend in the fresh water consumption measurements. This concurs with the stabilised trend of per-capita water consumption rates of other developed cities. To avoid incorporating unnecessary allowances for planning, the planning per-capita UFFs are taken to be the same as those stabilized existing UFFs of residential, commercial and industrial discharges for sewage infrastructure planning.

6.7 PVS zones within each of the 28 major sewage catchment were identified for the year 2002 scenario and for the projected most probable future developed scenario were identified and shown in **Appendix II.** For detailed layout and boundaries of each catchment, please refer to SMPs.

7. UNIT FLOW FACTORS – DOMESTIC FLOWS

7.1 The recommended unit flow factors for domestic flows for use in planning are shown in **Table T-1.** The derivations and justifications are included in **Appendix III**.

7.2 The categorization of residential populations makes reference to the categories of residential populations adopted in the projected population and employment data provided by the PlanD.

7.3 The unit flow factors of R2 to R4 types of residents are in general different from that of R1 and public rental residents. Different catchments have different compositions of these types of residents. Based on the proportion of each residential type in PlanD's population and employment data, the 2001 Census data and the population data in the latest SMP reports, the average general equivalent UFF of residents of permanent residential housing type and other housing type for each catchment are provided in **Appendix IV** and are also summarized in **Table 1**. The recommended housing type specific UFFs are always preferred than the catchment specific UFFs, which were formulated based on housing mix projected in SMPs and are subject to possible planning changes.

Table T-1 : Unit Flow Factors for Domestic Flows

	Unit	Datum (2002) (m^3/day)	Increase per Annum (m^3/day)	Planning for Future ($m^{3/}$day)
Domestic (housing type specific)				
Public rental		0.190	-	0.190
Private R1	person	0.190	-	0.190
R2	person	0.270	-	0.270
R3	person	0.340	0.003	0.370
R4	person	0.340	0.003	0.370
Traditional village	person	0.150	-	0.150
Modern village	person	0.270	-	0.270
Institutional and special class	person	0.190	-	0.190
Temporary and non-domestic	person	0.150	-	0.150
Mobile residents	person	0.190	-	0.190
Domestic (catchment specific)				
General- Permanent housing (for catchment wide planning)				
- Sandy Bay	person	0.320	0.003	0.350
- Stanley, Discovery Bay	person	0.290	-	0.290
- Shek O	person	0.280	0.007	0.350
- Outlying Islands, Sai Kung	person	0.260	0.001	0.270
- Yuen Long, Mui Wo	person	0.230	0.002	0.250
- Aberdeen, Wan Chai, North Lantau	person	0.230	-	0.230
- Sha Tin, Tai Po	person	0.210	-	0.220
- San Wai	person	0.200	0.003	0.230
-Wah Fu, Shek Wu Hui	person	0.200	0.001	0.210
- Northwest Kowloon, Tuen Mun, Central, North Point	person	0.200	-	0.200
- Ap Lei Chau, Chai Wan, Shau Kei Wan, Central Kowloon, East Kowloon, Kwai Chung, Tsing Yi, Tseung Kwan O	person	0.190	-	0.190
General- Other housing (for catchment wide planning)				
- All catchments	person	0.175	-	0.175

Notes of Table T-1:

(1) For planning a new sewerage system, the planning unit flow factors should be used. Adequate allowance should be provided in the proposed sewerage system to ensure that the sewerage system will be adequate for the worst possible future development scenarios.

(2) Permanent housing comprises public rental housing, subsidized sales flats and private permanent housing (R1, R2, R3 and R4). Other housing consists of non-domestic, institutional & special classes, and temporary housing.

8. UNIT FLOW FACTORS – COMMERCIAL AND INSTITUTIONAL FLOWS

8.1 Commercial flows comprise flows due to commercial activities and due to employees. Flows from Job types J2 – J12 are classified as commercial flows. The unit flow factors of the 11 Job types are provided in **Table T-2** below. The derivation of the UFFs of employees and students were presented in **Appendix III.**

Table T-2 : Unit Flow Factors of Commercial Flows and Student Flows

	Unit (per)	Datum (2002) (m^3/day)	Increase per Annum (m^3/day)	Planning for Future (m^3/day)
Commercial Employee	employee	0.080	-	0.080
Commercial activities				
(a) Specific trades:				
J2 Electricity Gas & Water	employee	0.250	-	0.250
J3 Transport, Storage & Communication	employee	0.100	-	0.100
J4 Wholesale & Retail	employee	0.200	-	0.200
J5 Import & Export	employee	-	-	-
J6 Finance, Insurance, Real Estate & Business Services	employee	-	-	-
J7 Agriculture & Fishing	employee	-	-	-
J8 Mining & Quarrying	employee	-	-	-
J9 Construction	employee	0.150	-	0.150
J10 Restaurants & Hotels	employee	1.500	-	1.500
J11 Community, Social & Personal Services	employee	0.200	-	0.200
J12 Public Administration	employee	-	-	-
(b) General –territorial average	employee	0.200	-	0.200
School student	person	0.040	-	0.040

Notes of Table T-2:

(1) For planning of a new sewerage system, the planning unit flow factors should be used and the worst possible combination of commercial flows for the future development scenarios should be considered to ensure that the sewerage system under planning will be sustainable.

(2) For job types J10 and J11, the "per-employee" unit flow factor takes into account the flows of customers and/or tenants.

(3) The total unit flow generated from an employee in a particular trade is the sum of the unit flow factor of employee and the unit flow factor of commercial activities of a particular trade under consideration.

9. UNIT FLOW FACTORS – INDUSTRIAL FLOWS

9.1 Industrial flows vary significantly from one industry to another. Industrial flows are best estimated based on flow survey data and water consumption data.

9.2 Based on water consumption records and discharge licenses, catchment-wide unit flow factors for manufacturing employees are provided in **Table T-3**. The unit flow factor of each manufacturing employee in the catchment of a treatment plant is the average per-employee industrial discharge of all manufacturing employees within that catchment at the stated planning horizon. For obtaining the characteristics of industrial flows of a particular local area, flow surveys are always recommended and reference to available good survey data in relevant SMPs should be made. The unit flow factors in **Table T-3** should be mainly used for planning catchment-wide facilities although they could form a basis for verifying the actual industrial flow against local flow survey data. Caution must be taken in directly applying these industrial UFFs for local sewerage planning purposes.

9.3 **Appendix VI** shows the derivations and justifications of the catchment-dependent UFFs for industrial flows.

Table T-3 : Unit Flow Factors for Industrial Flows

	Unit	Datum (2002) (m^3/day)	Increase per Annum (m^3/day)	Planning for Future (m^3/day)
Industrial employee	employee	0.080		0.080
Industrial activities J1 Manufacturing		See Note 1		See Note 1
- Territorial average	employee	0.560	-	0.560
- Hong Kong Island (except Aberdeen & Ap Lei Chau), San Po Kong(3)	employee	0.250	-	0.250
- North West Kowloon	employee	0.350	-	0.450
- East Kowloon (everall), Sha Tin, Lantau Island (except Mui Wo)	employee	0.450	-	0.450
- Cental Kowloon, North District, Aberdeen, Ap Lei Chau	employee	0.550	-	0.550
- Tsuen Wan, Kwai Chung	employee	0.650	-	0.650
- Tai Po	employee	0.750	-	0.750
- Tuen Mun, Tseung Kwan O, Yau Tong(3), Cheung Chau, Mui Wo	employee	1.000	-	1.000
- Tsing Yi	employee	1.500	-	1.500
- Sai Kung, Yuen Long	employee	2.000	-	2.000

Notes of Table T-3:

(1) Quantities of industrial discharges depend on the natures of individual industries. Local industrial discharges may vary significantly from one industrial premises to another and are best determined by updated flow survey data and water consumption records. The catchment-dependent unit flow factors for industrial flows in this table provide a means to estimate industrial flows for a catchment-wide sewerage facility, such as sewage treatment works and major sewage pumping stations. They may form a basis for refinement and adjustments when suitable latest survey results and water consumption data are available. They would be subject to periodic updates of EPD. As the actual per-employee unit flow factor of any local industrial area may vary significantly from these unit flow factors, caution must be taken in applying these factors direct to any local individual industrial premises.

(2) The total unit flow generated from an employee in a particular trade is the sum of the flows due to the employee and the unit flow factor for a particular trade under consideration.

(3) Yau Tong and San Po Kong are sub-catchments of the East Kowloon catchment. Figures are provided for reference for planning local sewage infrastructure.

10. CATCHMENT INFLOW FACTORS

10.1 Catchment Inflow Factors (P_{CIF}) are shown in **Table T-4** below. They are catchment-dependent and applicable to major sewerage facilities of a catchment. They indicate the net overall ingress of water or waste water to the sewerage system. They are not applicable to new catchments which are deemed to be free from misconnections and pipe defects. Caution must be taken in applying the P_{CIF} to sub-catchment sewerage. Flow measurement surveys would be required to confirm and identify the most appropriate P_{CIF} for estimating the average flow of a local sewerage facility.

Table T-4 : Catchment Inflow Factors, P_{CIF}

Catchment	Catchment Inflow Factor
Central, North Point, Sandy Bay, Wan Chai, Wah Fu, Stanley, Cental Kowloon, Yuen Long, San Wai, North District, Tai Po, North Lantau, Mui Wo	1.00
Chai Wan, Tuen Mun, Kwai Chung, Tsing Yi, East Kowloon	1.10
Sha Tin	1.15
Tseung Kwan O	1.20
Shau Kei Wan	1.25
Aberdeen, Ap Lei Chau, Sai Kung, North West Kowloon	1.30
Cheung Chau, Shek O	1.50

Notes of Table T-4:

(1) Catchment inflow factors will be updated regularly by EPD.

(2) For calculating the total peak flow from a new development area within a catchment of high inflow factors, the catchment inflow factor may not be applicable to the new development. However, it will be applicable in assessing the downstream existing sewerage facilities.

10.2 For some minor catchments not included in the list, the P_{CIF} needs to be further investigated based on historical flow records of sewerage facilities or applying that of a similar catchment with adjustments.

10.3 Based on the Population and Employment Data of 2002 Base-Year Estimates by PVS Zones and the approach in this GESF, the total average flows of 28 major sewage catchments are calculated in **Appendix VII**. Average flows calculated using SM1 and measured average flows are provided for reference and comparison.

10.4 The P_{CIF} is to broadly address the extent of the overall net excessive inflow situation of every catchment. It neither serves the purpose of estimating the exact total quantity of inflow of each catchment nor serves as a guideline for designing combined sewerage system. P_{CIF} figures higher than 1.5 are generally not recommended. Investigation and mitigation works for diverting storm water and tidal sea water from the sewerage system should be carried out for catchments with extraordinarily high P_{CIF} as soon as possible. For catchments with required P_{CIF} slightly higher than 1.5, the peaking factor would serve as another level of protection during assessing the peak sewage flow quantity that the related sewerage facility is projected to received.

11. PEAKING FACTORS

11.1 Peak flows are cumulative results of a combination of factors such as diurnal and seasonal flow variations of flow components, and characteristic response of inflow and base flows to storm events.

11.2 Verified and validated hydraulic models which make use of suitable diurnal flow patterns and storm profiles are good means to determine the peak flows. For major sewerage planning works and mitigation identification works, in particular those involving existing sewerage systems, peak flows determined from computer hydraulic modelling and simulation would be more realistic than those from multiplying ADWF figures by peaking factors and therefore would be preferred. Appropriate standards, procedures and requirements in local and overseas modelling guidelines and practice notes should be referred to in carrying out hydraulic modeling.

11.3 Determination of the peak flow using validated hydraulic models is in general the preferred method. If there are acceptable reasons, peak flows can alternatively obtained by using the following formula:

$$Q_{PEAK} = Q_{AVERAGE} \times P,$$

where Q_{PEAK} is the peak flow,
$Q_{AVERAGE}$ is the average dry weather flow, and
P is the peaking factor

11.4 Peaking factors account for the peak flows and provide adequate safety margin in planning sewerage facilities. The recommended peaking factors are shown in **Table T-5**. For contributing populations greater than 50,000, **Figure F-2** and **Figure F-3** show graphically the peaking factors for sewers and for sewage treatment facilities respectively. A brief analysis of the recommended peaking factors is included in

Appendix VIII for reference**.**

11.5 Under normal situation, peaking factors (excluding stormwater allowance) are applicable to planning sewerage facilities receiving flow from new upstream sewerage systems which essentially have no misconnections and defects for infiltration. If there is doubt about the service conditions of the upstream sewerage systems for the planning horizons under consideration, peaking factors (including stormwater allowance) should be used.

Table T-5 : Peaking Factors, P

Population Range	**Peaking Factor (including stormwater allowance) for facility with existing upstream sewerage**	**Peaking Factor (excluding stormwater allowance) for facility with new upstream sewerage**
(a) For sewers		
<1,000	8	6
1,000 – 5,000	6	5
5,000 – 10,000	5	4
10,000 – 50,000	4	3
>50,000	$\text{Max}\left(\frac{7.3}{N^{0.15}}, 2.4\right)$	$\text{Max}\left(\frac{6}{N^{0.175}}, 1.6\right)$
(b) Sewage Treatment Works, Preliminary Treatment Works and Pumping Stations		
<10,000	4	3
10,000 – 25,000	3.5	2.5
25,000 – 50,000	3	2
>50,000	$\text{Max}\left(\frac{3.9}{N^{0.065}}, 2.4\right)$	$\text{Max}\left(\frac{2.6}{N^{0.065}}, 1.6\right)$

Notes of Table T-5:

(1) N is the contributing population in thousands.

11.6 Peaking factors for sewers in **Table T-5** are only applicable to sewerage facilities which collect predominantly gravity flows. If significant portions of the flow received by a sewage facility are pumped flows, the cumulative effects of peak pumped flows are required to be considered in estimating the total flows.

11.7 The recommended peaking factors are not applicable to the tunnel systems of the Harbour Area Treatment Scheme (HATS), the design and planning of which were considered separately in Environmental & Engineering Feasibility Assessment Studies in relation to the way forward for the HATS.

12. CONTRIBUTING POPULATION

12.1 The contributing population is defined below. Essentially, the average UFF of all a typical R1 resident plus the typical UFF of employee (ie., 0.190 + 0.080 = 0.270m^3/person/day) is taken as the unit contributing flow.

$$\text{Contributing Population} = \frac{\text{Calculated total average flow } (m^3/\text{day})}{0.27\ (m^3/\text{person/day})}$$

13. BROAD IMPLICATIONS OF THE GUIDELINES ON MAJOR SEWERAGE FACILITIES

13.1 The recommended methodology and approach of flow estimation in this GESF are slightly different from those adopted in the SM1. Some preliminary validation of the recommended UFFs is included in **Appendix IX**. Discussions and comparisons of projected flows of major catchments estimated under these Guidelines and SM1 are provided in **Appendix X**.

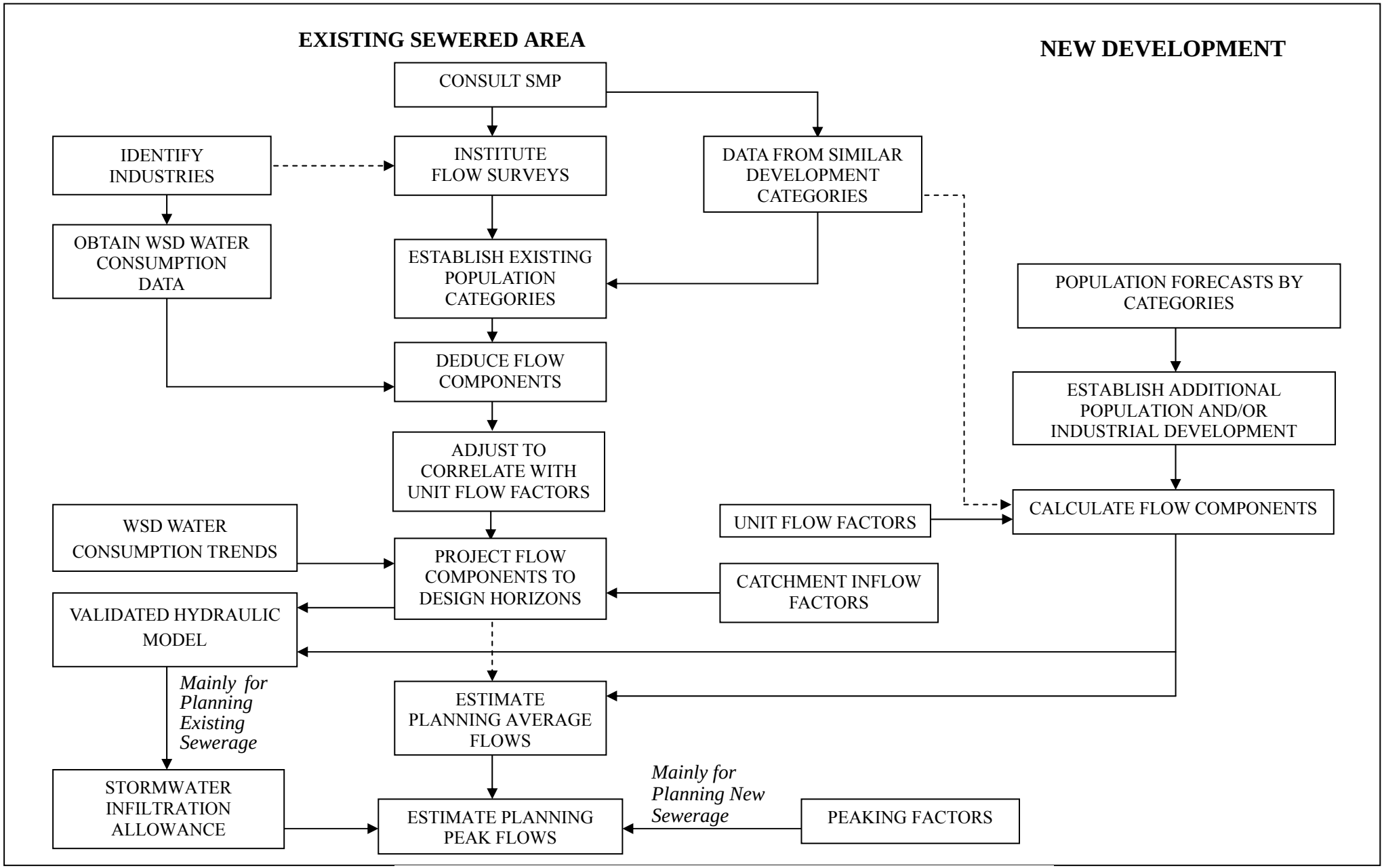


Figure F-1: Methodology for Flow Estimation

Figure F-2 : Peaking Factors for Sewers
- Contributing Populations Exceeding 50,000

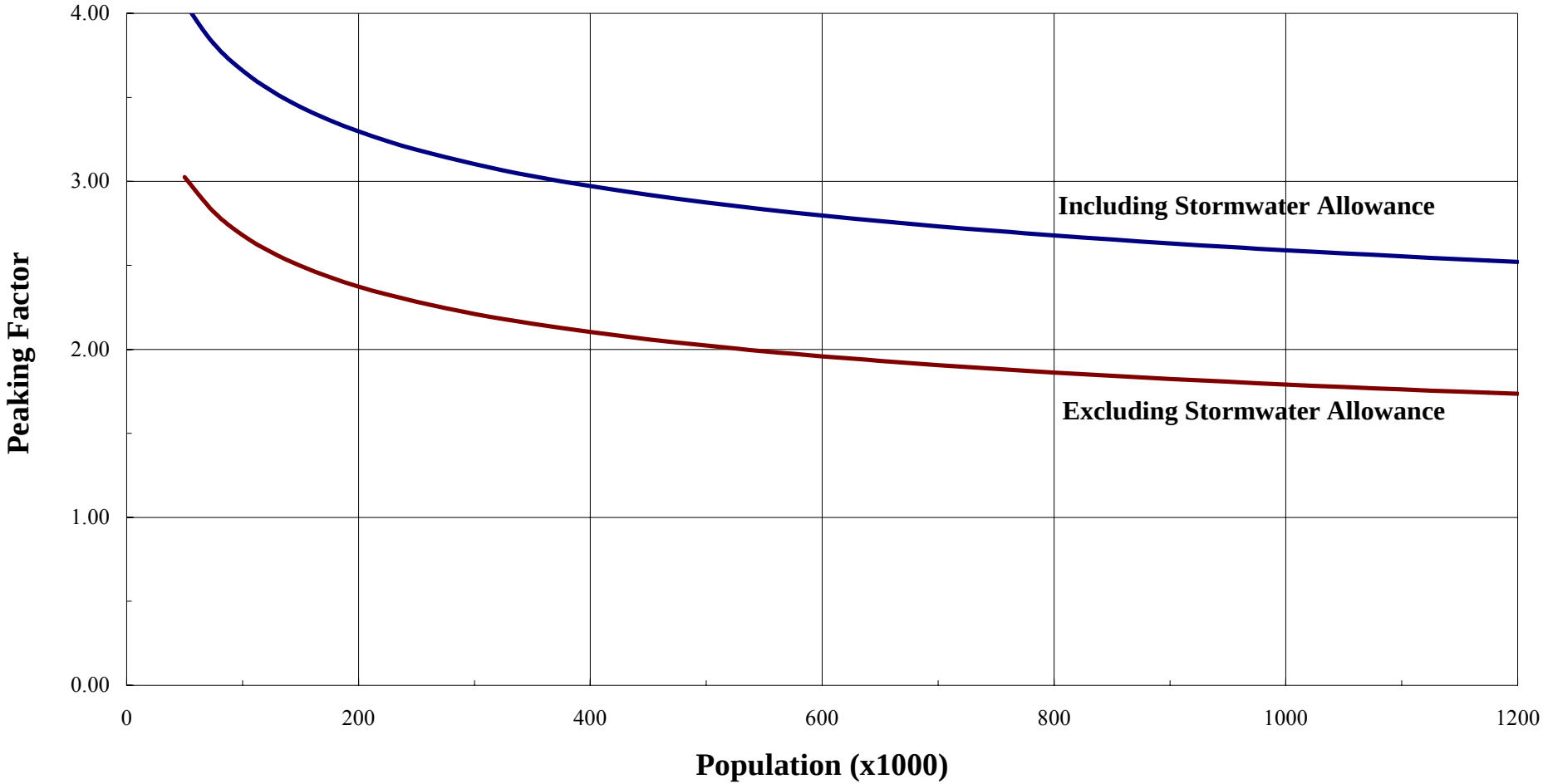
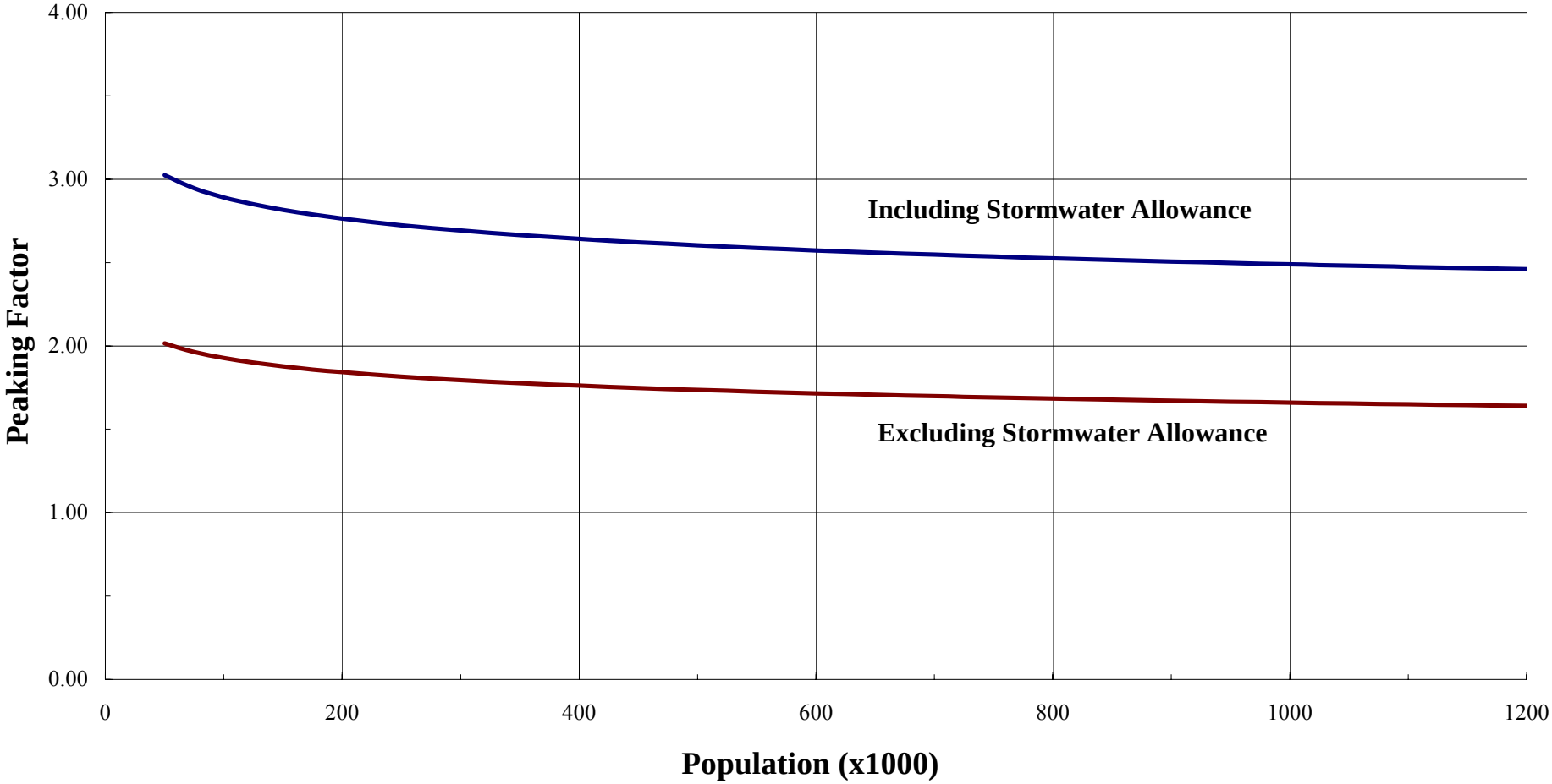


Figure F-3: Peaking Factors for Sewage Treatment Works, Preliminary Treatment Works and Pumping Stations -Contributing Populations Exceeding 50,000



Appendix I

Comparison of Surveyed Unit Flow Factors (including flow due to employee) in Reviewed Sewerage Master Plans (l/person/day)

Type	RHKISMP (Quoted Previous surveys)	RHKISMP (Survey-based UFF)	RCEKSMP (WP No. 2)	OISMP2R	RND&THSMP (model User Manual)-Sha Tin	RND&THSMP (model User Manual)-Tai Po	RND&THSMP (model User Manual)-Sheung Shui/ Fanling	Review of Sewage UFF and PF through flow gauging (1999)	DSD Research and Development Report No. RD 1011	Waste-water Engineering (Metcalf & Eddy)
Temporary	-	150	150		150	150	150			
Public Rental	168	180	175	175	175	175	175	152~168	150~170	
R1	181	180	190		240	160~240	240	104~319	160~180	194-335 for 3-p household
R2	254	250	273		200~276	200	200	277	250~265	
R3	417	300~345	370		370	100~300	100~300	284~550	300~330	
R4	-	-	370		370	100~300	100~300	284~550		
Traditional Village			150	175	150	150	150			
Modern village		180	238	240	240	240	240			
Employee	-		-	60	-	-	-			50(off)~75(ind)
J1 (E1) manufacturing	-		500~2100		89~1000	73~5250	660	Interim Guidelines		
J2 (E2) utilities	-	90~200	280	286	200~600	318	350			
J3 (E2) transport	-	90~200	280	286	200~600	318	350			
J4 (E3) wholesale/retail	-	90~200	280	286	200~600	318	350			
J5 (E4) Import/Export	88	90~200	280	286	200~600	318	350			
J6 (E4) finance	88	90~200	280	286	200~600	318	350			
J7 (E5) agriculture/fish.	-	90~200	280	286	200~600	318	350			
J8 (E5) mining/quarry.	-	90~200	280	286	200~600	318	350			
J9 (E5) construction	-	90~200	280	286	200~600	318	350			
J10 (E5) restaurant/hotel	780	1600	280/440	286	830/room/d	830/room/d	830/room/d			1000/bed
J11 (E5) commu./per.serv.	423	90~200	280	286	200~600	318	350			
J12 (E5) public admin.	88	90~200	280	286	200~600	318	350	125		
Institutional/School	-	25	20	286	25	25	25			
Hospital						1250	1250			

Legend:

600/bed 1250

RHKISMP : Review of Hong Kong Island Sewerage Master Plans

RCEKSMP : Review of Central and East Kowloon Sewerage Master Plans

OISMP2R : Outlying Island Sewerage Master Plan Stage 2 Review

RND&THSMP : Review of North District and Tolo Harbour Sewerage Master Plans

Appendix II

PVS Zones of 28 Major Sewage Catchments in 2002 and in 2016/Future Developed Scenario

STW/ PTW	338 PVS Zone No.	Assumed proportion of sewage flow of PVS served by the PTW/STW in 2002	Assumed proportion of sewage flow of PVS served by the PTW/STW in 2016/future scenario	Remark
Central PTW	001	1.00	1.00	
	002	1.00	1.00	
	003	1.00	1.00	
	004	1.00	1.00	
	005	1.00	1.00	
	006	1.00	1.00	
	007	1.00	0.70	
	008	1.00	1.00	
	009	1.00	0.00	
	010	0.80	0.00	
	012	1.00	1.00	
	013	0.70	0.80	
	041	0.00	0.00	
	042	0.00	0.10	
	291	1.00	1.00	
	292	1.00	1.00	
	293	1.00	1.00	
	233	1.00	1.00	Green Island
	234	1.00	1.00	Green Island
	294	0.90	0.00	
	295	1.00	0.80	
Wan Chai West PTW (Whole catchment proposed to discharge to Wan Chai East PTW ultimately)	010	0.20	0.00	
	011	1.00	0.00	
	013	0.30	0.00	
	014	1.00	0.00	
	015	0.70	0.00	
	016	1.00	0.00	
	017	0.20	0.00	
	040	0.35	0.00	
	041	0.20	0.00	
	237	1.00	0.00	C&WC Reclamation
	238	1.00	0.00	C&WC Reclamation
	294	0.10	0.00	
	295	0.00	0.00	
	296	1.00	0.00	
	297	0.00	0.00	
	298	0.10	0.00	
	299	1.00	0.00	
	325	1.00	0.00	C&WC Reclamation
Wan Chai East PTW	007	0.00	0.30	Ult. 30% from Wan Chai W
	009	0.00	1.00	Ult. 100% from Wan Chai W
	010	0.00	1.00	Ult. 100% from Wan Chai W
	011	0.00	1.00	Ult. 100% from Wan Chai W
	013	0.00	0.20	Ult. 20% from Wan Chai W
	014	0.00	1.00	Ult. 100% from Wan Chai W
	015	0.30	1.00	Ult. 70% from Wan Chai W
	016	0.00	1.00	Ult. 100% from Wan Chai W
	017	0.80	1.00	Ult. 20% from Wan Chai W
	018	1.00	1.00	
	019	1.00	1.00	
	020	0.10	0.10	
	036	1.00	0.20	
	037	1.00	0.20	
	038	1.00	1.00	
	039	1.00	1.00	
	040	0.35	0.70	Ult. 35% from Wan Chai W
	041	0.00	0.10	Ult. 10% from Wan Chai W
	237	0.00	1.00	Ult. 100% from Wan Chai W

	238	0.00	1.00	Ult. 100% from Wan Chai W
	294	0.00	1.00	Ult. 100% from Wan Chai W
	295	0.00	0.20	Ult. 20% from Wan Chai W
	296	0.00	1.00	Ult. 100% from Wan Chai W
	297	1.00	1.00	
	298	0.90	1.00	Ult. 10% from Wan Chai W
	299	0.00	1.00	Ult. 100% from Wan Chai W
	325	0.00	1.00	Ult. 100% from Wan Chai W
	326	1.00	1.00	
North Point PTW	018	0.00	0.00	
	020	0.90	0.90	
	021	1.00	1.00	
	022	1.00	1.00	
	023	1.00	1.00	
	024	1.00	1.00	
	025	1.00	1.00	
	035	1.00	1.00	
	036	0.00	0.80	
	037	0.00	0.80	
	053	0.00	0.00	
	228	0.50	0.50	
Stanley STW	052	1.00	1.00	
	053	0.40	0.50	
Shek O PTW	053	0.25	0.40	
Chai Wan PTW	030	1.00	1.00	
	032	1.00	1.00	
	033	1.00	1.00	
	034	1.00	1.00	
Shau Kei Wan PTW	026	1.00	1.00	
	027	1.00	1.00	
	028	1.00	1.00	
	029	1.00	1.00	
	031	1.00	1.00	
	053	0.00	0.00	
	228	0.50	0.50	
Ap Lei Chau PTW	048	1.00	1.00	
	230	1.00	1.00	
Aberdeen PTW	040	0.30	0.30	
	041	0.45	0.45	
	044	1.00	1.00	
	045	0.20	0.20	
	046	1.00	1.00	
	047	1.00	1.00	
	049	1.00	1.00	
	050	1.00	1.00	
	051	1.00	1.00	
Sandy Bay PTW	042	0.90	0.90	
Wah Fu PTW	041	0.35	0.35	
	045	0.80	0.80	
To Kwa Wan PTW	054	1.00	1.00	
	055	1.00	1.00	
	056	1.00	1.00	
	057	1.00	1.00	
	058	0.00	0.05	
	059	0.05	0.05	
	062	1.00	1.00	
	068	1.00	1.00	
	069	1.00	1.00	
	070	1.00	1.00	
	071	1.00	1.00	
	072	1.00	1.00	
	073	0.25	0.25	
	075	1.00	1.00	
	076	1.00	1.00	
	077	1.00	1.00	
	078	0.50	0.50	
	097	0.15	0.15	
	098	1.00	1.00	
	099	1.00	1.00	

	100	1.00	1.00	
	102	0.90	0.90	
	103	0.60	0.60	
	104	1.00	1.00	
	110	1.00	1.00	SEKD
	254	0.75	0.75	SEKD
	260	1.00	1.00	SEKD
	275	1.00	1.00	
	278	1.00	1.00	SEKD
	300	1.00	1.00	
	301	1.00	1.00	
	302	1.00	1.00	
	304	0.70	0.70	
	305	0.60	0.60	
	306	1.00	1.00	SEKD
	335	1.00	1.00	SEKD
Kwun Tong PTW	101	1.00	1.00	
	102	0.10	0.10	
	103	0.40	0.40	
	104	0.00	0.00	
	105	1.00	1.00	
	106	1.00	1.00	
	107	1.00	1.00	
	108	1.00	1.00	
	109	1.00	1.00	
	111	1.00	1.00	
	112	1.00	1.00	
	113	1.00	1.00	
	114	1.00	1.00	
	115	1.00	1.00	
	116	1.00	1.00	
	117	1.00	1.00	
	118	1.00	1.00	
	119	1.00	1.00	
	120	1.00	1.00	
	121	1.00	1.00	
	122	1.00	1.00	
	123	1.00	1.00	
	124	1.00	1.00	
	125	1.00	1.00	
	126	1.00	1.00	
	127	1.00	1.00	
	128	1.00	1.00	
	129	1.00	1.00	
	219	0.10	0.10	
	253	1.00	1.00	SEKD
	254	0.25	0.25	SEKD
	304	0.30	0.30	
	305	0.40	0.40	
	307	1.00	1.00	
	308	1.00	1.00	
	309	1.00	1.00	
	336	1.00	1.00	SEKD
	337	1.00	1.00	SEKD
North West Kowloon PS/PTW	058	1.00	0.95	
	059	0.95	0.95	
	060	1.00	1.00	
	061	1.00	1.00	
	063	1.00	1.00	
	064	1.00	1.00	
	065	1.00	1.00	
	066	1.00	1.00	
	067	1.00	1.00	
	073	0.75	0.75	
	074	1.00	1.00	
	078	0.50	0.50	
	079	1.00	1.00	
	080	1.00	1.00	
	081	1.00	1.00	

	082	1.00	1.00	
	083	1.00	1.00	
	084	1.00	1.00	
	085	1.00	1.00	
	086	1.00	1.00	
	087	1.00	1.00	
	088	1.00	1.00	
	089	1.00	1.00	
	090	1.00	1.00	
	091	1.00	1.00	
	092	1.00	1.00	
	093	1.00	1.00	
	094	1.00	1.00	
	095	1.00	1.00	
	096	1.00	1.00	
	097	0.85	0.85	
	235	1.00	1.00	
	236	1.00	1.00	
	255	1.00	1.00	
	256	1.00	1.00	
	271	1.00	1.00	
	272	1.00	1.00	
	273	1.00	1.00	
	274	1.00	1.00	
	276	1.00	1.00	
	277	0.10	0.10	
	303	1.00	1.00	
Tseung Kwan O PS	219	0.10	0.25	
	220	1.00	1.00	
	221	1.00	1.00	
	222	1.00	1.00	
	223	1.00	1.00	
	224	1.00	1.00	
	225	1.00	1.00	
	229	0.20	1.00	
	262	1.00	1.00	
	263	1.00	1.00	
	264	1.00	1.00	
	267	1.00	1.00	
	324	1.00	1.00	
	329	1.00	1.00	
San Wai STW	172	1.00	1.00	Hung Shui Kiu
	173	1.00	1.00	Tong Yan San Tsuen
	174	0.00	1.00	Ha Tsuen & Lau Fau Shan
	175	1.00	1.00	Tin Shui Wai
	176	1.00	1.00	Tin Shui Wai
	177	0.35	0.35	Yuen Long Town
	178	1.00	1.00	Yuen Long Town
	179	0.00	1.00	Yuen Long Town
	180	0.00	1.00	Yuen Long Town
	181	0.00	1.00	Tai Tong
	261	1.00	1.00	Tin Shui Wai
	280	1.00	1.00	Tin Shui Wai
	281	1.00	1.00	Tin Shui Wai
	313	1.00	1.00	Ping Shan
	314	1.00	1.00	Yuen Long Town
	315	1.00	1.00	Yuen Long Town
	317	0.00	0.50	Kam Tin
	318	0.00	1.00	Kam Tin
Yuen Long STW	177	0.65	0.65	Yuen Long Town
	182	0.00	1.00	Kam Tin
	183	0.00	1.00	Fairview & Nam Sang Wai
	184	0.00	0.80	Pat Heung, Shek Kong
	232	1.00	1.00	Wang Chau
	316	0.00	1.00	Kam Tin
	317	0.00	0.50	Kam Tin
	318	0.00	0.00	Kam Tin
	331	0.00	1.00	Ngau Tam Mei
	332	0.00	1.00	Ngau Tam Mei

	333	0.00	1.00	Ngau Tam Mei
	334	0.00	1.00	San Tin
Sai Kung STW	219	0.35	0.65	
Tai Po STW	184	0.00	0.20	
	193	0.00	0.00	
	194	1.00	1.00	
	195	0.60	1.00	Lam Tsuen Connection
	196	1.00	1.00	
	197	1.00	1.00	
	198	1.00	1.00	
	199	0.90	0.90	Pak Shek Kok
	330	0.10	0.80	Ting Kok Road Connection
Shatin STW	199	0.10	0.10	Pak Shek Kok
	200	0.00	0.00	
	201	1.00	1.00	
	202	1.00	1.00	
	203	1.00	1.00	
	204	0.80	0.90	
	205	1.00	1.00	
	206	1.00	1.00	
	207	1.00	1.00	
	208	1.00	1.00	
	209	1.00	1.00	
	210	1.00	1.00	
	211	1.00	1.00	
	212	1.00	1.00	
	213	1.00	1.00	
	214	1.00	1.00	
	215	1.00	1.00	
	216	1.00	1.00	
	217	1.00	1.00	
	218	0.80	1.00	Sai Sha Road Extension
	219	0.00	0.00	Part of Sai Kung
	231	1.00	1.00	
	322	0.90	1.00	
	323	1.00	1.00	
Pillar Point STW	157	1.00	1.00	
	158	1.00	1.00	
	159	1.00	1.00	
	160	1.00	1.00	
	161	1.00	1.00	
	162	1.00	1.00	
	163	1.00	1.00	
	164	1.00	1.00	
	165	1.00	1.00	
	166	1.00	1.00	
	167	1.00	1.00	
	168	1.00	1.00	
	169	1.00	1.00	
	170	1.00	1.00	
	171	1.00	1.00	
	258	1.00	1.00	
	259	1.00	1.00	
	312	1.00	1.00	
Kwai Chung PTW	130	1.00	1.00	
	131	1.00	1.00	
	132	1.00	1.00	
	133	1.00	1.00	
	134	1.00	1.00	
	135	1.00	1.00	
	136	1.00	1.00	
	137	1.00	1.00	
	138	1.00	1.00	
	139	1.00	1.00	
	140	1.00	1.00	
	141	1.00	1.00	
	142	1.00	1.00	
	143	1.00	1.00	
	144	1.00	1.00	

	145	1.00	1.00	
	146	1.00	1.00	
	147	1.00	1.00	
	148	1.00	1.00	
	149	1.00	1.00	
	150	1.00	1.00	
	151	1.00	1.00	
	277	0.90	0.90	
	310	1.00	1.00	
	311	1.00	1.00	
Tsing Yi PTW	152	1.00	1.00	
	153	1.00	1.00	
	154	1.00	1.00	
	155	0.00	0.00	
	257	1.00	1.00	
Shek Wu Hui STW	185	0.00	0.80	
	186	0.00	0.30	Remote area
	187	0.00	0.00	
	188	1.00	1.00	
	189	1.00	1.00	
	190	1.00	1.00	
	191	1.00	1.00	
	192	0.50	0.80	NENT Connection
	193	0.40	0.80	Remote area
	319	0.00	0.00	
	320	0.00	0.00	
	321	0.00	0.80	Eastern trunk connection
Cheung Chau STW	243	0.50 (res), 1.00 (emp)	1.00	
Mui Wo STW	244	0.80 (res), 1.00 (emp)	1.00	
	328	0.80 (res), 1.00 (emp)	1.00	
Siu Ho Wan STW	239	0.00	1.00	Yam O
	240	0.00	1.00	Container Terminal
	241	0.00	1.00	Discovery Bay
	245	1.00	1.00	
	246	1.00	1.00	
	247	1.00	1.00	Airport
	265	0.95	1.00	
	266	1.00	1.00	
	282	1.00	1.00	
	283	0.95	1.00	
	284	0.95	1.00	
	327	0.00	1.00	Disneyland
	338	0.00	1.00	Ma Wan

Note 1: Proportion figures varies from 2002 to 2016/future scenario are highlighted.

Note 2: The following PVS's are not included in the above as remarked

PVS	Remark
043	Cyber Port
156	Sham Tseng
226	Tai O
227	Po Toi Island
242	Peng Chau
251	Lamma Island
268-270	Reserved
285-290	Cross-Boundary Zone
248-250, 252, 279	Sea Zone

Unit Flow Factors of Typical Domestic Residents, Employees and Students

Unless otherwise stated, the following figures are based on WSD's metered fresh water consumption rates of years 2001 to 2003 and the PlanD's population and employment data by PVS Zones for years 2001 to 2003. Year 2003 is considered as a non-typical year because of the outbreak of SARS at the beginning of the year. The per-capita water consumption figures of resident were in general slightly higher than years 2001 and 2002.

From the supply side, the water consumption and population growth in the past 15 years are shown in **Table T-1** below. It can be seen that the overall per-capita consumption figure remains fairly constant during the past 10 years after a lot of industries have been migrated to the mainland. It is recommended that unless other apparent water consumption trends of individual population categories are observed, no growth in per capita unit flow factors is required beyond the base year.

Table III(a) – Water Consumption and Population of Hong Kong in the Past 15 Years

Calendar Year	Fresh Water Daily Average (Mm^3)	Salt Water Daily Average (Mm^3)	Total Water Daily Average (Mm^3)	Population of Hong Kong (million)	Total Daily Water Consumption per capita (m^3/person)
1986	1.93	***0.28***	2.21	5.495	0.402
1991	2.42	0.34	2.76	5.674	0.486
1996	2.54	0.51	3.05	6.413	0.476
2001	2.57	0.65	3.22	6.708	0.480
2003	2.60	0.66	3.26	6.803	0.479

Note of Table T-1: The figure in bold italics is a projected figure due to unavailability of data.

(1) Average Infiltration

In year 2002, the total metered fresh water consumption in the same year was 1.65Mm^3/d. The average pumped quantity of sea water for flushing was 0.66Mm^3/d. Based on a general assumption of 20% loss after pumps for conveying sea water, the sea water consumption was about 0.53Mm^3/d. Therefore the total water consumption was about 2.18Mm^3/d.

In year 2002, the volume of sewage received at various public sewage treatment works of Hong Kong was around 2.5Mm^3/d. The population served by public sewers is about 92% of the total population of Hong Kong. Taking into account that the small un-sewered population is essentially temporary domestic in nature and that average domestic flow is about 50% of the total sewage flow in Hong Kong, the total quantity of sewage collected

by the public sewerage system would be about 97%. The average net quantity of infiltration and inflow in the sewerage system would be about (2.5/0.97/2.18 – 1) x 100% = 18%.

In addition to accounting for the discharge of consumed water, the unit flow factor is also deemed to include a certain quantity of stormwater infiltration. It is prudent to incorporate a 5-8% allowance for infiltration in the unit flow factors calculated based on water consumption analysis. The remaining around 10-13% of infiltration and inflow will be addressed by the catchment inflow factor of each catchment.

Since the calculations are based on metered consumption figures and measured sewage flows at sewage treatment works, the small losses (e.g., evaporation) in the overall process of consumption after meter are deemed to be incorporated in the recommended unit flow factors and will not be addressed separately.

(2) Fresh water Consumption

From the WSD's Resources Planning (RP) Report No. 4/2000, the per capita fresh water consumption (PCC) rate of R1 residents have been shown to approximately fluctuate in the range 110~120 l/person/day. The PCC rate of public rental residents appears to match with that of R1 of around 110 l/person/day in year 1999.

From WSD's water metered consumption data and PlanD's population and employment data for years 2001 to 2003, the non-flushing PCC rates of public rental and private housing residents are obtained and tabulated in the following **Table III(b)**. To align with the available private permanent housing population in PlanD's data, only the PCC rates of private housing are estimated.

Table III(b) – Per-capita non-flushing water consumption rates (in m^3/person/d) of permanent residents

		Public Rental	Private Housing	Residential Permanent
	Rank no.*	19 and 20 NTS	21 to 24 and 26 NTS	19 to 24 and 26 NTS
Year 2001	Population	2078462	4298672	6377134
	PCC Rate	**0.1301**	**0.1237**	**0.1258**
Year 2002	Population	2067527	4358138	6425665
	PCC Rate	**0.1408**	**0.1262**	**0.1309**
Year 2003	Population	-	-	6439657
	PCC Rate	-	-	**0.1387**

* Rank no. is the categorisation of users in WSD's data and NTS denotes non-trade consumption.

The slightly higher PCC rates of public rental residents shown in **Table III(a)** are due to the relatively lower public rental figures (~2.1 million) in the population data of PlanD than that adopted in the WSD's RP Report (~2.4 million). According to the information of Hong Kong Housing Authority, the population of public rental housing residents of year

2003 is slightly more than 2.1 million. Therefore, it is believed that the PCC of public rental residents is only marginally higher than that of private housing residents probably because there are comparatively more full time home-staying persons, such as housewives, in public rental housing flats.

The PCC rates of permanent residents in year 2003 slightly increased due to the change in water consumption habit after the outbreak of the SARS disease. The PCC rate is expected to drop to the normal from year 2004 onwards.

From the reviewed SMPs, the UFFs of R2 to R4 are in general about 50% higher than that of R1 residents. However, the population of R2, R3 and R4 residents is only around 12% of the total private permanent residential population. Taking the above into account, the PCC rate of R1 residents can be taken as 0.120m^3/person/day for the base year 2002.

(3) <u>Flushing Water Consumption</u>

In DSD's Research and Development Report RD 1011, the flushing water per capita consumption rates of permanent housing residents derived based on analyses of metered fresh water consumption for flushing are shown in the **Table III(c)** below.

Table III(c) – Flushing water per capita consumption rate in DSD's Report RD 1011

UFF category	**PCC rate of Flushing Water (l/person/day)**
Low Cost Rental	50
Private R1	50
Private R2	80
Private R3	100

According to WSD,
the average daily supply of seawater for flushing purposes = 660,000 m^3/day,
the percentage of population supplied with seawater for flushing = 80%.

Taking this into account and assuming 20% leakage/wastage in the sea water distribution system, this implies that the total flushing water (seawater + fresh water) was
=660,000 x (1–0.2)/0.8 = 660,000 m^3/day

With a total land usual residents of 6.592 million as at mid 2002, the average daily flushing water consumption was
= 660,000/6,592,000 = 0.100 m^3/person/day.

Flushing water consumption comprises flushing water used by employees, students and home-staying persons.

(a) <u>Employees</u> (Population of J1-J12 = 3,172,000)

According to a survey carried out on non-government employees (2,592,200 persons) by the Census and Statistics Department (C&SD) in 2001,

54% usually worked 8 hrs or less per day (say, 7.5 hr/day),
32.9% usually worked more than 8 hrs up to 10 hrs per day (say, 9 hr/day), and
13.2% usually worked more than 10 hrs per day (say, 9 hr/day).

Therefore, the average working hours of non-government employees
= 7.5 x 0.54 + 9 x 0.329 + 10 x 0.132 = 8.3 hr/day

Assuming the average working hours of government employees is also around 8.5 hr/day and taking into account traveling time from home to work place, around 9.5 hours of a working day of an employee in average is employment related. If the average waking hours of employees is 16 hours and assume 5.5 work days/week, the percentage of employment related waking hours over a week is (9.5 x 5.5)/(16 x 7) x100 =50%. The majority of the remaining time (50%) can be assumed to be domestic related.

Therefore, flushing water consumption was

= 0.100 x 0.5
= 0.050 m^3/person/day.

(b) Students (kindergarten to tertiary) (Population of students = 1,216,000)

Assuming that the average school hours is 6 hr/d for 5 school days per week. Taking half of the total traveling time for school into account, around 7 hours of a school day of a student in average is school related. The percentage of school related waking hours over a week is (7 x 5)/(16 x 7) x 100 = 30%. The majority of the remaining time (70%) can be assumed to be domestic related.

Therefore, flushing water consumption was

= 0.100 x 0.3
= 0.030 m^3/person/day.

(c) Domestic consumption

The remaining population of 2,038,000 were assumed to be home staying. This group of people includes housewives, domestic helpers, the elderly, the unemployed and the pre-school toddlers. The majority of the waking hours can be assumed to be domestic related.

Assuming that 90% of the flushing water of non-working, non-schooling and home staying hours was used at home, the average per-person flushing water consumption was

= 0.100 x (3,172,000 x 0.5 + 1,216,000 x 0.7 + 2,038,000 x 1.0)/6,426,000 x 0.9
= 0.063m^3/person/day

According to DSD's data in Table III(c), the flushing water consumption rates vary against residential types. Taking into account the small overall population of R2-R4 residents and the 50-100% higher flushing water consumption rate of R2-R4 residents, the flushing water consumption for residents of private housing type R1 can be taken as 0.060m^3/person/day.

(4) Total Water Consumption Rates and Unit Flow Factors

The recommended unit flow factors for residential type R1/public rental housing, employees and students are calculated and shown below.

(a) Domestic Unit Flow Factor of R1 Residents and Public Housing Residents

The average domestic water consumption of permanent housing residents for the base year is

= average non-flushing fresh water consumption + average flushing water consumption
= 0.120 + 0.060
= 0.180m^3/person/day.

Incorporating some allowance for infiltration, the recommended UFF of R1/public rental housing residents is 0.190m^3/person/day.

This recommended UFF is in general in line with the findings in reviewed SMPs of Hong Kong Island and Kowloon.

According to WSD's Research and Development Report No. 4/2000, the "per-capita consumption" rate for R1 residents ranged from 0.110 to 0.125m^3/person/day in years 1994 - 1999. This in general agrees to the average fresh water daily consumption rate derived above.

In DSD's Research and Development Report No. RD 1011, further analyses show that the total "per-capita consumption" rate of R1 residents ranged from 0.160 - 0.180 m^3/person/day in year 1991-2000. The calculated total water consumption rate and the calculated UFF of a typical R1/public rental resident for the base year 2002 above are compatible with the findings of the DSD's report which was base on WSD's water consumption records.

(b) Domestic Unit Flow Factor of R2 Residents and modern village residents

From the findings of reviewed SMP, the UFF of R2 is in the region of 0.200~0.270m^3/person/day during years 1999-2000. The UFFs of R2 residents in urban SMPs are very close to 0.270m^3/person/day.

From the Research and Development Report No. RD 1011, the estimated total per capita water consumption (fresh water + flushing water) of R2 residents slightly fluctuates between 0.245m^3/person/day to 0.265m^3/person/day in the period in years 1992-2000. If 5% infiltration is taken into consideration, the UFF of R2 residents based on DSD's water consumption analysis would be in the region of about 0.270m^3/person/day.

The overall population of R2 residents is small relative to the overall population of R1 and public rental residents. The information above concurs to a recommended UFF of R2 residence of 0.270m^3/person/day.

Because of similarity in development density and for better planning sewerage in new low density village type developments in the rural area, the UFF of modern village is

recommended to be the same as that of R2. The estimated flows of modern village areas would be about 10% higher than those estimated by using the SM1. The impacts of this slightly higher UFF would be minimal as the planning of a lot of local sewers for modern village is governed by the minimum pipe size and the likely impacts on sewerage further downstream would be alleviated by the general reduction in UFF of R1 residents.

(c) Domestic Unit Flow Factor of R3 and R4 Residents

R3 and R4 residential areas are low density. From the findings of reviewed SMP, the UFF of residents in these areas is in the region of 0.300~0.420m^3/person/day in most urban areas during years 1999-2000.

The findings of the study *Review of Sewage UFF and PF through Flow Gauging (1999)* show that the UFF ranged from 0.284-0.550m^3/person/day.

From the Research and Development Report No. RD 1011, the estimated total per capita water consumption (fresh water + flushing water) of R3 residents slightly fluctuates between 0.300m^3/person/day to 0.335m^3/person/day in the period of years 1992-2000. If 5% infiltration is taken into consideration and the possible higher water consumption rate of R4, the UFF of R3 and R4 residents based on DSD's water consumption analysis would be in the region of about 0.340m^3/person/day as recommended in the SM1.

Based on the above and taking into account the relative small population of R3 and R4 residents, it is considered that the UFF of R3 and R4 of 0.340m^3/person/day is recommended for sewerage planning.

From WSD's Resource Planning Report No. 4/2000, the per-capita consumption rates of R3 and R4 residents are on a slight increasing trend. The ceiling UFF of R3 and R4 (0.370m^3/person/day) in SM1 appears to be a reasonable maximum for these types of residents for the future. It is recommended that the ceiling UFF of SM1 be taken as the future/planning UFF of these two types of residents for planning future sewerage.

(d) Employee flow

As shown in section (3)(a) above, the flushing water consumption is 0.050m^3/person/day.

From the analysis on fresh water consumption, the average per-employee fresh water consumption for employee J5 (Import & Export) and J6 (Finance, Insurance, Real Estate & Business Services) are shown in **Table III(d)**. The consumption rate is very constant at around 0.030m^3/person/day. J5 and J6 are office base job types which are generally believed to consume minimal commercial activities flow. The majority of the flesh water consumption rate can be assumed to be employment related. If this and some allowance for infiltration are taken into account, the UFF for employees is taken as

= 0.050 + 0.030 = 0.080m^3/person/day

Table III(d) – Fresh Water Consumption Rate of J5 and J6 Employees

	Job Type	**J5 & J6**
	Rank no. in WSD data	22 & 37
Year 2001	Population	993452
	Daily Water Consumption (m^3/d)	30370
	Water Consumption Rate (m^3/emp/d)	**0.0306**
Year 2002	Population	1007949
	Daily Water Consumption (m^3/d)	30210
	Water Consumption Rate (m^3/emp/d)	**0.0300**
Year 2003	Population	999450
	Daily Water Consumption (m^3/d)	28860
	Water Consumption Rate (m^3/emp/d)	**0.0289**

(e) Student flow

With 15% additional allowance for fresh water basin and cleaning flows and 10% for miscellaneous use for meals and laboratories, the average school-related water consumption of every student in year 2002 was

= 0.100 x 0.3 x 1.15 x1.1
≈ 0.038 m^3/person/day.

Taking into account the allowance for infiltration, the recommended UFF for students is 0.040m^3/person/day for the base year. Since this UFF have taken into account the trend of full time education, this UFF can be taken for future planning purposes.

Appendix IV

Unit flow Factor For Residential Permanent Housing Residents and Adjustment Factors for Private Permanent Residents

Table IV(a) - Unit Flow Factors of Domestic Residents for Year 2002 (Based on UFFs of GESF)

	Population						Unit Flow Factor			
Housing Type	Public Rental	Private R1	Private R2 & Modern Village	Private R3	Private Trad. Village	Temp	(A) Calc. Av. UFF for Residents of Perm. Housing*	(B) Rationalised UFF for Residents of Perm. Housing* [(A) refers]	(C) UFF for Residents of Private Perm. Housing*	Adjust. Factor for Private Perm. Residents [UFF in (C) /UFF of R1]
UFF (m3/person/day)	0.190	0.190	0.270	0.340	0.150	0.150				
Aberdeen	43959	45526	20261	13570	0	2313	0.220	0.230	0.236	1.24
Ap Lei Chau	44525	46190	0	0	0	612	0.190	0.190	0.190	1.00
Central	7341	195201	31415	6885	0	8205	0.205	0.200	0.205	1.08
Chai Wan	81249	106025	3074	269	0	1287	0.192	0.190	0.193	1.01
North Point	17424	198071	26309	493	0	5881	0.199	0.200	0.200	1.05
Sandy Bay	0	473	972	8920	1	834	0.327	0.320	0.327	1.72
Shau Kei Wan	37655	156502	112	0	0	2036	0.190	0.190	0.190	1.00
Shek O	0	0	1156	66	0	204	0.274	0.290	0.274	1.44
Stanley	3360	2399	1469	10026	0	509	0.284	0.290	0.307	1.61
Wah Fu	31304	1189	4	1742	0	400	0.198	0.200	0.279	1.47
Wan Chai E	3322	67207	33330	15676	0	7916	0.232	0.230	0.233	1.23
Wan Chai W	0	40343	18807	5990	0	8030	0.227	0.230	0.227	1.19
Central Kln	219026	347269	11264	3214	1594	26888	0.192	0.190	0.194	1.02
East Kln	463962	288475	44619	0	2454	19440	0.194	0.190	0.200	1.05
Tuen Mun	229500	237432	49389	7746	11651	7010	0.199	0.200	0.205	1.08
Tsing Yi	57816	22121	0	0	106	57	0.190	0.190	0.190	1.00
Cheung Chau	2665	752	18047	1488	1488	284	0.256	0.260	0.264	1.39
Peng Chau	730	776	4562	4948	484	362	0.285	0.260	0.291	1.53
Lamma Island	0	11	4997	296	834	462	0.257	0.260	0.257	1.35
Mui Wo	1383	623	2326	273	337	158	0.233	0.260	0.250	1.32
Tung Chung	29963	95305	74046	5686	0		0.223	0.230	0.229	1.20
Discovery Bay	0	647	10211	4376	0		0.287	0.290	0.287	1.51
Sha Tin	207297	305704	75912	21845	4071	2637	0.205	0.210	0.213	1.12
Tai Po	31585	104612	32785	21302	2832	2042	0.220	0.210	0.225	1.19
Shek Wu Hui	79958	111517	16842	2784	2132	2887	0.198	0.200	0.203	1.07
Yuen Long	0	36953	32713	18848	9240	7333	0.242	0.230	0.242	1.27
San Wai	130407	173808	24828	16208	14854	10829	0.201	0.200	0.207	1.09
Sai Kung	1966	7947	14144	8866	2322	1213	0.257	0.230	0.261	1.37
North West Kln	134076	528698	33739	27347	255	17312	0.199	0.200	0.202	1.06
Kwai Chung	262439	248566	24574	1113	2463	10891	0.194	0.190	0.197	1.04
Tseung Kwan O	103740	156469	0	4055	233	1531	0.192	0.190	0.194	1.02
Total	2226652	3526811	611907	214032	57351	149563	-	-	-	-

* Permanent housing includes all except temporary housing. Private permanent housing includes R1, R2, R3 and village.

Note: Breakdown of population figures are based on data of reviewed SMPs and Census data of 2001.

Table IV(b) - Unit Flow Factors of Domestic Residents for Year 2002 (Based on UFFs in SM1)

	Population						Unit Flow Factor		
Housing Type	Public Rental	Private R1 & Modern Village	Private R2	Private R3	Private Trad. Village	Temp	(A) Calc. Av. UFF for Residents of Perm. Housing*	(B) UFF for Residents of Private Perm. Housing*	Adjust. Factor for Private Perm. Residents [UFF in (B) /UFF of R1]
UFF (m3/person/day)	0.175	0.24	0.285	0.37	0.15	0.15			
Aberdeen	43959	46211	19576	13570	0	2313	0.238	0.273	1.14
Ap Lei Chau	44525	46190	0	0	0	612	0.208	0.240	1.00
Central	7341	196971	29645	6885	0	8205	0.247	0.250	1.04
Chai Wan	81249	106025	3074	269	0	1287	0.213	0.242	1.01
North Point	17424	198071	26309	493	0	5881	0.240	0.246	1.02
Sandy Bay	0	473	972	8920	1	834	0.356	0.356	1.48
Shau Kei Wan	37655	156502	112	0	0	2036	0.227	0.240	1.00
Shek O	0	1156	0	66	0	204	0.247	0.247	1.03
Stanley	3360	2399	1469	10026	0	509	0.307	0.339	1.41
Wah Fu	31304	1189	4	1742	0	400	0.187	0.317	1.32
Wan Chai E	3322	67207	33330	15676	0	7916	0.268	0.270	1.13
Wan Chai W	0	40343	18807	5990	0	8030	0.265	0.265	1.10
Central Kln	219026	347269	11264	3214	1594	26888	0.217	0.242	1.01
East Kln	463962	288475	44619	0	2454	19440	0.205	0.245	1.02
Tuen Mun	229500	255085	31736	7746	11651	7010	0.215	0.245	1.02
Tsing Yi	57816	22121	0	0	106	57	0.193	0.240	1.00
Cheung Chau	2665	18799	0	1488	1488	284	0.235	0.243	1.01
Peng Chau	730	5338	0	4948	484	362	0.288	0.296	1.23
Lamma Island	0	5008	0	296	834	462	0.234	0.234	0.98
Mui Wo	1383	2949	0	273	337	158	0.223	0.241	1.01
Tung Chung	29963	95305	74046	5686	0		0.250	0.263	1.10
Discovery Bay	0	647	10211	4376	0		0.308	0.308	1.28
Sha Tin	207297	333041	48575	21845	4071	2637	0.226	0.251	1.05
Tai Po	31585	118176	19221	21302	2832	2042	0.247	0.261	1.09
Shek Wu Hui	79958	125948	2411	2784	2132	2887	0.217	0.242	1.01
Yuen Long	0	69666	0	18848	9240	7333	0.257	0.257	1.07
San Wai	130407	198636	0	16208	14854	10829	0.219	0.243	1.01
Sai Kung	1966	22091	0	8866	2322	1213	0.263	0.268	1.12
North West Kln	134076	528698	33739	27347	255	17312	0.235	0.249	1.04
Kwai Chung	262439	248566	24574	1113	2463	10891	0.210	0.244	1.02
Tseung Kwan O	103740	156469	0	4055	233	1531	0.216	0.243	1.01
Total	2226652	3705024	433694	214032	57351	149563	-	-	-

* Permanent housing includes all except temporary housing. Private permanent housing includes R1, R2, R3 and village.

Note: Breakdown of population figures are based on data of reviewed SMPs and Census data of 2001.

Table IV(c) - Unit Flow Factors of Domestic Residents for Year 2016/Planning (Based on UFFs of these Guidelines)

	Population						Unit Flow Factor			
Housing Type	Public Rental	Private R1	Private R2 & Modern Village	Private R3	Private Trad. Village	Temp	(A) Calc. Av. UFF for Residents of Permanent Housing*	(B) Rationalised UFF for Residents of Perm. Housing* [(A) refers]	(C) UFF for Residents of Private Perm. Housing*	Adjust. Factor for Private Perm. Residents [UFF in (B) /UFF of R1]
UFF (m3/person/day)	0.19	0.19	0.27	0.37	0.15	0.15				
Aberdeen	50799	60929	19450	18489	0	1079	0.223	0.230	0.239	1.26
Ap Lei Chau	38863	47185	0	0	0	68	0.190	0.190	0.190	1.00
Central	7731	253532	39576	5915	0	8900	0.204	0.200	0.204	1.07
Chai Wan	73776	108659	2597	2665	0	259	0.194	0.190	0.196	1.03
North Point	14018	186744	37824	1880	0	7572	0.204	0.200	0.205	1.08
Sandy Bay	0	463	961	10523	2	559	0.355	0.350	0.355	1.87
Shau Kei Wan	38425	154179	94	0	0	682	0.190	0.190	0.190	1.00
Shek O	0	0	1051	3341	0	18	0.346	0.350	0.346	1.82
Stanley	5433	2385	1426	10535	0	317	0.292	0.290	0.330	1.74
Wah Fu	26378	2375	1467	3267	0	46	0.211	0.210	0.289	1.52
Wan Chai E	0	60266	22346	16777	0	7945	0.238	0.230	0.238	1.25
Wan Chai W	0	41546	17656	5625	0	14494	0.227	0.230	0.227	1.20
Central Kln	196234	493542	11965	6969	1200	35184	0.193	0.190	0.194	1.02
East Kln	562151	713524	58987	3209	2874	5112	0.194	0.190	0.197	1.04
Tuen Mun	239523	335112	75177	15789	9884	0	0.203	0.200	0.209	1.10
Tsing Yi	103119	85022	4449	3662	110	0	0.195	0.190	0.201	1.06
Cheung Chau	2617	738	17974	1828	0	0	0.266	0.270	0.276	1.45
Peng Chau	730	761	4942	1205	262	0	0.266	0.270	0.274	1.44
Lamma Island	0	11	6024	1077	834	0	0.271	0.270	0.271	1.43
Mui Wo	2066	914	4961	1521	337	0	0.257	0.250	0.275	1.45
Tung Chung	52618	142795	115584	9003	0		0.224	0.230	0.231	1.21
Discovery Bay	0	1100	16900	7200	0		0.295	0.290	0.295	1.55
Shatin	259702	359954	111430	77406	6181	17723	0.218	0.220	0.231	1.21
Tai Po	111800	118081	74534	14318	7501	10793	0.215	0.220	0.228	1.20
Shek Wu Hui	170520	182887	111198	9244	8796	13814	0.211	0.210	0.223	1.17
Yuen Long	34213	37863	120839	41590	9240	147	0.259	0.250	0.270	1.42
San Wai	152068	216089	240543	51660	14854	20	0.231	0.230	0.243	1.28
Sai Kung[@]								0.230		1.37
North West Kln	179203	716813	48014	38917	255	17312	0.201	0.200	0.203	1.06
Kwai Chung[@]								0.190		1.04
Tseung Kwan O[@]								0.190		1.02
Total	2321987	4323469	1167969	363615	62330	142044	-	-	-	-

* Permanent housing includes all except temporary housing. Private permanent housing includes R1, R2, R3 and village.

[@] No data were available for these catchments. UFF adjustment factors for 2002 were adopted.

Note: (1) Proposed UFFs for 2016 are used for calculating UFF adjustment factors for both year 2016 and the planning scenario.

(2) Breakdown of population figures is based on data of reviewed SMPs.

Table IV(d) - Unit Flow Factors of Domestic Residents for Year 2016/Planning (Based on UFFs in SM1)

	Population						Unit Flow Factor		
Housing Type	Public Rental	Private R1 & Modern Village	Private R2	Private R3	Private Trad. Village	Temp	(A) Calc. Av. UFF for Residents of Permanent Housing*	(B) UFF for Residents of Private Perm. Housing*	Adjust. Factor for Private Perm. Residents [UFF in (B) /UFF of R1]
UFF (m3/p/day)	0.175	0.24	0.3	0.37	0.15	0.15			
Aberdeen	50799	61412	18967	18489	0	1079	0.242	0.276	1.15
Ap Lei Chau	38863	47185	0	0	0	68	0.211	0.240	1.00
Central	7731	258986	34122	5915	0	8900	0.248	0.249	1.04
Chai Wan	73776	108659	2597	2665	0	259	0.217	0.244	1.02
North Point	14018	186744	37824	1880	0	7572	0.247	0.251	1.05
Sandy Bay	0	463	961	10523	2	559	0.359	0.359	1.50
Shau Kei Wan	38425	154179	94	0	0	682	0.227	0.240	1.00
Shek O	0	1051	0	3341	0	18	0.339	0.339	1.41
Stanley	5433	2385	1426	10535	0	317	0.296	0.341	1.42
Wah Fu	26378	2375	1467	3267	0	46	0.204	0.312	1.30
Wan Chai E	0	60266	22346	16777	0	7945	0.275	0.275	1.15
Wan Chai W	0	41546	17656	5625	0	14494	0.268	0.268	1.12
Central Kln	196234	493542	11965	6969	1200	35184	0.224	0.243	1.01
East Kln	562151	713524	58987	3209	2874	5112	0.216	0.245	1.02
Tuen Mun	239523	358503	51786	15789	9884	0	0.223	0.250	1.04
Tsing Yi	103119	89471	0	3662	110	0	0.208	0.245	1.02
Cheung Chau	2617	18712	0	1828	0	0	0.243	0.252	1.05
Peng Chau	730	5703	0	1205	262	0	0.251	0.259	1.08
Lamma Island	0	6035	0	1077	834	0	0.248	0.248	1.03
Mui Wo	2066	5875	0	1521	337	0	0.243	0.262	1.09
Tung Chung	52618	142795	115584	9003	0		0.255	0.270	1.13
Discovery Bay	0	1100	16900	7200	0		0.317	0.317	1.32
Shatin	259702	401050	70334	77406	6181	17723	0.236	0.265	1.10
Tai Po	111800	180717	11898	14318	7501	10793	0.224	0.249	1.04
Shek Wu Hui	170520	248879	45206	9244	8796	13814	0.224	0.250	1.04
Yuen Long	34213	68717	89985	41590	9240	147	0.272	0.288	1.20
San Wai	152068	237109	219523	51660	14854	20	0.253	0.275	1.15
Sai Kung[@]									1.12
North West Kln	179203	716813	48014	38917	255	17312	0.98	0.250	1.04
Kwai Chung[@]									1.02
Tseung Kwan O[@]									1.01
Total	2321987	4545067	877642	425356	69318	142044	-	-	-

* Permanent housing includes all except temporary housing. Private permanent housing includes R1, R2, R3 and village.

[@] No data were available for these catchments. UFF adjustment factors for 2002 were adopted.

Note: (1) Proposed UFFs for 2016 are used for calculating UFF adjustment factors for both 2016 and the planning scenario.

(2) Breakdown of population figures is based on reviewed SMP data.

Unit Flow Factors for Commercial Activities

Commercial flows comprise flows due to commercial activities and due to employees. Flows due to employees are discussed in **Appendix III**.

The following are the 11 commercial job types:

J2 Electricity Gas & Water
J3 Transport, Storage & Communication
J4 Wholesale & Retail
J5 Import & Export
J6 Finance, Insurance, Real Estate & Business Services
J7 Agriculture & Fishing
J8 Mining & Quarrying
J9 Construction
J10 Restaurants & Hotels
J11 Community, Social & Personal Services
J12 Public Administration

From the WSD's water consumption data of 2001 to 2003, the calculated overall per-employee consumption figures of job types J2 - J10 (except J7 and J8) are shown below:

Table V(a) - Overall Per-employee consumption rates (m^3/employee/day) of commercial activities J2-J6 and J9-J10

		J2	J3	J4	J5 & J6	J9	J10
	Rank no. in WSD data	13	12 & 32	19 & 26	22 & 37	33 & 36	20 & 21
Year 2001	Population	13700	358900	318270	993452	295500	229478
	Daily Water Consumption (MLD*)	14.68	10.43	55.83	30.37	41.71	258.36
	Water Consumption Rate (m^3/emp/d)	1.0713	0.0291	0.1754	0.0306	0.1412	1.1259
Year 2002	Population	12600	288608	322953	1007949	242449	214337
	Daily Water Consumption (MLD*)	16.07	9.65	55.96	30.21	36.48	255.18
	Water Consumption Rate (m^3/emp/d)	1.2758	0.0334	0.1733	0.0300	0.1505	1.1905
Year 2003	Population	13668	264775	309099	999450	214333	191533
	Daily Water Consumption (MLD*)	16.40	9.39	56.74	28.86	29.43	245.05
	Water Consumption Rate (m^3/emp/d)	1.1997	0.0355	0.1836	0.0289	0.1373	1.2794

* MLD denotes million litres per day (1 MLD = 1000m^3/day)

The water consumption data did not contain appropriate ranks for estimating the consumption rates of J7, J8 and J12 accurately. The unit flow factors of employees of J12 will be estimated by making reference to the available UFF of J5 and J6. Since the population of J7 and J8 are very small and the activities of some of these trades are believed to be remote from the sewerage system, it is recommended that the UFFs of J7 and J8 employees be the same as that of J5 and J6.

Licensed flow record of Year 2003 were made reference to in determining the UFFs of some job types. The total licensed flow of each employment type was in general less than the actual quantity of sewage due to the commercial activities of that employment type because some flows such as flushing water of customers were not required to be licensed. Therefore, the licensed flow record only provides a reference in determining the UFFs for commercial activities. A summary of all licensed trade flows is shown in **Annex 1** of this Appendix**.** The comparison of the estimated total flow of each job type calculated based on the recommended UFFs against the licensed flow of each job type is also provided at the bottom of the table in **Annex 1 of Appendix VII – Part 1**.

For easy reference and application of UFFs, recommended UFFs are grouped together in few representative figures as far as possible.

(a) J5, J6, J7, J8 and J12

According to the licensed flow data, there were very low or no licensed flows for job types J5 (Import/Export), J7 (Agriculture and Fishing), J8 (Mining and Quarrying) and J12 (Public Administration). The flows from the commercial activities of these job types are either small or incorporated in the unit flow of employees. The activities UFF of these job types is recommended to be zero.

(b) J10

The commercial activity flow for job type J10 (Restaurants and Hotels) is considerable. Based on the water consumption record, the per-employee fresh water consumption figure was 1.130-1.280m^3/employee/day. Based on licensed flow figures, the average per-employee discharge of this job type was only about 1.000m^3/employee/day which agrees to the fact that some discharges do not need to be licensed. In Working Paper No. 8 of Review of Hong Kong Island SMPs, some approaches of determining UFFs of commercial employees have assigned a unit flow of 1.600m^3/employee/day to J10 employees.

The three sources of information above tend to support that the UFF considered in the Reviewed Hong Kong Island SMPs is close to the reality. The UFF of J10 is deemed to include the flushing water discharge of hotel tenants and restaurant customers. The difference between the UFF considered in the Reviewed Hong Kong Island SMPs and the per-employee fresh water consumption figure was due to the quantity of flushing water used by the customers and the employee.

Eliminating the flow due to the employee and incorporating some allowance for infiltration, the recommended activities UFF of J10 is taken as 1.500m^3/employee/day.

(c) J2

In **Table V(a)**, the calculated per capita consumption rate of J2 was based on rank no. 13 (Utilities) of WSD water consumption data. However, rank no. 13 includes communication which J2 does not. Therefore, the actual water consumption rate of J2 should be less than that calculated by using the consumption data of rank no. 13. The employee population of communication is so high that it can significantly affect per-employee consumption rate of J2 if it is taken into account. Besides, the water consumption of water services may not be discharged to the sewerage system. To avoid overestimating the flow from J2 employee, the licensed flow figure of J2 job type is made reference to in determining the appropriate UFF of J2. From the information in **Annex 1** of this Appendix, the UFF of J2 is recommended to be $0.250m^3$/employee/day, which has included some allowance of infiltration for a population of J2 employee of around 13,000.

(d) J3

Although the water consumption rate of J3 in **Table V(a)** appears to resemble that of J5 and J6, this apparently low consumption rate of J3 may be due to the fact that the water consumption of the communication trade in rank no. 13 (utilities) has not been taken into consideration in the calculation. According to WSD categorization, rank no. 13 contains the communication trade. If the water consumption of the communication trade is taken into account, the actual consumption would be higher than the calculated. With reference to the licensed flow figures, the recommended activities UFF of J3 employees is $0.100m^3$/employee/day. This UFF is about the average consumption rate of all the J2 (5% in population) and J3 (95% in population) employees and is adopted as the recommended UFF of J3 employees because of the predominant population of J3 in comparing to that of J2.

Based on this recommended UFF of J3 and the recommended UFF of J2 in section **(c)** above, the sum of the total estimated activities flow of J2 and J3 is are about 31,000 m^3/day which is close to the total consumption of J2 and J3 of about $26,000m^3$/day plus some allowance for infiltration and for inconsistence in the categorization of trades in WSD's data. This justifies the recommended UFF of J3.

(e) J4

From the water consumption data, the per-employee unit flow of J4 ranged in about 0.175 ~ $0.185m^3$/employee/day. Taking into account the 5% infiltration allowance, the recommended UFF of a J4 employee is $0.200m^3$/employee/day.

(f) J9

According to WSD, rank no. 36 (construction supply) includes water consumption for construction activities. Based on the water consumption data, the per-employee consumption of J9 in year 2002 was about $0.150m^3$/employee/day. This figure is taken to be the recommended activities UFF for J9 employees.

(g) J11

From the water consumption data, rank code nos. 23-31 (except 26) are within the employment type J11. These ranks cover consumption of social and community services such

as clubs, institutions, beauty saloons, hospitals, clinics and cleansing. Unfortunately, these rank codes do not include consumptions of the customers of job type J11. Based on the total consumption of these rank codes and the actual J11 population, the calculated per-employee consumption rate was 0.100m^3/employee/day. Since the population figure used in the calculation is based on the actual J11 population, the actual UFF of J11 should be higher than this per-employee consumption figure.

Based on licensed discharge figures, which are categorized using the same HSIC industry coding system as that for the available population and employment data, the deduced activities UFF of J11 is about 0.120m^3/employee/day. However, as clarified at the beginning of this Appendix, the UFF calculated based on the licensed flow figure would be lower than the actual UFF.

Some activities of J11 involves consumption of flushing water e.g., in hospital, clinics, private clubs and elderly centres, by the users, customers and patients. The consumption of sea water is not included in the detailed flesh water consumption data. Taking into consideration the nature of J11, the population of J11 employees and the uncertainties in the water consumption and licensed flow data, it is recommended that the activities UFF of J11 is 0.200m^3/employee/day. Further flow analyses in the following appendices indicate that this recommended UFF is justified in estimating sewage flow in conjunction with other recommended UFFs..

(h) Average UFF of commercial activities

The territorial average UFF of commercial activities is obtained by dividing the calculated total flows of J2 – J12 by the total population of commercial employees. The results are shown in the **Table V(b).** The average UFF of commercial activities is 0.200m^3/employee/day for both the base year and the future planning scenario.

Table V(b) - Average UFF of commercial activities

	Calculated total flow (m^3/day)	Total population of commercial employees (person)	Average UFF of commercial activities (m^3/employee/day)
Year 2002	585,142	2,876,680	~0.200
Year 2016 (planning)	892,658	4,393,669	~0.200

Annex 1 of Appendix V

Summary of Licensed Trade Flows

Licensed Flow Rates (m^3/day) of Trade Discharges to Foul Sewers in Hong Kong – Yr 2003

Job Type	HSIC Category	Description	Licensed Flow Rate (m^3/day)	No. of discharges
7	1	Agriculture and Fishing	12	5
8	2	Mining and Quarrying	0	0
1	3	Manufacturing	84,552	2,162
2	4	Electricity, Gas and Water	2,539	39
9	5	Construction	10,675	370
3	7	Transport, Storage and Communication	6,890	141
6	8	Financing, Insurance, Real Estate & Business Services	6,219	85
4	611-612	Wholesale	13,871	125
4	621	Retail	15,450	1,889
5	631-632	Import/Export	631	23
10	641	Restaurants	162,881	9,246
10	651	Hotels and Boarding Houses	20,602	89
12	910	Public Administration	0	0
11	912-960 excluding 933	Community, Social and Personal Services	43,978	3,283
11	933	Medical, Dental, other Health and Veterinary Services	17,118	220
	DOM	Domestic	27	29
10 (70%) + 11 (30%)	C02	Semi-government Sector - Commercial Complex with Communal Effluent Treatment Facilities	4,544	36
10	C09	Semi-government Sector - Cooked Food Market/Bazaar with Effluent to Communal Treatment Facilities	4,438	63
4	M01	Government - Market with Communal Effluent Treatment Facilities	9,150	126
	S02	Government - Screening Plant	0	0
11	S09	Government - Swimming Pool	2,862	17
	W01	Government - Wastewater Treatment Plant	0	0
11	W02	Government - Water Supplies Department	3,374	27
11	Others	Government - Others	14,763	306
	Total :		424,576	18,281

Summary of Licensed Trade Flows

Job Type	Licensed flow (m^3/day)	Job Type	Licensed flow (m^3/day)
1	84,552	7	12
2	2,539	8	0
3	6,890	9	10,675
4	38,471	10	191,102
5	631	11	83,458
6	6,219	12	0

Appendix VI

Catchment-dependent Unit Flow Factors for Industrial Employees

The following shows the derivation of the catchment-dependent UFFs for industrial employees. Average per employee unit flows were analysed from the following sources of information:

(a) water consumption record
(b) licensed discharge record
(c) DSD's *Interim Guidelines on the Estimation of Industrial Wastewater Design Flows*

(A) Water Consumption

From the analysis of WSD water consumption data in **Table VI(a)**, the per-employee fresh water consumption of manufacturing industries* ranged from 0.540-0.600$m^{3/}$employee/day. To cater for possible errors due to variations of population and consumption data within the 3 years, the average consumption figure (0.560m^3/employee/day) of the 3 years is taken as the typical per-employee water consumption figure of 2002.

Table VI(a) - Average Per-employee water consumption of J1 Employees

	Job Type	**J1**
	Rank no. in WSD data	0 to 17 except 12 & 13
Year 2001	Population	219300
	Daily Water Consumption (MLD)	118.36
	Water Consumption Rate (m^3/emp/d)	**0.5397**
Year 2002	Population	208953
	Daily Water Consumption (MLD)	114.06
	Water Consumption Rate (m^3/emp/d)	**0.5459**
Year 2003	Population	180112
	Daily Water Consumption(MLD)	107.73
	Water Consumption Rate (m^3/emp/d)	**0.5981**

The manufacturing industries include drinks manufacturing which takes up about 7% of the total fresh water consumption. If the majority of this consumption is assumed to be discharged as sewage off site, the quantity of sewage to be deducted from the per-employee consumption figure would roughly be offset by the 5-8% allowance for infiltration. Therefore the recommended average activities UFF of J1 employees is 0.560$m^{3/}$employee/day.

Per-employee industrial activities UFF varies significantly from one area to another. To facilitate sewerage planning at the catchment level, local major industrial areas with significant numbers of industrial employees were selected from the employment data for analysis of per-capita consumption rates. The results of the analysis are shown in **Annex 1** to this Appendix. These UFFs play an important role in determining the appropriate UFFs of major sewerage catchments.

(B) Licensed Sewage Discharges

In 2002, the total licensed average flow for manufacturing industries* was about 109,000m^3/day. These licensed flows were for industrial activities which excluded sewage flows from employees. The licensed flows were of the same order of the average fresh water consumption in **Section (A)** above and thus supported the recommended average per-capita activities UFF.

(C) DSD's Interim Guidelines (1999)

According to the DSD's *Interim Guidelines on the Estimation of Industrial Wastewater Design Flows* (the Interim Guidelines), industries are categoried into high flow industries and low flow industries. The Interim Guidelines assumed that the employee density of low flow industries varies from 25m^2/peron to 50m^2/person. To calculate the average UFF for manufacturing employee in each catchment, the industrial water consumption figure and total licensed manufacturing flow were taken as a control total to back calculate the average employee density of manufacturing industries. It was found that the average employee density was about 50m^2/person in year 2002.

The low average employee density was probably due to the reduced usage of available industrial floor areas in the past few years and the unused industrial floor areas have been taken into consideration in the calculations. The average employee density may be reduced in future because of the change in land use from industrial use to business use. However, the deduced UFF for manufacturing employees will unlikely be affected.

Based on the calculated average employee density and with some assumptions on the proportion of areas for each of the industries I(a), I(b) and I(c). The catchment-dependent UFFs were then calculated in **Annex 2** to this Appendix.

* Hong Kong Standard Industrial Classification codes of manufacturing industries include those for textile, metal goods, electrical goods, food products, chemicals, plastics, clothing, rubber, paper, land int. industries, special industries, laundries, drinks, ice-making, and miscellaneous industries.

(D) Recommended Unit Flow Factors

The industrial per-employee consumption rates of a lot of industrial areas are typical enough for representing the UFF of their catchments. They are taken as the basis for formulating the catchment-dependent UFFs.

The industrial UFFs deduced from the Interim Guidelines vary comparatively less from one catchment to another. UFFs for rural industrial areas, such as Yuen Long, Tai Po and Tuen Mun, calculated from the Interim Guidelines are considerably less than those calculated from water consumption data. This is probably due to fact that the actual employee densities in these rural industrial areas are much lower than the average employee density of $50m^2$/employee assumed in the calculations. For industrial areas in Kowloon and Hong Kong Island, UFFs calculated using the Interim Guidelines are in general higher than those calculated using water consumption data. This may be due to the actual employee density of these areas being higher than the assumed. To reflect the actual situation of water consumption, the recommended UFFs are mainly based on water consumption data. The UFFs derived from Interim Guidelines are used for reference.

For Central Kowloon and East Kowloon catchments, the recommended UFFs are $0.550m^3$/employee/day and $0.450m^3$/employee/day respectively. The high UFF of $1.000m^3$/employee/day recommended in the reviewed SMPs of Central and East Kowloon catchments may have been due to more flow monitoring data were obtained from the Yau Tong industrial area which has an extraordinary high local industrial UFF (please refer to **Annex 1** of this Appendix). Contrary to Yau Tong, the per-employee consumption figure of San Po Kong is exceptionally low. The recommended UFFs for these two areas are provided in **Table VI(b)** for planning of sewerage related to these areas.

In Sha Tin and Tai Po, there were 2 major factories of drinks. The water consumption rates of these factories are around 50% and 20% of the total water consumption of industries in the PVS areas considered. The majority of water consumed in these factories of drinks was not discharged locally as sewage. The recommended UFFs are adjusted accordingly from the per-employee consumption figures to take this into account.

The recommended activities UFF of industrial employees are listed in **Table VI(b)**. A figure showing the level of each UFF figure relative to the territorial average is also provided for reference.

Table VI(b) - Recommended Unit Flow Factors for Industrial Flows

Catchment / Subcatchment	Activities UFF (m^3/employee/day)	Adjustment Factor (taking the Territorial Average as unity)
- Territorial Average	0.560	1.00
- Hong Kong Island (except Aberdeen & Ap Lei Chau), San Po Kong*	0.250	0.45
- North West Kowloon	0.350	0.63
- East Kowloon (overall), Sha Tin, Lantau Island (except Mui Wo)	0.450	0.80
- Cental Kowloon, North District, Aberdeen, Ap Lei Chau	0.550	0.98
- Tsuen Wan, Kwai Chung	0.650	1.16
- Tai Po	0.750	1.34
- Tuen Mun, Tseung Kwan O, Yau Tong*, Cheung Chau, Mui Wo	1.000	1.79
- Tsing Yi	1.500	2.68
- Sai Kung, Yuen Long	2.000	3.57

* Yau Tong and San Po Kong are sub-catchment areas of the East Kowloon catchment.

Per employee consumption (PEC) rate (in m^3/employee/day) of J1 Employees in Different Industrial Areas

Area	Equiv. TPU	PVS	Year 2001				Year 2002				Year 2003				Average PEC
			J1 Population	Total J1 Population	Daily Water Consumption (MLD*)	PEC	J1 Population	Total J1 Population	Daily Water Consumption (MLD*)	PEC	J1 Population	Total J1 Population	Daily Water Consumption (MLD*)	PEC	
HK Island						0.2674				0.2502				0.2537	0.2571
Chai Wan	162 part,	33	4596	8654	2.0179	0.2332	4384	8185	1.9610	0.2396	4081	8237	1.6617	0.2017	0.2248
and	163,	34	4058				3801				4156				
Siu Sai Wan	165 part, and 167														
North Point	151,	21	1304	7429	1.0005	0.1347	1201	6732	0.8879	0.1319	1294	6178	0.8264	0.1338	0.1334
Quarry Bay and	153 - 155	22	274				400				343				
Tai Koo		23	938				720				706				
		24	1525				1535				1946				
		25	3388				2876				1889				
Central	113 part,	6	688	1684	0.3012	0.1789	674	1587	0.2445	0.1541	545	1344	0.2298	0.1709	0.1680
	114 part,	7	996				914				799				
	121 part, 122 part														
Wong Chuk Hang	175	47	701	5296	2.9176	0.5509	672	5388	2.5125	0.4663	606	4915	2.6242	0.5339	0.5170
	176, 176	49	4595				4716				4309				
Ap Lei Chau	173 part,	48	436	546	0.2727	0.4995	749	890	0.3136	0.3524	450	611	0.2254	0.3690	0.4070
	174	230	110				141				161				
Western	111 part,	3	1103	1711	0.4389	0.2565	1179	1829	0.2999	0.2197	1019	1564	0.2925	0.2533	0.2432
	112 part,	4	403				449				406				
	113 part,	291	205				201				139				
	115 part, 116 part														

Area	Equiv. TPU	PVS	Year 2001				Year 2002				Year 2003				Average PEC
			J1 Population	Total J1 Population	Daily Water Consumption (MLD*)	PEC	J1 Population	Total J1 Population	Daily Water Consumption (MLD*)	PEC	J1 Population	Total J1 Population	Daily Water Consumption (MLD*)	PEC	
Tai Po	722 part, 726 part, 727, 728 part	194 197	9668 1676	11344	8.0624	0.7107	8371 1562	9933	8.0897	0.8118	7401 1259	8660	7.8756	0.9094	0.8115
Fanling	624- 628	188 189 190 191	137 1108 188 743	2176	0.8829	0.4058	283 904 242 890	2319	1.2673	0.5465	239 945 672 858	2714	1.5852	0.5841	0.5121
East Kowloon						0.3710				0.3595				0.4057	0.3787
Yau Tong	298 part	126	1382	1382	1.8995	1.3744	1457	1457	1.4920	1.0241	1362	1362	1.4884	1.0928	1.1638
Kwun Tong and Kowloon Bay	280 295	109 111 112 118 119 307 308 309	67 5953 69 5596 8964 1004 1624 4512	27789	8.9231	0.3211	76 5449 96 5123 8048 1094 1480 4120	25485	8.1935	0.3215	62 4408 113 3929 7454 961 1239 3618	21784	7.9020	0.3627	0.3351
San Po Kong	281 part, 284	101 304	12453 525	12978	1.8293	0.1410	11533 540	12073	1.6286	0.1349	10030 412	10442	1.5071	0.1443	0.1401
Central Kowloon															
To Kwa Wan	233 part, 236 part, 241, 242 243, 244 245, 246 247 part	70 71 75 76 77 260	216 3651 262 3705 342 1607	9783	3.6328	0.3713	303 3428 274 2178 508 1397	8088	3.1704	0.3920	250 2732 240 2359 470 1211	7262	3.5635	0.4907	0.4180

Area	Equiv. TPU	PVS	Year 2001				Year 2002				Year 2003				Average PEC
			J1 Population	Total J1 Population	Daily Water Consumption (MLD*)	PEC	J1 Population	Total J1 Population	Daily Water Consumption (MLD*)	PEC	J1 Population	Total J1 Population	Daily Water Consumption (MLD*)	PEC	
Kwai Chung	320 part	133	12206	45446	27.6452	0.6083	11171	42791	26.5281	0.6199	9542	33777	20.7692	0.6149	0.6144
and	323 part	134	6720				5986				4488				
Tsuen Wan	324 part	139	2147				1942				1518				
	325 part	143	3806				3795				3300				
	326 part	144	5887				6105				5555				
	327 part	146	2311				1926				1684				
	328 part	149	2211				2259				928				
	329	310	3840				3594				2050				
		311	6319				6014				4712				
Tsing Yi	350	153	57	2811	4.1095	1.4619	90	2960	4.5613	1.5410	52	2669	4.2719	1.6005	1.5345
	351 part	154	1344				1587				1534				
		155	1410				1283				1083				
		257	0				0				0				
Tseung Kwan O	839	224	4177	4205	3.7007	0.8801	4551	4600	4.3560	0.9470	5013	5013	4.8954	0.9765	0.9345
		329	28				49				0				
Yuen Long	528	232	3040	5028	10.8450	2.1569	3724	5532	9.9196	1.7931	3091	4717	10.1161	2.1446	2.0315
	524 part	178	1988				1808				1626				
	516														
	517														
Tuen Mun	423 part	165	5821	8939	7.6909	0.8604	5042	8201	7.5737	0.9236	4321	6959	7.3654	1.0583	0.9474
		166	4				41				35				
		168	2902				2824				2390				
		169	162				91				72				
		312	50				203				141				
Sha Tin															
Fo Tan	753 part	202	4960	6569	3.6645	0.5579	4199	5950	3.6694	0.6167	3384	5645	4.1142	0.7288	0.6345
Lik Yuen	756 part	214	1609				1751				2261				

Area	Equiv. TPU	PVS	Year 2001				Year 2002				Year 2003				Average PEC
			J1 Population	Total J1 Population	Daily Water Consumption (MLD*)	PEC	J1 Population	Total J1 Population	Daily Water Consumption (MLD*)	PEC	J1 Population	Total J1 Population	Daily Water Consumption (MLD*)	PEC	
North West Kln.						0.2585				0.2735				0.3060	0.2793
Mong Kok	221,	63	395	5400	1.4431	0.2672	471	5073	1.4005	0.2761	469	4430	1.2970	0.3011	0.2815
and	222,	64	910				906				865				
Tai Kok Tsui	227 and	65	628				543				500				
	229 part	66	341				272				202				
		67	3126				2881				2394				
Sham Shui Po	261	80	605	13670	3.4858	0.2550	591	11535	3.1421	0.2724	458	9320	2.8731	0.3083	0.2785
	264	81	2				28				30				
	265	82	343				358				275				
	266	83	493				483				338				
	267	84	28				61				40				
		89	1784				1507				1160				
		90	5938				5062				4161				
		91	3116				2327				1981				
		303	1362				1118				877				
Sai Kung	741,742, 744, 811- 815 820- 829 and 831	219	372	372	0.7492	2.0139	420	420	0.8535	2.0322	376	376	0.7137	1.8981	1.9814
Outlying Islands						1.9877				0.9586				0.9870	1.3111
Cheung Chau	920	243	110	110	0.1580	1.4361	148	148	0.1151	0.7779	97	97	0.0829	0.8541	1.0227
Lamma Island	911 & 912	251	33	33	0.1263	3.8264	40	40	0.0651	1.6274	25	25	0.0376	1.5026	2.3188

* MLD = Million litres per day

Catchment-dependent Industrial Unit Flow Factors

Kowloon and New Kowloon	Food	Beverage	Textile	Pulp & Paper	Basic Metal	Electro-plating	Electronic & Parts & Components	Slaughter House and Oil Depots	Regular Flow Industries I(a)	Regular Flow Industries I(b)	Regular Flow Industries I(c)	Average per employee flow
(a) Percentage area	0.34	0.28	1.57	0.65	1.81	0.05	0.93	0	70	10	14.37	
(b) Flow ($m^3/d/m^2$ total floor area)	0.019	0.024	0.14	0.18	0.012	0.059	0.186	0	0.0053	0.0041	0.00094	
(c) Area per employee (m^2/employee)	50	50	50	50	50	50	50	50	50	50	326	
(d) Flow (m^3/d/employee) =(b) x (c)	0.95	1.2	7	9	0.6	2.95	9.3	0	0.265	0.205	0.30644	
(e) Contributing flow (m^3/d/employee) =(a) x (d) / 100	0.003	0.003	0.110	0.059	0.011	0.001	0.086	0.000	0.186	0.021	0.044	0.524

Tsuen Wan & Kwai Chung	Food	Beverage	Textile	Pulp & Paper	Basic Metal	Electro-plating	Electronic & Parts & Components	Slaughter House and Oil Depots	Regular Flow Industries I(a)	Regular Flow Industries I(b)	Regular Flow Industries I(c)	Average per employee flow
(a) Percentage area	0.35	0	3.09	0.34	1.41	0.11	0.73	0	70	10	13.97	
(b) Flow ($m^3/d/m^2$ total floor area)	0.019	0.024	0.14	0.18	0.012	0.059	0.186	0	0.0053	0.0041	0.00094	
(c) Area per employee (m^2/employee)	50	50	50	50	50	50	50	50	50	50	326	
(d) Flow (m^3/d/employee) =(b) x (c)	0.95	1.2	7	9	0.6	2.95	9.3	0	0.265	0.205	0.30644	
(e) Contributing flow (m^3/d/employee) =(a) x (d) / 100	0.003	0.000	0.216	0.031	0.008	0.003	0.068	0.000	0.186	0.021	0.043	0.579

Hong Kong Island	Food	Beverage	Textile	Pulp & Paper	Basic Metal	Electro-plating	Electronic & Parts & Components	Slaughter House and Oil Depots	Regular Flow Industries I(a)	Regular Flow Industries I(b)	Regular Flow Industries I(c)	Average per employee flow
(a) Percentage area	0.84	0.55	0.15	0.32	1.33	0.03	0.46	0	75	5	16.32	
(b) Flow ($m^3/d/m^2$ total floor area)	0.019	0.024	0.14	0.18	0.012	0.059	0.186	0	0.0053	0.0041	0.00094	
(c) Area per employee (m^2/employee)	50	50	50	50	50	50	50	50	50	50	326	
(d) Flow (m^3/d/employee) =(b) x (c)	0.95	1.2	7	9	0.6	2.95	9.3	0	0.265	0.205	0.30644	
(e) Contributing flow (m^3/d/employee) =(a) x (d) / 100	0.008	0.007	0.011	0.029	0.008	0.001	0.043	0.000	0.199	0.010	0.050	0.365

Tuen Mun	Food	Beverage	Textile	Pulp & Paper	Basic Metal	Electro-plating	Electronic & Parts & Components	Slaughter House and Oil Depots	Regular Flow Industries I(a)	Regular Flow Industries I(b)	Regular Flow Industries I(c)	Average per employee flow
(a) Percentage area	0.59	0.28	1.45	0	2.69	0.03	0.69	0	65	5	24.27	
(b) Flow ($m^3/d/m^2$ total floor area)	0.019	0.024	0.14	0.18	0.012	0.059	0.186	0	0.0053	0.0041	0.00094	
(c) Area per employee (m^2/employee)	50	50	50	50	50	50	50	50	50	50	326	
(d) Flow (m^3/d/employee) =(b) x (c)	0.95	1.2	7	9	0.6	2.95	9.3	0	0.265	0.205	0.30644	
(e) Contributing flow (m^3/d/employee) =(a) x (d) / 100	0.006	0.003	0.102	0.000	0.016	0.001	0.064	0.000	0.172	0.010	0.074	0.449

Yuen Long & North NT	Food	Beverage	Textile	Pulp & Paper	Basic Metal	Electro-plating	Electronic & Parts & Components	Slaughter House and Oil Depots	Regular Flow Industries I(a)	Regular Flow Industries I(b)	Regular Flow Industries I(c)	Average per employee flow
(a) Percentage area	1.38	0	1.03	1.94	18.14	0.02	0.4	0	60	0	17.09	
(b) Flow ($m^3/d/m^2$ total floor area)	0.019	0.024	0.14	0.18	0.012	0.059	0.186	0	0.0053	0.0041	0.00094	
(c) Area per employee (m^2/employee)	50	50	50	50	50	50	50	50	50	50	326	
(d) Flow (m^3/d/employee) =(b) x (c)	0.95	1.2	7	9	0.6	2.95	9.3	0	0.265	0.205	0.30644	
(e) Contributing flow (m^3/d/employee) =(a) x (d) / 100	0.013	0.000	0.072	0.175	0.109	0.001	0.037	0.000	0.159	0.000	0.052	0.618

Tai Po	Food	Beverage	Textile	Pulp & Paper	Basic Metal	Electro-plating	Electronic & Parts & Components	Slaughter House and Oil Depots	Regular Flow Industries I(a)	Regular Flow Industries I(b)	Regular Flow Industries I(c)	Average per employee flow
(a) Percentage area	0.9	2.15	0	0	3.48	0	2.07	0	70	0	21.4	
(b) Flow ($m^3/d/m^2$ total floor area)	0.019	0.024	0.14	0.18	0.012	0.059	0.186	0	0.0053	0.0041	0.00094	
(c) Area per employee (m^2/employee)	50	50	50	50	50	50	50	50	50	50	326	
(d) Flow (m^3/d/employee) =(b) x (c)	0.95	1.2	7	9	0.6	2.95	9.3	0	0.265	0.205	0.30644	
(e) Contributing flow (m^3/d/employee) =(a) x (d) / 100	0.009	0.026	0.000	0.000	0.021	0.000	0.193	0.000	0.186	0.000	0.066	0.499

Sha Tin	Food	Beverage	Textile	Pulp & Paper	Basic Metal	Electro-plating	Electronic & Parts & Components	Slaughter House and Oil Depots	Regular Flow Industries I(a)	Regular Flow Industries I(b)	Regular Flow Industries I(c)	Average per employee flow
(a) Percentage area	0.93	0.28	0.6	0.32	0.45	0.02	0.76	0	75	0	21.64	
(b) Flow ($m^3/d/m^2$ total floor area)	0.019	0.024	0.14	0.18	0.012	0.059	0.186	0	0.0053	0.0041	0.00094	
(c) Area per employee (m^2/employee)	50	50	50	50	50	50	50	50	50	50	326	
(d) Flow (m^3/d/employee) =(b) x (c)	0.95	1.2	7	9	0.6	2.95	9.3	0	0.265	0.205	0.30644	
(e) Contributing flow (m^3/d/employee) =(a) x (d) / 100	0.009	0.003	0.042	0.029	0.003	0.001	0.071	0.000	0.199	0.000	0.066	0.422

Sai Kung	Food	Beverage	Textile	Pulp & Paper	Basic Metal	Electro-plating	Electronic & Parts & Components	Slaughter House and Oil Depots	Regular Flow Industries I(a)	Regular Flow Industries I(b)	Regular Flow Industries I(c)	Average per employee flow
(a) Percentage area	0.51	0	0.64	0	19.97	0.03	0	0	60	0	18.85	
(b) Flow ($m^3/d/m^2$ total floor area)	0.019	0.024	0.14	0.18	0.012	0.059	0.186	0	0.0053	0.0041	0.00094	
(c) Area per employee (m^2/employee)	50	50	50	50	50	50	50	50	50	50	326	
(d) Flow (m^3/d/employee) =(b) x (c)	0.95	1.2	7	9	0.6	2.95	9.3	0	0.265	0.205	0.30644	
(e) Contributing flow (m^3/d/employee) =(a) x (d) / 100	0.005	0.000	0.045	0.000	0.120	0.001	0.000	0.000	0.159	0.000	0.058	0.387

Lantau Island	Food	Beverage	Textile	Pulp & Paper	Basic Metal	Electro-plating	Electronic & Parts & Components	Slaughter House and Oil Depots	Regular Flow Industries I(a)	Regular Flow Industries I(b)	Regular Flow Industries I(c)	Average per employee flow
(a) Percentage area	0.34	0	1.21	0.32	1.81	0.05	0.52	0	60	0	35.75	
(b) Flow ($m^3/d/m^2$ total floor area)	0.019	0.024	0.14	0.18	0.012	0.059	0.186	0	0.0053	0.0041	0.00094	
(c) Area per employee (m^2/employee)	50	50	50	50	50	50	50	50	50	50	326	
(d) Flow (m^3/d/employee) =(b) x (c)	0.95	1.2	7	9	0.6	2.95	9.3	0	0.265	0.205	0.30644	
(e) Contributing flow (m^3/d/employee) =(a) x (d) / 100	0.003	0.000	0.085	0.029	0.011	0.001	0.048	0.000	0.159	0.000	0.110	0.446

Comparison of Total Average Flows of Major Sewage Catchments

Flow comparisons are carried out for 28 major sewage catchments. Measured flow records of treatment plants of these catchments are compared with the flow figures estimated using the SM1 and using these Guidelines. The comparison is essentially based on the flow records of year 2002. However, to reduce the impact of any possible errors in flow measurement records and to provide means for checking, flow data of year 2001 and year 2003 are included for reference.

Based on the TPEDM 2002 Base-Year Estimates by PVS Zones, total average flows of 28 major sewage catchments are calculated in **Annexes 1 and 2** of this Appendix. A summary in **Table VII(a)** compares (a) 2002 average flows calculated by using flow factors in SM1 with a UFF of 0.600m^3/employee/d for manufacturing flows, and (b) 2002 average flow calculated by using the recommended UFFs with CIFs of this GESF against (c) the recorded average flows at the PTWs/STWs for years 2001, 2002 and 2003. Total estimated daily flows for all PTWs/STWs and only HATS PTWs are also provided at the bottom of the table for comparison.

The performance of the recommended UFFs is inversely proportional to the deviation of the calculated sewage flow from the measured flow. Deviation of the calculated figure from the measured figure is represented as a percentage of the measured figure. The weight of the figure is the measured flow figures divided by the total quantity of measured flows of the 28 catchments. The flow-weighted absolute percentage error of a calculated figure is the product of the percentage deviation and the weight of the measured flow. The sum of these percentage errors for each flow estimating methodology is shown at the bottom of the table. It can be seen that the flow weighted absolute percentage errors of using GESF and SM1 are around 3% and 13% respectively. In general, the flow figures estimated based GESF appears to better match with the measured flow figures.

Based on the recommended catchment inflow factors, the total inflow quantities considered in the calculations are about 11% of the total average daily quantity of sewage of the 28 catchments. This agrees with the objective state in Section **(1)** of **Appendix III**.

It can be seen from individual calculated flow figures that the estimated flows at the PTWs of Central, Wan Chai West and North Point using flow factors in SM1 are significantly higher than those measured at these PTWs. For those catchments susceptible to high inflow, such as Aberdeen Ap Lei Chau, Yuen Long and Cheung Chau, the flow factors in SM1 appears to underestimate the total flows to these PTWs/STWs. The recommended set of flow factors in GESF appears to better estimate the measured flows and address actual situations.

Table VII(a) - Comparison of total average flows of major sewage catchments estimated using the UFFs in SM1 and proposed UFFs against the measured figures for year 2002

Selected Plant	Design ADWF of Plant (m^3/d)	Treatment Plant Measured Flow (m^3/d)	Flow Estimated Using Flow Factors of SM1 (m^3/d)	Flow Estimated Using Flow Factors of GESF (m^3/d)
Chai Wan PTW	42,000	59,167	66,244	59,825
Shau Kei Wan PTW	39,000	71,050	67,113	71,337
To Kwa Wan PTW	288,000	210,481	230,601	214,567
Kwun Tong PTW	333,000	276,114	304,855	284,473
North West Kowloon PS	406,000	371,890	326,978	367,850
Tseung Kwan O PS	212,000	100,855	90,090	99,746
Kwai Chung PTW	318,000	223,383	227,707	218,431
Tsing Yi PTW	88,000	55,214	53,742	54,922
Central PTW	110,000	101,803	154,605	108,374
Wan Chai W PTW	40,000	59,485	77,892	56,384
Wan Chai E PTW	65,000	73,475	87,102	78,590
North Point PTW	118,000	73,964	104,520	81,070
Ap Lei Chau STW	35,000	31,886	26,363	30,619
Aberdeen STW	54,000	73,038	48,634	56,081
Sandy Bay STW	8,900	4,314	5,389	4,760
Wah Fu STW	16,000	10,645	10,960	10,624
Stanley STW	11,600	7,916	7,925	7,375
Shek O STW	1,180	1,038	625	937
San Wai STW	164,000	105,100	103,006	103,671
Yuen Long STW	70,000	16,533	10,990	18,368
Sai Kung STW	8,000	9,176	7,728	9,149
Tai Po STW	88,000	78,642	94,946	89,920
Sha Tin STW	150,000	219,083	213,514	217,617
Pillar Point STW	200,000	165,083	155,266	162,827
Shek Wu Hui STW	80,000	73,842	77,821	71,488
Cheung Chau STW	4,000	9,254	4,864	7,648
Mui Wo STW	2,380	1,297	1,674	1,840
Siu Ho Wan STW	162,000	24,468	26,970	20,916
Total of all STWs/PTWs:		2,508,169	2,588,124	2,509,408
Total of all HATS PTWs:		1,796,737	1,882,794	1,797,652
Sum of all flow weighted abs. error (%) of all STWs/PTWs:			13.13	3.64
Sum of all flow weighted abs. error (%) of all HATS PTWs:			15.44	3.58

Notes of Table VII(a):

(i) For flow figures estimated using SM1, a prevalent industrial activity UFF of 0.60 m^3/employee/day generally adopted under HATS for industrial flows is used.

(ii) Flows are calculated based on 2002 base year TPEDM.

(iii) Estimated flows in excess of 20% different from the measured flows are highlighted.

2002 SEWAGE FLOWS OF MAJOR CATCHMENTS ESTIMATED USING FLOW FACTORS IN GESF AND
TPEDM 2002 BASE-YEAR ESTIMATES BY PVS ZONE (as at Mid-2002)
Part 1

Annex 1 of Appendix VII - Part 1

Selected major catchment (PTW/STW)	Population										Flows							
	Public Rental	Subsidized Sale Flat	Private Permanent	Non-domestic	Institutional & Special Classes	Temporary	Resident Total (excl. Mob res)	Mobile Residental Population	Resident Total (incl. Mob res)	Full-time School Places	Total Ave. Flow (m3/d)	Catchment Inflow factor	Sub-total Ave. Res. Flow (m3/d)	Priv. Perm. Res. UFF adjustment factor	Sub-total Ave. Ind. Flow (m3/d)	Ind. UFF adjustment factor	Sub-total Ave. Com. Flow (m3/d)	Sub-total Ave. Inst. Flow (m3/d)
Unit flow factor (m3/person/day)	0.19	0.19	0.19	0.15	0.19	0.15		0.19		0.04								
Central & Western	5,771	-	198,858	694	3,574	969	209,865	1,874	211,739	50,430								
- Central and Western (Central PTW)	5,771	-	198,858	694	3,574	968	209,864	1,874	211,738	50,430	108,370	1.00	43,186	1.08	1,822	0.45	61,345	2,017
- Green Island Reclaimation (Central PTW)	-	-	-	-	-	1	1	-	1	-	4	1.00	0	1.08	0	0.45	4	-
Wan Chai and North Point	13,933	5,890	352,841	634	3,227	1,379	377,904	4,265	382,170	101,778								
- Wan Chai West (Wan Chai W PTW)	-	-	60,835	128	745	361	62,069	690	62,759	19,259	52,280	1.00	14,101	1.19	571	0.45	36,839	770
- Central and Wan Chai Reclamation (Wan Chai W PTW)	-	-	803	-	5	9	817	10	827	-	4,103	1.00	186	1.19	12	0.45	3,906	-
- Wan Chai East (Wan Chai E PTW)	8,095	-	97,683	369	1,171	393	107,711	1,291	109,002	40,672	78,590	1.00	24,949	1.23	716	0.45	51,299	1,627
- North Point (North Point PTW)	5,838	5,890	193,519	137	1,306	617	207,307	2,274	209,582	41,847	81,070	1.00	41,685	1.05	2,495	0.45	35,216	1,674
Hong Kong Island South	3,286	3,389	10,402	99	3,437	392	21,004	146	21,150	3,805								
- Stanley (Stanley STW)	3,286	3,389	8,891	98	3,435	258	19,356	129	19,486	3,404	7,375	1.00	5,111	1.61	14	0.45	2,113	136
- Shek O (Shek O STW)	-	-	1,511	0	2	134	1,648	17	1,664	400	937	1.50	656	1.44	3	0.45	255	24
Chai Wan and Shaukeiwan	110,487	92,236	177,762	297	2,230	740	383,752	3,456	387,208	54,216								
- Chai Wan (Chai Wan PTW)	69,381	58,293	55,267	85	1,585	84	184,696	1,523	186,219	30,548	59,825	1.10	39,150	1.01	3,018	0.45	16,313	1,344
- Shaukeiwan (Shau Kei Wan PTW)	41,106	33,943	122,494	212	645	656	199,056	1,933	200,989	23,668	71,337	1.25	47,692	1.00	701	0.45	21,761	1,183
Aberdeen, Ap Lei Chau and Pok Fu Lam	94,221	30,894	113,923	436	5,599	1,649	246,721	1,832	248,553	43,362								
- Ap Lei Chau (Ap Lei Chau STW)	40,349	8,038	39,768	9	354	27	88,545	660	89,205	9,881	30,619	1.30	22,032	1.00	727	0.98	7,347	514
- Aberdeen (Aberdeen STW)	27,574	12,080	51,273	336	2,951	1,104	95,317	732	96,049	21,458	48,903	1.30	27,405	1.24	4,958	0.98	15,425	1,116
- Repulse Bay and Shouson Hill (Aberdeen STW)	-	-	14,538	53	-	258	14,849	148	14,997	2,956	7,178	1.30	4,550	1.24	18	0.98	2,457	154
- Sandy Bay (Sandy Bay STW)	-	-	6,062	19	2,090	208	8,379	60	8,439	3,475	4,760	1.00	2,424	1.72	10	0.45	2,188	139
- Wah Fu (Wah Fu STW)	26,298	10,776	2,282	19	204	51	39,631	232	39,863	5,592	10,624	1.00	8,737	1.47	21	0.45	1,641	224
Central and East Kowloon	567,542	244,694	471,846	2,271	9,480	6,830	1,302,662	10,995	1,313,658	237,393								
- Central Kowloon (To Kwa Wan PTW)	158,894	64,876	253,488	1,110	4,005	4,208	486,580	4,555	491,135	109,831	209,198	1.00	94,313	1.02	6,396	0.98	104,096	4,393
- East Kowloon - incl. SEKD East (Kwun Tong PTW)	408,648	179,818	208,017	1,161	5,475	2,622	805,741	6,311	812,052	127,086	284,473	1.10	173,605	1.05	23,520	0.80	81,756	5,592
- SEKD West (To Kwa Wan PTW)	-	-	10,342	-	-	-	10,342	130	10,471	476	5,369	1.00	2,029	1.02	879	0.98	2,442	19
North West Kowloon (North West Kowloon PS)	148,651	36,706	483,630	1,353	9,753	7,990	688,083	6,322	694,404	193,904	367,850	1.30	178,743	1.06	10,758	0.63	168,265	10,083
Tseung Kwan O (Tseung Kwan O PS)	94,320	136,634	67,356	29	2,112	170	300,620	2,269	302,889	46,112	99,746	1.20	69,979	1.02	6,953	1.79	20,601	2,213
Yuen Long and Kam Tin	167,533	63,646	136,096	570	1,723	5,298	374,867	2,910	377,776	87,118								
- Ha Tsuen & Lau Fau Shan (San Wai STW)	-	-	-	-	-	-	-	-	-	-	-	1.00	-	1.09	-	3.57	-	-
- Tin Shui Wai (San Wai STW)	132,040	62,696	39,611	10	659	1	235,017	1,865	236,882	44,252	59,174	1.00	46,757	1.09	841	3.57	9,807	1,770
- Hung Shui Kiu (San Wai STW)	-	-	5,959	134	246	2,044	8,383	64	8,448	205	2,615	1.00	1,620	1.09	425	3.57	563	8
- Ping Shan (San Wai STW)	-	-	7,451	36	-	403	7,890	69	7,958	1,820	3,322	1.00	1,622	1.09	1,054	3.57	574	73
- Tong Yan San Tsuen (San Wai STW)	686	-	7,578	26	26	1,201	9,517	86	9,603	3,937	4,509	1.00	1,905	1.09	1,787	3.57	659	157
- Yuen Long Town (San Wai STW)	12,182	950	62,498	335	487	830	77,283	603	77,885	26,743	34,052	1.00	15,837	1.09	4,650	3.57	12,496	1,070
- Tai Tong (San Wai STW)	-	-	-	-	-	-	-	-	-	-	-	1.00	-	1.09	-	3.57	-	-
- Kam Tin South and North (Yuen Long STW)	-	-	-	-	-	-	-	-	-	-	-	1.00	-	1.27	-	3.57	-	-
- Fairview Park & Nam San Wai (Yuen Long STW)	-	-	-	-	-	-	-	-	-	-	-	1.00	-	1.27	-	3.57	-	-
- Ngau Tam Mei (Yuen Long STW)	-	-	-	-	-	-	-	-	-	-	-	1.00	-	1.27	-	3.57	-	-
- San Tin (Yuen Long STW)	-	-	-	-	-	-	-	-	-	-	-	1.00	-	1.27	-	3.57	-	-
- Wang Chau (Yuen Long STW)	22,625	-	13,000	29	305	819	36,777	223	37,001	10,161	18,368	1.00	7,663	1.27	7,888	3.57	2,411	406
- Pat Heung & Shek Kong (Yuen Long STW)	-	-	-	-	-	-	-	-	-	-	-	1.00	-	1.27	-	3.57	-	-
Port Shelter (Sai Kung STW)	745	802	14,953	20	1,167	292	17,977	148	18,125	4,202	9,149	1.30	5,901	1.37	402	3.57	2,627	219
Tolo Harbour	253,308	284,956	329,062	771	12,177	6,047	886,321	7,656	893,977	181,347								
- Tai Po (Tai Po STW)	73,691	88,701	101,952	458	2,609	3,940	271,352	2,229	273,581	62,317								
* Lam Tsuen	-	-	-	-	-	-	-	-	-	-	-	1.00	-	1.19	-	1.34	-	-
* Wu Kau Tang	-	-	-	-	-	-	-	-	-	-	-	1.00	-	1.19	-	1.34	-	-
* Ting Kok	-	-	846	2	54	9	911	9	919	-	265	1.00	205	1.19	4	1.34	56	-
* Tai Po Industrial Estate Area	-	-	3,474	-	1,245	172	4,891	37	4,929	3,020	9,470	1.00	1,055	1.19	6,952	1.34	1,342	121
* Hong Lok Yuen	-	-	9,313	16	1	1,949	11,280	106	11,386	379	3,053	1.00	2,421	1.19	23	1.34	594	15
* Tai Po Town	73,691	88,701	78,657	424	1,310	1,196	243,980	1,973	245,953	57,118	73,907	1.00	52,708	1.19	1,621	1.34	17,294	2,285
* Tai Po Kau and Pak Shek Kok	-	-	9,661	16	-	614	10,291	103	10,394	1,800	3,225	1.00	2,298	1.19	23	1.34	832	72
- Shatin (Sha Tin STW)	179,617	196,255	227,110	313	9,568	2,106	614,969	5,427	620,396	119,030								
* Shatin	151,939	90,126	178,349	299	8,906	1,997	431,615	3,907	435,522	88,960	161,647	1.15	102,095	1.12	4,710	0.80	50,750	4,092
* Ma On Shan	27,678	106,129	48,761	14	661	110	183,354	1,520	184,874	30,070	55,969	1.15	44,451	1.12	193	0.80	9,943	1,383
Tuen Mun (Pillar Point STW)	167,504	135,896	173,677	153	6,955	5,924	490,109	3,684	493,793	100,907								
- So Kwun Wat	167,504	135,896	159,017	119	6,955	2,262	471,752	3,581	475,334	98,984	156,782	1.10	104,171	1.08	11,485	1.79	36,771	4,355
- Lam Tei & Yick Yuen	-	-	14,660	34	-	3,663	18,357	103	18,460	1,923	6,045	1.10	3,941	1.08	868	1.79	1,152	85
Tsuen Wan, Kwai Chung and Tsing Yi	332,981	87,701	269,128	1,162	4,902	5,016	700,890	6,236	707,125	126,576								
- Tsuen Wan and Kwai Chung (Kwai Chung PTW)	252,620	26,440	221,192	1,147	4,046	4,909	510,354	4,544	514,898	98,712	218,431	1.10	109,417	1.04	36,647	1.16	68,023	4,343
- Tsing Yi (Tsing Yi PTW)	80,361	61,261	47,937	15	856	107	190,536	1,692	192,228	27,864	54,922	1.10	40,170	1.00	3,660	2.68	9,867	1,226
North District (Shek Wu Hui STW)	67,724	89,932	78,810	195	1,743	6,572	244,975	2,250	247,225	58,551								
- Kau Lung Hang	-	-	-	-	-	-	-	-	-	-	-	1.00	-	1.07	-	0.98	-	-
- Ping Kong	-	-	-	-	-	-	-	-	-	-	-	1.00	-	1.07	-	0.98	-	-
- Kwu Tung South	-	-	-	-	-	-	-	-	-	-	-	1.00	-	1.07	-	0.98	-	-
- Kwu Tung North	-	-	-	-	-	-	-	-	-	-	-	1.00	-	1.07	-	0.98	-	-
- Fanling / Sheung Shui Town	66,453	89,932	74,768	88	1,656	4,395	237,292	2,220	239,512	57,116	69,244	1.00	47,518	1.07	1,458	0.98	17,983	2,285
- Ping She / Ta Kwu Ling	-	-	2,086	99	71	1,664	3,919	13	3,932	495	1,249	1.00	704	1.07	111	0.98	413	20
- Luk Keng	1,271	-	1,956	8	16	513	3,764	17	3,781	940	995	1.00	724	1.07	25	0.98	209	38
- Lung Yeuk Tau & Kwan Tei South	-	-	-	-	-	-	-	-	-	-	-	1.00	-	1.07	-	0.98	-	-
Outlying Islands	24,410	7,635	16,778	52	396	569	49,840	312	50,152	10,080								
- Cheung Chau (Cheung Chau STW)	1,212	-	9,394	23	211	323	11,162	41	11,203	2,510	7,648	1.50	4,216	1.39	240	1.79	3,041	151
- Mui Wo (Mui Wo STW)	966	-	2,944	29	29	163	4,131	14	4,145	653	1,840	1.00	959	1.32	25	1.79	830	26
- Discovery Bay (Siu Ho Wan STW)	-	-	-	-	-	-	-	-	-	-	-	1.00	-	1.51	-	0.80	-	-
- Ma Wan, Lantau North & Port Dev (Siu Ho Wan STW)	-	-	-	-	-	-	-	-	-	-	-	1.00	-	1.20	-	0.80	-	-
- Tung Chun/Tai Ho New Town (Siu Ho Wan STW)	22,232	7,635	4,439	1	155	82	34,544	257	34,801	6,917	10,399	1.00	7,068	1.20	40	0.80	3,015	277
- Airport Development (Siu Ho Wan STW)	-	-	2	-	1	-	3	-	3	-	10,517	1.00	1	1.20	3,111	0.80	7,405	-
Total Population	2,052,416	1,221,009	2,895,122	8,735	68,473	49,836	6,295,591	54,355	6,349,946	1,299,782								
Trade flows(activities+employee):	130,532	4,158	50,643	88,695	40,130	39,676	1,207	10	52,089	333,953	195,285	9,432	945,808	2,509,408		1,405,957		151,831		893,921	57,699
Trade flows (activities only):	114,215	3,150	28,135	63,354	-	-	-	-	33,971	317,044	139,489	-	699,357	Av. Res. UFF :		0.2214		135,515		585,142	
Licenced flows:	84,552	2,539	6,890	38,471	631	6,219	12	-	10,675	191,102	83,458	-	424,549					84,552		339,997	
Average commercial activities UFF, excl. CIF (=Trade Flow/ Popn of J2-J12)																				0.2034	

Selected major catchment (PTW/STW)	Manufac-turing	Electricity, Gas & Water	Transport Storage & Communicatn	Wholesale & Retail	Import / Export	Financing, Ins., Real Estate & Bus. Serv.	Agriculture & Fishing	Mining & Quarrying	Constructn	Restaurants & Hotels	Community, Social & Personal Services	Public Admin.	Total
	J1	J2	J3	J4	J5	J6	J7	J8	J9	J10	J11	J12	
Unit flow factor (m3/person/day)	0.64	0.33	0.18	0.28	0.08	0.08	0.08	0.08	0.23	1.58	0.28	0.08	
Central & Western	5,486	9	22,365	24,389	37,700	115,740	243	-	11,498	14,284	43,584	9,740	285,039
- Central and Western (Central PTW)	5,486	9	22,365	24,389	37,670	115,740	243	-	11,498	14,284	43,580	9,739	285,004
- Green Island Reclaimation (Central PTW)	0	-	0	0	30	0	-	-	0	0	4	1	35
Wan Chai and North Point	11,427	3,780	30,573	39,658	57,405	145,695	251	-	29,490	36,689	92,365	31,524	478,856
- Wan Chai West (Wan Chai W PTW)	1,719	1,245	10,292	8,731	16,312	63,237	42	-	6,533	10,384	21,889	21,564	161,947
- Central and Wan Chai Reclamation (Wan Chai W PTW)	35	-	2,011	228	831	3,535	-	-	30	1,700	1,470	324	10,165
- Wan Chai East (Wan Chai E PTW)	2,157	328	8,636	18,781	18,816	45,091	50	-	7,231	16,602	38,870	6,035	162,597
- North Point (North Point PTW)	7,516	2,207	9,634	11,918	21,446	33,832	159	-	15,697	8,003	30,135	3,601	144,148
Hong Kong Island South	49	9	231	779	141	539	20	20	523	529	3,068	1,839	7,749
- Stanley (Stanley STW)	43	6	212	746	130	468	12	12	504	508	2,684	1,808	7,133
- Shek O (Shek O STW)	6	4	19	33	11	71	8	8	20	21	384	31	615
Chai Wan and Shaukeiwan	9,954	12	9,270	12,242	19,087	15,346	1,678	3	7,859	7,516	36,657	3,774	123,398
- Chai Wan (Chai Wan PTW)	8,265	3	5,429	5,575	11,788	5,001	597	-	3,531	2,770	19,887	1,784	64,631
- Shaukeiwan (Shau Kei Wan PTW)	1,688	9	3,841	6,667	7,299	10,344	1,081	3	4,328	4,746	16,770	1,990	58,767
Aberdeen, Ap Lei Chau and Pok Fu Lam	7,072	579	6,382	8,043	7,883	6,882	3,245	-	5,184	4,271	35,796	2,989	88,325
- Ap Lei Chau (Ap Lei Chau STW)	889	561	2,979	2,015	944	1,454	1,322	-	1,104	1,014	7,873	97	20,253
- Aberdeen (Aberdeen STW)	6,067	18	2,664	4,982	6,571	3,530	1,609	-	2,462	2,812	13,696	2,539	46,952
- Repulse Bay and Shouson Hill (Aberdeen STW)	22	-	181	295	106	1,195	17	-	933	94	4,636	94	7,573
- Sandy Bay (Sandy Bay STW)	29	-	90	88	60	299	-	-	150	63	7,055	101	7,936
- Wah Fu (Wah Fu STW)	65	-	468	663	202	403	296	-	535	287	2,534	158	5,612
Central and East Kowloon	52,068	1,492	59,509	67,684	164,107	79,953	889	2	44,336	52,808	129,080	16,684	668,612
- Central Kowloon (To Kwa Wan PTW)	10,175	694	24,945	37,395	66,914	43,078	303	-	15,584	36,688	63,577	9,130	308,483
- East Kowloon - incl. SEKD East (Kwun Tong PTW)	40,495	799	33,942	29,500	91,732	32,124	586	2	27,798	15,878	63,542	5,790	342,187
- SEKD West (To Kwa Wan PTW)	1,397	-	623	789	5,461	4,750	-	-	954	242	1,961	1,764	17,942
North West Kowloon (North West Kowloon PS)	19,121	3,598	35,338	63,353	77,725	53,437	719	-	36,984	34,518	104,468	16,256	445,518
Tseung Kwan O (Tseung Kwan O PS)	5,353	17	5,115	5,651	1,895	3,708	290	31	8,942	3,736	21,670	1,973	58,381
Yuen Long and Kam Tin	8,005	185	7,634	12,778	4,985	6,625	1,115	-	9,629	7,233	23,621	2,755	84,566
- Ha Tsuen & Lau Fau Shan (San Wai STW)	-	-	-	-	-	-	-	-	-	-	-	-	-
- Tin Shui Wai (San Wai STW)	404	-	2,986	3,247	1,290	2,167	570	-	4,398	2,438	11,145	674	29,319
- Hung Shui Kiu (San Wai STW)	204	-	180	433	134	113	104	-	224	67	799	-	2,258
- Ping Shan (San Wai STW)	507	-	204	291	122	94	37	-	206	120	706	11	2,297
- Tong Yan San Tsuen (San Wai STW)	859	-	228	326	429	168	35	-	394	80	926	-	3,445
- Yuen Long Town (San Wai STW)	2,236	184	2,975	7,538	2,386	3,477	242	-	3,623	3,882	7,766	1,988	36,298
- Tai Tong (San Wai STW)	-	-	-	-	-	-	-	-	-	-	-	-	-
- Kam Tin South and North (Yuen Long STW)	-	-	-	-	-	-	-	-	-	-	-	-	-
- Fairview Park & Nam San Wai (Yuen Long STW)	-	-	-	-	-	-	-	-	-	-	-	-	-
- Ngau Tam Mei (Yuen Long STW)	-	-	-	-	-	-	-	-	-	-	-	-	-
- San Tin (Yuen Long STW)	-	-	-	-	-	-	-	-	-	-	-	-	-
- Wang Chau (Yuen Long STW)	3,794	2	1,060	944	624	606	126	-	784	646	2,279	82	10,948
- Pat Heung & Shek Kong (Yuen Long STW)	-	-	-	-	-	-	-	-	-	-	-	-	-
Port Shelter (Sai Kung STW)	147	36	275	580	284	488	237	-	352	534	4,684	825	8,443
Tolo Harbour	18,458	1,085	21,506	26,011	32,872	23,446	1,355	0	24,979	17,096	87,295	10,541	264,646
- Tai Po (Tai Po STW)	10,383	450	4,898	7,555	4,569	5,981	873	0	7,181	4,797	23,310	3,753	73,751
* Lam Tsuen	-	-	-	-	-	-	-	-	-	-	-	-	-
* Wu Kau Tang	-	-	-	-	-	-	-	-	-	-	-	-	-
* Ting Kok	5	-	11	15	9	12	19	0	26	12	76	6	190
* Tai Po Industrial Estate Area	8,371	256	1,145	82	914	1,384	-	-	844	22	2,162	141	15,321
* Hong Lok Yuen	28	-	124	165	153	228	110	-	153	10	1,557	-	2,527
* Tai Po Town	1,952	111	3,506	7,179	3,317	4,012	744	-	4,987	4,753	17,963	3,548	52,072
* Tai Po Kau and Pak Shek Kok	28	83	113	114	176	344	-	-	1,172	1	1,552	58	3,641
- Shatin (Sha Tin STW)	8,075	636	16,608	18,456	28,303	17,466	482	-	17,798	12,299	63,985	6,788	190,895
* Shatin	7,757	620	14,325	14,747	26,981	14,860	333	-	14,380	10,159	50,297	5,027	159,485
* Ma On Shan	318	16	2,284	3,710	1,323	2,606	149	-	3,418	2,140	13,688	1,760	31,410
Tuen Mun (Pillar Point STW)	10,375	1,208	13,544	13,129	10,100	7,614	1,551	69	11,461	8,509	35,691	5,584	118,833
- So Kwun Wat	9,646	910	13,189	12,713	9,845	7,395	1,480	2	10,705	8,334	34,380	5,510	114,108
- Lam Tei & Yick Yuen	729	298	355	416	255	219	71	67	755	175	1,312	74	4,725
Tsuen Wan, Kwai Chung and Tsing Yi	47,767	213	37,302	31,608	80,944	26,847	457	-	24,500	15,988	57,119	6,449	329,196
- Tsuen Wan and Kwai Chung (Kwai Chung PTW)	45,663	213	34,025	28,263	78,015	24,706	314	-	19,546	13,728	45,840	5,827	296,140
- Tsing Yi (Tsing Yi PTW)	2,105	-	3,276	3,345	2,929	2,141	143	-	4,954	2,260	11,279	622	33,056
North District (Shek Wu Hui STW)	2,536	328	5,206	7,835	6,098	4,956	1,429	-	5,337	4,966	17,943	3,368	60,001
- Kau Lung Hang	-	-	-	-	-	-	-	-	-	-	-	-	-
- Ping Kong	-	-	-	-	-	-	-	-	-	-	-	-	-
- Kwu Tung South	-	-	-	-	-	-	-	-	-	-	-	-	-
- Kwu Tung North	-	-	-	-	-	-	-	-	-	-	-	-	-
- Fanling / Sheung Shui Town	2,319	310	4,999	7,522	5,933	4,903	981	-	4,831	4,898	17,490	2,273	56,458
- Ping She / Ta Kwu Ling	177	19	158	136	112	22	277	-	462	40	245	872	2,518
- Luk Keng	40	-	49	177	53	31	171	-	45	28	208	223	1,025
- Lung Yeuk Tau & Kwan Tei South	-	-	-	-	-	-	-	-	-	-	-	-	-
Outlying Islands	6,138	45	27,099	3,027	399	4,673	1,607	-	5,398	2,683	4,406	3,598	59,074
- Cheung Chau (Cheung Chau STW)	148	-	281	1,076	114	191	1,485	-	353	603	1,706	253	6,209
- Mui Wo (Mui Wo STW)	23	18	229	268	54	155	81	-	152	283	683	145	2,090
- Discovery Bay (Siu Ho Wan STW)	-	-	-	-	-	-	-	-	-	-	-	-	-
- Ma Wan, Lantau North & Port Dev (Siu Ho Wan STW)	-	-	-	-	-	-	-	-	-	-	-	-	-
- Tung Chun/Tai Ho New Town (Siu Ho Wan STW)	76	27	1,359	648	208	448	42	-	4,016	666	1,832	439	9,760
- Airport Development (Siu Ho Wan STW)	5,891	-	25,230	1,035	23	3,880	-	-	877	1,131	185	2,760	41,014
Total Population	203,956	12,599	281,349	316,768	501,625	495,948	15,087	125	226,472	211,362	697,445	117,899	3,080,636
Trade flows(activities+employee):	130,532	4,158	50,643	88,695	40,130	39,676	1,207	10	52,089	333,953	195,285	9,432	945,808
Trade flows (activities only):	114,215	3,150	28,135	63,354	-	-	-	-	33,971	317,044	139,489	-	699,357
Licenced flows:	84,552	2,539	6,890	38,471	631	6,219	12	-	10,675	191,102	83,458	-	424,549

2002 SEWAGE FLOWS OF MAJOR CATCHMENTS ESTIMATED USING FLOW FACTORS IN GESF AND TPEDM 2002 BASE-YEAR ESTIMATES BY PVS ZONE (as at Mid-2002)

Annex 1 of App. VII - Part 2

Part 2

Plant	Design Average (m3/d)	2001 Measured Average Flow (m3/d)	2002 Measured Average Flow (m3/d)	2003 Measured Average Flow (m3/d)	2002 Calculated Total Ave. Flow (m3/d)	Sub-total Calculated Res. Ave. Flow (m3/d)	Sub-total Calculated Ind. Ave. Flow (m3/d)	Sub-total Calculated Comml. Ave. Flow (m3/d)	Sub-total Calculated Inst. Ave. Flow (m3/d)	%age Res. (%)	%age Ind. (%)	%age Com. (%)	%age Inst. (%)	Absolute Error (m3/d)	Flow Weighted % Error (%)
Central PTW	110,000	95,145	101,803	109,568	108,374	43,187	1,822	61,349	2,017	40	2	57	2	6,571	
Wan Chai W PTW	40,000	51,867	59,458	37,190	56,384	14,287	582	40,744	770	25	1	72	1	3,074	
Wan Chai E PTW	65,000	62,267	73,475	97,386	78,590	24,949	716	51,299	1,627	32	1	65	2	5,115	
North Point PTW	118,000	74,169	73,964	78,378	81,070	41,685	2,495	35,216	1,674	51	3	43	2	7,106	
Stanley STW	11,600	7,425	7,916	7,655	7,375	5,111	14	2,113	136	69	0	29	2	541	
Shek O STW	1,180	1,050	1,038	1,089	937	656	3	255	24	70	0	27	3	101	
Chai Wan PTW	42,000	61,798	59,167	60,951	59,825	39,150	3,018	16,313	1,344	65	5	27	2	658	
Shau Kei Wan PTW	39,000	74,975	71,050	77,727	71,337	47,692	701	21,761	1,183	67	1	31	2	287	
Ap Lei Chau STW	35,000	32,910	31,886	38,838	30,619	22,032	727	7,347	514	72	2	24	2	1,267	
Aberdeen STW	54,000	74,896	73,038	72,840	56,081	31,955	4,976	17,881	1,270	57	9	32	2	16,957	
Sandy Bay STW	8,900	3,997	4,314	4,234	4,760	2,424	10	2,188	139	51	0	46	3	446	
Wah Fu STW	16,000	10,714	10,645	9,154	10,624	8,737	21	1,641	224	82	0	15	2	21	
To Kwa Wan PTW	288,000	231,009	210,481	213,611	214,567	96,341	7,275	106,538	4,412	45	3	50	2	4,086	
Kwun TongPTW	333,000	293,474	276,114	299,106	284,473	173,605	23,520	81,756	5,592	61	8	29	2	8,359	
North West Kln PS	406,000	369,660	371,890	371,581	367,850	178,743	10,758	168,265	10,083	49	3	46	3	4,040	
Tseung Kwan O PS	212,000	84,149	100,855	104,034	99,746	69,979	6,953	20,601	2,213	70	7	21	2	1,109	
San Wai STW	164,000	79,573	105,100	110,985	103,671	67,740	8,755	24,098	3,078	65	8	23	3	1,429	
Yuen Long STW	70,000	43,088	16,533	16,970	18,368	7,663	7,888	2,411	406	42	43	13	2	1,835	
Sai Kung STW	8,000	10,485	9,176	9,487	9,149	5,901	402	2,627	219	64	4	29	2	27	
Tai Po STW	88,000	83,113	78,642	86,110	89,920	58,687	8,622	20,118	2,493	65	10	22	3	11,278	
Sha Tin STW	150,000	220,041	219,083	219,879	217,617	148,844	4,903	60,692	5,475	68	2	28	3	1,466	
Pillar Point STW	200,000	161,346	165,083	169,841	162,827	108,111	12,353	37,923	4,440	66	8	23	3	2,256	
Kwai Chung PTW	318,000	185,931	223,383	201,488	218,431	109,417	36,647	68,023	4,343	50	17	31	2	4,952	
Tsing Yi PTW	88,000	44,015	55,214	68,325	54,922	40,170	3,660	9,867	1,226	73	7	18	2	292	
Shek Wu Hui STW	80,000	69,942	73,842	82,153	71,488	48,946	1,594	18,605	2,342	68	2	26	3	2,354	
Cheung Chau STW	4,000	10,753	9,254	8,954	7,648	4,216	240	3,041	151	55	3	40	2	1,606	
Mui Wo STW	2,380	1,434	1,297	1,384	1,840	959	25	830	26	52	1	45	1	543	
Siu Ho Wan STW	162,000	20,626	24,468	29,320	20,916	7,068	3,151	10,420	277	34	15	50	1	3,552	
Total of all PTWs/STWs/PSs:		2,459,852	2,508,169	2,588,238	2,509,408	1,408,255	151,831	893,921	57,699	56	6	36	2	91,327	3.64
Total of all HATS PTWs:		1,750,976	1,796,737	1,844,411	1,797,652	944,352	103,880	710,788	38,632	53	6	40	2	64,339	3.58

2002 SEWAGE FLOWS OF MAJOR CATCHMENTS ESTIMATED USING FLOW FACTORS IN THE EXISTING SEWERAGE MANUAL AND TPEDM 2002 BASE-YEAR ESTIMATES BY PVS ZONE (as at Mid-2002)
Part 1

Selected major catchment (PTW/STW)	Population									Flows					
	Public Rental	Subsidized Sale Flat	Private Permanent	Non-domestic	Institutional & Special Classes	Temporary	Resident Total (excl. Mob res)	Mobile Residental Population	Resident Total (incl. Mob res)	Total Ave. Flow (m3/d)	Sub-total Ave. Res. Flow (m3/d)	Priv. Perm. Res. UFF adjustment factor	Sub-total Ave. Ind. Flow (m3/d)	Sub-total Ave. Com. Flow (m3/d)	Sub-total Ave. Inst. Flow (m3/d)
Unit flow factor (m3/person/day)	0.175	0.24	0.24	0.15	0.15	0.15		0.24							
Central & Western	5,771	-	198,858	694	3,574	969	209,865	1,874	211,739						
- Central and Western (Central PTW)	5,771	-	198,858	694	3,574	968	209,864	1,874	211,738	154,593	51,880	1.04	3,621	97,831	1,261
- Green Island Reclaimation (Central PTW)	-	-	-	-	-	1	1	-	1	12	0	1.04	0	12	-
Wan Chai and North Point	13,933	5,890	352,841	634	3,227	1,379	377,904	4,265	382,170						
- Wan Chai West (Wan Chai W PTW)	-	-	60,835	128	745	361	62,069	690	62,759	74,107	16,411	1.10	1,134	56,080	481
- Central and Wan Chai Reclamation (Wan Chai W PTW)	-	-	803	-	5	9	817	10	827	3,785	217	1.10	23	3,545	-
- Wan Chai East (Wan Chai E PTW)	8,095	-	97,683	369	1,171	393	107,711	1,291	109,002	87,102	28,508	1.13	1,423	56,154	1,017
- North Point (North Point PTW)	5,838	5,890	193,519	137	1,306	617	207,307	2,274	209,582	104,520	50,692	1.02	4,961	47,821	1,046
Hong Kong Island South	3,286	3,389	10,402	99	3,437	392	21,004	146	21,150						
- Stanley (Stanley STW)	3,286	3,389	8,891	98	3,435	258	19,356	129	19,486	7,925	5,330	1.41	29	2,482	85
- Shek O (Shek O STW)	-	-	1,511	0	2	134	1,648	17	1,664	625	398	1.03	4	213	10
Chai Wan and Shaukeiwan	110,487	92,236	177,762	297	2,230	740	383,752	3,456	387,208						
- Chai Wan (Chai Wan PTW)	69,381	58,293	55,267	85	1,585	84	184,696	1,523	186,219	66,244	40,297	1.01	5,455	19,728	764
- Shaukeiwan (Shau Kei Wan PTW)	41,106	33,943	122,494	212	645	656	199,056	1,933	200,989	67,113	45,429	1.00	1,114	19,978	592
Aberdeen, Ap Lei Chau and Pok Fu Lam	94,221	30,894	113,923	436	5,599	1,649	246,721	1,832	248,553						
- Ap Lei Chau (Ap Lei Chau STW)	40,349	8,038	39,768	9	354	27	88,545	660	89,205	26,363	18,751	1.00	587	6,777	247
- Aberdeen (Aberdeen STW)	27,574	12,080	51,273	336	2,951	1,104	95,317	732	96,049	41,843	22,993	1.14	4,004	14,310	536
- Repulse Bay and Shouson Hill (Aberdeen STW)	-	-	14,538	53	-	258	14,849	148	14,997	6,791	4,060	1.14	14	2,643	74
- Sandy Bay (Sandy Bay STW)	-	-	6,062	19	2,090	208	8,379	60	8,439	5,389	2,515	1.48	19	2,767	87
- Wah Fu (Wah Fu STW)	26,298	10,776	2,282	19	204	51	39,631	232	39,863	10,960	8,836	1.32	43	1,942	140
Central and East Kowloon	567,542	244,694	471,846	2,271	9,480	6,830	1,302,662	10,995	1,313,658						
- Central Kowloon (To Kwa Wan PTW)	158,894	64,876	253,488	1,110	4,005	4,208	486,580	4,555	491,135	221,338	107,469	1.01	6,716	104,408	2,746
- East Kowloon - incl. SEKD East (Kwun Tong PTW)	408,648	179,818	208,017	1,161	5,475	2,622	805,741	6,311	812,052	304,855	169,359	1.02	26,727	105,592	3,177
- SEKD West (To Kwa Wan PTW)	-	-	10,342	-	-	-	10,342	130	10,471	9,263	2,538	1.01	922	5,790	12
North West Kowloon (North West Kowloon PS)	148,651	36,706	483,630	1,353	9,753	7,990	688,083	6,322	694,404	326,978	160,271	1.04	12,620	149,239	4,848
Tseung Kwan O (Tseung Kwan O PS)	94,320	136,634	67,356	29	2,112	170	300,620	2,269	302,889	90,090	66,844	1.01	3,533	18,560	1,153
Yuen Long and Kam Tin	167,533	63,646	136,096	570	1,723	5,298	374,867	2,910	377,776						
- Ha Tsuen & Lau Fau Shan (San Wai STW)	-	-	-	-	-	-	-	-	-	-	-	1.01	-	-	-
- Tin Shui Wai (San Wai STW)	132,040	62,696	39,611	10	659	1	235,017	1,865	236,882	59,947	48,454	1.01	267	10,120	1,106
- Hung Shui Kiu (San Wai STW)	-	-	5,959	134	246	2,044	8,383	64	8,448	2,682	1,824	1.01	135	719	5
- Ping Shan (San Wai STW)	-	-	7,451	36	-	403	7,890	69	7,958	2,895	1,888	1.01	334	627	46
- Tong Yan San Tsuen (San Wai STW)	686	-	7,578	26	26	1,201	9,517	86	9,603	3,736	2,165	1.01	567	905	98
- Yuen Long Town (San Wai STW)	17,404	950	64,000	341	558	864	84,116	640	84,755	33,745	19,207	1.01	1,487	12,325	726
- Tai Tong (San Wai STW)	-	-	-	-	-	-	-	-	-	-	-	1.01	-	-	-
- Kam Tin South and North (Yuen Long STW)	-	-	-	-	-	-	-	-	-	-	-	1.07	-	-	-
- Fairview Park & Nam San Wai (Yuen Long STW)	-	-	-	-	-	-	-	-	-	-	-	1.07	-	-	-
- Ngau Tam Mei (Yuen Long STW)	-	-	-	-	-	-	-	-	-	-	-	1.07	-	-	-
- San Tin (Yuen Long STW)	-	-	-	-	-	-	-	-	-	-	-	1.07	-	-	-
- Wang Chau (Yuen Long STW)	17,404	-	11,499	23	235	785	29,944	186	30,131	10,990	6,199	1.07	2,493	2,101	197
- Pat Heung & Shek Kong (Yuen Long STW)	-	-	-	-	-	-	-	-	-	-	-	1.07	-	-	-
Port Shelter (Sai Kung STW)	745	802	14,953	20	1,167	292	17,977	148	18,125	7,728	4,622	1.12	97	2,904	105
Tolo Harbour	253,308	284,956	329,062	771	12,177	6,047	886,321	7,656	893,977						
- Tai Po (Tai Po STW)	73,691	88,701	101,952	458	2,609	3,940	271,352	2,229	273,581						
* Lam Tsuen	-	-	-	-	-	-	-	-	-	-	-	1.09	-	-	-
* Wu Kau Tang	-	-	-	-	-	-	-	-	-	-	-	1.09	-	-	-
* Ting Kok	-	-	846	2	54	9	911	9	919	301	233	1.09	3	65	-
* Tai Po Industrial Estate Area	-	-	3,474	-	1,245	172	4,891	37	4,929	9,163	1,130	1.09	5,525	2,432	76
* Hong Lok Yuen	-	-	9,313	16	1	1,949	11,280	106	11,386	3,659	2,757	1.09	18	875	9
* Tai Po Town	73,691	88,701	78,657	424	1,310	1,196	243,980	1,973	245,953	77,848	57,590	1.09	1,288	17,542	1,428
* Tai Po Kau and Pak Shek Kok	-	-	9,661	16	-	614	10,291	103	10,394	3,974	2,647	1.09	18	1,265	45
- Shatin (Sha Tin STW)	179,617	196,255	227,110	313	9,568	2,106	614,969	5,427	620,396						
* Shatin	151,939	90,126	178,349	299	8,906	1,997	431,615	3,907	435,522	157,311	96,863	1.05	5,120	53,105	2,224
* Ma On Shan	27,678	106,129	48,761	14	661	110	183,354	1,520	184,874	56,202	44,359	1.05	210	10,882	752
Tuen Mun (Pillar Point STW)	167,504	135,896	173,677	153	6,955	5,924	490,109	3,684	493,793						
- So Kwun Wat	167,504	135,896	159,017	119	6,955	2,262	471,752	3,581	475,334	149,170	103,768	1.02	6,366	36,562	2,475
- Lam Tei & Yick Yuen	-	-	14,660	34	-	3,663	18,357	103	18,460	6,096	4,168	1.02	481	1,398	48
Tsuen Wan, Kwai Chung and Tsing Yi	332,981	87,701	269,128	1,162	4,902	5,016	700,890	6,236	707,125						
- Tsuen Wan and Kwai Chung (Kwai Chung PTW)	252,620	26,440	221,192	1,147	4,046	4,909	510,354	4,544	514,898	227,707	107,435	1.02	30,137	87,667	2,468
- Tsing Yi (Tsing Yi PTW)	80,361	61,261	47,937	15	856	107	190,536	1,692	192,228	53,742	40,823	1.00	1,389	10,833	697
North District (Shek Wu Hui STW)	67,724	89,932	78,810	195	1,743	6,572	244,975	2,250	247,225						
- Kau Lung Hang	-	-	-	-	-	-	-	-	-	-	-	1.01	-	-	-
- Ping Kong	-	-	-	-	-	-	-	-	-	-	-	1.01	-	-	-
- Kwu Tung South	-	-	-	-	-	-	-	-	-	-	-	1.01	-	-	-
- Kwu Tung North	-	-	-	-	-	-	-	-	-	-	-	1.01	-	-	-
- Fanling / Sheung Shui Town	66,453	89,932	74,768	88	1,656	4,395	237,292	2,220	239,512	74,913	53,006	1.01	1,530	18,949	1,428
- Ping She / Ta Kwu Ling	-	-	2,086	99	71	1,664	3,919	13	3,932	1,732	784	1.01	117	819	12
- Luk Keng	1,271	-	1,956	8	16	513	3,764	17	3,781	1,176	781	1.01	26	345	24
- Lung Yeuk Tau & Kwan Tei South	-	-	-	-	-	-	-	-	-	-	-	1.01	-	-	-
Outlying Islands	24,410	7,635	16,778	52	396	569	49,840	312	50,152						
- Cheung Chau (Cheung Chau STW)	1,212	-	9,394	23	211	323	11,162	41	11,203	4,864	2,582	1.01	97	2,122	63
- Mui Wo (Mui Wo STW)	966	-	2,944	29	29	163	4,131	14	4,145	1,674	919	1.01	15	724	16
- Discovery Bay (Siu Ho Wan STW)	-	-	-	-	-	-	-	-	-	-	-	1.28	-	-	-
- Ma Wan, Lantau North & Port Dev (Siu Ho Wan STW)	-	-	-	-	-	-	-	-	-	-	-	1.10	-	-	-
- Tung Chun/Tai Ho New Town (Siu Ho Wan STW)	22,232	7,635	4,439	1	155	82	34,544	257	34,801	10,788	7,175	1.10	50	3,389	173
- Airport Development (Siu Ho Wan STW)	-	-	2	-	1	-	3	-	3	16,182	1	1.10	3,888	12,293	-
Total Population	2,052,416	1,221,009	2,895,122	8,735	68,473	49,836	6,295,591	54,355	6,349,946						
Trade flows(activities+employee):	134,611	4,410	98,472	110,869	175,569	173,582	5,280	44	79,265	73,977	244,106	41,265	1,141,449	2,588,124	1,414,181		134,611	1,006,838	32,495
Trade flows (activities only):	122,373	3,654	81,591	91,863	145,471	143,825	4,375	36	65,677	61,295	202,259	34,191	956,611				122,373	834,237	
Licenced flows	109,264	2,647	24,924	39,449	631	6,081	2	0	71,742	198,760	127,712	0	581,212				109,264	471,948	

2002 SEWAGE FLOWS OF MAJOR CATCHMENTS ESTIMATED USING FLOW FACTORS IN THE EXISTING SEWERAGE MANUAL AND TPEDM 2002 BASE-YEAR ESTIMATES BY PVS ZONE (as at Mid-2002)
Part 2

Selected Plant	Design ADWF (m3/d)	2001 Measured Average Flow (m3/d)	2002 Measured Average Flow (m3/d)	2003 Measured Average Flow (m3/d)	2002 Calculated Total Ave. Flow (m3/d)	Sub-total Calculated Res. Ave. Flow (m3/d)	Sub-total Calculated Ind. Ave. Flow (m3/d)	Sub-total Calculated Comml. Ave. Flow (m3/d)	Sub-total Calculated Inst. Ave. Flow (m3/d)	Percentage Residential (%)	Percentage Industrial (%)	Percentage Commercial (%)	Percentage Institution (%)	Absolute Error (m3/d)	Flow Weighted % Error (%)
Central PTW	110,000	95,145	101,803	109,568	154,605	51,880	3,621	97,843	1,261	34	2	63	1	52,802	
Wan Chai W PTW	40,000	51,867	51,318	37,190	77,892	16,628	1,158	59,625	481	21	1	77	1	26,574	
Wan Chai E PTW	65,000	62,267	73,475	97,386	87,102	28,508	1,423	56,154	1,017	33	2	64	1	13,627	
North Point PTW	118,000	74,169	73,964	78,378	104,520	50,692	4,961	47,821	1,046	48	5	46	1	30,556	
Stanley STW	11,600	7,425	7,916	7,655	7,925	5,330	29	2,482	85	67	0	31	1	9	
Shek O STW	1,100	1,050	1,038	1,089	625	398	4	213	10	64	1	34	2	413	
Chai Wan PTW	42,000	61,798	59,167	60,951	66,244	40,297	5,455	19,728	764	61	8	30	1	7,077	
Shau Kei Wan PTW	39,000	74,975	70,946	77,727	67,113	45,429	1,114	19,978	592	68	2	30	1	3,833	
Ap Lei Chau STW	35,000	32,910	31,886	38,838	26,363	18,751	587	6,777	247	71	2	26	1	5,523	
Aberdeen STW	54,000	74,896	73,038	72,840	48,634	27,053	4,019	16,952	610	56	8	35	1	24,404	
Sandy Bay STW	8,900	3,997	4,314	4,234	5,389	2,515	19	2,767	87	47	0	51	2	1,075	
Wah Fu STW	16,000	10,714	10,645	9,154	10,960	8,836	43	1,942	140	81	0	18	1	315	
To Kwa Wan PTW	288,000	231,009	211,379	213,611	230,601	110,007	7,638	110,198	2,758	48	3	48	1	19,222	
Kwun TongPTW	333,000	293,474	274,600	299,106	304,855	169,359	26,727	105,592	3,177	56	9	35	1	30,255	
North West Kowloon PS	406,000	*369,660*	369,660	371,581	326,978	160,271	12,620	149,239	4,848	49	4	46	1	42,682	
Tseung Kwan O PS	212,000	84,149	100,181	104,034	90,090	66,844	3,533	18,560	1,153	74	4	21	1	10,091	
San Wai STW	164,000	79,573	105,100	110,985	103,006	73,539	2,790	24,696	1,981	71	3	24	2	2,094	
Yuen Long STW	70,000	43,088	16,533	16,970	10,990	6,199	2,493	2,101	197	56	23	19	2	5,543	
Sai Kung STW	8,000	10,485	9,176	9,487	7,728	4,622	97	2,904	105	60	1	38	1	1,448	
Tai Po STW	88,000	83,113	78,642	86,110	94,946	64,357	6,853	22,179	1,558	68	7	23	2	16,304	
Sha Tin STW	150,000	220,041	219,083	219,879	213,514	143,868	5,348	65,252	3,021	67	3	31	1	5,569	
Pillar Point STW	200,000	161,346	165,083	169,841	155,266	107,936	6,848	37,960	2,523	70	4	24	2	9,817	
Kwai Chung PTW	318,000	185,931	221,011	201,488	227,707	107,435	30,137	87,667	2,468	47	13	38	1	6,696	
Tsing Yi PTW	88,000	44,015	53,963	68,325	53,742	40,823	1,389	10,833	697	76	3	20	1	222	
Shek Wu Hui STW	80,000	69,942	73,842	82,153	77,821	54,571	1,674	20,113	1,464	70	2	26	2	3,979	
Cheung Chau STW	4,000	10,753	9,254	8,954	4,864	2,582	97	2,122	63	53	2	44	1	4,390	
Mui Wo STW	2,380	1,434	1,297	1,384	1,674	919	15	724	16	55	1	43	1	377	
Siu Ho Wan STW	162,000	20,626	24,468	29,320	26,970	7,176	3,939	15,682	173	27	15	58	1	2,502	
Total of all PTWs/STWs/PSs:		2,459,852	2,492,782	2,588,238	2,588,124	1,416,827	134,629	1,008,103	32,540	55	5	39	1	327,400	13.13
Total of all HATS PTWs:		1,750,976	1,781,350	1,844,411	1,882,794	945,329	104,444	811,677	21,344	50	6	43	1	274,954	15.44

Analysis of Peaking Factors and Peak Flows

Peaking factors account for the peak flows and provide adequate safety margin in planning sewerage facilities.

Recommended peaking factors in this GESF are derived with reference to the Sewerage Manual – Part 1 (SM1). The factors are inversely proportional to the contributing population. The global peaking factor for a contributing population of less than 50,000 in the SM1 is considered adequate and adopted in this GESF. For a contributing population above 50,000, the global peaking factor curves of sewage treatment works $P_{(STW)}$ and of sewers $P_{(sewer)}$ in SM1 are adopted with adjustment to

(a) take into account the analysis results of this Appendix

(b) eliminate a cross-over of the two curve at a contributing population of around 1,000,000 as in SM1,

(c) reduce the discontinuities at the transitions between the stepped peaking factors for populations less than 50,000 and the peaking factor curves for populations higher than 50,000 and

(d) incorporate adequate planning margins.

In general the recommended peaking factors of this GESF are slightly higher than those of SM1.

Peaking factors consist of peaking factors including stormwater allowance, which are used for estimating flow in existing sewers with high storm responses, and peaking factors excluding stormwater allowance, which are used for estimating sewage flow in a sewage facility with essentially new and proper upstream sewerage and with negligible inflow and infiltration at the planning horizon under consideration. The following are the recommended peaking factor curves. The justifications are included in the following **Sections (A)** and **(B)**.

For including stormwater allowance,

$$P_{(sewer)} = \text{Max}\left(\frac{7.3}{N^{0.15}} , 2.4 \right)$$

$$P_{(STW)} = \text{Max}\left(\frac{3.9}{N^{0.065}} , 2.4 \right)$$

For excluding stormwater allowance,

$$P_{(sewer)} = \text{Max}\left(\frac{6}{N^{0.175}} , 1.6 \right)$$

$$P_{(STW)} = \text{Max}\left(\frac{2.6}{N^{0.065}} , 1.6 \right)$$

(A) <u>Peaking factors including stormwater allowance</u>

The recommended peaking factors were verified against the flow records of PTWs/STWs of year 2002, in which there were 3 major storm events. These storm events occurred within August to October 2002, with the one occurring on 15 September considered to be the most severe. In terms of rainfall depth, these major storm events are of approximate return periods from 2 to 10 years over a 1-hour to 2-hour duration. In terms of rainfall intensity, they are of an approximate return period of around 2 years over a 5-minute to 60-minute duration. Since year 2002 contains a number of storm events with return period of slightly over 2 years, it is considered that year 2002 is a suitable year for checking the performance of the recommended peaking factors of PTWs/STWs.

For PTWs of HATS Stage I, flow data taken in the channel leading to the drop shaft of HATS tunnels were available at 1-minute intervals. The measured peaking factor (including storm allowance) is calculated by dividing the highest per-minute flow in year 2002 by the average flow of the year 2002. For STWs and other PTWs, only total daily flows with typical diurnal patterns were available. The measured peaking factor (including stormwater allowance) is obtained by multiplying the yearly peaking factor in year 2002 (i.e., the highest recorded daily flow figure at each STW in year 2002 divided by the average daily flow in year 2002) by a typical diurnal peaking factor of 1.5. It should be noted that the typical diurnal peaking factors of some catchments may be higher than this typical figure which is calculated based on coarse data available at the time of analysis. The measured peaking factors of PTWs of HATS constitute the set of important data to verify the performance of the recommended peaking factors.

Owing to unknown reasons, there are few abnormal figures in the available per minute flow records of PTWs of HATS Stage I. Some are abnormally high and some are extraordinarily low or missing. The average yearly flows are not much affected by these few abnormal figures. However, in determining the measured peaking factor, care must be exercised to exclude these abnormal figures from consideration. Normally, a peak flow figure of 99.9 percentile (in term of duration over the whole year) is sufficient to eliminate effects of this abnormality. Therefore, peaking factors based on peak flow figures at 99.9 percentile or above would be acceptable for calculating the measured peaking factors.

Figure VIII-F1 shows the measured peaking factors (including stormwater allowance) against the curves of recommended peaking factors (including stormwater allowance) of $P_{(STW)}$ and $P_{(sewer)}$. The required percentile figures to enable the measured peaking factors to approximately satisfy the global peaking factors of SM1 are provided for treatment plants with per-minute peaking factor exceeding the recommended peaking factors.

Based on the measured peaking factors, there is trend that the peaking factor (including storm water allowance) would not decrease significantly against a population increase beyond a contributing population of around 1,000,000. The recommended minimum peaking factor of 2.4 addresses this trend well.

(B) Peaking factors excluding stormwater allowance

Figure VIII-F2 shows the measured peaking factors (excluding stormwater allowance) of the selected PTWs/STWs and the curves of recommended peaking factors (excluding stormwater allowance). For PTWs of HATS, the measured peak flow factors (excluding stormwater allowance) is taken as the mean daily peak flow of year 2002 divided by the mean daily average flow of year 2002. For STWs and other PTWs, the measured peaking factor is obtained by multiplying the peaking factor of November 2002 (i.e., the highest recorded daily flow figure of each PTW in the driest month divided by the average daily flow in year 2002) by a typical diurnal peaking factor of 1.5.

Broadly speaking, the recommended peaking factor curves can be satisfied by the majority of the catchments under analysis. The exception is Tseung Kwan O PS, the measuring device of which may have been significantly affected by the pumping operations immediately upstream in the treatment works.

Dry day diurnal flow patterns of PTWs of HATS Stage I were analysed. The typical diurnal flow pattern of a major preliminary treatment works and the seasonal variation of total flow of Hong Kong over a year are shown in **Figure VIII-F3** and **Figure VIII-F4** respectively. As March 2003 was identified to be a month with very little amount of rainfall and the Kwun Tong PTW is one of the largest sewage catchments, the plotting of mean 1-minute flow figures of March 2003 of the Kwun Tong PTW is chosen as a typical diurnal flow pattern of a major preliminary treatment works.

From **Figure VIII-F3** and **Figure VIII-F4**, it was found that the typical dry-day measured diurnal peaking factor and the typical measured seasonal peaking factor for major treatment plants are approximately 1.35 and 1.15 respectively. A typical peaking factor of 1.55 can be obtained by the multiplication of these two factors. Therefore, a minimum peaking factor of 1.6 is proposed to impose on peaking factors $P_{(STW)}$ and $P_{(sewer)}$ (both excluding storm water allowance). This minimum figure would only take effects in major sewage catchments (for a contributing population above 1.5 million).

Figure VIII-F5 and **Figure VIII-F6** show the comparison between the peaking factors recommended in this GESF and the global peaking factors of SM1.

Figure VIII-F1: Measured Peaking Factors (including stormwater) of STW/PTW against Recommended P(STW) & P(sewers)

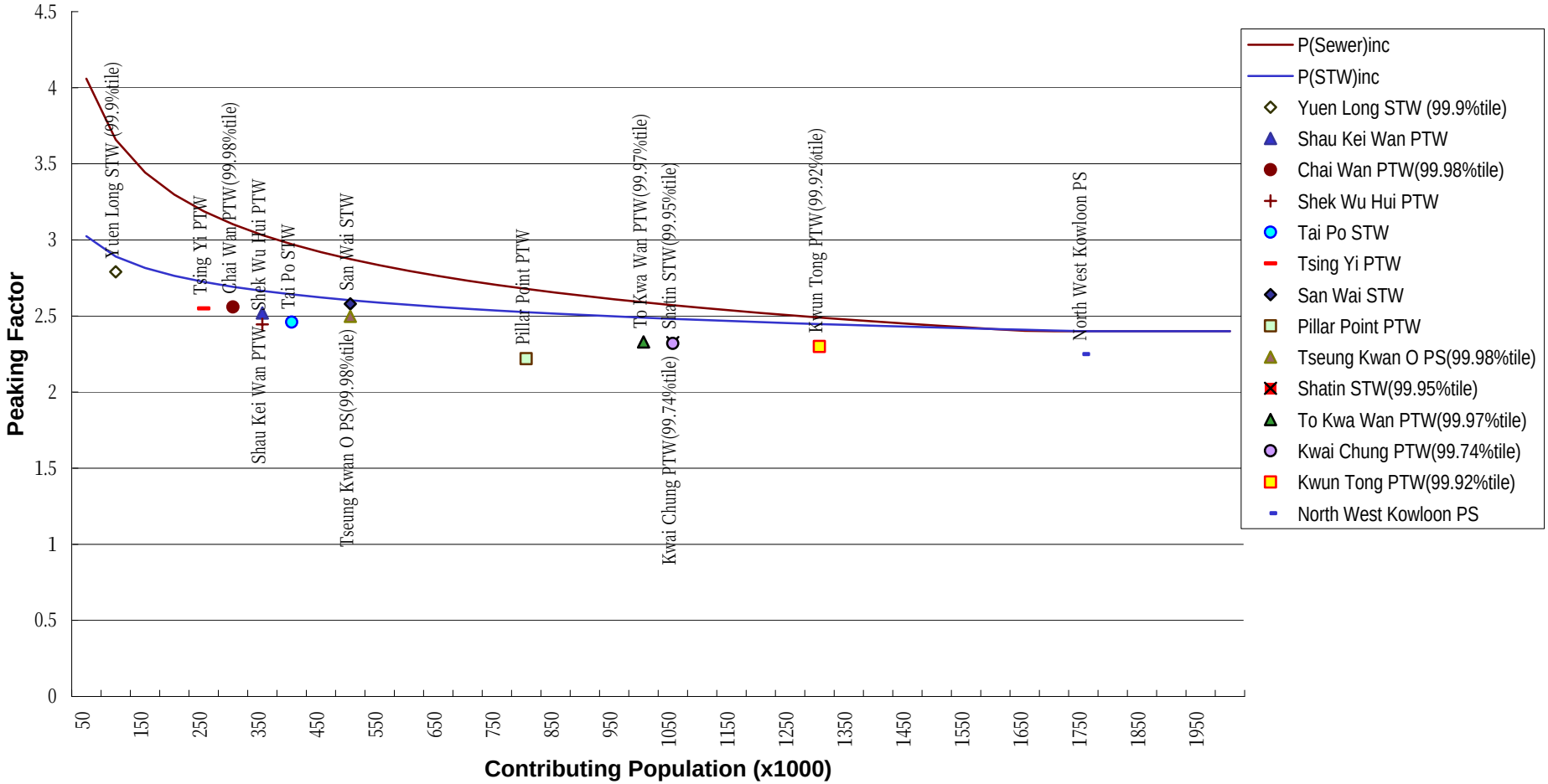


Figure VIII-F2: Measured Peaking Factors (excluding stormwater) of STW/PTW against Recommended P(STW) & P(sewers)

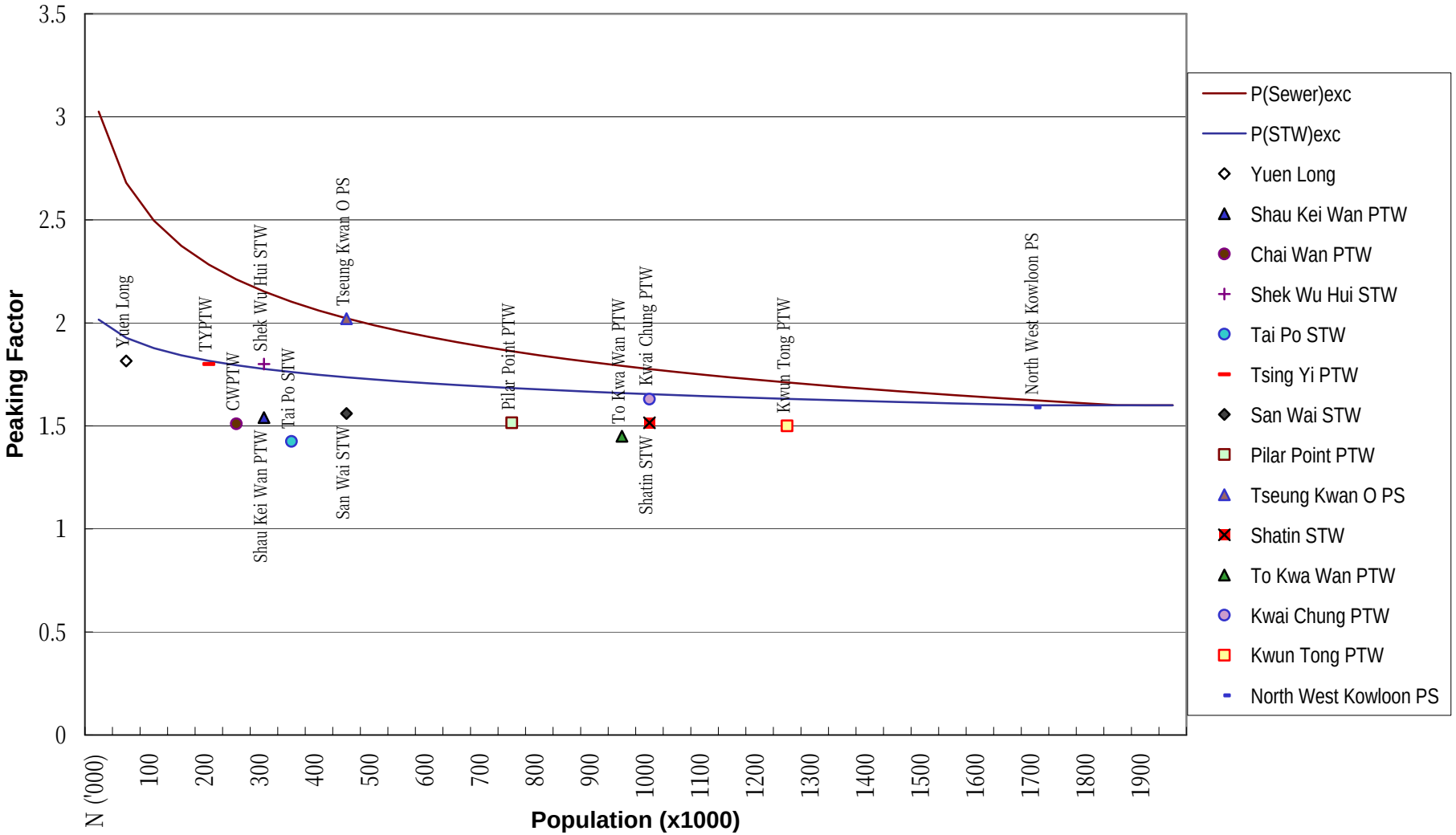


Figure VIII-F3 : Typical Diurnal Flow Pattern of Kwun Tong PTW (Taken as a Typical Major PTW)

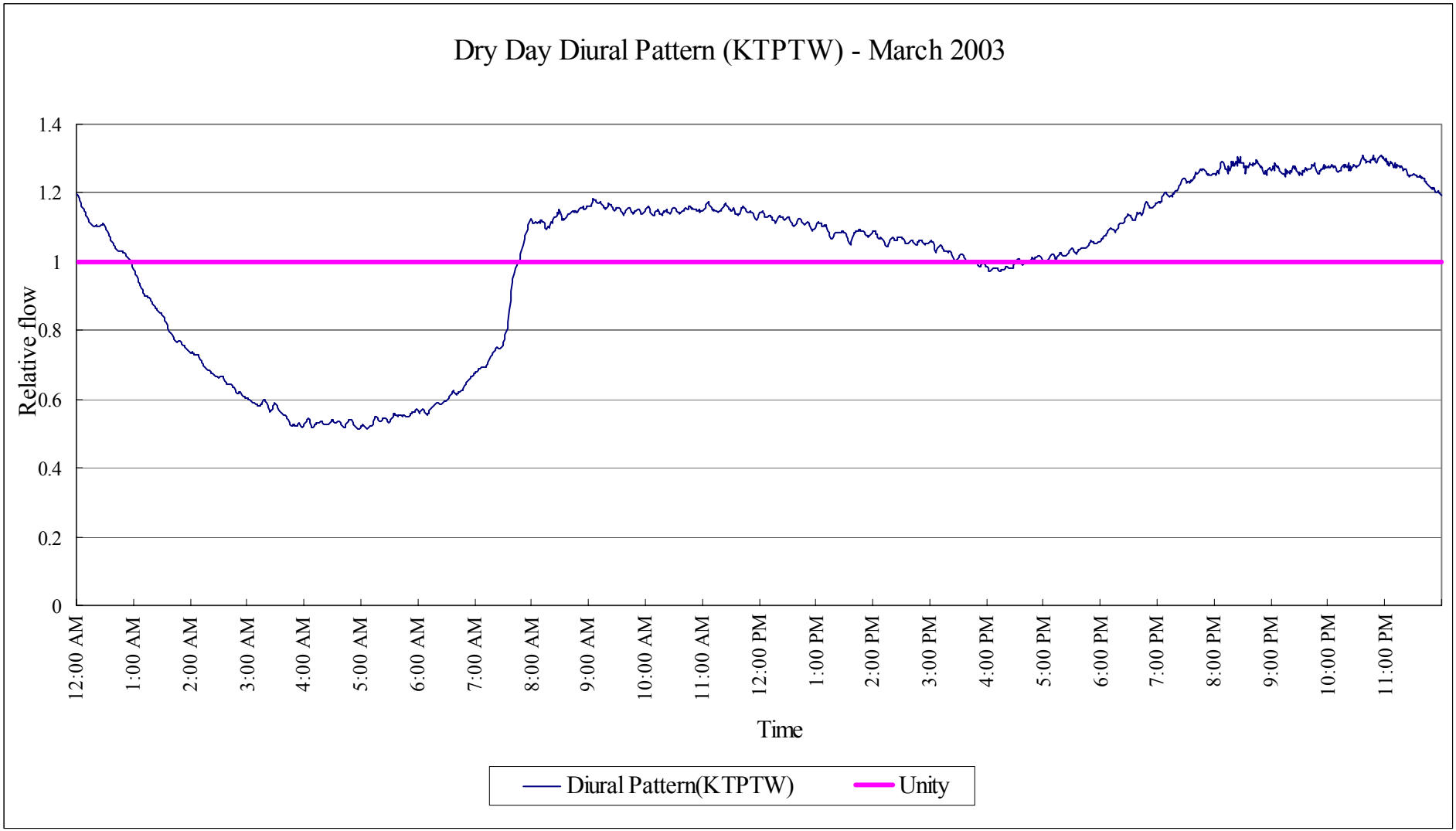


Figure VIII-F4 : The Seasonal Variation of Average Monthly Flow of Year 2002

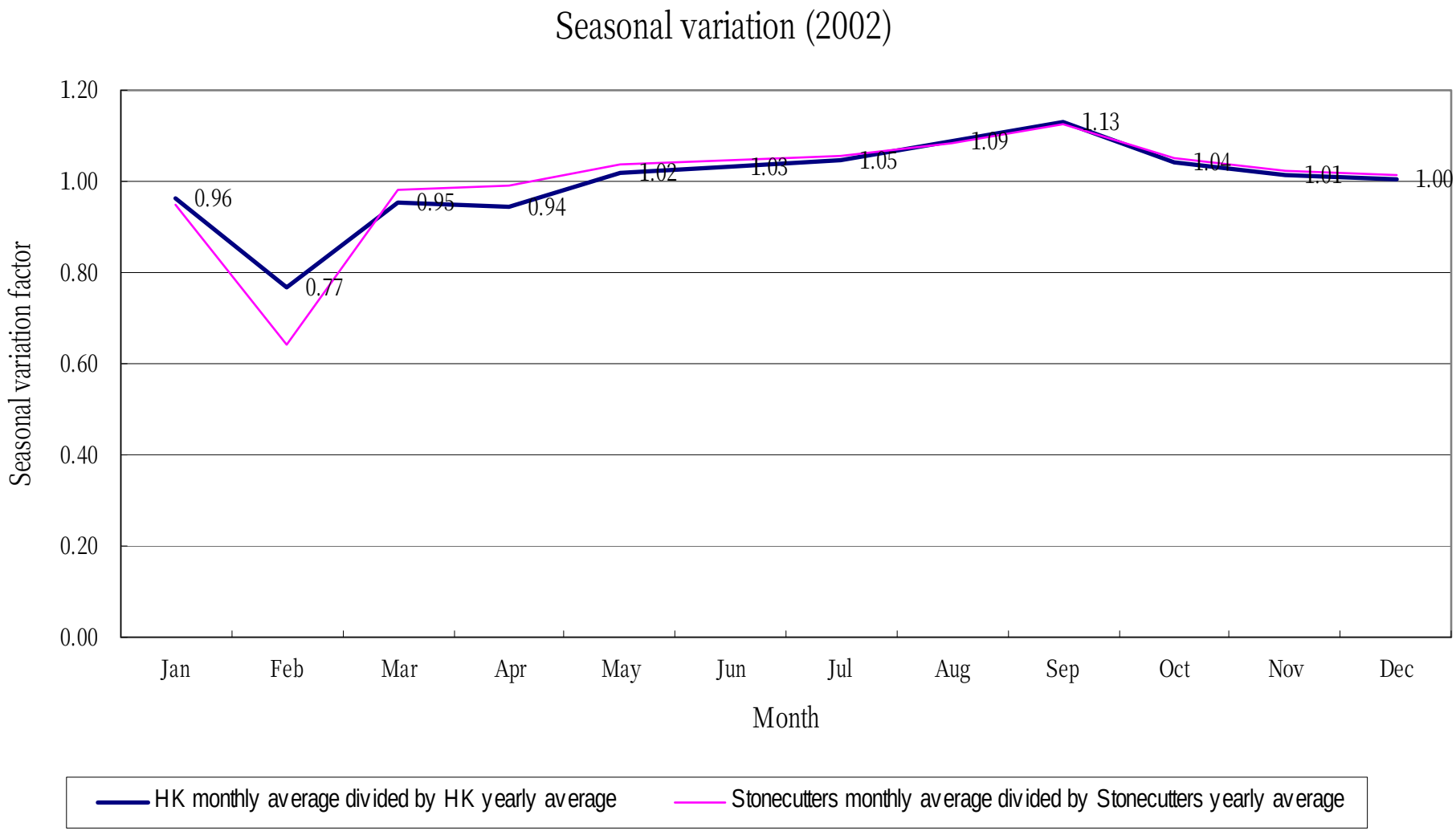


Figure VIII-F5: Comparison of Global Peaking Factors for Sewers -Populations Exceeding 50,000

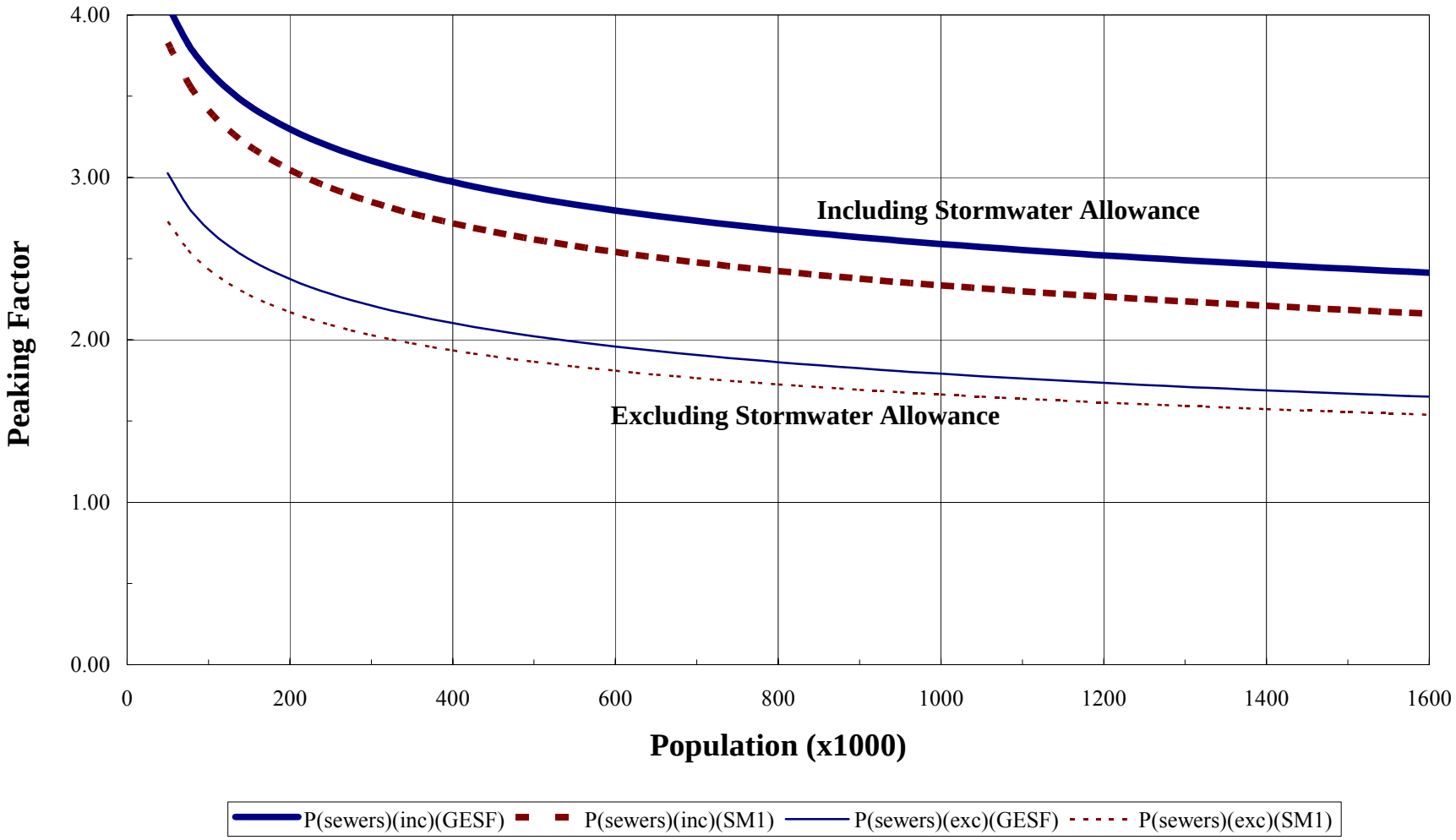
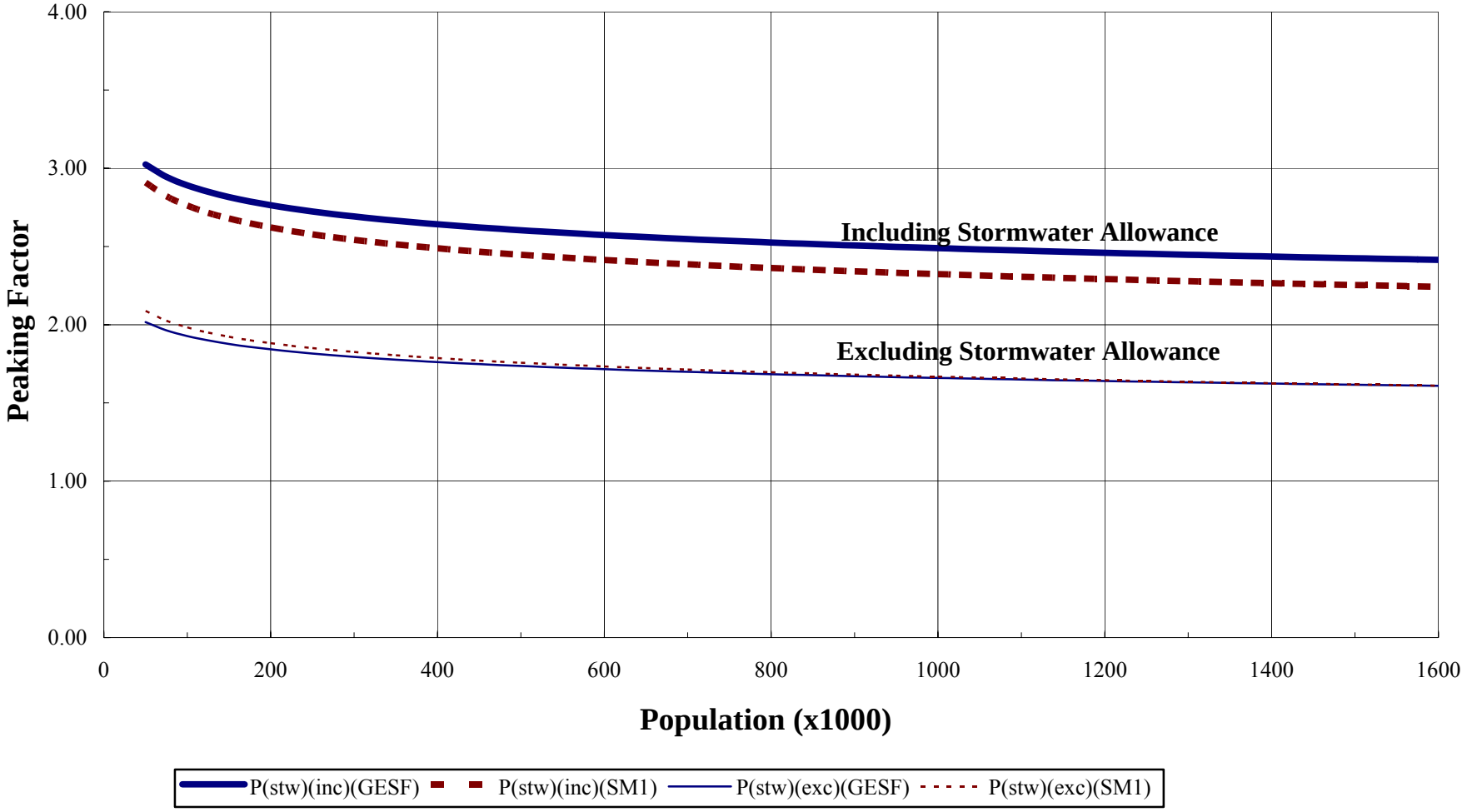


Figure VIII-F6: Comparison of Peaking Factors for STW -Populations Exceeding 50,000



Appendix IX

Preliminary Validation of Unit Flow Factors of GESF

Simple preliminary validation of the recommended unit flow factors of GESF and SM1 by available flow data were carried out. Since the errors in local flow data and local population data are expected to be much higher than those data at catchment level, it is recommended that the preliminary validation below be used for reference and be interpreted by relevant engineering professionals.

Flow survey data of Review of Central and East Kowloon SMPs were available with consultants' advice on the quality of data. Those survey stations which the consultants reported to have obtained good surveyed flow figures are selected for preliminary validation of the planning unit flow factors.

The selected stations covered commercial areas and residential areas. The surveyed results together with the estimated average flow figures using the methodologies of SM1 and GESF based on the street block level population and employment data of year 1999 in the Final Report of Review of Central and East Kowloon Sewerage Master Plans are listed below:

Table IX(a) - Comparison of Flows Estimated Using SM1 and GESF against surveyed Flows in Central and East Kowloon

Station No.	Location	Measured Average Flow (l/s)	Flow Estimated Using SM1 (l/s)	Flow Estimated Using GESF (l/s)
20	Tak Hong St., Hung Hom	100	100.13	99.60
20A	Tak Hong St., Hung Hom	37	58.53	47.12
37A	Chun Yan St.	10	5.92	5.25
41	Junction Road	15	10.86	11.63
54	Mody Road, Tsim Sha Tsui	85	143.51	141.28
92	Middle Road	15	47.05	49.40
93	Wylie Road, Kings Park	74	48.18	41.29

Estimated flow figures of station nos. 20, 20A and 41 are within 30% of the measured values. They are considered as good examples of estimating the actual sewage flows in view of the potentially high uncertainty in correctly measuring low flow and in population assumption.

The estimated figures of station nos 54 and 92 using both methodologies deviate much from the measured figure on the safe side. This may have been due to the possible errors in the flow measurements and in the assumption of local population and employment figures in the SMP or planning data.

Based on these limited results, neither the approach of GESF nor the approach of SM1 can be very satisfactorily validated at the local sewerage level, especially for stations with small flows. Further validation will need to be carried out with additional survey results of sewers which predominately serve domestic residents or limited types of commercial activities.

Tak Hong Street (20) *(1999)*

Area	TPU	Street Block	Commercial / Industrial Employment Data													Residential Population Data										Portion of TPU
			Total Employment	J1	J2	J3	J4	J5	J6	J7	J8	J9	J10	J11	J12	Institutions /School	Low Cost Rental	R1	R2	R3	R4	Traditional Village	Modern Village	Temporary / Non-domestic	Total Population	
																(person)	(person)	(person)	(person)	(person)	(person)	(person)	(person)	(person)	(person)	
Hung Hom Bay	*213*	*21304*	*773*	*0*	*0*	*47*	*233*	*206*	*72*	*0*	*0*	*87*	*30*	*80*	*18*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1*
	245	*24510*	*1500*	*0*	*0*	*94*	*197*	*409*	*142*	*0*	*0*	*172*	*292*	*159*	*35*	*0*	*0*	*5337*	*0*	*0*	*0*	*0*	*0*	*0*	*5337*	*0.75*
		24511	*918*	*0*	*0*	*57*	*121*	*250*	*87*	*0*	*0*	*105*	*179*	*97*	*22*	*0*	*0*	*3263*	*0*	*0*	*0*	*0*	*0*	*0*	*3263*	*1*
		24513	*3308*	*0*	*0*	*209*	*275*	*912*	*317*	*0*	*0*	*384*	*778*	*354*	*79*	*0*	*0*	*6434*	*0*	*0*	*0*	*0*	*0*	*1338*	*7772*	*1*
		24514	*688*	*0*	*0*	*43*	*90*	*188*	*65*	*0*	*0*	*79*	*134*	*73*	*16*	*0*	*0*	*2448*	*0*	*0*	*0*	*0*	*0*	*0*	*2448*	*1*
		24515	*1162*	*0*	*0*	*73*	*153*	*317*	*110*	*0*	*0*	*133*	*226*	*123*	*27*	*0*	*0*	*4134*	*0*	*0*	*0*	*0*	*0*	*0*	*4134*	*1*
		24516	*1596*	*0*	*0*	*100*	*212*	*435*	*151*	*0*	*0*	*183*	*309*	*169*	*37*	*2925*	*0*	*3672*	*0*	*0*	*0*	*0*	*0*	*0*	*3672*	*0.5*
		24519	*321*	*89*	*0*	*21*	*9*	*90*	*31*	*0*	*0*	*38*	*0*	*35*	*8*	*0*	*0*	*3*	*0*	*0*	*0*	*0*	*0*	*0*	*3*	*0.25*
Unit flow factors of GESF				*0.630*	*0.330*	*0.180*	*0.250*	*0.080*	*0.080*	*0.080*	*0.080*	*0.480*	*1.580*	*0.280*	*0.080*	*0.040*	*0.190*	*0.190*	*0.270*	*0.340*	*0.340*	*0.150*	*0.270*	*0.150*		
Unit flow factors of SM1				*0.660*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.025*	*0.175*	*0.240*	*0.300*	*0.370*	*0.370*	*0.240*	*0.240*	*0.150*		
Flow (GESF)				*0.162*	*0.000*	*1.156*	*3.264*	*2.241*	*0.778*	*0.000*	*0.000*	*5.656*	*31.463*	*3.045*	*0.193*	*0.677*	*0.000*	*48.640*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*2.323*		
Flow (SM1)				*0.170*	*0.000*	*2.247*	*4.569*	*9.802*	*3.406*	*0.000*	*0.000*	*4.124*	*6.970*	*3.806*	*0.846*	*0.423*	*0.000*	*61.440*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*2.323*		

Total trade flow (GESF) *48.63* *Total residential (GESF)* *50.96* *Total (GESF)* *99.60 l/s*
Total trade flow (SM1) *36.36* *Total residential (SM1)* *63.76* *Total (SM1)* *100.13 l/s*
Measured Average Flow *100 l/s*

Tak Hong Street (20A) *(1999)*

Area	TPU	Street Block	Commercial / Industrial Employment Data													Residential Population Data										Portion of TPU
			Total Employment	J1	J2	J3	J4	J5	J6	J7	J8	J9	J10	J11	J12	Institutions /School	Low Cost Rental	R1	R2	R3	R4	Traditional Village	Modern Village	Temporary / Non-domestic	Total Population	
																(person)	(person)	(person)	(person)	(person)	(person)	(person)	(person)	(person)	(person)	
To Kwan Wan	*244*	*24427*	*5396*	*0*	*0*	*481*	*208*	*2099*	*729*	*0*	*0*	*883*	*0*	*815*	*181*	*140*	*0*	*2286*	*0*	*0*	*0*	*0*	*0*	*14*	*2300*	*1*
Hung Hom Bay	*245*	*24512*	*1202*	*0*	*0*	*75*	*157*	*328*	*114*	*0*	*0*	*138*	*235*	*127*	*28*	*140*	*0*	*5276*	*0*	*0*	*0*	*0*	*0*	*0*	*5276*	*0.25*
		24516	*1596*	*0*	*0*	*100*	*212*	*435*	*151*	*0*	*0*	*183*	*309*	*169*	*37*	*2925*	*0*	*3672*	*0*	*0*	*0*	*0*	*0*	*0*	*3672*	*0.5*
		24517	*1010*	*0*	*0*	*63*	*135*	*275*	*96*	*0*	*0*	*116*	*194*	*107*	*24*	*975*	*0*	*1587*	*0*	*0*	*0*	*0*	*0*	*0*	*1587*	*1*
		24518	*866*	*0*	*0*	*54*	*113*	*236*	*82*	*0*	*0*	*99*	*170*	*92*	*20*	*0*	*0*	*4079*	*0*	*0*	*0*	*0*	*0*	*0*	*4079*	*0.5*
		24519	*321*	*89*	*0*	*21*	*9*	*90*	*31*	*0*	*0*	*38*	*0*	*35*	*8*	*0*	*0*	*3*	*0*	*0*	*0*	*0*	*0*	*0*	*3*	*0.25*
Unit flow factors of GESF				*0.630*	*0.330*	*0.180*	*0.250*	*0.080*	*0.080*	*0.080*	*0.080*	*0.480*	*1.580*	*0.280*	*0.080*	*0.040*	*0.190*	*0.190*	*0.270*	*0.340*	*0.340*	*0.150*	*0.270*	*0.150*		
Unit flow factors of SM1				*0.660*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.025*	*0.175*	*0.240*	*0.300*	*0.370*	*0.370*	*0.240*	*0.240*	*0.150*		
Flow (GESF)				*0.162*	*0.000*	*1.344*	*1.583*	*2.606*	*0.905*	*0.000*	*0.000*	*6.578*	*9.002*	*3.542*	*0.225*	*1.209*	*0.000*	*19.942*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.024*		
Flow (SM1)				*0.170*	*0.000*	*2.613*	*2.216*	*11.399*	*3.961*	*0.000*	*0.000*	*4.796*	*1.994*	*4.428*	*0.982*	*0.756*	*0.000*	*25.190*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.024*		

Total trade flow (GESF) *27.16* *Total residential (GESF)* *19.97* *Total (GESF)* *47.12 l/s*
Total trade flow (SM1) *33.32* *Total residential (SM1)* *25.21* *Total (SM1)* *58.53 l/s*
Measured Average Flow *37 l/s*

Chun Yan Street (37A) *(1999)*

Area	TPU	Street Block	Commercial / Industrial Employment Data													Residential Population Data										Portion of TPU
			Total Employment	J1	J2	J3	J4	J5	J6	J7	J8	J9	J10	J11	J12	Institutions /School	Low Cost Rental	R1	R2	R3	R4	Traditional Village	Modern Village	Temporary / Non-domestic	Total Population	
																(person)	(person)	(person)	(person)	(person)	(person)	(person)	(person)	(person)	(person)	
Diamond Hill	*281*	*28123*	*233*	*0*	*0*	*14*	*42*	*63*	*22*	*0*	*0*	*27*	*35*	*25*	*5*	*1675*	*0*	*2326*	*0*	*0*	*0*	*0*	*0*	*0*	*2326*	*0.75*
Unit flow factors of GESF				*0.630*	*0.330*	*0.180*	*0.250*	*0.080*	*0.080*	*0.080*	*0.080*	*0.480*	*1.580*	*0.280*	*0.080*	*0.040*	*0.190*	*0.190*	*0.270*	*0.340*	*0.340*	*0.150*	*0.270*	*0.150*		
Unit flow factors of SM1				*0.660*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.025*	*0.175*	*0.240*	*0.300*	*0.370*	*0.370*	*0.240*	*0.240*	*0.150*		
Flow (GESF)				*0.000*	*0.000*	*0.022*	*0.091*	*0.044*	*0.015*	*0.000*	*0.000*	*0.113*	*0.480*	*0.061*	*0.003*	*0.582*	*0.000*	*3.836*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*		
Flow (SM1)				*0.000*	*0.000*	*0.043*	*0.128*	*0.191*	*0.067*	*0.000*	*0.000*	*0.082*	*0.106*	*0.076*	*0.015*	*0.363*	*0.000*	*4.846*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*		

Total trade flow (GESF) *1.41* *Total residential (GESF)* *3.84* *Total (GESF)* *5.25 l/s*
Total trade flow (SM1) *1.07* *Total residential (SM1)* *4.85* *Total (SM1)* *5.92 l/s*
Measured Average Flow *10 l/s*

Junction Road (41) *(1999)*

Area	TPU	Street Block	Commercial / Industrial Employment Data													Institutions /School	Residential Population Data									Portion of TPU
			Total Employment	J1	J2	J3	J4	J5	J6	J7	J8	J9	J10	J11	J12		Low Cost Rental	R1	R2	R3	R4	Traditional Village	Modern Village	Temporary / Non-domestic	Total Population	
																(person)	(person)	(person)	(person)	(person)	(person)	(person)	(person)	(person)	(person)	(person)	
Wang Tau Hom	*282*	*28210*	*350*	*4*	*0*	*22*	*76*	*94*	*33*	*0*	*0*	*40*	*36*	*37*	*8*	*700*	*4000*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*4000*	*1*
		28223	*648*	*1*	*0*	*40*	*140*	*175*	*61*	*0*	*0*	*74*	*74*	*68*	*15*	*0*	*5900*	*2816*	*0*	*0*	*0*	*0*	*0*	*0*	*8716*	*0.05*
		28225	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Unit flow factors of GESF				*0.630*	*0.330*	*0.180*	*0.250*	*0.080*	*0.080*	*0.080*	*0.080*	*0.080*	*0.480*	*1.580*	*0.280*	*0.080*	*0.040*	*0.190*	*0.190*	*0.270*	*0.340*	*0.340*	*0.150*	*0.270*	*0.150*	
Unit flow factors of SM1				*0.660*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.025*	*0.175*	*0.240*	*0.300*	*0.370*	*0.370*	*0.240*	*0.240*	*0.150*	
Flow (GESF)				*0.030*	*0.000*	*0.050*	*0.240*	*0.095*	*0.033*	*0.000*	*0.000*	*0.243*	*0.726*	*0.131*	*0.008*	*0.324*	*9.445*	*0.310*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	
Flow (SM1)				*0.031*	*0.000*	*0.097*	*0.336*	*0.416*	*0.146*	*0.000*	*0.000*	*0.177*	*0.161*	*0.164*	*0.035*	*0.203*	*8.699*	*0.391*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	

Total trade flow (GESF) *1.88* *Total residential (GESF)* *9.75* *Total (GESF)* *11.63* *l/s*
Total trade flow (SM1) *1.77* *Total residential (SM1)* *9.09* *Total (SM1)* *10.86* *l/s*
Measured Average Flow *15* *l/s*

Mody Road, TST (54) *(1999)*

Area	TPU	Street Block	Commercial / Industrial Employment Data													Institutions /School	Residential Population Data									Portion of TPU
			Total Employment	J1	J2	J3	J4	J5	J6	J7	J8	J9	J10	J11	J12		Low Cost Rental	R1	R2	R3	R4	Traditional Village	Modern Village	Temporary / Non-domestic	Total Population	
																(person)	(person)	(person)	(person)	(person)	(person)	(person)	(person)	(person)	(person)	(person)	
Tsim Sha Tsui	*212*	*21203*	*1550*	*0*	*0*	*96*	*258*	*421*	*146*	*0*	*0*	*177*	*252*	*164*	*36*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*595*	*595*	*0.65*
		21204	*561*	*13*	*0*	*35*	*87*	*153*	*53*	*0*	*0*	*64*	*84*	*59*	*13*	*1115*	*0*	*670*	*0*	*0*	*0*	*0*	*0*	*0*	*670*	*0.5*
		21205	*1294*	*73*	*0*	*81*	*179*	*354*	*123*	*0*	*0*	*149*	*168*	*137*	*30*	*0*	*0*	*770*	*0*	*0*	*0*	*0*	*0*	*0*	*770*	*0.65*
		21223	*1707*	*44*	*0*	*106*	*262*	*465*	*161*	*0*	*0*	*196*	*252*	*181*	*40*	*0*	*0*	*1688*	*0*	*0*	*0*	*0*	*0*	*0*	*1688*	*0.8*
King's Park	*226*	*22607*	*630*	*69*	*0*	*40*	*79*	*173*	*60*	*0*	*0*	*73*	*54*	*67*	*15*	*975*	*0*	*2641*	*0*	*0*	*0*	*0*	*0*	*758*	*3399*	*0.7*
		22608	*242*	*69*	*0*	*16*	*7*	*70*	*24*	*0*	*0*	*29*	*0*	*27*	*0*	*210*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1*
		22614	*1010*	*69*	*0*	*63*	*150*	*276*	*96*	*0*	*0*	*116*	*109*	*107*	*24*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*203*	*203*	*1*
		22615	*1010*	*69*	*0*	*63*	*150*	*276*	*96*	*0*	*0*	*116*	*109*	*107*	*24*	*0*	*0*	*1321*	*0*	*0*	*0*	*0*	*0*	*135*	*1456*	*1*
Ho Man Tin	*235*	*23510*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*639*	*0*	*0*	*0*	*0*	*0*	*0*	*639*	*1*
		23512	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1850*	*0*	*0*	*0*	*0*	*0*	*0*	*1850*	*0.5*
		23513	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*369*	*0*	*0*	*0*	*0*	*0*	*0*	*369*	*0.8*
	236	*23608*	*1053*	*0*	*0*	*65*	*190*	*285*	*99*	*0*	*0*	*120*	*158*	*111*	*25*	*1350*	*11550*	*0*	*0*	*0*	*0*	*0*	*0*	*128*	*11678*	*1*
		23609	*1098*	*13*	*0*	*68*	*191*	*298*	*103*	*0*	*0*	*125*	*158*	*116*	*26*	*630*	*11550*	*0*	*0*	*0*	*0*	*0*	*0*	*128*	*11678*	*1*
		23610	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1350*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1*
		23618	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0.3*
		23623	*602*	*0*	*0*	*37*	*109*	*163*	*57*	*0*	*0*	*69*	*90*	*63*	*14*	*975*	*0*	*11672*	*0*	*0*	*0*	*0*	*0*	*0*	*11672*	*1*
		23624	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1350*	*0*	*3349*	*0*	*0*	*0*	*0*	*0*	*0*	*3349*	*0.7*
Unit flow factors of GESF				*0.630*	*0.330*	*0.180*	*0.250*	*0.080*	*0.080*	*0.080*	*0.080*	*0.480*	*1.580*	*0.280*	*0.080*	*0.040*	*0.190*	*0.190*	*0.270*	*0.340*	*0.340*	*0.150*	*0.270*	*0.150*		
Unit flow factors of SM1				*0.660*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.025*	*0.175*	*0.240*	*0.300*	*0.370*	*0.370*	*0.240*	*0.240*	*0.150*		
Flow (GESF)				*0.352*	*0.000*	*0.135*	*4.020*	*2.261*	*0.784*	*0.000*	*0.000*	*5.704*	*21.549*	*3.072*	*0.190*	*3.102*	*50.799*	*46.689*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*2.624*		
Flow (SM1)				*0.369*	*0.000*	*0.263*	*5.629*	*9.890*	*3.432*	*0.000*	*0.000*	*4.159*	*4.774*	*3.840*	*0.830*	*1.939*	*46.788*	*58.975*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*2.624*		

Total trade flow (GESF) *41.17* *Total residential (GESF)* *100.11* *Total (GESF)* *141.28* *l/s*
Total trade flow (SM1) *35.12* *Total residential (SM1)* *108.39* *Total (SM1)* *143.51* *l/s*
Measured Average Flow *80* *l/s*

Middle Road (92) *(1999)*

Area	TPU	Street Block	Commercial / Industrial Employment Data													Institutions /School	Residential Population Data									Portion of TPU
			Total Employment	J1	J2	J3	J4	J5	J6	J7	J8	J9	J10	J11	J12		Low Cost Rental	R1	R2	R3	R4	Traditional Village	Modern Village	Temporary / Non-domestic	Total Population	
																(person)	(person)	(person)	(person)	(person)	(person)	(person)	(person)	(person)	(person)	
Tsim Sha Tsui	*211*	*21122*	*5125*	*279*	*0*	*319*	*889*	*1395*	*484*	*0*	*0*	*587*	*510*	*542*	*120*	*0*	*0*	*593*	*0*	*0*	*0*	*0*	*0*	*0*	*593*	*0.6*	
		21123	*2174*	*146*	*0*	*136*	*359*	*593*	*206*	*0*	*0*	*249*	*204*	*230*	*51*	*0*	*0*	*683*	*0*	*0*	*0*	*0*	*0*	*0*	*683*	*1*	
		21127	*3084*	*0*	*0*	*194*	*384*	*846*	*294*	*0*	*0*	*356*	*608*	*329*	*73*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*583*	*583*	*0.8*	*
		21128	*4052*	*71*	*0*	*257*	*311*	*1122*	*389*	*0*	*0*	*472*	*897*	*436*	*97*	*0*	*0*	*1251*	*0*	*0*	*0*	*0*	*0*	*0*	*1251*	*0.6*	**
Unit flow factors of GESF				*0.630*	*0.330*	*0.180*	*0.250*	*0.080*	*0.080*	*0.080*	*0.080*	*0.480*	*1.580*	*0.280*	*0.080*	*0.040*	*0.190*	*0.190*	*0.270*	*0.340*	*0.340*	*0.150*	*0.270*	*0.150*			
Unit flow factors of SM1				*0.660*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.025*	*0.175*	*0.240*	*0.300*	*0.370*	*0.370*	*0.240*	*0.240*	*0.150*			
Flow (GESF)				*2.596*	*0.000*	*1.327*	*4.011*	*2.574*	*0.894*	*0.000*	*0.000*	*6.496*	*23.033*	*3.500*	*0.222*	*0.000*	*0.000*	*3.935*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.810*			
Flow (SM1)				*2.719*	*0.000*	*2.580*	*5.615*	*11.262*	*3.909*	*0.000*	*0.000*	*4.736*	*5.102*	*4.375*	*0.971*	*0.000*	*0.000*	*4.971*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.810*			

Total trade flow (GESF) *44.65*
Total trade flow (SM1) *41.27*

Total residential (GESF) *4.74*
Total residential (SM1) *5.78*

Total (GESF) *49.40* *l/s*
Total (SM1) *47.05* *l/s*
Measured Average Flow *25* *l/s*

Notes:

** The portion of TPU served for J10 is 0.2.*

*** The portion of TPU served for J10 is 0.7.*

Wyli Road, Kings Park (93) *(1999)*

Area	TPU	Street Block	Commercial / Industrial Employment Data													Institutions /School	Residential Population Data									Portion of TPU
			Total Employment	J1	J2	J3	J4	J5	J6	J7	J8	J9	J10	J11	J12		Low Cost Rental	R1	R2	R3	R4	Traditional Village	Modern Village	Temporary / Non-domestic	Total Population	
																(person)	(person)	(person)	(person)	(person)	(person)	(person)	(person)	(person)	(person)	
Ho Man Tin	*235*	*23510*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*639*	*0*	*0*	*0*	*0*	*0*	*0*	*639*	*1*	
	236	*23608*	*1053*	*0*	*0*	*65*	*190*	*285*	*99*	*0*	*0*	*120*	*158*	*111*	*25*	*1350*	*11550*	*0*	*0*	*0*	*0*	*0*	*0*	*128*	*11678*	*1*	*
		23610	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1350*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0.2*	
		23623	*602*	*0*	*0*	*37*	*109*	*163*	*57*	*0*	*0*	*69*	*90*	*63*	*14*	*975*	*0*	*11672*	*0*	*0*	*0*	*0*	*0*	*0*	*11672*	*1*	
		23624	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1350*	*0*	*3349*	*0*	*0*	*0*	*0*	*0*	*0*	*3349*	*0.65*	
Unit flow factors of GESF				*0.630*	*0.330*	*0.180*	*0.250*	*0.080*	*0.080*	*0.080*	*0.080*	*0.480*	*1.580*	*0.280*	*0.080*	*0.040*	*0.190*	*0.190*	*0.270*	*0.340*	*0.340*	*0.150*	*0.270*	*0.150*			
Unit flow factor of SM1				*0.660*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.350*	*0.025*	*0.175*	*0.240*	*0.300*	*0.370*	*0.370*	*0.240*	*0.240*	*0.150*			
Flow (GEFS)				*0.000*	*0.000*	*0.213*	*0.865*	*0.415*	*0.144*	*0.000*	*0.000*	*1.050*	*4.535*	*0.564*	*0.036*	*1.608*	*0.000*	*31.860*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*			
Flow (SM1)				*0.000*	*0.000*	*0.413*	*1.211*	*1.815*	*0.632*	*0.000*	*0.000*	*0.766*	*1.005*	*0.705*	*0.158*	*1.005*	*0.000*	*40.244*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.222*			

Total trade flow (GESF) *9.43*
Total trade flow (SM1) *7.71*

Total residential (GESF) *31.86*
Total residential (SM1) *40.47*

Total (GESF) *41.29* *l/s*
Total (SM1) *48.18* *l/s*
Measured Average Flow *74* *l/s*

Notes:

** The portion of TPU served for Residential and Institutions are 0.*

Implications of GESF

Caution must be taken in interpreting the information in this Appendix because the calculations of flows for Year 2016 and Year X are based on the assumption that sewage flows to the catchment PTW/STW are predominately gravity flows. The effects of major pumping facilities, if any, upstream of the PTW/STW have not been taken into consideration in estimating the peak flows. In addition, the population projections in the studied TPEDM data may not be the worst case ultimate scenario required to be formulated for preparing proper sewerage master plans.

Although some unit flow factors adopted in SMP studies may slightly deviate from those recommended in SM1, the majority of the ceiling UFFs in SM1 have been adopted in the hydraulic models of SMPs for the projection of sewage flows. The findings and hydraulic models of these SMPs may need to be re-visited and updated based on GESF.

(A) Year 2016

To visualize the impacts of adopting the new set of UFFs, catchment inflow factors and planning peaking factors on future development scenarios, comparison of projected average flows and peak flows of 28 selected major PTWs/STWs for year 2016 estimated using the methodologies in SM1 and in GESF based on Year 2016 TPEDM (Scenario II) data complied in 2002 are presented in **Table X(a)** and **Table X(b)**. The detailed calculations are included in **Annexes 1 and 2** of this Appendix.

A number of PTWs/STWs is projected to have peak flows estimated using GESF lower than using SM1. Examples are the Central PTW, North Point PTW, Chai Wan PTW and Kwun Tong PTW. The existing capacities of the Central PTW and the Kwun Tong PTW are projected to be marginally adequate by year 2016 based on the flows estimated using the GESF. This finding is different from that in the reviewed SMPs. Further investigation based on latest development projections, such as the forthcoming revised development plan of the reviewed South East Kowloon Development, would be required.

The existing capacity of North Point PTW is projected to be adequate for the projected peak flow up to year 2016. Subject to the results of further detailed investigation, there would be room to adjust the original programmes and scopes of upgrading works for the North Point PTW.

With a total projected peak flow of Wan Chai E PTW lower than that of the SMP, there may be room for revisiting the scope of upgrading works for the Wan Chai E PTW.

In catchments, such as, North West Kowloon, Shek O, Shau Kei Wan, and Tuen Mun (Pillar Point STW), the projected peak flows for year 2016 estimated by using the GESF are higher than both the projected flows estimated by using SM1 and the existing capacities of treatment plants of these catchments. Except for Shek O STW, upgrading works for the PTWs/STWs of these catchments have been proposed. The performance of these PTWs/STWs is recommended to be continuously monitored. The proposed upgrading works for these PTWs/STWs would need to be completed before year 2016 to cope with the projected

development needs. Subject to further detailed investigation, the scope of the proposed upgrading works of Shau Kei Wan PTW would require minor adjustments to cater for the slightly higher estimated peak flow.

For Tsing Yi, the projected population of industrial employees for year 2016 is about 4 times as high as that of 2002. The occurrence of the projected shortfall depends on the nature of these new industries and on whether these new industries will be situated in the southwestern corner of the island which were served by private sewage treatment plants. The UFF may need to be reviewed based on the latest water consumption trend to confirm local industrial flow characteristics. Subject to further investigation, the urgency and requirement of upgrading Tsing Yi PTW could be further investigated and monitored.

For catchments with high catchment inflow factors, such as Shek O, continued flow monitoring works are recommended in these catchments to keep abreast of any changes in the infiltration/inflow problems. Unless the high inflow situations can be alleviated in the future, the recommended catchment inflow factors of these catchments or their updates would still be applicable.

For Shek Wu Hui STW, the projected flows estimated using SM1 and GESF are both higher than the planned upgraded plant capacity. Subject to further detailed investigation, the scope of works may need to be revisited.

(B) <u>Year X</u>

The Year X is an unspecified future date reflecting full development of the sewage catchments according to current outline zoning plans and land use factors, and has been established as the design horizon for the HATS projects. Comparison of projected average flows and peak flows have also been carried out for HATS catchments using the Year X TPEDM data issued by PlanD for the Environmental Engineering Feasibility Assessment Studies (EEFS) in relation to the way forward for the HATS. The average flow comparison and peak flow comparison are presented in **Table X(c)** and **X(d)** respectively. The detailed calculations are included in **Annexes 3 and 4** of this Appendix. Similar to the calculations in the EEFS studies, a 5% uncertainty allowance to all population figures and a 4% adjustment to the employment population figures have been adopted.

Akin to the projected situations of year 2016, upgrading works have been proposed for most of the PTWs/STWs identified to have shortfalls in Year X although the programme and scope of upgrading may need to be further investigated.

For Year X, To Kwa Wan PTW, Kwun Tong PTW and Tsing Yi PTW, which have not been proposed for upgrading, are projected to have shortfall. The performance of these PTWs/STWs and the projected development growths of these catchments require carefully monitoring. The requirement of upgrading will have to be revisited with more available updated flow and population projection data on a case by case basis. For Shau Kei Wan PTW and North West Kowloon Pumping Station, the scopes of the proposed upgrading works would need to be reviewed.

Table X(a) - Comparison of total average flows of major catchments for year 2016 estimated by using the methodologies of SM1 and GESF against the 2002 measured figures and the design ADWF of the sewage treatment plants

Selected Plant	Design ADWF of Plant (m^3/d)	2002 Measured Average Flow (m^3/d)	2016/Ult. Projected Flow in SMP (m^3/d)	2016 Flow Estimated Using UFFs of SM1 (m^3/d)	2016 Flow Estimated Using UFFs of GESF (m^3/d)
Chai Wan PTW	42,000	59,167	57,520	78,337	64,586
Shau Kei Wan PTW	39,000	70,946	59,603	76,678	77,519
To Kwa Wan PTW	288,000	211,379	343,546	313,346	292,607
Kwun Tong PTW	333,000	274,600	463,240	448,759	384,218
North West Kowloon PS	406,000	369,660	508,871	429,332	487,394
Tseung Kwan O PS	212,000	100,181	188,126	153,147	175,814
Kwai Chung PTW	318,000	221,011	318,000	285,782	260,642
Tsing Yi PTW	88,000	53,963	57,447	68,501	78,496
Central PTW	110,000	101,803	157,291	174,425	125,277
Wan Chai W PTW	40,000	51,318	109,553	136,982	98,064
Wan Chai E PTW	65,000	73,475	93,803	91,127	80,821
North Point PTW	118,000	73,964	110,541	126,192	99,027
Ap Lei Chau STW	35,000	31,886	25,731	30,190	32,641
Aberdeen STW	54,000	73,038	59,117	61,784	68,815
Sandy Bay STW	8,900	4,314	7,997	8,574	8,059
Wah Fu STW	16,000	10,645	8,952	11,066	10,868
Stanley STW	11,600	7,916	7,467	9,092	8,570
Shek O STW	1,100	1,038	370	1,800	2,636
San Wai STW	164,000	105,100	207,950	196,154	196,053
Yuen Long STW	70,000	16,533	120,260	56,459	60,184
Sai Kung STW	8,000	9,176	21,820	17,268	23,103
Tai Po STW	88,000	78,642	116,172	124,317	123,124
Sha Tin STW	150,000	219,083	282,596	257,585	272,735
Pillar Point STW	200,000	165,083	230,446	209,624	219,843
Shek Wu Hui STW	80,000	73,842	155,000	123,210	118,256
Cheung Chau STW	4,000	9,254	7,211	7,540	12,433
Mui Wo STW	2,380	1,297	3,155	1,743	1,937
Siu Ho Wan STW	162,000	24,468	157,248	125,935	123,969
Total of all STWs/PTWs:		2,492,782	3,801,327	3,624,948	3,507,690
Total of all HATS PTWs:		1,781,350	2,631,934	2,494,221	2,344,847
Sum of all flow weighted deviation (%) from 2002 measured flow of all STWs/PTWs:				46.60	41.05
Sum of all flow weighted deviation (%) from 2002 measured flow of HATS PTWs:				41.47	32.11

Notes of Table X(a):

(i) For flow figures estimated using SM1, a prevalent industrial activity UFF of 0.600m^3/employee/day generally adopted under HATS for industrial flows is used.

(ii) Flows are calculated based on 2016 TPEDM complied in September 2002. If 2016 projected flow is not available in SMP, the ultimate projected flow in SMP is listed instead.

(iii) PTWs/STWs with design ADWF less than 1,000m^3/d are not included in this table.

(iv) GESF estimated flows higher than the corresponding SMP projected flows are highlighted.

Table X(b) - Comparison of total peak flows of major catchments for year 2016 estimated by using the UFFs of SM1 and GESF against the design and planned capacities of the sewage treatment plants

Selected Plant	2002 Plant Design Capacity (m^3/s)	Upgraded Plant Capacity under Planning (m^3/s)	2016/Ult. Projected Peak Flow in SMP (m^3/s)	2016 Peak Flow Estimated Using SM1 (m^3/s)	2016 Estimated Peak Flow Using GESF (m^3/s)
Chai Wan PTW	2.610	-	1.73	2.291	2.042
Shau Kei Wan PTW	1.750	2.120	1.78	2.246	2.422
To Kwa Wan PTW	9.320	-	8.99	8.258	8.386
Kwun Tong PTW	10.930	-	11.86	11.513	10.819
North West Kowloon PS(vi)	8.500	Planned	-	11.051	13.539
Tseung Kwan O PS	6.850	-	3.92	4.259	5.209
Kwai Chung PTW	10.300	-	-	7.584	7.526
Tsing Yi PTW	2.000	-	1.72	2.023	2.451
Central PTW	3.810	4.640	4.38	4.803	3.794
Wan Chai W PTW	1.680	See note (v)	3.13	3.841	3.018
Wan Chai E PTW	4.610	8.110	5.55	2.635	2.518
North Point PTW	3.430	4.060	3.16	3.561	3.045
Ap Lei Chau STW	1.200	-	0.92	0.948	1.079
Aberdeen STW	2.080	3.600	2.08	1.839	2.167
Sandy Bay STW	0.310	0.510	0.28	0.298	0.280
Wah Fu STW	1.090	-	0.31	0.384	0.377
Stanley STW	0.402	-	0.26	0.316	0.298
Shek O STW	0.095	-	0.03	0.083	0.122
San Wai STW	5.694	8.542	-	5.355	5.767
Yuen Long STW	2.431	2.431	-	1.692	1.912
Sai Kung STW	0.278	0.764	-	0.566	0.781
Tai Po STW	2.697	4.514	-	3.512	3.733
Sha Tin STW	5.208	11.806	-	6.889	7.852
Pillar Point STW	5.787	6.460	6.20	5.694	6.419
Shek Wu Hui STW	2.778	3.229	-	3.483	3.595
Cheung Chau STW	0.185	0.590	0.59	0.262	0.432
Mui Wo STW	0.083	0.525	0.23	0.081	0.090
Siu Ho Wan STW	3.750	5.000	4.63	3.554	3.757
Total of all STWs/PTWs:	99.858			99.019	103.428
Total of all HATS PTWs:	70.470			67.534	68.671

Notes of Table X(b):

(i) For flow figures estimated using SM1, a prevalent industrial activity UFF of $0.600m^3$/employee/day generally adopted under HATS for industrial flows is used.

(ii) Flows are calculated based on 2016 TPEDM complied in September 2002. If 2016 projected peak flow is not available in SMP, the ultimate projected flow in SMP is listed instead.

(iii) GESF estimated flows higher than the corresponding existing/future upgraded plant capacities are highlighted.

(iv) According to the reviewed HKI SMP, Wan Chai W PTW will be decommissioned. Sewage of Wan Chai West will be diverted to Wan Chai E PTW.

(v) The current design capacity of North West Kowloon PTW is $14.7m^3/s$.

(vi) For comparison on the same basis, peak flow figures are obtained by applying peaking factors to the average flow figures of individual catchments. The effects of upstream pumped sewage flows within each catchment have not been taken into account.

Table X(c) - Comparison of total average flows of HATS catchments for Year X estimated by using the UFFs of SM1 and GESF against the 2002 measured figures and 2002 design ADWF of plants

Selected Plant	Design ADWF of Plant (m^3/d)	2002 Average Measured Flow of Plant (m^3/d)	Year X Average Flow Extracted from EEFS Final Study Report (m^3/d)	Year X Average Flow Estimated Using Flow Factors of SM1 (m^3/d)	Year X Average Flow Estimated Using Flow Factors of GESF (m^3/d)
Chai Wan PTW	42,000	59,167	82,883	87,286	73,906
Shau Kei Wan PTW	39,000	70,946	88,713	82,863	82,679
To Kwa Wan PTW	288,000	211,379	408,621	349,346	332,979
Kwun Tong PTW	333,000	274,600	503,593	506,090	458,226
North West Kowloon PS	406,000	369,660	514,168	470,411	555,672
Tseung Kwan O PS	212,000	100,181	206,157	159,336	194,203
Kwai Chung PTW	318,000	221,011	330,110	320,215	300,217
Tsing Yi PTW	88,000	53,963	82,025	72,364	84,900
Central PTW	110,000	101,803	164,249	188,564	140,787
Wan Chai W PTW	40,000	51,318	103,063	121,509	87,560
Wan Chai E PTW	65,000	73,475	77,903	87,537	81,371
North Point PTW	118,000	73,964	121,165	130,583	103,347
Ap Lei Chau STW	35,000	31,886	32,014	33,117	36,128
Aberdeen STW	54,000	73,038	66,439	71,478	80,913
Sandy Bay STW	8,900	4,314	7,921	8,529	8,567
Wah Fu STW	16,000	10,645	12,914	10,925	13,997
Total:			2,792,698	2,700,153	2,635,453

Notes of Table X(c):

(i) Flows are calculated based on Year X TPEDM by PVS Zone (updated in October 2001, residential updated in August 2002).

(ii) The Cyberport STW is not included in this table.

(iii) Estimated flows exceeding the corresponding flow figures estimated in EEFS studies are highlighted.

(iv) The catchment boundaries of some PTWs are slightly different from those defined in the EPD's desktop study.

(v) In the EEFS study, the unit flow factor of industrial activity in Kowloon areas and Tseung Kwan O has adopted the unit flow factor of 1.0m^3/employee/day for industrial activities in Review of Central and East Kowloon SMPs. However, in the calculations above, a unit flow factor of 0.6m^3/employee/day for industrial activities was used across the board for comparison.

(vi) According to the reviewed HKI SMP, Wan Chai W PTW will be decommissioned. Sewage of Wan Chai West will be diverted to Wan Chai E PTW.

Table X(d) - Comparison of total peak flows of HATS catchments for Year X estimated by using the UFFs of SM1 and GESF against their plant design capacities in 2002 and in the future

Selected Plant	2002 Treatment Plant Design Capacity (m^3/s)	Planned upgraded Treatment Plant Design Capacity (m^3/s)	Year X Peak Flow from EEFS Final Study Report (m^3/s)	Year X Peak Flow Estimated Using SM1 (m^3/s)	Year X Peak Flow Estimated Using GESF (m^3/s)
Chai Wan PTW	2.61	-	2.69	2.532	2.316
Shau Kei Wan PTW	1.75	2.12	2.60	2.413	2.573
To Kwa Wan PTW	9.32	-	10.18	9.132	9.463
Kwun Tong PTW	10.93	-	12.13	12.867	12.756
North West Kowloon PS(v)	8.50	Upgrade planned	12.34	12.026	15.435
Tseung Kwan O PS	6.85	-	5.75	4.418	5.716
Kwai Chung PTW	10.3	-	8.53	8.426	8.590
Tsing Yi PTW	2.00	-	2.66	2.129	2.637
Central PTW	3.81	4.64	4.74	5.163	4.232
Wan Chai W PTW	1.68	See note (iv)	See note (iv)	3.438	2.714
Wan Chai E PTW	4.61	8.11	5.14	2.539	2.534
North Point PTW	3.43	4.06	3.49	3.675	3.169
Ap Lei Chau STW	1.20	-	1.21	1.033	1.186
Aberdeen STW	2.08	3.60	2.22	2.105	2.521
Sandy Bay STW	0.31	0.51	0.40	0.296	0.297
Wah Fu STW	1.09	-	0.57	0.379	0.489
Total :	70.47			72.569	76.629

Notes of Table X(d):

(i) Flows are calculated based on Year X TPEDM by PVS Zone (updated in October 2001, residential updated in August 2002).

(ii) The Cyberport STW is not included in this table.

(iii) Estimated flows exceeding the existing/future upgraded capacities of the plant are highlighted.

(iv) According to the reviewed HKI SMPs, Wan Chai W PTW will be decommissioned. Sewage of Wan Chai West will be diverted to Wan Chai E PTW.

(v) The current design capacity of North West Kowloon PTW is $14.7m^3/s$.

(vi) For comparison on the same basis, each peak flow figure is obtained by applying a single appropriate peaking factor to the average flow figure of that catchment. The effects of upstream pumped sewage flows within each catchment have not been taken into account.

2016 SEWAGE FLOWS OF MAJOR CATCHMENTS ESTIMATED USING FLOW FACTORS IN GESF AND
2016 TPEDM BY PVS ZONE, Scenario II (as at Mid-2016)
Part 1

Annex 1 of Appendix X - Part 1

	Population										Flows							
Selected major catchment (PTW/STW)	Public Rental	Subsidized Sale Flat	Private Permanent	Non-domestic	Institutional & Special Classes	Temporary	Resident Total (excl. Mob res)	Mobile Residental Population	Resident Total (incl. Mob res)	Full-time School Places	Total Ave. Flow (m3/d)	Catchment Inflow factor	Sub-total Ave. Res. Flow (m3/d)	Priv. Perm. Res. UFF adjustment factor	Sub-total Ave. Ind. Flow (m3/d)	Ind. UFF adjustment factor	Sub-total Ave. Com. Flow (m3/d)	Sub-total Ave. inst. Flow (m3/d)
Unit flow factor (m3/person/day)	0.19	0.19	0.19	0.15	0.19	0.15		0.19		0.04								
Central & Western	18,971	-	239,254	1,702	4,885	1,219	266,031	3,162	269,193	48,840								
- Central and Western (Central PTW)	4,556	-	228,981	1,702	4,885	1,218	241,342	2,933	244,275	46,838	119,353	1.00	49,341	1.07	1,539	0.45	66,600	1,874
- Green Island Reclaimation (Central PTW)	14,414	-	10,273	-	-	1	24,689	229	24,918	2,002	5,923	1.00	4,871	1.07	-	0.45	972	80
Wan Chai and North Point	11,841	7,213	350,722	1,383	3,512	1,617	376,289	5,982	382,271	89,105								
- Wan Chai West (Wan Chai W PTW)	-	-	61,290	339	848	363	62,840	983	63,823	16,231	86,027	1.00	14,427	1.20	906	0.45	70,045	649
- Central and Wan Chai Reclamation (Wan Chai W PTW)	-	-	656	-	5	11	672	22	695	-	12,037	1.00	156	1.20	17	0.45	11,863	-
- Wan Chai East (Wan Chai E PTW)	1,377	-	81,742	634	1,108	330	85,191	1,408	86,599	22,616	80,821	1.00	20,298	1.25	838	0.45	58,780	905
- North Point (North Point PTW)	10,464	7,213	207,034	411	1,551	912	227,585	3,569	231,154	50,258	99,027	1.00	47,123	1.08	2,869	0.45	47,024	2,010
Hong Kong Island South	2,997	2,941	16,250	201	3,571	526	26,485	334	26,819	4,996								
- Stanley (Stanley STW)	2,997	2,941	12,251	195	3,567	312	22,264	283	22,547	4,225	8,570	1.00	6,400	1.74	6	0.45	1,995	169
- Shek O (Shek O STW)	-	-	3,998	6	4	214	4,221	51	4,273	771	2,636	1.50	2,139	1.82	2	0.45	448	46
Chai Wan and Shaukeiwan	101,239	78,987	196,673	541	2,373	1,065	380,878	4,694	385,572	50,765								
- Chai Wan (Chai Wan PTW)	62,783	50,085	62,661	155	1,717	124	177,525	2,076	179,601	28,468	64,586	1.10	38,231	1.03	2,027	0.45	23,075	1,253
- Shaukeiwan (Shau Kei Wan PTW)	38,455	28,902	134,012	387	656	940	203,352	2,618	205,971	22,297	77,519	1.25	48,852	1.00	813	0.45	26,739	1,115
Aberdeen, Ap Lei Chau and Pok Fu Lam	95,583	27,556	144,034	835	5,884	1,689	275,581	3,372	278,953	45,275								
- Ap Lei Chau (Ap Lei Chau STW)	36,082	8,037	40,290	23	389	28	84,849	843	85,693	8,523	32,641	1.30	21,163	1.00	3,009	0.98	8,025	443
- Aberdeen (Aberdeen STW)	36,364	10,540	67,402	589	3,186	1,139	119,220	1,584	120,804	22,409	61,439	1.30	34,754	1.26	65	0.98	25,454	1,165
- Repulse Bay and Shouson Hill (Aberdeen STW)	-	-	18,015	153	-	268	18,437	278	18,715	3,740	7,377	1.30	5,758	1.26	4	0.98	1,421	194
- Sandy Bay (Sandy Bay STW)	-	-	13,297	36	2,090	215	15,639	261	15,900	5,292	8,059	1.00	5,209	1.87	32	0.45	2,606	212
- Wah Fu (Wah Fu STW)	23,136	8,978	5,029	34	219	39	37,436	406	37,841	5,310	10,868	1.00	8,571	1.52	6	0.45	2,079	212
Central and East Kowloon	651,803	249,891	847,834	3,968	13,073	6,592	1,773,162	21,853	1,795,015	265,263								
- Central Kowloon (To Kwa Wan PTW)	170,886	50,858	338,653	1,851	7,040	4,166	573,454	7,466	580,920	96,087	249,894	1.00	111,614	1.02	2,269	0.98	132,167	3,843
- East Kowloon - incl. SEKD East (Kwun Tong PTW)	466,508	199,033	383,994	2,113	6,033	2,426	1,060,107	12,139	1,072,246	145,703	384,218	1.10	228,774	1.04	6,582	0.80	142,451	6,411
- SEKD West (To Kwa Wan PTW)	14,410	-	125,187	4	-	-	139,601	2,248	141,849	23,473	42,714	1.00	27,427	1.02	-	0.98	14,348	939
North West Kowloon (North West Kowloon PS)	220,091	29,082	641,055	2,739	13,211	9,367	915,545	13,195	928,739	180,555	487,394	1.30	238,700	1.06	4,924	0.63	234,381	9,389
Tseung Kwan O (Tseung Kwan O PS)	145,869	113,989	211,542	89	2,969	462	474,920	4,770	479,690	79,081	175,814	1.20	110,827	1.02	14,177	1.79	47,014	3,796
Yuen Long and Kam Tin	278,198	61,244	412,553	1,369	2,660	14,913	770,937	9,566	780,503	112,092								
- Ha Tsuen & Lau Fau Shan (San Wai STW)	-	-	14,211	13	-	1,250	15,474	162	15,635	45	4,709	1.00	3,676	1.28	267	3.57	764	2
- Tin Shui Wai (San Wai STW)	186,919	60,406	49,148	13	724	1	297,212	3,427	300,639	49,309	78,794	1.00	62,949	1.28	113	3.57	13,760	1,972
- Hung Shui Kiu (San Wai STW)	54,256	-	43,721	218	252	1,911	100,359	1,650	102,008	6,207	28,461	1.00	21,622	1.28	3,151	3.57	3,440	248
- Ping Shan (San Wai STW)	-	-	21,323	64	-	247	21,634	170	21,804	1,506	7,404	1.00	5,265	1.28	1,034	3.57	1,045	60
- Tong Yan San Tsuen (San Wai STW)	2,939	-	15,429	7	26	1,147	19,548	305	19,853	10,680	8,220	1.00	4,547	1.28	2,207	3.57	1,039	427
- Yuen Long Town (San Wai STW)	11,930	838	115,217	712	682	918	130,296	1,612	131,907	28,473	59,409	1.00	31,171	1.28	4,000	3.57	23,099	1,139
- Tai Tong (San Wai STW)	-	-	29,980	35	16	1,301	31,330	338	31,669	1,187	9,056	1.00	7,559	1.28	452	3.57	998	47
- Kam Tin South and North (Yuen Long STW)	-	-	33,964	69	191	2,253	36,478	368	36,845	2,472	12,485	1.00	9,618	1.42	527	3.57	2,241	99
- Fairview Park & Nam San Wai (Yuen Long STW)	-	-	26,690	97	-	944	27,731	565	28,296	3,911	9,478	1.00	7,465	1.42	298	3.57	1,560	156
- Ngau Tam Mei (Yuen Long STW)	-	-	22,129	28	6	2,240	24,403	239	24,642	275	7,323	1.00	6,357	1.42	141	3.57	815	11
- San Tin (Yuen Long STW)	-	-	5,864	13	25	1,066	6,968	137	7,105	246	2,194	1.00	1,775	1.42	59	3.57	350	10
- Wang Chau (Yuen Long STW)	22,155	-	19,466	55	340	807	42,824	423	43,247	6,960	22,944	1.00	9,736	1.42	8,608	3.57	4,322	278
- Pat Heung & Shek Kong (Yuen Long STW)	-	-	15,412	44	397	827	16,680	172	16,852	822	5,759	1.00	4,397	1.42	537	3.57	793	33
Port Shelter (Sai Kung STW)	1,351	1,255	35,306	92	2,579	722	41,304	484	41,788	10,324	23,103	1.30	13,621	1.37	932	3.57	8,013	537
Tolo Harbour	284,484	257,573	445,597	1,599	13,789	6,022	1,009,065	13,151	1,022,216	177,472								
- Tai Po (Tai Po STW)	71,074	78,037	150,544	867	3,488	4,197	308,207	4,016	312,223	56,995								
* Lam Tsuen	-	-	3,853	11	99	207	4,170	43	4,213	205	1,198	1.00	938	1.20	54	1.34	198	8
* Wu Kau Tang	-	-	-	-	-	-	-	-	-	-	-	1.00	-	1.20	-	1.34	-	-
* Ting Kok	-	-	12,472	32	487	63	13,054	169	13,223	-	3,708	1.00	2,982	1.20	36	1.34	689	-
* Tai Po Industrial Estate Area	-	-	5,378	-	1,477	149	7,004	171	7,174	7,986	12,603	1.00	1,562	1.20	8,380	1.34	2,341	319
* Hong Lok Yuen	-	-	26,995	63	1	2,703	29,761	453	30,214	1,627	8,101	1.00	6,656	1.20	4	1.34	1,376	65
* Tai Po Town	71,074	78,037	75,342	738	1,424	704	227,319	2,674	229,993	36,490	71,716	1.00	49,469	1.20	378	1.34	20,409	1,460
* Tai Po Kau and Pak Shek Kok	-	-	26,504	23	-	371	26,898	508	27,406	10,687	25,799	1.00	6,199	1.20	16,462	1.34	2,711	427
- Shatin (Sha Tin STW)	213,410	179,537	295,053	732	10,301	1,825	700,858	9,135	709,993	120,477								
* Shatin	180,751	81,862	208,428	679	9,467	1,707	482,894	6,316	489,210	92,467	193,683	1.15	120,103	1.21	5,725	0.80	63,603	4,253
* Ma On Shan	32,659	97,675	86,625	53	834	118	217,964	2,819	220,782	28,010	79,052	1.15	56,690	1.21	88	0.80	20,985	1,288
Tuen Mun (Pillar Point STW)	244,713	110,084	255,150	552	7,185	6,497	624,181	7,858	632,039	92,690								
- So Kwun Wat	219,235	110,084	224,264	515	7,185	1,450	562,733	6,922	569,655	89,696	195,062	1.10	125,959	1.10	13,006	1.79	52,150	3,947
- Lam Tei & Yick Yuen	25,478	-	30,885	38	-	5,047	61,448	936	62,384	2,994	24,781	1.10	13,460	1.10	2,895	1.79	8,294	132
Tsuen Wan, Kwai Chung and Tsing Yi	396,304	73,752	313,591	2,065	5,111	4,909	795,731	10,091	805,823	121,269								
- Tsuen Wan and Kwai Chung (Kwai Chung PTW)	299,940	25,480	263,848	2,028	4,218	4,826	600,339	7,588	607,927	93,099	260,642	1.10	129,174	1.04	22,650	1.16	104,722	4,096
- Tsing Yi (Tsing Yi PTW)	96,365	48,272	49,744	36	893	84	195,393	2,503	197,896	28,170	78,496	1.10	42,994	1.08	14,342	2.68	19,921	1,239
North District (Shek Wu Hui STW)	118,618	77,167	177,740	626	1,956	12,062	388,169	5,132	393,301	54,933								
- Kau Lung Hang	-	-	1,271	1	-	695	1,967	14	1,981	624	532	1.00	390	1.17	-	0.98	118	25
- Ping Kong	-	-	1,796	7	-	540	2,343	15	2,358	644	619	1.00	484	1.17	10	0.98	99	26
- Kwu Tung South	-	-	-	-	-	-	-	-	-	-	-	1.00	-	1.17	-	0.98	-	-
- Kwu Tung North	-	-	-	-	-	-	-	-	-	-	-	1.00	-	1.17	-	0.98	-	-
- Fanling / Sheung Shui Town	116,551	77,167	146,171	141	1,762	4,244	346,036	4,747	350,783	51,867	106,033	1.00	73,687	1.17	1,860	0.98	28,410	2,075
- Ping She / Ta Kwu Ling	-	-	5,905	291	110	2,576	8,882	78	8,961	-	3,377	1.00	1,779	1.17	691	0.98	907	-
- Luk Keng	2,066	-	8,087	58	32	987	11,231	140	11,371	997	3,109	1.00	2,380	1.17	53	0.98	636	40
- Lung Yeuk Tau & Kwan Tei South	-	-	14,511	126	51	3,020	17,709	138	17,847	801	4,587	1.00	3,734	1.17	117	0.98	704	32
Outlying Islands	111,836	7,073	194,877	265	3,698	2,934	320,683	3,616	324,299	47,555								
- Cheung Chau (Cheung Chau STW)	2,873	-	17,887	105	400	510	21,776	159	21,935	4,025	12,433	1.50	8,509	1.45	328	1.79	3,355	242
- Mui Wo (Mui Wo STW)	968	-	2,985	52	29	386	4,419	33	4,453	1,233	1,937	1.00	1,084	1.45	14	1.79	790	49
- Discovery Bay (Siu Ho Wan STW)	-	-	19,595	8	-	-	19,603	224	19,827	2,933	8,318	1.00	5,815	1.55	3	0.80	2,384	117
- Ma Wan, Lantau North & Port Dev (Siu Ho Wan STW)	-	-	9,307	27	5	62	9,400	43	9,443	975	13,850	1.00	2,162	1.21	-	0.80	11,649	39
- South Lantau, incl Tai O, Ngong Ping (Siu Ho Wan STW)	1,108	287	5,214	44	3,061	1,909	11,622	74	11,696	1,010	3,603	1.00	2,364	1.21	97	0.80	1,102	40
- Tung Chun/Tai Ho New Town (Siu Ho Wan STW)	106,887	6,786	139,888	29	203	67	253,860	3,083	256,943	37,379	77,592	1.00	54,668	1.21	23	0.80	21,407	1,495
- Airport Development (Siu Ho Wan STW)	-	-	1	-	1	-	2	0	2	-	20,606	1.00	0	1.21	3,790	0.80	16,815	-
Total Population	2,683,898	1,097,806	4,482,178	18,026	86,456	70,596	8,438,960	107,261	8,546,221	1,380,213								
Trade flows(activities+employee):	113,334	4,193	92,383	117,570	67,016	62,684	453	7	75,839	527,737	285,185	11,086	1,357,486	3,507,690		1,927,632		153,416		1,365,501	61,142
Trade flows (activities only):	99,167	3,176	51,324	83,978	-	-	-	-	49,460	501,016	203,704	-	991,825	Av. Res. UFF :		0.2256		141,020		892,658	

Average commercial activities UFF, excl. CIF (=Trade Flow/ Popn of J2-J12) 0.2032

2016 SEWAGE FLOWS OF MAJOR CATCHMENTS ESTIMATED USING FLOW FACTORS IN GESF AND 2016 TPEDM BY PVS ZONE, Scenario II (as at Mid-2016)
Part II

Annex 1 of Appendix X - Part 2

Selected Plant	Design ADWF (m3/d)	2002 Measured Average Flow (m3/d)	2016 Calculated Total Ave. Flow (m3/d)	Peak flow Using PFs of GESF (m3/s)	STW/PTW Design Capacity at 2002 (m3/s)	Sub-total Calculated Res. Ave. Flow (m3/d)	Sub-total Calculated Ind. Ave. Flow (m3/d)	Sub-total Calculated Comml. Ave. Flow (m3/d)	Sub-total Calculated Inst. Ave. Flow (m3/d)	Percentage Residential (%)	Percentage Industrial (%)	Percentage Commercial (%)	Percentage Institution (%)	Absolute Deviation from 2002 (m3/d)	Flow Weighted % Deviation (%)
Central PTW	110,000	101,803	125,277	3.794	3.810	54,212	1,539	67,572	1,954	43	1	54	2	23,474	
Wan Chai W PTW	40,000	51,318	98,064 WCW decom.	3.018	1.680	14,584	923	81,908	649	15	1	84	1	46,746	
Wan Chai E PTW	65,000	73,475	80,821	2.518	4.610	20,298	838	58,780	905	25	1	73	1	7,346	
North Point PTW	118,000	73,964	99,027	3.045	3.430	47,123	2,869	47,024	2,010	48	3	47	2	25,063	
Stanley STW	11,600	7,916	8,570	0.298	0.402	6,400	6	1,995	169	75	0	23	2	654	
Shek O STW	1,100	1,038	2,636	0.122	0.095	2,139	2	448	46	81	0	17	2	1,598	
Chai Wan PTW	42,000	59,167	64,586	2.042	2.610	38,231	2,027	23,075	1,253	59	3	36	2	5,418	
Shau Kei Wan PTW	39,000	70,946	77,519	2.422	1.750	48,852	813	26,739	1,115	63	1	34	1	6,574	
Ap Lei Chau STW	35,000	31,886	32,641	1.079	1.200	21,163	3,009	8,025	443	65	9	25	1	755	
Aberdeen STW	54,000	73,038	68,815	2.167	2.080	40,512	69	26,875	1,360	59	0	39	2	4,223	
Sandy Bay STW	8,900	4,314	8,059	0.280	0.310	5,209	32	2,606	212	65	0	32	3	3,745	
Wah Fu STW	16,000	10,645	10,868	0.377	1.090	8,571	6	2,079	212	79	0	19	2	223	
To Kwa Wan PTW	288,000	211,379	292,607	8.386	9.320	139,041	2,269	146,515	4,782	48	1	50	2	81,229	
Kwun TongPTW	333,000	274,600	384,218	10.819	10.930	228,774	6,582	142,451	6,411	60	2	37	2	109,618	
North West Kowloon PS	406,000	369,660	487,394	13.539	8.500	238,700	4,924	234,381	9,389	49	1	48	2	117,734	
Tseung Kwan O PS	212,000	100,181	175,814	5.209	6.850	110,827	14,177	47,014	3,796	63	8	27	2	75,632	
San Wai STW	164,000	105,100	196,053	5.767	5.694	136,789	11,223	44,144	3,896	70	6	23	2	90,953	
Yuen Long STW	70,000	16,533	60,184	1.912	2.431	39,347	10,170	10,080	587	65	17	17	1	43,651	
Sai Kung STW	8,000	9,176	23,103	0.781	0.278	13,621	932	8,013	537	59	4	35	2	13,927	
Tai Po STW	88,000	78,642	123,124	3.733	2.697	67,806	25,314	27,724	2,280	55	21	23	2	44,482	
Sha Tin STW	150,000	219,083	272,735	7.852	5.208	182,991	22,275	87,299	5,969	67	8	32	2	53,652	
Pillar Point STW	200,000	165,083	219,843	6.419	5.787	139,419	15,901	60,444	4,078	63	7	27	2	54,760	
Kwai Chung PTW	318,000	221,011	260,642	7.526	10.300	129,174	22,650	104,722	4,096	50	9	40	2	39,631	
Tsing Yi PTW	88,000	53,963	78,496	2.451	2.000	42,994	14,342	19,921	1,239	55	18	25	2	24,533	
Shek Wu Hui STW	80,000	73,842	118,256	3.595	2.778	82,453	2,732	30,874	2,197	70	2	26	2	44,414	
Cheung Chau STW	4,000	9,254	12,433	0.432	0.185	8,509	328	3,355	242	68	3	27	2	3,179	
Mui Wo STW	2,380	1,297	1,937	0.090	0.083	1,084	14	790	49	56	1	41	3	640	
Siu Ho Wan STW	162,000	24,468	123,969	3.757	3.750	62,644	3,815	52,255	1,651	51	3	42	1	99,501	
Total of all PTWs/STWs/PSs:		2,492,782	3,507,690	103.428	99.858	1,931,467	169,781	1,367,110	61,529	55	5	39	2	1,023,353	41.05
Total of all HATS PTWs:		1,781,350	2,344,847	68.671	70.470	1,188,265	77,069	1,039,686	39,826	51	3	44	2	571,942	32.11

2016 SEWAGE FLOWS OF MAJOR CATCHMENTS ESTIMATED USING UNIT FLOW FACTORS IN THE EXISTING SEWERAGE MANUAL AND
2016 TPEDM BY PVS ZONE, Scenario II (as at Mid-2016) 2016
Part 1

Annex 2 of Appendix X - Part 1

	Population										Flows					
Selected major catchment (PTW/STW)	Public Rental	Subsidized Sale Flat	Private Permanent	Non-domestic	Institutional & Special Classes	Temporary	Resident Total (excl. Mob res)	Mobile Residental Population	Resident Total (incl. Mob res)	Full-time School Places	Total Ave. Flow (m3/d)	Sub-total Ave. Res. Flow (m3/d)	Priv. Perm. Res. UFF adjustment factor	Sub-total Ave. Ind. Flow (m3/d)	Sub-total Ave. Com. Flow (m3/d)	Sub-total Ave. Inst. Flow (m3/d)
Unit flow factor (m3/person/day)	0.175	0.24	0.24	0.15	0.15	0.15		0.24		0.025						
Central & Western	18,971	-	239,254	1,702	4,885	1,219	266,031	3,162	269,193	48,840						
- Central and Western (Central PTW)	4,556	-	228,981	1,702	4,885	1,218	241,342	2,933	244,275	46,838	168,361	59,826	1.04	3,059	104,305	1,171
- Green Island Reclaimation (Central PTW)	14,414	-	10,273	-	-	1	24,689	229	24,918	2,002	6,063	5,142	1.04	-	872	50
Wan Chai and North Point	11,841	7,213	350,722	1,383	3,512	1,617	376,289	5,982	382,271	89,105						
- Wan Chai West (Wan Chai W PTW)	-	-	61,290	339	848	363	62,840	983	63,823	16,231	125,182	16,943	1.12	1,801	106,032	406
- Central and Wan Chai Reclamation (Wan Chai W PTW)	-	-	656	-	5	11	672	22	695	-	11,800	184	1.12	34	11,582	-
- Wan Chai East (Wan Chai E PTW)	1,377	-	81,742	634	1,108	330	85,191	1,408	86,599	22,616	91,127	23,451	1.15	1,665	65,445	565
- North Point (North Point PTW)	10,464	7,213	207,034	411	1,551	912	227,585	3,569	231,154	50,258	126,192	57,109	1.05	5,703	62,123	1,256
Hong Kong Island South	2,997	2,941	16,250	201	3,571	526	26,485	334	26,819	4,996						
- Stanley (Stanley STW)	2,997	2,941	12,251	195	3,567	312	22,264	283	22,547	4,225	9,092	6,381	1.42	12	2,594	106
- Shek O (Shek O STW)	-	-	3,998	6	4	214	4,221	51	4,273	771	1,800	1,399	1.41	3	379	19
Chai Wan and Shaukeiwan	101,239	78,987	196,673	541	2,373	1,065	380,878	4,694	385,572	50,765						
- Chai Wan (Chai Wan PTW)	62,783	50,085	62,661	155	1,717	124	177,525	2,076	179,601	28,468	78,337	39,385	1.02	3,663	34,578	712
- Shaukeiwan (Shau Kei Wan PTW)	38,455	28,902	134,012	387	656	940	203,352	2,618	205,971	22,297	76,678	46,755	1.00	1,294	28,016	613
Aberdeen, Ap Lei Chau and Pok Fu Lam	95,583	27,556	144,034	835	5,884	1,689	275,581	3,372	278,953	45,275						
- Ap Lei Chau (Ap Lei Chau STW)	36,082	8,037	40,290	23	389	28	84,849	843	85,693	8,523	30,190	18,181	1.00	2,430	9,323	256
- Aberdeen (Aberdeen STW)	36,364	10,540	67,402	589	3,186	1,139	119,220	1,584	120,804	22,409	54,888	28,993	1.15	53	25,003	840
- Repulse Bay and Shouson Hill (Aberdeen STW)	-	-	18,015	153	-	268	18,437	278	18,715	3,740	6,895	5,102	1.15	3	1,650	140
- Sandy Bay (Sandy Bay STW)	-	-	13,297	36	2,090	215	15,639	261	15,900	5,292	8,574	5,201	1.50	63	3,177	132
- Wah Fu (Wah Fu STW)	23,136	8,978	5,029	34	219	39	37,436	406	37,841	5,310	11,066	8,560	1.30	11	2,361	133
Central and East Kowloon	651,803	249,891	847,834	3,968	13,073	6,592	1,773,162	21,853	1,795,015	265,263						
- Central Kowloon (To Kwa Wan PTW)	170,886	50,858	338,653	1,851	7,040	4,166	573,454	7,466	580,920	96,087	263,265	128,073	1.01	2,382	130,408	2,402
- East Kowloon - incl. SEKD East (Kwun Tong PTW)	466,508	199,033	383,994	2,113	6,033	2,426	1,060,107	12,139	1,072,246	145,703	448,759	228,863	1.02	7,480	208,773	3,643
- SEKD West (To Kwa Wan PTW)	14,410	-	125,187	4	-	-	139,601	2,248	141,849	23,473	50,081	33,407	1.01	-	16,087	587
North West Kowloon (North West Kowloon PS)	220,091	29,082	641,055	2,739	13,211	9,367	915,545	13,195	928,739	180,555	429,332	212,746	1.04	5,777	205,392	5,417
Tseung Kwan O (Tseung Kwan O PS)	145,869	113,989	211,542	89	2,969	462	474,920	4,770	479,690	79,081	153,147	106,109	1.01	7,204	37,660	2,175
Yuen Long and Kam Tin	278,198	61,244	412,553	1,369	2,660	14,913	770,937	9,566	780,503	112,092						
- Ha Tsuen & Lau Fau Shan (San Wai STW)	-	-	14,211	13	-	1,250	15,474	162	15,635	45	5,091	4,150	1.15	85	854	1
- Tin Shui Wai (San Wai STW)	186,919	60,406	49,148	13	724	1	297,212	3,427	300,639	49,309	77,814	63,881	1.15	36	12,664	1,233
- Hung Shui Kiu (San Wai STW)	54,256	-	43,721	218	252	1,911	100,359	1,650	102,008	6,207	29,684	22,315	1.15	1,000	6,214	155
- Ping Shan (San Wai STW)	-	-	21,323	64	-	247	21,634	170	21,804	1,506	7,468	5,973	1.15	328	1,130	38
- Tong Yan San Tsuen (San Wai STW)	2,939	-	15,429	7	26	1,147	19,548	305	19,853	10,680	7,361	5,023	1.15	701	1,371	267
- Yuen Long Town (San Wai STW)	11,930	838	115,217	712	682	918	130,296	1,612	131,907	28,473	58,673	34,852	1.15	1,270	21,839	712
- Tai Tong (San Wai STW)	-	-	29,980	35	16	1,301	31,330	338	31,669	1,187	10,063	8,558	1.15	143	1,331	30
- Kam Tin South and North (Yuen Long STW)	-	-	33,964	69	191	2,253	36,478	368	36,845	2,472	12,902	10,247	1.20	167	2,426	62
- Fairview Park & Nam San Wai (Yuen Long STW)	-	-	26,690	97	-	944	27,731	565	28,296	3,911	10,262	7,979	1.20	95	2,091	98
- Ngau Tam Mei (Yuen Long STW)	-	-	22,129	28	6	2,240	24,403	239	24,642	275	7,788	6,772	1.20	45	964	7
- San Tin (Yuen Long STW)	-	-	5,864	13	25	1,066	6,968	137	7,105	246	2,649	1,887	1.20	19	737	6
- Wang Chau (Yuen Long STW)	22,155	-	19,466	55	340	807	42,824	423	43,247	6,960	16,905	9,765	1.20	2,732	4,233	174
- Pat Heung & Shek Kong (Yuen Long STW)	-	-	15,412	44	397	827	16,680	172	16,852	822	5,954	4,670	1.20	170	1,093	21
Port Shelter (Sai Kung STW)	1,351	1,255	35,306	92	2,579	722	41,304	484	41,788	10,324	17,268	10,689	1.12	228	6,093	258
Tolo Harbour	284,484	257,573	445,597	1,599	13,789	6,022	1,009,065	13,151	1,022,216	177,472						
- Tai Po (Tai Po STW)	71,074	78,037	150,544	867	3,488	4,197	308,207	4,016	312,223	56,995						
* Lam Tsuen	-	-	3,853	11	99	207	4,170	43	4,213	205	1,341	1,020	1.04	43	273	5
* Wu Kau Tang	-	-	-	-	-	-	-	-	-	-	-	-	1.04	-	-	-
* Ting Kok	-	-	12,472	32	487	63	13,054	169	13,223	-	3,942	3,241	1.04	29	673	-
* Tai Po Industrial Estate Area	-	-	5,378	-	1,477	149	7,004	171	7,174	7,986	12,306	1,627	1.04	6,661	3,818	200
* Hong Lok Yuen	-	-	26,995	63	1	2,703	29,761	453	30,214	1,627	9,087	7,262	1.04	3	1,782	41
* Tai Po Town	71,074	78,037	75,342	738	1,424	704	227,319	2,674	229,993	36,490	74,977	51,793	1.04	300	21,971	912
* Tai Po Kau and Pak Shek Kok	-	-	26,504	23	-	371	26,898	508	27,406	10,687	22,665	6,796	1.04	13,084	2,517	267
- Shatin (Sha Tin STW)	213,410	179,537	295,053	732	10,301	1,825	700,858	9,135	709,993	120,477						
* Shatin	180,751	81,862	208,428	679	9,467	1,707	482,894	6,316	489,210	92,467	185,451	111,562	1.10	6,222	65,355	2,312
* Ma On Shan	32,659	97,675	86,625	53	834	118	217,964	2,819	220,782	28,010	72,133	55,198	1.10	96	16,139	700
Tuen Mun (Pillar Point STW)	244,713	110,084	255,150	552	7,185	6,497	624,181	7,858	632,039	92,690						
- So Kwun Wat	219,235	110,084	224,264	515	7,185	1,450	562,733	6,922	569,655	89,696	184,378	124,853	1.04	7,209	49,849	2,467
- Lam Tei & Yick Yuen	25,478	-	30,885	38	-	5,047	61,448	936	62,384	2,994	25,246	13,155	1.04	1,605	10,404	82
Tsuen Wan, Kwai Chung and Tsing Yi	396,304	73,752	313,591	2,065	5,111	4,909	795,731	10,091	805,823	121,269						
- Tsuen Wan and Kwai Chung (Kwai Chung PTW)	299,940	25,480	263,848	2,028	4,218	4,826	600,339	7,588	607,927	93,099	285,782	126,799	1.02	18,626	138,029	2,327
- Tsing Yi (Tsing Yi PTW)	96,365	48,272	49,744	36	893	84	195,393	2,503	197,896	28,170	68,501	41,611	1.02	5,444	20,743	704
North District (Shek Wu Hui STW)	118,618	77,167	177,740	626	1,956	12,062	388,169	5,132	393,301	54,933						
- Kau Lung Hang	-	-	1,271	1	-	695	1,967	14	1,981	624	763	425	1.04	-	322	16
- Ping Kong	-	-	1,796	7	-	540	2,343	15	2,358	644	678	534	1.04	10	117	16
- Kwu Tung South	-	-	-	-	-	-	-	-	-	-	-	-	1.04	-	-	-
- Kwu Tung North	-	-	-	-	-	-	-	-	-	-	-	-	1.04	-	-	-
- Fanling / Sheung Shui Town	116,551	77,167	146,171	141	1,762	4,244	346,036	4,747	350,783	51,867	108,757	78,203	1.04	1,953	27,304	1,297
- Ping She / Ta Kwu Ling	-	-	5,905	291	110	2,576	8,882	78	8,961	-	4,364	1,939	1.04	725	1,699	-
- Luk Keng	2,066	-	8,087	58	32	987	11,231	140	11,371	997	3,504	2,575	1.04	56	848	25
- Lung Yeuk Tau & Kwan Tei South	-	-	14,511	126	51	3,020	17,709	138	17,847	801	5,144	4,135	1.04	123	867	20
Outlying Islands	111,836	7,073	194,877	265	3,698	2,934	320,683	3,616	324,299	47,555						
- Cheung Chau (Cheung Chau STW)	2,873	-	17,887	105	400	510	21,776	159	21,935	4,025	7,540	5,201	1.05	133	2,025	181
- Mui Wo (Mui Wo STW)	968	-	2,985	52	29	386	4,419	33	4,453	1,233	1,743	1,028	1.09	9	675	31
- Discovery Bay (Siu Ho Wan STW)	-	-	19,595	8	-	-	19,603	224	19,827	2,933	8,469	6,263	1.32	3	2,130	73
- Ma Wan, Lantau North & Port Dev (Siu Ho Wan STW)	-	-	9,307	27	5	62	9,400	43	9,443	975	9,877	2,548	1.13	-	7,304	24
- South Lantau, incl Tai O, Ngong Ping	1,108	287	5,214	44	3,061	1,909	11,622	74	11,696	1,010	4,118	2,456	1.13	121	1,516	25
- Tung Chun/Tai Ho New Town (Siu Ho Wan STW)	106,887	6,786	139,888	29	203	67	253,860	3,083	256,943	37,379	74,857	59,268	1.13	29	14,626	934
- Airport Development (Siu Ho Wan STW)	-	-	1	-	1	-	2	0	2	-	32,732	0	1.13	4,737	27,994	-
Total Population	2,683,898	1,097,806	4,482,178	18,026	86,456	70,596	8,438,960	107,261	8,546,221	1,380,213						
Trade flows (activities+employee):	116,876	4,447	179,633	146,962	293,194	274,241	1,983	32	115,407	116,904	356,481	48,500	1,654,660	3,629,065	1,938,062		116,876	1,537,784	36,343
Trade flows (activities only):	106,251	3,684	148,839	121,768	242,932	227,229	1,643	26	95,623	96,863	295,370	40,186	1,380,415				104,480	1,274,164	

	Manufac-turing J1	Electricity, Gas & Water J2	Transport Storage & Communicatn J3	Wholesale & Retail J4	Import / Export J5	Financing, Ins., Real Estate & Bus. Serv. J6	Agriculture & Fishing J7	Mining & Quarrying J8	Constructn J9	Restaurants & Hotels J10	Community, Social & Personal Services J11	Public Admin. J12	Total
Unit flow factor (m3/person/day)	0.66	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	
Central & Western	4,636	-	30,828	24,245	44,420	117,856	74	-	11,866	16,226	47,402	7,588	305,141
- Central and Western (Central PTW)	4,636	-	30,709	23,941	44,387	117,744	74	-	11,730	15,974	45,899	7,558	302,651
- Green Island Reclaimation (Central PTW)	-	-	119	304	33	111	-	-	136	253	1,503	30	2,490
Wan Chai and North Point	13,944	3,851	60,209	56,615	90,137	244,199	83	-	43,388	58,032	99,035	44,973	714,467
- Wan Chai West (Wan Chai W PTW)	2,728	1,317	24,147	18,903	32,742	131,136	13	-	14,566	20,747	29,896	29,483	305,678
- Central and Wan Chai Reclamation (Wan Chai W PTW)	51	-	1,693	5,303	2,984	11,675	-	-	509	4,891	2,863	3,173	33,144
- Wan Chai East (Wan Chai E PTW)	2,523	332	15,324	19,697	26,295	56,902	12	-	8,696	20,218	33,179	6,334	189,510
- North Point (North Point PTW)	8,641	2,202	19,046	12,712	28,116	44,486	59	-	19,618	12,177	33,096	5,983	186,135
Hong Kong Island South	22	13	317	660	97	448	19	40	523	419	3,704	2,254	8,515
- Stanley (Stanley STW)	18	7	272	623	82	353	11	22	462	396	2,928	2,254	7,428
- Shek O (Shek O STW)	5	6	45	37	15	95	8	18	60	23	776	-	1,087
Chai Wan and Shaukeiwan	7,510	4	22,788	13,442	32,334	40,168	535	4	14,967	8,365	41,501	4,729	186,349
- Chai Wan (Chai Wan PTW)	5,550	-	15,447	6,032	20,603	20,490	194	-	7,853	3,138	22,186	2,850	104,343
- Shaukeiwan (Shau Kei Wan PTW)	1,960	4	7,341	7,410	11,732	19,678	341	4	7,114	5,227	19,316	1,879	82,006
Aberdeen, Ap Lei Chau and Pok Fu Lam	3,879	589	9,602	9,489	20,197	18,595	956	-	8,698	6,270	41,634	2,582	122,491
- Ap Lei Chau (Ap Lei Chau STW)	3,682	575	2,105	1,859	4,843	5,440	446	-	3,179	936	7,178	77	30,318
- Aberdeen (Aberdeen STW)	80	14	6,595	6,939	15,109	11,690	391	-	4,168	4,865	19,459	2,207	71,516
- Repulse Bay and Shouson Hill (Aberdeen STW)	5	-	235	108	94	1,011	4	-	297	25	2,940	-	4,718
- Sandy Bay (Sandy Bay STW)	96	-	170	116	77	165	7	-	241	120	8,119	62	9,174
- Wah Fu (Wah Fu STW)	17	-	497	467	74	289	108	-	813	324	3,938	236	6,765
Central and East Kowloon	14,942	1,440	110,345	86,061	294,263	141,938	263	1	75,041	75,184	210,862	19,654	1,029,995
- Central Kowloon (To Kwa Wan PTW)	3,609	673	35,647	41,269	77,110	51,300	104	-	23,734	46,611	84,477	11,669	376,203
- East Kowloon - incl. SEKD East (Kwun Tong PTW)	11,333	767	71,723	39,404	208,425	84,847	159	1	48,561	24,595	111,802	6,211	607,828
- SEKD West (To Kwa Wan PTW)	-	-	2,974	5,388	8,728	5,791	-	-	2,747	3,978	14,583	1,774	45,964
North West Kowloon (North West Kowloon PS)	8,752	3,546	57,759	80,031	111,639	80,367	559	-	46,179	50,634	139,000	17,122	595,588
Tseung Kwan O (Tseung Kwan O PS)	10,915	35	11,477	12,426	3,118	11,082	137	25	10,903	10,857	45,038	2,502	118,514
Yuen Long and Kam Tin	10,289	237	16,919	20,874	15,625	16,088	735	-	16,412	14,116	58,229	3,474	172,998
- Ha Tsuen & Lau Fau Shan (San Wai STW)	129	-	639	350	96	110	30	-	209	155	852	-	2,570
- Tin Shui Wai (San Wai STW)	54	-	3,010	3,586	610	1,596	186	-	4,746	3,650	18,304	496	36,238
- Hung Shui Kiu (San Wai STW)	1,515	-	1,347	942	5,406	3,521	3	-	1,812	369	4,354	-	19,269
- Ping Shan (San Wai STW)	497	-	385	361	160	66	5	-	655	201	1,387	11	3,726
- Tong Yan San Tsuen (San Wai STW)	1,062	-	623	383	403	115	6	-	403	100	1,883	-	4,978
- Yuen Long Town (San Wai STW)	1,924	192	5,655	11,565	6,581	8,785	79	-	4,507	7,525	16,086	1,422	64,321
- Tai Tong (San Wai STW)	217	-	421	287	207	119	89	-	593	68	2,019	-	4,021
- Kam Tin South and North (Yuen Long STW)	253	14	1,162	893	449	133	137	-	802	461	2,880	-	7,184
- Fairview Park & Nam San Wai (Yuen Long STW)	143	-	453	382	461	705	28	-	628	161	3,122	33	6,117
- Ngau Tam Mei (Yuen Long STW)	68	29	302	261	134	44	46	-	268	100	1,572	-	2,823
- San Tin (Yuen Long STW)	29	-	216	95	30	32	13	-	143	21	441	1,114	2,134
- Wang Chau (Yuen Long STW)	4,140	2	2,398	1,461	799	758	39	-	1,243	1,211	4,098	87	16,236
- Pat Heung & Shek Kong (Yuen Long STW)	258	-	307	308	288	104	75	-	402	96	1,230	311	3,380
Port Shelter (Sai Kung STW)	345	73	744	1,522	548	823	128	-	1,035	1,515	9,730	1,292	17,755
Tolo Harbour	40,057	1,084	34,081	30,291	43,619	28,413	532	1	32,334	25,059	116,916	9,182	361,569
- Tai Po (Tai Po STW)	30,484	422	10,073	8,312	7,220	7,837	350	1	9,414	6,307	34,912	3,820	119,153
* Lam Tsuen	65	-	77	77	72	26	19	-	101	24	308	78	845
* Wu Kau Tang	-	-	-	-	-	-	-	-	-	-	-	-	-
* Ting Kok	44	-	125	206	86	64	27	1	241	162	1,009	-	1,965
* Tai Po Industrial Estate Area	10,092	237	4,358	203	1,290	794	-	-	955	158	2,765	149	21,001
* Hong Lok Yuen	5	-	286	419	180	361	36	-	526	93	3,191	-	5,096
* Tai Po Town	455	104	4,814	6,533	5,347	6,236	256	-	7,027	5,189	23,681	3,588	63,230
* Tai Po Kau and Pak Shek Kok	19,824	81	412	874	245	357	12	-	565	682	3,959	4	27,016
- Shatin (Sha Tin STW)	9,573	661	24,008	21,979	36,399	20,576	182	-	22,920	18,751	82,004	5,362	242,416
* Shatin	9,428	642	20,990	16,575	35,110	17,586	135	-	17,780	13,218	61,496	3,196	196,157
* Ma On Shan	146	19	3,018	5,403	1,289	2,990	47	-	5,140	5,533	20,508	2,166	46,258
Tuen Mun (Pillar Point STW)	13,355	1,167	21,305	16,813	20,370	13,516	445	20	18,068	13,632	61,174	5,642	185,506
- So Kwun Wat	10,923	877	18,169	14,414	11,628	7,865	430	2	15,924	11,698	55,806	5,612	153,349
- Lam Tei & Yick Yuen	2,431	289	3,136	2,399	8,741	5,651	15	18	2,144	1,934	5,368	30	32,157
Tsuen Wan, Kwai Chung and Tsing Yi	36,470	226	69,367	39,163	143,213	52,026	126	-	34,367	27,059	82,256	5,830	490,104
- Tsuen Wan and Kwai Chung (Kwai Chung PTW)	28,222	226	59,970	35,268	132,183	44,898	87	-	27,977	22,041	66,433	5,286	422,592
- Tsing Yi (Tsing Yi PTW)	8,248	-	9,397	3,895	11,030	7,128	39	-	6,391	5,018	15,823	544	67,513
North District (Shek Wu Hui STW)	4,345	328	9,051	11,689	7,449	4,581	461	-	9,465	8,281	32,927	4,789	93,367
- Kau Lung Hang	-	-	18	16	7	1	8	-	44	4	129	694	921
- Ping Kong	16	-	33	37	6	7	10	-	42	11	189	-	352
- Kwu Tung South	-	-	-	-	-	-	-	-	-	-	-	-	-
- Kwu Tung North	-	-	-	-	-	-	-	-	-	-	-	-	-
- Fanling / Sheung Shui Town	2,959	300	7,203	10,640	6,950	4,430	234	-	8,373	7,975	30,139	1,768	80,971
- Ping She / Ta Kwu Ling	1,099	28	1,324	248	148	22	104	-	527	75	693	1,686	5,954
- Luk Keng	85	-	161	459	108	61	78	-	197	102	758	497	2,507
- Lung Yeuk Tau & Kwan Tei South	186	-	313	289	230	59	28	-	281	114	1,019	143	2,663
Outlying Islands	7,624	112	58,446	16,570	10,668	13,447	613	-	6,489	18,360	29,109	6,957	168,395
- Cheung Chau (Cheung Chau STW)	202	-	347	922	60	161	503	-	575	669	2,328	220	5,987
- Mui Wo (Mui Wo STW)	13	19	231	232	39	184	25	-	222	268	628	79	1,941
- Discovery Bay (Siu Ho Wan STW)	5	-	511	737	246	1,067	-	-	318	788	2,348	71	6,090
- Ma Wan, Lantau North & Port Dev (Siu Ho Wan STW)	-	-	4,478	3,393	21	313	1	-	2,223	4,963	5,377	100	20,868
- South Lantau, incl Tai O, Ngong Ping	183	70	155	289	41	140	47	-	323	261	1,123	1,882	4,514
- Tung Chun/Tai Ho New Town (Siu Ho Wan STW)	43	23	3,002	8,392	454	2,704	2	-	2,104	8,356	16,148	604	41,832
- Airport Development (Siu Ho Wan STW)	7,178	-	49,723	2,604	9,807	8,877	36	-	724	3,056	1,157	4,000	87,162
Trade flows (activities+employee):	116,876	4,447	179,633	146,962	293,194	274,241	1,983	32	115,407	116,904	356,481	48,500	1,654,660
Trade flows (activities only):	106,251	3,684	148,839	121,768	242,932	227,229	1,643	26	95,623	96,863	295,370	40,186	1,380,415

2016 SEWAGE FLOWS OF MAJOR CATCHMENTS ESTIMATED USING UNIT FLOW FACTORS IN THE EXISTING SEWERAGE MANUAL AND 2016 TPEDM BY PVS ZONE, Scenario II (as at Mid-2016)
Part 2

Annex 2 of Appendix X - Part 2

Selected Plant	Design ADWF (m3/d)	2002 Measured Average Flow (m3/d)	2016 Calculated Total Ave. Flow (m3/d)	2016 Calculated Peak Flow (m3/s)	STW/PTW Design Capacity at 2002 (m3/s)	Sub-total Calculated Res. Ave. Flow (m3/d)	Sub-total Calculated Ind. Ave. Flow (m3/d)	Sub-total Calculated Comml. Ave. Flow (m3/d)	Sub-total Calculated Inst. Ave. Flow (m3/d)	Percentage Residential (%)	Percentage Industrial (%)	Percentage Commercial (%)	Percentage Institution (%)	Absolute Deviation from 2002 (m3/d)	Flow Weighted % Deviation (%)
Central PTW	110,000	101,803	174,425	4.803	3.810	64,968	3,059	105,177	1,221	37	2	60	1	72,622	
Wan Chai W PTW	40,000	51,318	136,982 WCW decom.	3.841	1.680	17,127	1,835	117,614	406	13	1	86	0	85,664	
Wan Chai E PTW	65,000	73,475	91,127	2.635	4.610	23,451	1,665	65,445	565	26	2	72	1	17,652	
North Point PTW	118,000	73,964	126,192	3.561	3.430	57,109	5,703	62,123	1,256	45	5	49	1	52,228	
Stanley STW	11,600	7,916	9,092	0.316	0.402	6,381	12	2,594	106	70	0	29	1	1,176	
Shek O STW	1,100	1,038	1,800	0.083	0.095	1,399	3	379	19	78	0	21	1	762	
Chai Wan PTW	42,000	59,167	78,337	2.291	2.610	39,385	3,663	34,578	712	50	5	44	1	19,170	
Shau Kei Wan PTW	39,000	70,946	76,678	2.246	1.750	46,755	1,294	28,016	613	61	2	37	1	5,732	
Ap Lei Chau STW	35,000	31,886	30,190	0.948	1.200	18,181	2,430	9,323	256	60	8	31	1	1,696	
Aberdeen STW	54,000	73,038	61,784	1.839	2.080	34,095	56	26,653	981	55	0	43	2	11,254	
Sandy Bay STW	8,900	4,314	8,574	0.298	0.310	5,201	63	3,177	132	61	1	37	2	4,260	
Wah Fu STW	16,000	10,645	11,066	0.384	1.090	8,560	11	2,361	133	77	0	21	1	421	
To Kwa Wan PTW	288,000	211,379	313,346	8.258	9.320	161,480	2,382	146,495	2,989	52	1	47	1	101,968	
Kwun TongPTW	333,000	274,600	448,759	11.513	10.930	228,863	7,480	208,773	3,643	51	2	47	1	174,159	
North West Kowloon PS	406,000	369,660	429,332	11.051	8.500	212,746	5,777	205,392	5,417	50	1	48	1	59,672	
Tseung Kwan O PS	212,000	100,181	153,147	4.259	6.850	106,109	7,204	37,660	2,175	69	5	25	1	52,966	
San Wai STW	164,000	105,100	196,154	5.355	5.694	144,752	3,563	45,404	2,435	74	2	23	1	91,054	
Yuen Long STW	70,000	16,533	56,459	1.692	2.431	41,320	3,228	11,544	367	73	6	20	1	39,926	
Sai Kung STW	8,000	9,176	17,268	0.566	0.278	10,689	228	6,093	258	62	1	35	1	8,092	
Tai Po STW	88,000	78,642	124,317	3.512	2.697	71,738	20,119	31,034	1,425	58	16	25	1	45,675	
Sha Tin STW	150,000	219,083	257,585	6.889	5.208	173,556	19,402	84,012	3,279	67	8	33	1	38,502	
Pillar Point STW	200,000	165,083	209,624	5.694	5.787	138,008	8,814	60,253	2,549	66	4	29	1	44,541	
Kwai Chung PTW	318,000	221,011	285,782	7.584	10.300	126,799	18,626	138,029	2,327	44	7	48	1	64,771	
Tsing Yi PTW	88,000	53,963	68,501	2.023	2.000	41,611	5,444	20,743	704	61	8	30	1	14,538	
Shek Wu Hui STW	80,000	73,842	123,210	3.483	2.778	87,811	2,868	31,158	1,373	71	2	25	1	49,368	
Cheung Chau STW	4,000	9,254	7,540	0.262	0.185	5,201	133	2,025	181	69	2	27	2	1,714	
Mui Wo STW	2,380	1,297	1,743	0.081	0.083	1,028	9	675	31	59	0	39	2	446	
Siu Ho Wan STW	1,220 162,000	24,468	125,935	3.554	3.750	68,079	4,769	52,054	1,032	54	4	41	1	101,467	
Total of all PTWs/STWs:		2,493,133	3,624,948	99.019	99.873	1,942,403	129,839	1,538,785	36,585	54	4	42	1	1,161,845	46.60
Total of all HATS PTWs:		1,781,350	2,494,221	67.534	70.470	1,192,439	66,692	1,211,560	23,529	48	3	49	1	738,772	41.47

YEAR X SEWAGE FLOWS OF MAJOR CATCHMENTS ESTIMATED USING FLOW FACTORS IN GESF AND
Year X TPEDM by PVS Zone, X-year Scenario
Part 1

Annex 3 of Appendix X - Part 1

Selected major catchment (PTW/STW)	Population									Flows							
	Public Rental	Subsidized Sale Flat	Private Permanent	Non-domestic	Institutional & Special Classes	Temporary	Resident Total (excl. Mob res)	Mobile Residental Population	Resident Total (incl. Mob res)	Yr. X + 5/9% Total Ave. Flow (m3/d)	Catchment Inflow factor	Yr. X +5% Sub-total Ave. Res. Flow (m3/d)	Priv. Perm. Res. UFF adjustment factor	Yr. X +9% Sub-total Ave. Ind. Flow (m3/d)	Ind. UFF adjustment factor	Yr. X + 9% Sub-total Ave. Com. Flow (m3/d)	Yr. X +5% Sub-total Ave. Inst. Flow (m3/d)
Unit flow factor (m3/person/day)	0.19	0.19	0.19	0.15	0.19	0.15		0.19									
Central & Western	19,061	-	231,928	1,710	4,884	1,225	258,808	4,232	263,040								
- Central and Western (Central PTW)	4,578	-	221,672	1,710	4,884	1,223	234,068	3,977	238,045	133,992	1.00	50,462	1.07	2,689	0.45	78,874	1,967
- Green Island Reclaimation (Central PTW)	14,483	-	10,256	-	-	1	24,740	254	24,995	6,794	1.00	5,335	1.07	-	0.45	1,375	84
Wan Chai and North Point	11,897	7,848	338,275	1,389	3,512	1,624	364,545	6,001	370,546								
- Wan Chai West (Wan Chai W PTW)	-	-	57,796	340	848	365	59,350	1,322	60,672	82,705	1.00	14,489	1.20	1,494	0.45	66,040	682
- Central and Wan Chai Reclamation (Wan Chai W PTW)	-	-	658	-	5	11	674	26	701	4,855	1.00	167	1.20	34	0.45	4,654	-
- Wan Chai East (Wan Chai E PTW)	1,384	-	77,586	636	1,108	332	81,045	1,978	83,023	81,371	1.00	20,653	1.25	1,027	0.45	58,741	950
- North Point (North Point PTW)	10,513	7,848	202,235	413	1,551	916	223,476	2,674	226,150	103,347	1.00	48,666	1.08	2,861	0.45	49,709	2,111
Hong Kong Island South	-	-	-	-	-	-	-	-	-								
- Stanley (Stanley STW)	-	-	-	-	-	-	-	-	-	-	1.00	-		-	0.45	-	-
- Shek O (Shek O STW)	-	-	-	-	-	-	-	-	-	-	1.50	-		-	0.45	-	-
Chai Wan and Shaukeiwan	108,576	83,053	185,665	543	2,373	1,070	381,279	3,950	385,229								
- Chai Wan (Chai Wan PTW)	69,940	53,460	54,361	155	1,717	125	179,758	1,917	181,675	73,906	1.10	41,051	1.03	3,812	0.45	27,727	1,315
- Shaukeiwan (Shau Kei Wan PTW)	38,636	29,593	131,303	387	656	945	201,520	2,034	203,554	82,679	1.25	50,691	1.00	1,714	0.45	29,103	1,171
Aberdeen, Ap Lei Chau and Pok Fu Lam	101,339	26,517	138,959	837	5,884	1,697	275,233	2,721	277,954								
- Ap Lei Chau (Ap Lei Chau STW)	36,251	8,839	39,067	23	389	28	84,597	784	85,381	36,128	1.30	22,141	1.00	3,563	0.98	9,959	465
- Aberdeen (Aberdeen STW)	36,535	14,304	64,489	590	3,185	1,145	120,248	1,213	121,461	72,767	1.30	39,572	1.26	3,589	0.98	28,383	1,224
- Repulse Bay and Shouson Hill (Aberdeen STW)	-	-	17,675	154	-	269	18,098	192	18,290	8,146	1.30	5,948	1.26	38	0.98	1,956	204
- Sandy Bay (Sandy Bay STW)	-	-	12,915	36	2,090	216	15,258	124	15,382	8,567	1.00	5,719	1.87	36	0.45	2,590	222
- Wah Fu (Wah Fu STW)	28,553	3,373	4,813	34	219	39	37,031	408	37,439	13,997	1.00	11,348	1.52	7	0.45	2,419	223
Central and East Kowloon	697,241	234,989	915,086	3,988	13,256	6,566	1,871,126	16,346	1,887,472								
- Central Kowloon (To Kwa Wan PTW)	184,993	47,987	355,306	1,857	7,039	4,186	601,369	6,339	607,708	287,369	1.00	123,404	1.02	4,992	0.98	154,938	4,036
- East Kowloon - incl. SEKD East (Kwun Tong PTW)	497,770	187,002	421,519	2,127	6,217	2,381	1,117,015	8,010	1,125,025	458,226	1.10	256,546	1.04	24,388	0.80	170,560	6,731
- SEKD West (To Kwa Wan PTW)	14,477	-	138,260	4	-	-	152,742	1,997	154,739	45,609	1.00	31,488	1.02	418	0.98	12,718	986
North West Kowloon (North West Kowloon PS)	249,941	33,114	666,163	2,747	13,210	9,411	974,586	11,822	986,409	555,672	1.30	273,023	1.07	12,335	0.63	260,456	9,858
Tseung Kwan O (Tseung Kwan O PS)	82,590	201,550	157,702	104	6,124	256	448,326	2,113	450,439	194,203	1.20	109,973	1.02	24,010	1.79	56,234	3,986
Yuen Long and Kam Tin	-	-	-	-	-	-	-	-	-								
- Ha Tsuen & Lau Fau Shan (San Wai STW)	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Tin Shui Wai (San Wai STW)	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Hung Shui Kiu (San Wai STW)	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Ping Shan (San Wai STW)	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Tong Yan San Tsuen (San Wai STW)	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Yuen Long Town (San Wai STW)	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Tai Tong (San Wai STW)	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Kam Tin South and North (Yuen Long STW)	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Fairview Park & Nam San Wai (Yuen Long STW)	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Ngau Tam Mei (Yuen Long STW)	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- San Tin (Yuen Long STW)	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Wang Chau (Yuen Long STW)	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Pat Heung & Shek Kong (Yuen Long STW)	-	-	-	-	-	-	-	-	-	-		-		-		-	-
Port Shelter (Sai Kung STW)																	
Tolo Harbour	-	-	-	-	-	-	-	-	-								
- Tai Po (Tai Po STW)	-	-	-	-	-	-	-	-	-	-		-		-		-	-
* Lam Tsuen	-	-	-	-	-	-	-	-	-	-		-		-		-	-
* Wu Kau Tang	-	-	-	-	-	-	-	-	-	-		-		-		-	-
* Ting Kok	-	-	-	-	-	-	-	-	-	-		-		-		-	-
* Tai Po Industrial Estate Area	-	-	-	-	-	-	-	-	-	-		-		-		-	-
* Hong Lok Yuen	-	-	-	-	-	-	-	-	-	-		-		-		-	-
* Tai Po Town	-	-	-	-	-	-	-	-	-	-		-		-		-	-
* Tai Po Kau and Pak Shek Kok	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Shatin (Sha Tin STW)	-	-	-	-	-	-	-	-	-	-		-		-		-	-
* Shatin	-	-	-	-	-	-	-	-	-	-		-		-		-	-
* Ma On Shan	-	-	-	-	-	-	-	-	-	-		-		-		-	-
Tuen Mun (Pillar Point STW)	-	-	-	-	-	-	-	-	-								
- So Kwun Wat	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Lam Tei & Yick Yuen	-	-	-	-	-	-	-	-	-	-		-		-		-	-
Tsuen Wan, Kwai Chung and Tsing Yi	418,328	59,135	309,266	2,068	5,110	4,932	798,839	5,220	804,058								
- Tsuen Wan and Kwai Chung (Kwai Chung PTW)	301,348	28,532	261,772	2,031	4,218	4,848	602,749	4,370	607,119	300,217	1.10	138,231	1.04	36,855	1.16	120,830	4,301
- Tsing Yi (Tsing Yi PTW)	116,981	30,602	47,493	36	893	84	196,090	850	196,939	84,900	1.10	45,806	1.06	17,574	2.68	20,219	1,301
North District (Shek Wu Hui STW)	-	-	-	-	-	-	-	-	-								
- Kau Lung Hang	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Ping Kong	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Kwu Tung South	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Kwu Tung North	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Fanling / Sheung Shui Town	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Ping She / Ta Kwu Ling	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Luk Keng	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Lung Yeuk Tau & Kwan Tei South	-	-	-	-	-	-	-	-	-	-		-		-		-	-
Outlying Islands	-	-	-	-	-	-	-	-	-								
- Cheung Chau (Cheung Chau STW)	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Mui Wo (Mui Wo STW)	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Discovery Bay (Siu Ho Wan STW)	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Ma Wan. Lantau North & Port Dev (Siu Ho Wan STW)	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- South Lantau, incl Tai O, Ngong Ping (Siu Ho Wan STW	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Tung Chun/Tai Ho New Town (Siu Ho Wan STW)	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Airport Development (Siu Ho Wan STW)	-	-	-	-	-	-	-	-	-	-		-		-		-	-
Total Population	1,688,973	646,206	2,943,042	13,387	54,353	26,782	5,372,742	52,405	5,425,146								
Trade flows (activities+employee):	114,459	3,159	70,561	113,741	47,444	57,552	206	3	60,081	436,214	158,960	8,078	1,070,458	2,635,453		1,294,713		141,436		1,157,486	41,817
Trade flows (activities only):	103,728	2,584	47,041	89,368	11,861	14,388	51	1	44,408	419,649	124,897	2,020	859,997					128,918		756,268	

Selected major catchment (PTW/STW)	Population																								Flows							
	Full-time School Places	Manufac-turing J1	Electricity, Gas & Water J2	Transport Storage & Communicatn J3	Wholesale & Retail J4	Import / Export J5	Financing, Ins., Real Estate & Bus. Serv. J6	Agriculture & Fishing J7	Mining & Quarrying J8	Constructn J9	Restaurants & Hotels J10	Community, Social & Personal Services J11	Public Admin. J12	Total	Yr. X + 5/9% Total Ave. Flow (m3/d)	Catchment Inflow factor	Yr. X +5% Sub-total Ave. Res. Flow (m3/d)	Priv. Perm. Res. UFF adjustment factor	Yr. X +9% Sub-total Ave. Ind. Flow (m3/d)	Ind. UFF adjustment factor	Yr. X + 9% Sub-total Ave. Com. Flow (m3/d)	Yr. X +5% Sub-total Ave. Inst. Flow (m3/d)
Unit flow factor (m3/person/day)	0.04	0.64	0.33	0.18	0.28	0.08	0.08	0.08	0.08	0.23	1.58	0.28	0.08										
Central & Western	48,840	7,430	38	36,085	28,536	33,044	125,975	36	-	14,600	20,711	34,746	7,385	308,586									
- Central and Western (Central PTW)	46,838	7,430	38	35,954	27,873	32,975	125,760	36	-	14,459	20,158	34,315	7,354	306,352	133,992	1.00	50,462	1.07	2,689	0.45	78,874	1,967
- Green Island Reclaimation (Central PTW)	2,002	-	-	131	663	70	215	-	-	141	553	430	31	2,234	6,794	1.00	5,335	1.07	-	0.45	1,375	84
Wan Chai and North Point	89,105	14,966	3,451	57,292	44,474	50,841	220,979	110	-	43,635	52,642	78,888	42,433	609,712									
- Wan Chai West (Wan Chai W PTW)	16,231	4,128	712	24,006	13,025	15,123	115,306	35	-	13,363	18,745	24,744	29,100	258,286	82,705	1.00	14,489	1.20	1,494	0.45	66,040	682
- Central and Wan Chai Reclamation (Wan Chai W PTW)	-	95	-	539	233	519	4,950	-	-	196	1,964	1,858	11	10,366	4,855	1.00	167	1.20	34	0.45	4,654	-
- Wan Chai East (Wan Chai E PTW)	22,616	2,839	322	14,950	17,220	14,744	52,656	33	-	8,819	19,691	25,859	6,210	163,344	81,371	1.00	20,653	1.25	1,027	0.45	58,741	950
- North Point (North Point PTW)	50,258	7,905	2,417	17,797	13,996	20,455	48,068	42	-	21,257	12,242	26,427	7,111	177,716	103,347	1.00	48,666	1.08	2,861	0.45	49,709	2,111
Hong Kong Island South	-	-	-	-	-	-	-	-	-	-	-	-	-	-									
- Stanley (Stanley STW)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.00	-		-	0.45	-	-
- Shek O (Shek O STW)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.50	-		-	0.45	-	-
Chai Wan and Shaukeiwan	50,765	13,367	15	19,760	19,837	32,532	41,990	554	7	16,506	9,582	35,956	4,497	194,603									
- Chai Wan (Chai Wan PTW)	28,468	9,577	3	11,624	11,769	24,568	16,223	168	-	8,584	4,191	20,201	2,599	109,508	73,906	1.10	41,051	1.03	3,812	0.45	27,727	1,315
- Shaukeiwan (Shau Kei Wan PTW)	22,297	3,790	12	8,136	8,068	7,963	25,767	387	7	7,921	5,391	15,754	1,898	85,095	82,679	1.25	50,691	1.00	1,714	0.45	29,103	1,171
Aberdeen, Ap Lei Chau and Pok Fu Lam	45,275	8,187	879	12,380	16,256	20,583	23,737	871	-	9,805	6,957	31,568	3,281	134,504									
- Ap Lei Chau (Ap Lei Chau STW)	8,523	3,999	851	4,078	3,225	1,556	8,438	364	-	2,890	1,206	6,086	84	32,779	36,128	1.30	22,141	1.00	3,563	0.98	9,959	465
- Aberdeen (Aberdeen STW)	22,409	4,028	18	7,095	11,869	18,879	13,955	346	-	4,987	4,687	14,223	2,940	83,025	72,767	1.30	39,572	1.26	3,589	0.98	28,383	1,224
- Repulse Bay and Shouson Hill (Aberdeen STW)	3,740	43	-	331	316	43	653	8	-	452	333	1,951	-	4,130	8,146	1.30	5,948	1.26	38	0.98	1,956	204
- Sandy Bay (Sandy Bay STW)	5,292	99	9	217	261	44	251	12	-	348	302	5,998	-	7,542	8,567	1.00	5,719	1.87	36	0.45	2,590	222
- Wah Fu (Wah Fu STW)	5,310	18	1	659	585	60	440	141	-	1,128	429	3,311	257	7,028	13,997	1.00	11,348	1.52	7	0.45	2,419	223
Central and East Kowloon	265,263	46,417	1,453	119,759	133,778	245,326	152,453	255	28	78,407	87,766	165,609	20,643	1,051,895									
- Central Kowloon (To Kwa Wan PTW)	96,087	7,283	764	43,401	47,866	65,113	62,223	99	-	28,843	52,669	70,411	11,477	390,148	287,369	1.00	123,404	1.02	4,992	0.98	154,938	4,036
- East Kowloon - incl. SEKD East (Kwun Tong PTW)	145,703	38,524	689	72,479	79,829	172,897	83,546	156	28	47,121	31,591	88,894	5,670	621,425	458,226	1.10	256,546	1.04	24,388	0.80	170,560	6,731
- SEKD West (To Kwa Wan PTW)	23,473	610	-	3,879	6,083	7,316	6,684	-	-	2,443	3,506	6,304	3,496	40,322	45,609	1.00	31,488	1.02	418	0.98	12,718	986
North West Kowloon (North West Kowloon PS)	180,555	20,113	3,421	63,667	86,272	82,708	88,493	336	-	49,212	55,897	116,368	14,007	580,495	555,672	1.30	273,023	1.07	12,335	0.63	260,456	9,858
Tseung Kwan O (Tseung Kwan O PS)	79,081	16,959	37	10,663	17,151	3,033	6,209	177	-	11,190	15,632	28,725	2,372	112,149	194,203	1.20	109,973	1.02	24,010	1.79	56,234	3,986
Yuen Long and Kam Tin	-	-	-	-	-	-	-	-	-	-	-	-	-	-									
- Ha Tsuen & Lau Fau Shan (San Wai STW)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Tin Shui Wai (San Wai STW)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Hung Shui Kiu (San Wai STW)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Ping Shan (San Wai STW)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Tong Yan San Tsuen (San Wai STW)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Yuen Long Town (San Wai STW)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Tai Tong (San Wai STW)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Kam Tin South and North (Yuen Long STW)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Fairview Park & Nam San Wai (Yuen Long STW)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Ngau Tam Mei (Yuen Long STW)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- San Tin (Yuen Long STW)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Wang Chau (Yuen Long STW)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Pat Heung & Shek Kong (Yuen Long STW)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
Port Shelter (Sai Kung STW)																							
Tolo Harbour	-	-	-	-	-	-	-	-	-	-	-	-	-	-									
- Tai Po (Tai Po STW)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
* Lam Tsuen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
* Wu Kau Tang	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
* Ting Kok	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
* Tai Po Industrial Estate Area	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
* Hong Lok Yuen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
* Tai Po Town	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
* Tai Po Kau and Pak Shek Kok	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Shatin (Sha Tin STW)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
* Shatin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
* Ma On Shan	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
Tuen Mun (Pillar Point STW)	-	-	-	-	-	-	-	-	-	-	-	-	-	-									
- So Kwun Wat	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Lam Tei & Yick Yuen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
Tsuen Wan, Kwai Chung and Tsing Yi	121,269	51,402	278	72,401	59,914	124,979	59,565	231	-	37,868	26,898	75,857	6,359	515,752									
- Tsuen Wan and Kwai Chung (Kwai Chung PTW)	93,099	42,130	275	64,274	53,988	114,133	52,722	163	-	31,161	23,161	58,630	5,746	446,383	300,217	1.10	138,231	1.04	36,855	1.16	120,830	4,301
- Tsing Yi (Tsing Yi PTW)	28,170	9,272	3	8,128	5,926	10,846	6,843	68	-	6,707	3,737	17,227	613	69,369	84,900	1.10	45,806	1.06	17,574	2.68	20,219	1,301
North District (Shek Wu Hui STW)	-	-	-	-	-	-	-	-	-	-	-	-	-	-									
- Kau Lung Hang	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Ping Kong	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Kwu Tung South	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Kwu Tung North	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Fanling / Sheung Shui Town	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Ping She / Ta Kwu Ling	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Luk Keng	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Lung Yeuk Tau & Kwan Tei South	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
Outlying Islands	-	-	-	-	-	-	-	-	-	-	-	-	-	-									
- Cheung Chau (Cheung Chau STW)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Mui Wo (Mui Wo STW)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Discovery Bay (Siu Ho Wan STW)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Ma Wan. Lantau North & Port Dev (Siu Ho Wan STW)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- South Lantau, incl Tai O, Ngong Ping (Siu Ho Wan STW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Tung Chun/Tai Ho New Town (Siu Ho Wan STW)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
- Airport Development (Siu Ho Wan STW)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		-	-
Total Population	880,151	178,842	9,571	392,008	406,219	593,046	719,401	2,570	36	261,223	276,085	567,716	100,978	3,507,695									
Trade flows (activities+employee):		114,459	3,159	70,561	113,741	47,444	57,552	206	3	60,081	436,214	158,960	8,078	1,070,458	2,635,453		1,294,713		141,436		1,157,486	41,817
Trade flows (activities only):		103,728	2,584	47,041	89,368	11,861	14,388	51	1	44,408	419,649	124,897	2,020	859,997					128,918		756,268		

YEAR X SEWAGE FLOWS OF MAJOR CATCHMENTS ESTIMATED USING FLOW FACTORS IN GESF AND Year X TPEDM by PVS Zone, X-year Scenario
Part 2

Annex 3 of Appendix X - Part 2

Selected Plant	Design ADWF (m3/d)	2002 Measured Average Flow (m3/d)	Yr. X + 5/9% Calculated Total Ave. Flow (m3/d)	Yr. X + 5/9% Calculated Peak Flow (m3/s)	STW/PTW Design Capacity at 2002 (m3/s)	Sub-total Calculated Res. Ave. Flow (m3/d)	Sub-total Calculated Ind. Ave. Flow (m3/d)	Sub-total Calculated Comml. Ave. Flow (m3/d)	Sub-total Calculated Inst. Ave. Flow (m3/d)	Percentage Residential (%)	Percentage Industrial (%)	Percentage Commercial (%)	Percentage Institution (%)	Absolute Deviation from 2002 (m3/d)	Flow Weighted % Deviation (%)
Central PTW	110,000	101,803	140,787	4.232	3.810	55,798	2,689	80,249	2,051	40	2	57	1	38,984	
Wan Chai W PTW	40,000	51,318	87,560 WCW decom.	2.714	1.680	14,656	1,528	70,694	682	17	2	81	1	36,242	
Wan Chai E PTW	65,000	73,475	81,371	2.534	4.610	20,653	1,027	58,741	950	25	1	72	1	7,896	
North Point PTW	118,000	73,964	103,347	3.169	3.430	48,666	2,861	49,709	2,111	47	3	48	2	29,383	
Chai Wan PTW	42,000	59,167	73,906	2.316	2.610	41,051	3,812	27,727	1,315	56	5	38	2	14,739	
Shau Kei Wan PTW	39,000	70,946	82,679	2.573	1.750	50,691	1,714	29,103	1,171	61	2	35	1	11,733	
Ap Lei Chau STW	35,000	31,886	36,128	1.186	1.200	22,141	3,563	9,959	465	61	10	28	1	4,242	
Aberdeen STW	54,000	73,038	80,913	2.521	2.080	45,520	3,627	30,339	1,428	56	4	37	2	7,875	
Sandy Bay STW	8,900	4,314	8,567	0.297	0.310	5,719	36	2,590	222	67	0	30	3	4,253	
Wah Fu STW	16,000	10,645	13,997	0.489	1.090	11,348	7	2,419	223	81	0	17	2	3,352	
To Kwa Wan PTW	288,000	211,379	332,979	9.463	9.320	154,891	5,410	167,656	5,022	47	2	50	2	121,600	
Kwun TongPTW	333,000	274,600	458,226	12.756	10.930	256,546	24,388	170,560	6,731	56	5	37	1	183,626	
North West Kowloon PS	406,000	369,660	555,672	15.435	8.500	273,023	12,335	260,456	9,858	49	2	47	2	186,012	
Tseung Kwan O PS	212,000	100,181	194,203	5.716	6.850	109,973	24,010	56,234	3,986	57	12	29	2	94,022	
Kwai Chung PTW	318,000	221,011	300,217	8.590	10.300	138,231	36,855	120,830	4,301	46	12	40	1	79,207	
Tsing Yi PTW	88,000	53,963	84,900	2.637	2.000	45,806	17,574	20,219	1,301	54	21	24	2	30,937	
Total of all HATS PTWs:		1,781,350	2,635,453	76.629	70.470	1,294,713	141,436	1,157,486	41,817	49	5	44	2	854,102	47.95

YEAR X SEWAGE FLOWS OF MAJOR SEWAGE CATCHMENTS ESTIMATED USING FLOW FACTORS IN THE EXISTING SEWERAGE MANUAL AND

Year X TPEDM by PVS Zone, X-year Scenario

Part 1

Annex 4 of Appendix X - Part 1

	Population										Flows					
Selected major catchment (PTW/STW)	Public Rental	Subsidized Sale Flat	Private Permanent	Non-domestic	Institutional & Special Classes	Temporary	Resident Total (excl. Mob res)	Mobile Residental Population	Resident Total (incl. Mob res)	Full-time School Places	Yr. X+5/9% Total Ave. Flow (m3/d)	Yr. X +5% Sub-total Ave. Res. Flow (m3/d)	Priv. Perm. Res. UFF adjustment factor	Yr. X + 9% Sub-total Ave. Ind. Flow (m3/d)	Yr. X + 9% Sub-total Ave. Com. Flow (m3/d)	Yr. X + 5% Sub-total Ave. Inst. Flow (m3/d)
Unit flow factor (m3/person/day)	0.175	0.24	0.24	0.15	0.24	0.15		0.24		0.025						
Central & Western	19,061	-	231,928	1,710	4,884	1,225	258,808	4,232	263,040	48,840						
- Central and Western (Central PTW)	4,578	-	221,672	1,710	4,884	1,223	234,068	3,977	238,045	46,838	182,246	61,632	1.04	5,345	114,039	1,229
- Green Island Reclaimation (Central PTW)	14,483	-	10,256	-	-	1	24,740	254	24,995	2,002	6,318	5,413	1.04	-	852	53
Wan Chai and North Point	11,897	7,848	338,275	1,389	3,512	1,624	364,545	6,001	370,546	89,105						
- Wan Chai West (Wan Chai W PTW)	-	-	57,796	340	848	365	59,350	1,322	60,672	16,231	117,327	16,970	1.12	2,970	96,961	426
- Central and Wan Chai Reclamation (Wan Chai W PTW)	-	-	658	-	5	11	674	26	701	-	4,182	195	1.12	68	3,919	-
- Wan Chai East (Wan Chai E PTW)	1,384	-	77,586	636	1,108	332	81,045	1,978	83,023	22,616	87,537	23,669	1.15	2,042	61,233	594
- North Point (North Point PTW)	10,513	7,848	202,235	413	1,551	916	223,476	2,674	226,150	50,258	130,583	58,794	1.05	5,687	64,783	1,319
Hong Kong Island South	-	-	-	-	-	-	-	-	-	-						
- Stanley (Stanley STW)																
- Shek O (Shek O STW)																
Chai Wan and Shaukeiwan	108,576	83,053	185,665	543	2,373	1,070	381,279	3,950	385,229	50,765						
- Chai Wan (Chai Wan PTW)	69,940	53,460	54,361	155	1,717	125	179,758	1,917	181,675	28,468	87,286	41,526	1.02	6,890	38,124	747
- Shaukeiwan (Shau Kei Wan PTW)	38,636	29,593	131,303	387	656	945	201,520	2,034	203,554	22,297	82,863	48,533	1.00	2,727	31,018	585
Aberdeen, Ap Lei Chau and Pok Fu Lam	101,339	26,517	138,959	837	5,884	1,697	275,233	2,721	277,954	45,275						
- Ap Lei Chau (Ap Lei Chau STW)	36,251	8,839	39,067	23	389	28	84,597	784	85,381	8,523	33,117	19,037	1.00	2,877	10,979	224
- Aberdeen (Aberdeen STW)	36,535	14,304	64,489	590	3,185	1,145	120,248	1,213	121,461	22,409	64,553	30,929	1.15	2,898	30,138	588
- Repulse Bay and Shouson Hill (Aberdeen STW)	-	-	17,675	154	-	269	18,098	192	18,290	3,740	6,925	5,237	1.15	31	1,559	98
- Sandy Bay (Sandy Bay STW)	-	-	12,915	36	2,090	216	15,258	124	15,382	5,292	8,529	5,480	1.50	71	2,839	139
- Wah Fu (Wah Fu STW)	28,553	3,373	4,813	34	219	39	37,031	408	37,439	5,310	10,925	8,098	1.30	13	2,674	139
Central and East Kowloon	697,241	234,989	915,086	3,988	13,256	6,566	1,871,126	16,346	1,887,472	265,263						
- Central Kowloon (To Kwa Wan PTW)	184,993	47,987	355,306	1,857	7,039	4,186	601,369	6,339	607,708	96,087	294,786	140,962	1.01	5,239	146,063	2,522
- East Kowloon - incl. SEKD East (Kwun Tong PTW)	497,770	187,002	421,519	2,127	6,217	2,381	1,117,015	8,010	1,125,025	145,703	506,090	252,175	1.02	27,714	222,377	3,825
- SEKD West (To Kwa Wan PTW)	14,477	-	138,260	4	-	-	152,742	1,997	154,739	23,473	54,559	38,354	1.01	439	15,150	616
North West Kowloon (North West Kowloon PS)	249,941	33,114	666,163	2,747	13,210	9,411	974,586	11,822	986,409	180,555	470,411	237,416	1.04	14,469	213,786	4,740
Tseung Kwan O (Tseung Kwan O PS)	82,590	201,550	157,702	104	6,124	256	448,326	2,113	450,439	79,081	159,336	108,745	1.01	12,200	36,315	2,076
Yuen Long and Kam Tin	-	-	-	-	-	-	-	-	-	-						
- Ha Tsuen & Lau Fau Shan (San Wai STW)	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
- Tin Shui Wai (San Wai STW)	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
- Hung Shui Kiu (San Wai STW)	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
- Ping Shan (San Wai STW)	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
- Tong Yan San Tsuen (San Wai STW)	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
- Yuen Long Town (San Wai STW)	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
- Tai Tong (San Wai STW)	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
- Kam Tin South and North (Yuen Long STW)	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
- Fairview Park & Nam San Wai (Yuen Long STW)	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
- Ngau Tam Mei (Yuen Long STW)	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
- San Tin (Yuen Long STW)	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
- Wang Chau (Yuen Long STW)	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
- Pat Heung & Shek Kong (Yuen Long STW)	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
Port Shelter (Sai Kung STW)																
Tolo Harbour	-	-	-	-	-	-	-	-	-	-						
- Tai Po (Tai Po STW)	-	-	-	-	-	-	-	-	-	-						
* Lam Tsuen	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
* Wu Kau Tang	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
* Ting Kok	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
* Tai Po Industrial Estate Area	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
* Hong Lok Yuen	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
* Tai Po Town	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
* Tai Po Kau and Pak Shek Kok	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
- Shatin (Sha Tin STW)	-	-	-	-	-	-	-	-	-	-						
* Shatin	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
* Ma On Shan	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
Tuen Mun (Pillar Point STW)	-	-	-	-	-	-	-	-	-	-						
- So Kwun Wat	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
- Lam Tei & Yick Yuen	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
Sham Tseng																
Tsuen Wan, Kwai Chung and Tsing Yi	418,328	59,135	309,266	2,068	5,110	4,932	798,839	5,220	804,058	121,269						
- Tsuen Wan and Kwai Chung (Kwai Chung PTW)	301,348	28,532	261,772	2,031	4,218	4,848	602,749	4,370	607,119	93,099	320,215	133,240	1.02	30,309	154,222	2,444
- Tsing Yi (Tsing Yi PTW)	116,981	30,602	47,493	36	893	84	196,090	850	196,939	28,170	72,364	42,027	1.02	6,670	22,927	739
North District (Shek Wu Hui STW)	-	-	-	-	-	-	-	-	-	-						
- Kau Lung Hang	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
- Ping Kong	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
- Kwu Tung South	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
- Kwu Tung North	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
- Fanling / Sheung Shui Town	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
- Ping She / Ta Kwu Ling	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
- Luk Keng	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
- Lung Yeuk Tau & Kwan Tei South	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
Outlying Islands	-	-	-	-	-	-	-	-	-	-						
- Lamma Island	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
- Cheung Chau (Cheung Chau STW)	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
- Mui Wo (Mui Wo STW)	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
- Discovery Bay (Siu Ho Wan STW)	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
- Ma Wan. Lantau North & Port Dev (Siu Ho Wan STW)	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
- South Lantau, incl Tai O, Ngong Ping	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
- Tung Chun/Tai Ho New Town (Siu Ho Wan STW)	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
- Airport Development (Siu Ho Wan STW)	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
Total Population	1,688,973	646,206	2,943,042	13,387	54,353	26,782	5,372,742	52,405	5,425,146	880,151						
Trade flows (activities+employee):	118,036	3,350	137,203	142,177	207,566	251,790	900	12	91,428	96,630	198,700	35,342	1,283,134	2,700,153	1,278,432	128,659	1,269,957	23,104
Trade flows (activities only):	107,305	2,776	113,682	117,804	171,983	208,626	745	10	75,755	80,065	164,637	29,284	1,072,673			116,140	965,367	

YEAR X SEWAGE FLOWS OF MAJOR SEWAGE CATCHMENTS ESTIMATED USING FLOW FACTORS IN THE EXISTING SEWERAGE MANUAL AND Year X TPEDM by PVS Zone, X-year Scenario
Part 2

Annex 4 of Appendix X - Part 2

Selected Plant	Design ADWF (m3/d)	2002 Measured Average Flow (m3/d)	Yr. X+5/9% Calculated Total Ave. Flow (m3/d)	Yr. X + 5/9% Calculated Peak Flow (m3/s)	STW/PTW Design Capacity at 2002 (m3/s)	Sub-total Calculated Res. Ave. Flow (m3/d)	Sub-total Calculated Ind. Ave. Flow (m3/d)	Sub-total Calculated Comml. Ave. Flow (m3/d)	Sub-total Calculated Inst. Ave. Flow (m3/d)	Percentage Residential (%)	Percentage Industrial (%)	Percentage Commercial (%)	Percentage Institution (%)	Absoulte Deviation from 2002 (m3/d)	Flow Weighted % Deviation (%)
Central PTW	110,000	101,803	188,564	5.163	3.810	67,046	5,345	114,891	1,282	36	3	61	1	86,761	
Wan Chai W PTW	40,000	51,318	121,509 WCW decom.	3.438	1.680	17,166	3,038	100,880	426	14	2	83	0	70,191	
Wan Chai E PTW	65,000	73,475	87,537	2.539	4.610	23,669	2,042	61,233	594	27	2	70	1	14,062	
North Point PTW	118,000	73,964	130,583	3.675	3.430	58,794	5,687	64,783	1,319	45	4	50	1	56,619	
Chai Wan PTW	42,000	59,167	87,286	2.532	2.610	41,526	6,890	38,124	747	48	8	44	1	28,119	
Shau Kei Wan PTW	39,000	70,946	82,863	2.413	1.750	48,533	2,727	31,018	585	59	3	37	1	11,917	
Ap Lei Chau STW	35,000	31,886	33,117	1.033	1.200	19,037	2,877	10,979	224	57	9	33	1	1,231	
Aberdeen STW	54,000	73,038	71,478	2.105	2.080	36,166	2,929	31,697	686	51	4	44	1	1,560	
Sandy Bay STW	8,900	4,314	8,529	0.296	0.310	5,480	71	2,839	139	64	1	33	2	4,215	
Wah Fu STW	16,000	10,645	10,925	0.379	1.090	8,098	13	2,674	139	74	0	24	1	280	
To Kwa Wan PTW	288,000	211,379	349,346	9.132	9.320	179,316	5,678	161,213	3,138	51	2	46	1	137,967	
Kwun TongPTW	333,000	274,600	506,090	12.867	10.930	252,175	27,714	222,377	3,825	50	5	44	1	231,490	
North West Kowloon PS	406,000	369,660	470,411	12.026	8.500	237,416	14,469	213,786	4,740	50	3	45	1	100,751	
Tseung Kwan O PS	212,000	100,181	159,336	4.418	6.850	108,745	12,200	36,315	2,076	68	8	23	1	59,155	
Kwai Chung PTW	318,000	221,011	320,215	8.426	10.300	133,240	30,309	154,222	2,444	42	9	48	1	99,204	
Tsing Yi PTW	88,000	53,963	72,364	2.129	2.000	42,027	6,670	22,927	739	58	9	32	1	18,400	
Total of all HATS PTWs:		1,781,350	2,700,153	72.569	70.470	1,278,432	128,659	1,269,957	23,104	47	5	47	1	921,922	51.75