Appendix 5B
Pollutant Loading Calculation

Table of Contents

List of Tables

1. BASELINE POLLUTANT LOADING BEFORE THE STW UPGRADING

1.1 Baseline Cheung Chau STW Discharge

1.1.1 The current flow rate and water quality of the sewage influent to the Cheung Chau Sewage Treatment Works (STW) are shown in Table 5B- 1**.** The data in Table 5B- 1 were compiled from the recent wastewater monitoring results from 2010 to 2011 at the Cheung Chau STW.

Table 5B- 1 : Characteristics of Wastewater Inflow to Cheung Chau STW (2010-2011)

Flow (m^3/d)	pH	BOD (mg/L)	TSS (mg/L)	E. coil CFU/100mL	NH_3-N (mg/L)	TKN (mg/L)	Cl (mg/L)
8,817	6.9	134	144	58,071,429	11	24	4,426

Note: The data are based on the monitoring results from 1 June 2010 to 1 July 2011 provided by EPD

1.1.2 Currently, sewage is treated in the Cheung Chau STW through a primary treatment unit. Table 5B- 2 lists the statistics on treatment efficiency for a typical STW of primary treatment as referenced in the Harbour Area Treatment Scheme (HATS) Stage 2A EIA Study Report (Table A6-2A-7). The estimated baseline pollutant loading from the current Cheung Chau STW is shown in Table 5B-3, which was calculated based on the inflow data listed in Table 5B- 1 and the treatment efficiencies shown in Table 5B- 2.

Table 5B- 2 : Typical Treatment Efficiencies for Sewage Treatment Works

Type of Treatment Plant	BOD	TSS	NH_3-N	Org-N	Ortho P	TP	Cu	E.coli
Primary Treatment (no disinfection)	32.5%	55%	0%	15%	0%	15%	26%	50%

Table 5B- 3 : Current Pollutant Loading from Cheung Chau STW (2010-2011)

Flow (m^3/d)	BOD (kg/d)	TSS (kg/d)	*E. coil* (CFU/d)	NH_3-N (kg/d)	TKN (kg/d)	Org-N (kg/d)
8,817	797	571	$2.56x10^{15}$	97	194	97

1.2 Baseline Stormwater Discharge

1.2.1 There are 12 stormwater outfalls in Cheung Chau Island. The original pollution loads from the 12 stormwater outfalls were compiled from the regional water quality model "Update Model", which is a fully calibrated and verified model developed under Update on Cumulative Water Quality and Hydrological Effect of Coastal Development and Upgrading of Assessment Tool Study (1998) by EPD. In consideration of the difference in time horizon between the year of projection in the Update Model (2012) and the year of the Cheung Chau STW assessment (2019), an additional projection of pollution loading was conducted.

1.2.2 The latest data on population projection are available from the 2006-based TPEDM for years of 2011, 2016, 2021, 2026 and 2031, respectively. Based on these population data, the pollution loading for year 2019 was determined through extrapolation from the 2012 data. Table 5B- 4 shows the projected pollution loading for each stormwater outfall in Cheung Chau Island at the year of 2019.

Table 5B- 4 : Projected Pollution Loading from Each Stormwater Outfall in Cheung Chau for Year 2019

	Flow (m^3/d)	BOD (kg/d)	TSS (kg/d)	*E. coil* (CFU/d)	NH_3-N (kg/d)	TKN (kg/d)	Org-N (kg/d)
Dry Season	325	41.8	39.8	3.41E+13	4.1	7.2	3.1
Wet Season	1,408	66.1	86.7	3.41E+13	4.3	8.7	4.4

2. POLLUTANT LOADING UPON COMMISIONING OF THE UPGRADED STW

2.1 Upgraded Cheung Chau STW Discharge

2.1.1 Upon commissioning of the Project, pollutant loading from the upgraded Cheung Chau STW is expected to be substantially reduced. This is attributed to the enhanced efficiency of the upgraded treatment system and improved effluent quality from the upgraded Cheung Chau STW.

2.1.2 The design effluent flow rate and water quality for the upgraded Cheung Chau STW are shown in Table 5B- 5**.** The resultant pollutant loading from the upgraded Cheung Chau STW is shown in Table 5B- 6.

Table 5B- 5 : Design Flow and Effluent Quality for Upgraded Cheung Chau STW

Flow (m^3/d)	BOD mg/L	TSS mg/L	NH_3-N mg/L	TN mg/L	E. coil CFU/100mL
9,800	20	30	5	10	1,000

Table 5B- 6 : Estimated Pollutant Loading from Upgraded Cheung Chau STW

Flow (m^3/d)	BOD (kg/d)	TSS (kg/d)	*E. coil* (CFU/d)	NH_3-N (kg/d)	TKN (kg/d)	NO_3 (kg/d)
9,800	196	294	9.80×10^{10}	49	73.5	24.5

2.2 Pollution Loading from Stormwater Outfalls

2.2.1 Upon commissioning of the Project, more sewage is to be intercepted due to the expanded coverage of the sewerage pipe system compared to the current condition. As a result, less sewage is expected to be lost into the stormwater systems and less pollution loadings from the stormwater outfalls is expected.

2.2.2 A conservative approach was taken to account for pollution loadings from the stormwater outfalls. The pollution loadings from the stormwater outfalls before and after the upgrading of STW were assumed to be the same. Given that the pollution loading from STW is far greater than that from the stormwater outfalls, and that the focus of this EIA study is on the effluent discharge from the Cheung Chau STW to compare its pre- and post-upgrading conditions, this assumption is reasonable from the EIA perspective.