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6. SEWERAGE AND SEWAGE TREATMENT IMPLICATIONS

6.1 Introduction

6.1.1 The proposed development scheme at TKO 137 and TKO 132 will generate wastewater and sewage flows arising from the population, employment intake and operation of the proposed facilities. The expected impact/ implication on the existing and planned sewerage systems and the proposals of sewerage infrastructure and mitigation measures to support the proposed development are discussed in this section.

6.2 Design Guidelines and Standards

6.2.1 The following established guidelines and standards are adopted for sewage flow estimation, assessment and evaluation of sewerage and sewage treatment implications of the Project:

(a) DSD's *Sewerage Manual*, Drainage Record Plan and standard drawings;

(b) EPD's *Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning* (GESF) Version 1.0; and

(c) Environmental Impact Assessment Ordinance (EIAO), *Technical Memorandum on Environmental Impact Assessment Process* (EIAO-TM), Annex 14.

6.3 Methodology and Design Parameters

Objectives

6.3.1 The objectives of the this section are summarized as follows:-

(a) To conduct a desktop review based on available information to assess the capacities of the existing sewerage infrastructure;

(b) To provide an initial assessment and evaluation of the sewerage impacts arising from the proposed development;

(c) To propose and recommend the sewerage scheme and mitigation measures for the proposed development.

Unit Flow Factors

6.3.2 The Unit Flow Factor (UFF) in Table T-1 and T-2 of GESF are used to estimate the sewage flow. With reference to GESF, commercial flows comprise flows due to commercial activities and employees. The total UFF for commercial flows is therefore sum of UFF for employee plus various commercial activities. The relevant UFF for estimating sewage flow generated from Tseung Kwan O Area 137 (TKO 137) and Tseung Kwan O Area 132 (TKO 132) are shown in **Table 6.1**.

Table 6.1 Adopted Unit Flow Factors for Domestic, Commercial and Industrial Flows

	Unit	Unit Flow (m^3/day)
Domestic		
R2 Public Housing	person	0.270
R3 Private Housing	person	0.370
Commercial		
Commercial Employee	employee	0.080
Commercial Activities		
(a) Specific Trades		
J2 Electricity Gas & Water	employee	0.250
J4 Wholesale & Retail	employee	0.200
J10 Restaurants & Hotels	employee	1.500
J11 Community, Social & Personal Services	employee	0.200
J12 Public Administration	employee	-
(b) General – Territorial Average	employee	0.200
School Student	person	0.040
Visitor	person	0.080
Industrial		
Industrial Employee	employee	0.080

Catchment Inflow Factors

6.3.3 The catchment inflow factor (Pcif) caters for the net overall ingress of water or wastewater to the sewerage system. It is catchment dependent and applicable to major sewerage facilities of a catchment. It is not applicable to new catchments which are deemed to be free from misconnections and pipe defects. Since both TKO 137 and TKO 132 are new development area, the Pcif is not applicable in estimating the sewage flow.

Peaking Factors

6.3.4 Peaking factor caters diurnal and seasonal flow variations of flow components and characteristics response of inflow and base flows to storm events.

6.3.5 Under normal condition, 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. Peaking factors for various population range including and excluding stormwater allowance for design of sewer and EPP are shown in **Table 6.2**.

Table 6.2 Peaking Factors for Various Population Range

Population Range	Peaking Factor (including stormwater allowance) for facility with existing upstream sewage	Peaking Factor (excluding stormwater allowance) for facility with new upstream sewage
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	Max (7.3/ $N^{0.15}$,2.4)	Max (6/ $N^{0.175}$,1.6)
Sewage Treatment Works, Preliminary Treatment Works and Pumping Station		
< 10,000	4	3
10,000 – 25,000	3.5	2.5
25,000 – 50,000	3	2
> 50,000	Max (3.9/ $N^{0.065}$,2.4)	Max (2.6/ $N^{0.065}$,1.6)

Notes:
N = Contributing population in thousands

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

6.4 Development Parameters

Design Population for TKO 137

6.4.1 Based on the latest development schedule, the domestic and non-domestic population for TKO 137 are anticipated to be 135,011 and 23,418 which are summarized in **Table 6.3** as below. The domestic household size of 2.7 is adopted for TKO 137.

Table 6.3 Summary of Design Domestic and Non-domestic Population for TKO 137

Land Use	Design Population / Employees
Domestic	
Public Housing	92,977
Private Housing	42,034
Non-domestic	
Government	705
Community, Social & Personal Services	3,612
General Non-domestic Activities	7,773
Restaurant	1,943
Wholesale & Retail	190
Education (Employee)	805
Education (Student)	8,230
Electricity Gas & Water (Employee)	110
Electricity Gas & Water (Visitor)	50
Open Space	N/A
Total:	***158,429***

Design Population for TKO 132

6.4.2 Based on the latest development schedule, the non-domestic population for TKO 132 are anticipated to be 389 which are summarized in **Table 6.4** as below.

Table 6.4 Summary of Design Non-domestic Population for TKO 132

Public Facilities	Area (ha)	Design Employees
Public Fill Transfer Facilities (PFTF)	4	70
Construction Waste Handling Facilities (CWHF)	4.5	120
Refuse Transfer Station (RTS)	3	130
Concrete Batching Plant (CBP)	0.6	9
Electricity Facilities (EF)	5.6	60
Road and Amenity	2	-
Total (about)	***19.8***	***389***

6.5 Sewage Flow Estimation

6.5.1 Based on the design parameters and assumptions discussed in previous sections, the estimated sewage flow for TKO 137 and TKO 132 are summarized in **Table 6.5** and **6.6** below.

Table 6.5 Estimated Sewage Flow for TKO 137

Planned Usage	No. of Population	Unit Flow Factor (m^3/day)	ADWF (m^3/day)
Domestic Flow			
Public Housing (R2)	92,977	0.27	25,104
Private Housing (R3)	42,034	0.37	15,553
Commercial Flow			
Government (J12)	705	0.08	56
Community, Social & Personal Services (J11)	3,612	0.28	1,011
General Non-domestic Activities (General – Territorial Average)	7,773	0.28	2,176
Restaurant (J10)	1,943	1.58	3,070
Wholesale & Retail (J4)	190	0.28	53
Education (Employee) (J11)	805	0.28	225
Education (School Student)	8,230	0.04	329
Electricity Gas & Water (Employee) (J2)	110	0.33	36
Electricity Gas & Water (Visitor)	50	0.08	4
		Total ADWF	***47,618 or 551.13 (ℓ/s)***
		Peaking Factor	*2.79*[1]
		Total Peak Flow	***1,537.66 (ℓ/s)***

Remarks:
1 – Peaking factor (including stormwater allowance) of propose EPP is applied as a conservative approach

Table 6.6 Estimated Sewage Flow for TKO 132

Planned Usage	Design Employees	Industrial employee Unit Flow Factor (m^3/day)	Industrial wastewater Design Flow (m^3/day)	ADWF (m^3/day)
PFTF	70	0.08	0	6
CWHF	120	0.08	60	70
RTS	130	0.08	200	211
CBP	9	0.08	60	61
EFs	60	0.08	0	5
			Total ADWF	***353 or 4.09 (ℓ/s)***
			Peaking Factor	*4*[1]
			Total Peak Flow	***16.36 (ℓ/s)***

Remarks:
1 – Peaking factor (including stormwater allowance) of propose SPS is applied as a conservative approach

6.5.2 The development in TKO 137 would be implemented in phases from 2030 to 2041 whereas the development for TKO 132 would be implemented in phases from 2030 to 2035. The latest implementation programme with flow build up are summarized in **Table 6.7** and **6.8** below:

Table 6.7 Flow Build Up for TKO 137

Intake Year	Cumulative ADWF(m^3/day)	Contribution
2030	10,436	E1, E2, G1, G2, G3, OU1, PU1&2
2033	18,899	$Flow_{2030}$ + PU3&4, OU4
2035	32,465	$Flow_{2033}$ + G4, E3, E4, E5, OU2, OU3, PR1, PU5, PU6
2038	35,404	$Flow_{2035}$ + PR4
2041	47,618	$Flow_{2038}$ + PR2, PR3, PR5

Table 6.8 Flow Build Up for TKO 132

Intake Year	Cumulative ADWF(m^3/day)	Contribution
2030	67	PFTF, CBP
2031	348	$Flow_{2030}$ + RTS, CWHF
2035	353	$Flow_{2031}$ + EFs

6.6 Existing and Planned Conditions

6.6.1 The proposed development scheme of TKO 137 and TKO 132 site are unsewered area. Assessment on sewerage impact to the existing Tseung Kwan O Preliminary Treatment Works (TKOPTW) is carried out. It is observed that except the insignificant sewage flow from TKO 132, the spare capacity of TKOPTW is unable to cater all the sewage flow from TKO 137 but only able to cater the flow of 1st and 2nd population intake from TKO 137 temporarily. Therefore, to cater the ultimate situation of the development sites, a new TKO 137 Effluent Polishing Plant (TKO 137 EPP) has to be constructed at TKO 137 and a new sewage pumping station has to be constructed at TKO 132.

6.7 Proposed Sewerage

Proposed Sewerage Scheme for TKO 137

6.7.1 For proper conveyance of sewage to the newly constructed EPP, a new gravity sewerage system using polyethylene (PE) pipe is proposed to construct within TKO 137.

6.7.2 The TKO 137 EPP is designed for secondary plus treatment level and the treated sewage effluent (TSE) is proposed to discharge to seawall outfall within TKO 137 and subsequently discharge to the sea.

6.7.3 A new TKO 137 EPP is proposed as the spare capacity of TKOPTW is unable to cater all the sewage flow from TKO 137 but only able to cater the flow of first and second population intake from TKO 137 temporarily prior to the TKO 137 EPP operation commencement in 2034. To cater for the sewage flow arising from the first and second population intake to TKOPTW (in 2030 and 2033 respectively) prior to TKO 137 EPP operation, an interim arrangement is thus proposed to divert the sewage flow arising from TKO 137 to TKOPTW via a proposed advance sewage pumping station and associated pipeworks. After being processed at TKOPTW, the sewage would be conveyed to the Habour Area Treatment Scheme (HATS) facility at Stonecutter Island for treatment and disposal. Then, the sewage will be redirected to TKO 137 EPP for treatment upon its commencement of operation in 2034.

6.7.4 The TKO 137 EPP has to be designed to cater for the full population intake with design capacity of 54,000m^3/day (including approx. 10% design allowance with consideration of the reserved land) to provide greater flexibility to cope with future change. The layout is shown in **Figure 6.1.** Owing to the flow build up of both TKOPTW and TKO 137 EPP, phased implementation of the TKO 137 EPP is recommended and tabularised in **Table 6.9**.

Figure 6.1 Layout Plan of TKO 137 EPP

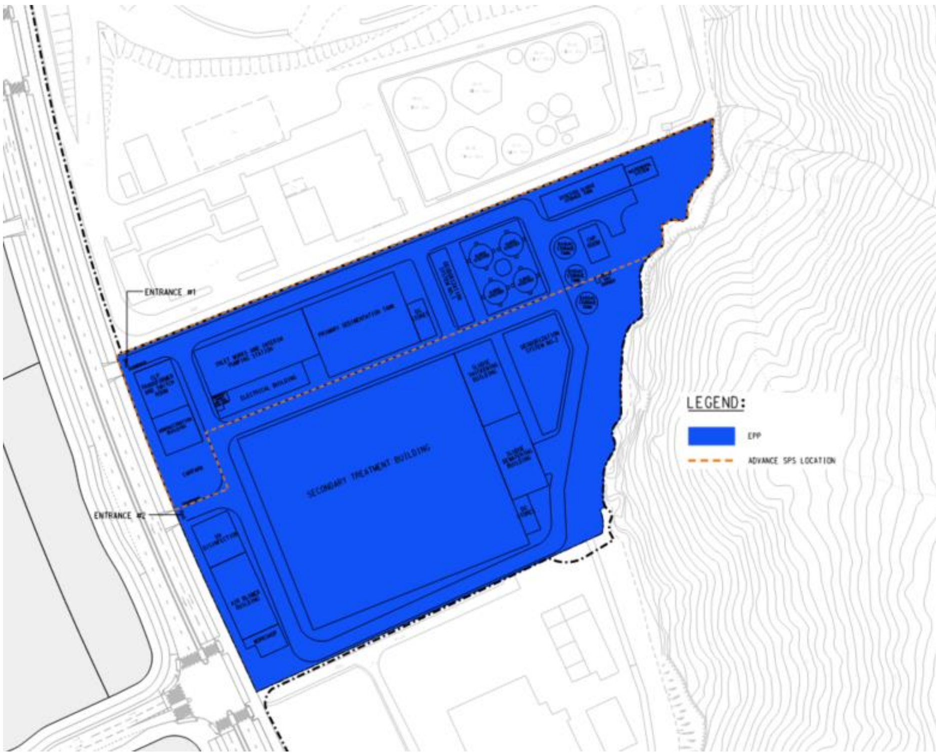

Table 6.9 Phased Implementation of TKO 137 EPP

Phasing	Commission year	Total Design Capacity of TKO 137 EPP (m^3/day)
Phase 1	2034 Q4	39,000
Phase 2	2041 Q4	54,000 (ultimate capacity)

Process Flow of Sewage Treatment for TKO 137 EPP

6.7.5 Raw sewage will first be screened by coarse and fine screens to remove large solids, followed by grit removal to remove small particles and heavy sediments. Screenings and grit will be discharged to covered bins / skips for disposal off-site. Screening and grit removal equipment will be fully enclosed by covers for odour control. Emergency bypass arrangements will be provided to overflow raw or partially treated sewage from the inlet works in case of blinding of the coarse or fine screens or for any other cause of plant failure.

6.7.6 Screened and de-gritted sewage will then be treated by primary sedimentation, for example lamella plate settlers or others, to remove fine suspended solid matter. Surface oil and grease will be removed by scum scrapers, and primary sludge will be collected in the bottom of the primary sedimentation tank by scrapers and pumped to holding tanks for sludge treatment.

6.7.7 Compact biological treatment technology will be adopted for TKO 137 EPP, for example, Moving Bed Biofilm Reactor (MBBR), or Aerobic Granular Sludge (AGS), etc. Microorganisms in aerated bioreactors will decompose and remove the organic matter and biological nutrients in the sewage. The compact biological treatment will include a solid-liquid separation process to separate clarified treated effluent from the microorganisms and suspended solids secondary sludge. Waste secondary sludge will be pumped to holding tanks for sludge treatment.

6.7.8 Clarified treated effluent will be disinfected by UV irradiation to further reduce concentration of E.coli prior to discharge. Disinfected treated effluent will be discharged to nearby storm drainage system via short treated effluent pipeline from the EPP. A small proportion of treated effluent would be internal circulated within the EPP for sewage treatment process use (e.g. pipe flushing) as required.

6.7.9 Drawing nos. 4110446/SK1001 illustrates the process flow of sewage treatment at TKO 137 EPP in **Appendix 6.1**.

Process Flow of Sludge Treatment for TKO 137 EPP

6.7.10 Primary and secondary sludge will be thickened and dewatered by mechanical thickening equipment, contained within mechanically ventilated sludge thickening / dewatering building to contain and transfer odour air to the deodorisation system. Dilute liquid removed from the sludges will be transferred back to the treatment process for further treatment, via a side-stream treatment process to remove ammonia and organics content if considered beneficial to the overall treatment process during detailed design, in terms of process sizing, energy efficiency and treatment effectiveness. Coagulant and / or flocculant chemicals are required for sludge conditioning to achieve effective thickening and dewatering operation.

6.7.11 Depending on detailed design, sludge transportation and disposal, and environmental / safety risk considerations, thickened primary and secondary sludge may be treated in sludge digesters prior to dewatering and off-site disposal. Biogas obtained from anaerobic digesters would be utilised by Combined Heat and Power (CHP) generation units or boiler, with any excess biogas disposed of by waste gas burner in the emergency case when the CHP system and / or boiler are not operational.

6.7.12 Biogas would be treated to reduce the H2S content and moisture content prior to storage and utilisation to generate electricity and / or hot water in the CHP / boiler system. Exhaust gas, containing some NO2 and SO2 would be generated during the biogas combustion process. Heat generated would be used to maintain the operation temperature for sludge digestion. A standby CHP unit will be provided to ensure the CHP system operates at the design capacity in terms of maximum biogas consumption rate, to avoid wasting any excess biogas by flaring in the waste gas burner.

6.7.13 If necessary to achieve the required dewatered sludge dry solid content for disposal to T. Park sludge incinerator or landfill, a portion of dewatered sludge would have its moisture content further reduced using sludge dryers, via heating and evaporation, for then blending with the main dewatered sludge stream prior to disposal. Heat would be supplied in the form of hot water or steam, utilizing biogas fired boiler(s) for steam production and / or waste heat from the CHP units. The exhaust gas from biogas combustion in the boiler(s) would have similar maximum discharge rate and composition as that of the CHP units. Evaporated water from the dried sludge would be re-condensed and returned to the treatment process for further treatment.

6.7.14 Drawing nos. 4110446/SK1002 illustrates the process flow of sludge treatment at TKO 137 EPP in **Appendix 6.2**.

Alternative treatment process options

6.7.15 Alternative treatment process options considered for each basic process stage as follows.

6.7.16 For primary treatment, potential alternative processes would include Chemically Enhanced Primary Treatment (CEPT), double deck traditional sedimentation tanks, and mechanical fine mesh (MFM) filters. CEPT requires significant amount of chemical dosing to achieve settling rates and high removal efficiency within a small footprint. However, the removal rates achieved are not necessary or beneficial upstream of secondary treatment, which requires some readily available organic load to facilitate the denitrification biological processes, therefore CEPT was not adopted. Double deck sedimentation tanks would be very large and either visually imposing or requiring significant amount of deep excavation, so was also not considered the most suitable primary treatment system for this plant. MFM filters comprise filter belt type mechanical treatment units, are would thus be very numerous and complex for this mid-sized treatment plant.

6.7.17 For secondary treatment, as mentioned above, advanced compact treatment technologies would be adopted such as MBBR, AGS or any other well-proven alternative. All well proven technologies would be readily able to achieve the treated effluent quality as required, presented in Section 5 Table 5.19, therefore the exact treatment technology adopted would be determined at detailed design stage.

6.7.18 Of the three common disinfection technologies, ultraviolet (UV), chlorination and ozone treatment, chlorination is not recommended as the treated effluent would contain residual chlorine and chlorinated compounds which may be harmful to aquatic life in the ultimate receiving water body. Ozone and UV leave no residual chemical compounds in the effluent; however, compared to UV disinfection, ozonation requires a larger footprint and much higher power consumption than UV disinfection system, therefore UV disinfection is recommended.

6.7.19 As mentioned above, sludge treatment with or without digestion (anaerobic or aerobic) will be determined during detailed design, depending on plant layout and space availability, sludge transportation and disposal, and environmental / safety risk considerations.

6.7.20 Sludge digestion has environmental benefits of reducing the sludge solids content and volume to be disposed of at T.Park/landfill, with anaerobic digestion also providing renewable biogas energy for electrical power and heat generation; although generating some emissions from biogas combustion. Digested sludge would have lower organic content and be more stable in terms of minimizing odour level in the downstream dewatering process, and during off-site transportation and disposal.

Location and Layout Considerations

6.7.21 Plant location has been selected at a relatively unobtrusive location at the back hill-side of the TKO 137 area rather than sea-front side, and as far away as possible from housing and other more sensitive receiver locations.

6.7.22 The site footprint assigned to the EPP uses the minimum area of the overall TKO 137 development area as practicable, therefore compact treatment technologies and compact plant and building layouts will be adopted.

6.7.23 Key layout considerations include locating the potentially high odour and noise emission treatment processes and equipment, as well as deodourization units, and also visually impacting process plant and equipment well set back from the site boundary to provide maximum distance to odour, noise and visual sensitive receivers.

6.7.24 In addition, the scale and size of above-ground structures will be determined during detailed design to achieve a balance between the plant's hydraulic operation, visual impacts, and also considerations of in-ground depth and generation of excavation waste volumes for disposal.

Wastes Generated from TKO 137 EPP

6.7.25 During the operation of TKO 137 EPP, the main waste types to be generated would be screenings, grit, dewatered sewage sludge. The screenings and grit would be compacted and properly stored in covered container prior to disposal. The transportation and disposal of the screenings and grit would be managed and controlled by a license waste collector.

6.7.26 Under Phase 1 of TKO 137 EPP, sewage sludge will undergo a dewatering process to form a sludge cake; while in Phase 2 a sludge digestion system may also be incorporated, depending on detailed design of each phase. The estimated amount of dewatered sludge generated by TKO 137 EPP, for Phase 1 without digestion, and Phase 2 with digestion, are approximately 30 tonnes per day respectively. All sludge cake generated will be transferred in enclosed sludge cake trucks to T.Park or landfill in all phases. Sludge tankers will be fully enclosed to minimize odour and public nuisance. It is estimated around 3-4 containers per day will be required to transport dewatered sludge for disposal at T. Park / landfill.

Deodorisation Facilities at TKO 137 EPP

6.7.27 All treatment units including channels, tanks, mechanical equipment, etc will be fully contained, covered or enclosed to prevent the odour release and potential nuisance to adjacent sensitive receivers.

6.7.28 Emissions sources with high and low odour concentrations will be extracted and passed to deodorization arrangements to control odour emissions. Ventilation fans will be provided to extract odourous air from sewage and sludge buildings and process units to the deodorization system for treatment. A single integrated or two separate deodorisation systems will be installed, with single or two-stage deodorisation, depending on practical considerations of exact plant and equipment layout, odour source ventilation rates, and odour concentrations.

6.7.29 In two-stage deodorisation systems, odorous air is first treated by biotrickling filter followed by activated carbon filter for final polishing. Biotrickling filters make use of bacteria and other microorganisms to convert odorous to non-odorous compounds, and are commonly used to treat odour with high and consistent H2S levels, with low operational complexity and cost. Activated carbon filters are used for final polishing or to treat low concentration odorous air and / or remove multiple odour compounds, to achieve very low discharge odour levels. The exact ventilation and deodorisation system arrangement will be determined during detailed design, to meet the air quality requirements as described in Section 3 of this EIA report.

Water Quality Impacts

6.7.30 The potential water quality impacts associated with the discharges from the TKO 137 EPP and proposed advance sewage pumping stations under normal operation and emergency situations have been evaluated in the water quality assessment of the EIA study and no adverse water quality impact to the identified sensitive receivers is anticipated. Details of the water quality impacts are presented in Section 5.

Proposed Sewerage Scheme for TKO 132

6.7.31 A local sewerage network and a new sewage pumping station (SPS) with associated rising main in form of PE pipes are proposed to constructed at TKO 132 for collecting the sewage arising from the operation of the public facilities at TKO 132. The collected sewage will be conveyed by the proposed rising main running along the proposed viaduct at TKO 132 and discharged to the existing sewers at Tiu Keng Leng. The sewage would then be conveyed to the existing TKOPTW and ultimately conveyed to HATS facility at Stonecutter Island for treatment and disposal. The design capacity of the proposed SPS is $400m^3$/day including approx. 10% allowance. The existing TKOPTW and HATS facilities have been assessed to have sufficient capacity to accommodate the additional sewage/wastewater flow arising from the new development at TKO 132.

Implementation Agent for Sewerage Facilities

6.7.32 An agreement has been obtained to undertake the construction and maintenance of the proposed sewerage facilities by the relevant parties which are summarized in **Table 6.10** below.

Table 6.10 Summary of Implementation Agent

Proposed Sewerage Facilities	Construction party	Maintenance party
SPS in TKO 132	CEDD	DSD
Advance SPS in TKO 137	CEDD/DSD (Subject to further discussion)	DSD
TKO 137 EPP	DSD	DSD

6.7.33 The alignment and layout of the new sewerage scheme in TKO 132 and TKO 137 are shown in the Drawing nos. 4110446/SK2000 to 4110446/SK2002 in **Appendix 6.3**.

6.8 Contingency plan for the proposed EPP and SPS

6.8.1 An assessment of the potential water quality impacts due to construction and operation of the Project has been conducted. Details of the impact assessment including the identification and quantification of the potential water quality impacts due to emergency discharge of non-screened raw sewage and the recommended measures to mitigate the potential impacts are presented in Section 5. To avoid potential water quality impact to the surrounding waters including the ecological resources and the water abstraction point to TKODP for potable water production, extensive effort will be endeavored to avoid the occurrence for emergency discharges. In order to achieve this, the design of EPP and SPS will be cautiously planned to include general provisions including as follows respectively:

For EPP at TKO 137 (including advance SPS)

(a) By-pass mechanism should be provided for both coarse screens and / or fine screens in the inlet to avoid/minimize failure in coarse/fine screens;

(b) Interim by-pass should be provided after the primary treatment and settlement of the sewage to avoid raw sewage by-pass as much as possible;

(c) Regular maintenance and checking of all plant equipment / facilities, treatment units, penstocks should be undertaken to maintain a good operation condition and prevent equipment failure;

(d) Standby pumps and treatment facilities would be provided in case of unexpected breakdown of pumping and treatment facilities such that the standby pumps and treatment facilities could take over and function to replace the broken pumps and treatment facilities; and

(e) Dual feed electricity supply would be provided.

For SPS at TKO 132

(f) A bar screen (with clear spacing of no less than 25mm) should be provided to cover the opening of any emergency sewage bypass which can prevent the discharge of floating solids into receiving waters as far as practicable while ensuring flooding at the facilities would not occur event if the screen were blocked;

(g) An alarm should be installed to signal emergency high water level in the wet well;

(h) Twin rising mains would be provided. Should one of the duty mains be taken out of operation, the remaining one would still be able to deliver the peak flow;

(i) Supervisory Control and Data Acquisition (SCADA) system and closed-circuit television (CCTV) will be provided for active monitoring in order to transmit signals showing irregularity or any operational problem of the SPS to the nearby STW or other manned SPS such that immediate actions can be taken in case of emergency;

(j) Regular maintenance and checking of plant equipment should be undertaken to prevent equipment failure;

(k) An emergency storage tank / spare volume of wet well should be provided for the proposed SPS to cater for breakdown and maintenance of duty pump;

(l) Standby pumps would be provided in case of unexpected breakdown of pumping such that the standby pumps could take over and function to replace the broken pumps; and

(m) Backup power supply facilities such as diesel generator would be provided in case of power failure to sustain the function of pumping facilities.

6.9 Conclusion

6.9.1 The implications of potential impacts on the existing public sewerage system from the potential sewage generated by the Project was assessed.

6.9.2 The latest development parameters of the proposed development have been utilized for calculation.

6.9.3 The estimated ADWF for TKO 137 would be approximately 47,618m3/day. A sewerage network is proposed to collect sewage within TKO 137. As the spare capacity of the existing TKOPTW is unable to cater for the full intake for TKO 137, a new TKO 137 EPP with secondary plus treatment level is proposed within TKO 137. Interim advance works involve diverting sewage from TKO 137 to TKOPTW via an advance sewage pumping station to manage sewage flow before the commissioning of TKO 137 EPP. Phased implementation may be recommended for the TKO 137 EPP and if implemented in phases with design capacity of the TKO 137 EPP of 39,000m3/day and ultimately reach up to 54,000m3/day for Phase 1 and 2 respectively.

6.9.4 The estimated ADWF for TKO 132 would be approximately 353m3/day. A local gravity system and a SPS of 400m3/day design capacity with associated rising main are proposed at TKO 132 to convey the sewage from the public facilities to existing sewerage system at Tiu Keng Leng along the proposed viaduct. The sewage would then be conveyed to the existing TKOPTW and ultimately conveyed to HATS facility for treatment and disposal.

6.9.5 Overall with the provision of the proposed sewers and sewerage facilities at TKO 132 and 137, it is anticipated that the Project would not result in adverse implications on sewerage and sewage treatment.