1. BACKGROUND

1.1.1 The Subject Site is located at Lot 1457 R.P. in D.D. 123, Fung Lok Wai (FLW), Yuen Long and is about 2 km north of the Yuen Long New Town. To the west of the subject site is the Hong Kong Wetland Park (HKWP), with Mai Po located to its northeast and Yuen Long Industrial Estate (YLIE) to southeast. More particulars of the project are given in Section 2 of the main text for this EIA report.

1.1.2 The existing communal sewerage in the vicinity of the subject is reviewed and studied in Section 8 of the EIA report for this project. Three options namely Strategies A1, A2 and B are identified to be feasible for the disposal of the sewage from the subject site, as shown in Fig. A8-1 and Fig. A8-2. These options will be further discussed below in this Sewerage Impact Assessment (SIA) to recommend the most viable option.

1.1.3 This SIA has been prepared based on information contained in the "Agreement No. CE 10/95 Tin Shui Wai Development Engineering Investigations for Development of Areas 3, 30 and 31 of the Development Zone and the Reserve Zone Final Investigation Report Volume 1" (the Final Investigation Report) dated March 1997 and the "Review of Yuen Long and Kam Tin Sewerage and Sewage Treatment Requirements – Agreement No. CE 55/95" (the Review) dated March 1999.

1.1.4 For Strategy A1, it is proposed to lay an approximately 1,356m long new rising main and gravity sewer in existing local roads south of the subject, mainly along Fuk Shun Street, an existing public road next to Leon Court, for delivering the sewage from a proposed pumping facilities of the subject site to the existing Yuen Long Sewage Treatment Works (YLSTW) directly, without collecting sewage from other catchments en-route. No technical difficulties are envisaged in designing the capacities of the proposed works to meet the design flow from the subject site, following the conditioned required by Drainage Services Department in the detailed design stage.

1.1.5 Strategy A2 is to deliver the sewage from the subject site to YLSTW, following the upstream routing for Strategy 1 for an approximately 150m to Fung Shun Street and an approximately 431m along Fung Shun Street. The downstream routing for Strategy A2 is proposed to connect to the existing communal foul sewerage in Fung Hi Street from which the sewage is conveyed to YLSTW via existing sewers in Fuk Hi Street, Wang Lee Street and Wang Lok Street inside the Yuen Long Industrial Estate (YLIE). The capacity of the existing downstream sewerage will be assessed in the following sections of this SIA to ascertain the viability of Strategy A2.

1.1.6 For Strategy B, an approximately 940m long sewer is proposed to be constructed from the subject site to Tin Wah Road, where some communal sewerage facilities are existing. The capacity of the existing sewerage under Tin Wah Road will be reviewed in following sections under this SIA. As an alternative to upgrading the existing sewerage, it is proposed to construct an approximately 1,327m long new gravity sewer in parallel to the existing sewerage connecting to the existing Tin Wan Road Sewage Pumping Station (TWRSPS). The sewage will then be successively pumped via the existing Ha Tsuen Sewage Pumping Station (HTSPS) the existing San Wai Sewage Treatment Works (SWSTW) for treatment.

1.1.7 The sewerage works proposed in the above options are all under public roads and will be designed and constructed according to the standard requirements accepted by Drainage Services Department.

2. PROPOSED DEVELOPMENTS AND SEWAGE FLOWS PROJECTIONS

2.1.1 The proposed residential development at FLW will house a total population of about 8,490. The sewage generated will be domestic in nature and no industrial wastewater discharges are expected.

2.1.2 As per recommendations in the Sewerage Manual published by the Drainage Services

Department in 1995, based on the above estimated population at 100% occupancy, the sewage flows from the FLW Development has been estimated as shown in the following table:

Table 2.1 Projected Sewage Flows from the FLW Development

Subject Site (FLW)	Population (Head)	Global Unit Flow Factor (m^3/d)	ADWF m^3/d	Peaking Factor	PWWF m^3/s
FLW Residential, PH(R3))	8,490	0.37	3,141.3	5.11	16,111.4 m^3/d (186 l/s)
FLW (Employee)	200	0.06	12		
		Total	3,153.3		

3. PLANNED POPULATION AND SEWAGE FLOWS PROJECTIONS

Strategy A2

3.1.1 The sewage generated in the catchment area of Strategy A2 includes domestic sewage from the village development and industrial sewage from the YLIE. It could include some stormwater infiltration. Sewage flows have been estimated based on population forecast and global unit flow factors recommended in the Sewerage Manual.

3.1.2 Since no exact figures on the sewage flows generated by the village developments along Fung Shun Street and each industrial development in the YLIE are made available, the number of village houses within the catchment area are identified through site investigation and survey maps. To give a conservative value, it is assumed that every village house is 3 storeys high and there are 3 persons per storey. With reference to the Review and the TDSR Scenario B for Yuen Long District, the projected ultimate population for the catchment areas are assumed to be 126% of existing population. Since the Review has stated that the there was a sharp decline of wastewater generating industry over the last few years. The projection of ultimate sewage flows generated from industrial area are based on the existing net area of each relevant industrial development.

Strategy B

Ultimate Population Forecast

3.1.3 With reference to Appendix H of the Final Investigation Report, ultimate population with sewage flows inventory in TSWDZ and TSWRZ were used for designing the sewers in TSWRZ. The figure has therefore been used as the maximum baseline in testing the spare capacity, if any, available for the proposed Development.

Projection of Sewage Flows

3.1.4 The sewage generated in TSW is domestic, commercial, and institutional in nature. It could include some stormwater infiltration. Sewage flows have been estimated based on population forecast and global unit flow factors recommended in the Sewerage Manual.

4. SEWAGE CATCHMENTS

Strategy A2

4.1.1 Existing sewers under Fuk Hi Street receive sewage from the village development along Fuk Shun Street and the sewage generated from the western part of the YLIE. They are subsequently diverted to existing sewers beneath Wang Lee Street and then Wang Lok Street which convey the sewage from the eastern part of the YLIE and Long Ping to YLSTW.

4.1.2 The relevant sub-catchments of the sewerage network proposed in Strategy A2 are presented in

Figure A8-1 and Table 4.1 below. That information is employed to conduct a SIA on the proposed sewage option.

Table 4.1 Sub-catchment areas of Strategy A2

Sub-catchment area	Major Development
1	Man Wa Garden and surrounding houses
2	Village development along Fuk Shun Street, including Shing Uk Tsuen, Jade Court, Vienna Villa, Tai Tseng Wai, Carole Garden, Ng Uk Tsuen, Tai Tseng Ng Uk Tsuen and Leon Court.
3	Western part of the YLIE, including Kyoma Industrial Co. Ltd., TDK Manufacturing (HK) Co. LTd., CME Agent, Toppan Printing, South China Paper Ltd., La Win Lables Specialist Industrial Ltd., Yau Sang Galvanizers (Hot-Dip) Co., Yuen Long Textile Co. Ltd., Premier Printing Group Ltd., Yip Shing Diesel Engineering Co., Polarcup HK Ltd, United laboratories and the China Engineers Ltd.

Strategy B

4.1.3 With reference to the "Agreement No. CE 10/95 Tin Shui Wai Development Engineering Investigations for Development of Areas 3, 30 and 31 of the Development Zone and the Reserve Zone Final Investigation Report Volume 1" (the Final Investigation Report) dated March 1997, sewage from the whole Tin Shui Wai Reserve Zone (TSWRZ) is discharged through a gravity sewers network in carriageways to TWRSPS. The sewage will be discharged to HTSPS via a 2 km long rising mains along the Western Drainage Channel (WDC). The sewage will eventually be treated at SWSTW and discharged to the submarine outfall at Urmston Road.

4.1.4 The sewers under Tin Wah Road collects all sewage generated from the TSWRZ. They are then conveyed to TWRSPS.

4.1.5 All sewage installations including TWRSPS and the associated rising mains are designed for the ultimate flows of the TSW Developments.

4.1.6 The sub-catchments of the sewerage network under Tin Wah Road in TSWRZ are presented in Figure A8-2 and Table 4.2 below. Those information are employed to conduct a SIA on the proposed sewage option.

Table 4.2 Sub-catchment and the Planning Areas in TSWRZ

Sub-catchment area	Planning Areas
1 (300 DIA)	120
2 (300 DIA)	117a 117b
3 (375 DIA)	104a
4 (675 DIA)	104b 103a 108a 108b 109 107b 114 115 116a 116b
5 (750 DIA)	103b
6 (900 DIA)	31b 31d 33b
7 (1050 DIA)	102a
8 (1200 DIA)	101 102b 105 106 107a 110 111a 111b 112 113

5. CAPACITY OF MAJOR SEWERAGE INFRASTRUCTURE

Strategy A2

5.1.1 In the early planning, the estimated sewage inflow to YLSTW was expected to exceed the constructed capacity of 70,000 m^3/d by year 2011. However, it will depend on the actual development in the catchment and the sewage flow build-up due to the Yuen Long Industrial Estate. The information provided by DSD illustrating the projected total flow to YLSTW from 2000 to 2016 is illustrated in Figure A8-3.

5.1.2 Actually, only about 15,000 m^3/d DWF of the raw sewage is discharged to YLSTW as at 2007. That is much less than the originally estimated ADWF of about 43,000 m^3/d as indicated in the above Figure 8-5. Such phenomenon is the result of a sharp decline of wastewater generating industry over the last few years. Industrial wastewater flows from Yuen Long Industrial Estate discharging into the Yuen Long STW are expected to remain at their current magnitude or even decline.

5.1.3 Different schemes proposed for the disposal of the treated effluent from YLSTW being reviewed by the Government are designed for the DWF of just only 50,000 m^3/d. It is thus found that the existing YLSTW with the DWF capacity of 70,000 m^3/d would have spare capacity of about 20,000 m^3/d that will be sufficient to cater for the flow discharged from the subject site.

5.1.4 Having considered with such spare capacity, it is ascertained that the YLSTW is capable of catering the estimated residential sewage of 3,153 m^3/d from the Project

Strategy B

5.1.5 The existing capacity of Tin Wan Road Sewage Pumping Station has an ultimate capacity for a peak flow of 1,284 l/s.

5.1.6 The Ha Tsuen Sewage Pumping Station (HTSPS) is designed to have a capacity of 246,000 m3/d for 2016 population. According to the latest design of DSD, the total sewage flows feeding into the Ha Tsuen SPS is some 231,000 m3/day DWF by 2016. There would be a spare capacity of 15,000 m3/day DWF by 2016.

6. EXISTING SEWERAGE NETWORK

Strategy A2

6.1.1 Figure A8-4 shows the proposed upstream pipeline for Strategy A2 at south of the subject site and Fuk Shun Street and the existing sewerage network and manholes around YLIE and environs as per DSD's Yuen Long District Drainage Record (Sheet no. 2-SW-24C, 2-SW-24D, 6-NW-4A and 6-NW-4B, revision Date: May 2001).

6.1.2 The existing sewer at Fuk Hi Street (downstream sewer of manhole HK20354808 sizing 750mm in diameter and downstream sewer of manhole HK20355901 sizing 900mm in diameter) receive sewage from the village development along Fuk Shun Street and the western part of the YLIE. The sewer are subsequently diverted to existing sewers beneath Wang Lee Street (sizing 1200mm diameter) and then Wang Lok Street (sizing max. 1800mm diameter) which collect sewer from the eastern part of the YLIE and Long Ping. All the sewage are ultimately received by the YLSTW.

6.1.3 In the SIA, the proposed upstream pipeworks in Fuk Shun Street is assumed to cater sewage from sub-catchment 1 and the FLW Project if the Government poses a condition on proposed pipe laying in public road for serving adjacent un-sewered area in future. The sewage from sub-catchments 2 and 3 is assumed to be discharged to the manholes HK20360001 and HK20354808 respectively of the existing sewerage network.

Strategy B

6.1.4 With reference to the Final Investigation Report, sewage from the whole RZ is discharged through a gravity sewers network in carriageways to SWSTW via the existing TWRSPS and HTSPS.

6.1.5 All sewage installations including TWRSPS and the associated rising mains are designed for the

ultimate flows of the TSW Developments.

6.1.6 Figure A8-5 shows the existing sewerage network under Tin Wah Road, which collects all the sewerage generated from the TSWRZ as per TDD's sewerage plan (Drawing no. SD9, SD10, SD11, SD12 and SD13, revision Date: May 1998). The sections of sewer under Tin Wah Road are of various sizes. At the "upstream" side (i.e. sub-catchment area 1 and 2 starting at the manhole s11102), sewer with size 300mm conveys flows from Area 117 and 120. At sub-catchment 3 (manhole s11107), the sewer received the flows from Area 104 is in size 375mm. The sewer between sub-catchment 4 (manhole s10519) and 6 (manhole s11117) is in size 750mm. After receiving part of flows from Area 102, the sewer started from sub-catchment 7 (manhole s11121) to sub-catchment 8 (manhole s10127) is in size 1050mm while the sewer leading to the pumping station at Area 101 from sub-catchment 8 (manhole s10127) is in size 1200mm.

7. EVALUATION OF SEWERAGE IMPACT

7.1 Approach and Methodology

Estimated Flows

7.1.1 The Average Dry Weather Flows (ADWF) as well as the Peak Wet Weather Flows (PWWF) of Strategy A2 and Strategy B have been estimated in Figure A8-6 and Figure A8-7.

Evaluation of Sewerage Impact

7.1.2 The capacity of sewage pipe has been calculated based on the Manning's equation assuming full bore flow at no surcharge as below:

$$Q = A_w V$$

$$V = \frac{R^{2/3} S^{1/2}}{n}$$

where A_w = Wetted Area (Cross-sectional area of water body, m^2)

V = Velocity of flow

R = hydraulic radius (m) = Aw/Pw

s = slope of the total energy line

n = Manning's roughness coefficient, m-1/3s (n=0.016 for poor roughness condition adopted for the assessment and design)

Aw = wetted area, m2

Pw = wetted perimeter, m

7.1.3 Impact on various segments of sewer has been checked by comparing the estimated peak flow (PWWF) with the capacity of the respective sewer. It is assumed that 5% of the sewer capacity could be obstructed by siltation.

7.2 Results and Discussion

Strategy A2

7.2.1 As shown in Figure A8-6, the existing manhole (HK193690050) nearest to the Project is considered to have spare capacity to absorb the capacity of PWWF 0.186 m3/s from the ultimate flows from the Project.

7.2.2 From the sewage flows estimated, adequacy of the capacity of the remaining segment of sewerage network between the manholes has been evaluated in the following table.

Table 7.1 Evaluation of Adequacy of Sewerage Network Leading to the Manhole HK20355902

Ultimate Flow	Length	Level (out)	Level (in)	d	A_w	P_w	R	s	n	V	Q_C	Q_p	Is $Q_c > Q_p$?	% of capacity	Siltation	Remaining Capacities
	m	m	m	m	m^2	m	m		$m^{-1/3}$ s	m/s	m^3/s	m^3/s				
Proposed Sewage Pipe (HK19369005>HK2036001)	51.0	7.23	4.53	0.375	0.110	1.178	0.094	0.0529	0.016	2.968	0.328	0.189	Y	58%	5%	37%
Proposed Sewage Pipe (HK2036001>HK20353801)	380.0	4.53	3.29	0.600	0.283	1.885	0.150	0.0033	0.016	1.008	0.285	0.251	Y	88%	5%	7%
Existing Sewage Pipe (HK20354808>HK20355901)	89.0	1.58	1.46	0.750	0.442	2.356	0.188	0.0013	0.016	0.752	0.332	0.286	Y	86%	5%	9%

Note: Qc is the maximum flow capacity of sewage pipe

Qp is the sewerage flow passing through that sewage pipe section

7.2.3 The sewerage network at the downstream of manhole HK20355902 in the size of 900mm diameter) is adjoined by two sewers upstream, sizing 750mm and 300mmm in diameter. The following table has illustrated that the downstream of manhole HK20355902 is designed to have spare capacity even the two sewers upstream are full-loaded. As such, the remaining sewers after manhole HK20355902 are considered to be insensitive to the capacity upstream and thus have enough capacity to cope with the additional flows from the Project.

Table 7.2 Sensitivity Test of the downstream of Manhole HK20355902

Ultimate Flow	Length	Level (out)	Level (in)	d	A_w	P_w	R	s	n	V	Q_C	Q_p	Is $Q_c > Q_p$?	% of capacity	Siltation	Remaining Capacity
Sewage Pipe (HK20354808>HK20355901)	89.0	1.58	1.46	0.750	0.442	2.356	0.188	0.0013	0.016	0.752	0.332					
Sewage Pipe (HK20356702>HK20355901)	210.0	2.87	1.91	0.300	0.071	0.942	0.075	0.0046	0.016	0.752	0.053					
Sewage Pipe (HK20355901>HK20355902)	50.0	1.31	1.27	0.900	0.636	2.827	0.225	0.0008	0.016	0.654	0.416	0.385	Y	93%	5%	2%

Note: Qc is the maximum flow capacity of sewage pipe

Qp is the sewerage flow passing through that sewage pipe section

Strategy B

7.2.4 As shown in Figure A8-7, the existing TWRSPS having ultimate capacity PWWF 6.269 m3/s is considered to have enough spare capacity to absorb the ultimate flows from the FLW Development and TSWRZ (i.e. PWWF 1.424 m3/s).

7.2.5 HTSPS is also identified to have spare capacity to absorb the ultimate flows from the FLW Development.

7.2.6 From the sewage flows estimated, adequacy of the capacity of each segment of sewerage network between the manholes has been evaluated in the following table.

Table 7.3 Evaluation of Adequacy of Sewerage Network Leading to TWRSPS

Ultimate Flow	Length	Level (out)	Level (in)	d	A_w	P_w	R	s	n	V	Q_C	Q_p	Is $Q_c > Q_p$?	% of capacity
	m	m	m	m	m^2	m	m		$m^{-1/3}$ s	m/s	m^3/s	m^3/s		
Sewage Pipe (s11102>s11103)	42.0	5.98	5.77	0.300	0.071	0.942	0.075	0.0050	0.016	0.790	0.056	0.183	N	329%
Sewage Pipe (s11103>s11107)	161.0	2.92	1.65	0.300	0.071	0.942	0.075	0.0079	0.016	0.987	0.070	0.183	N	263%
Sewage Pipe (s11107>s10519)	235.2	1.57	-0.28	0.375	0.110	1.178	0.094	0.0078	0.016	1.142	0.126	0.198	N	157%
Sewage Pipe (s10519>s11117)	241.1	-1.29	-1.78	0.750	0.442	2.356	0.188	0.0020	0.016	0.923	0.408	0.618	N	151%
Sewage Pipe (s11117>s11121)	269.5	-1.95	-2.31	0.900	0.636	2.827	0.225	0.0013	0.016	0.845	0.538	0.690	N	128%
Sewage Pipe (s11121>s10127)	206.8	-2.44	-2.72	1.050	0.866	3.299	0.263	0.0014	0.016	0.943	0.816	0.782	Y	96%
Sewage Pipe (s10127>s11125a)	171.5	-2.93	-3.37	1.200	1.131	3.770	0.300	0.0026	0.016	1.419	1.605	1.461	Y	91%

Note: Qc is the maximum flow capacity of sewage pipe

Qp is the sewage flow passing through that sewage pipe section

7.2.7 Results in Table 7.3 indicate that all segments of sewage pipes, except the section from manhole s11121 to s11125a, will not have enough capacity to cope with the additional flows from the

Project.

7.3 Mitigation Measures

Strategy A2

7.3.1 No upgrading works is considered necessary for Strategy A2.

Strategy B

7.3.2 Apparently, on-line upgrading of the existing 948.8m long sewage pipes from manhole s11102 to s11121 is necessary to cope with the additional discharge from the FLW Development to TWRSPS via the sewers under Tin Wah Road. The diameter of the proposed upgrading pipes and the adequacy of sewerage network after upgrading the sewage pipes are illustrated as follows:

Table 7.4 Evaluation of Adequacy of Sewerage Network Leading to the TWRSPS with the upgraded sewage pipes

Ultimate Flow	Length	Level (out)	Level (in)	d	A_w	P_w	R	s	n	V	Q_C	Q_p	Is $Q_c > Q_p$?	% of capacity	Siltation	Remaining capacities
	m	m	m	m	m^2	m	m		$m^{-1/3}$ s	m/s	m^3/s	m^3/s				
Sewage Pipe (s11102>s11103)	42.0	5.98	5.77	**0.600**	0.283	1.885	0.150	0.0050	0.016	1.254	0.354	0.183	Y	52%	0.05	43%
Sewage Pipe (s11103>s11107)	161.0	2.92	1.65	**0.600**	0.283	1.885	0.150	0.0079	0.016	1.567	0.443	0.183	Y	41%	0.05	54%
Sewage Pipe (s11107>s10519)	235.2	1.57	-0.28	**0.600**	0.283	1.885	0.150	0.0078	0.016	1.563	0.442	0.198	Y	45%	0.05	50%
Sewage Pipe (s10519>s11117)	241.1	-1.29	-1.78	**0.900**	0.636	2.827	0.225	0.0020	0.016	1.042	0.663	0.618	Y	93%	0.05	2%
Sewage Pipe (s11117>s11121)	269.5	-1.95	-2.31	**1.050**	0.866	3.299	0.263	0.0013	0.016	0.936	0.811	0.690	Y	85%	0.05	10%
Sewage Pipe (s11121>s10127)	206.8	-2.44	-2.72	1.200	1.131	3.770	0.300	0.0014	0.016	1.031	1.166	0.782	Y	67%	5%	28%
Sewage Pipe (s10127>s11125a)	171.5	-2.93	-3.37	1.200	1.131	3.770	0.300	0.0026	0.016	1.419	1.605	1.461	Y	91%	5%	4%

7.3.3 As an alternative to minimize interruption to the operation of the existing sewerage, it is also feasible to lay a new sewer alongside the existing one at Tin Wah Road to convey the flow.

7.3.4 Notwithstanding, all proposed sewerage works at Tin Wah Road will be programmed in such a way as to maintain the normal function of the existing sewer and normal traffic on the road.

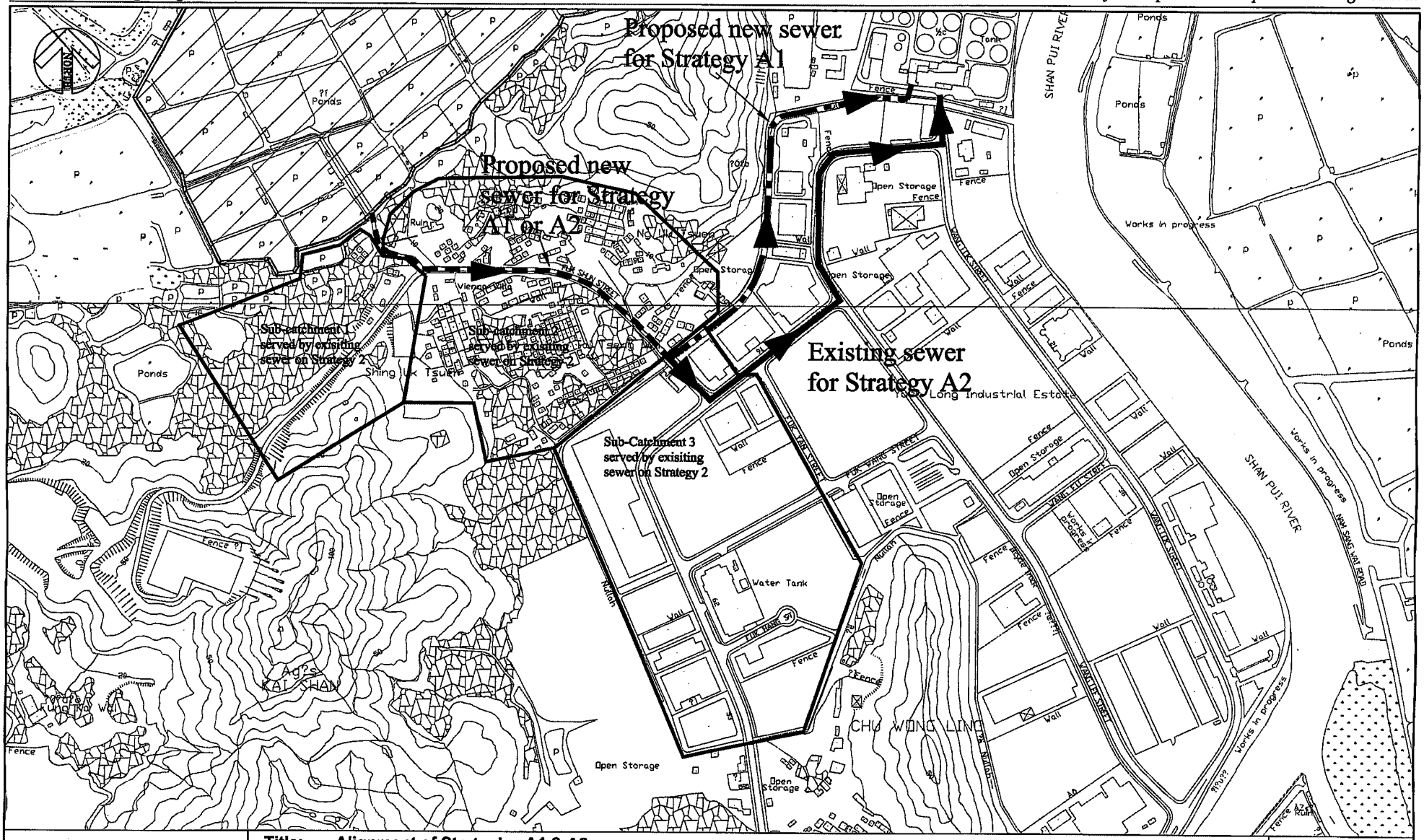
7.4 Conclusion

7.4.1 A detailed sewerage impact assessment has been conducted to evaluate the feasibility and possible impact on absorbing the additional flows from the FLW Development to YLSTW (Strategy A1 or A2); or to SWSTW via the sewers under Tin Wah Road, TWRSPS, and HTSPS (Strategy B).

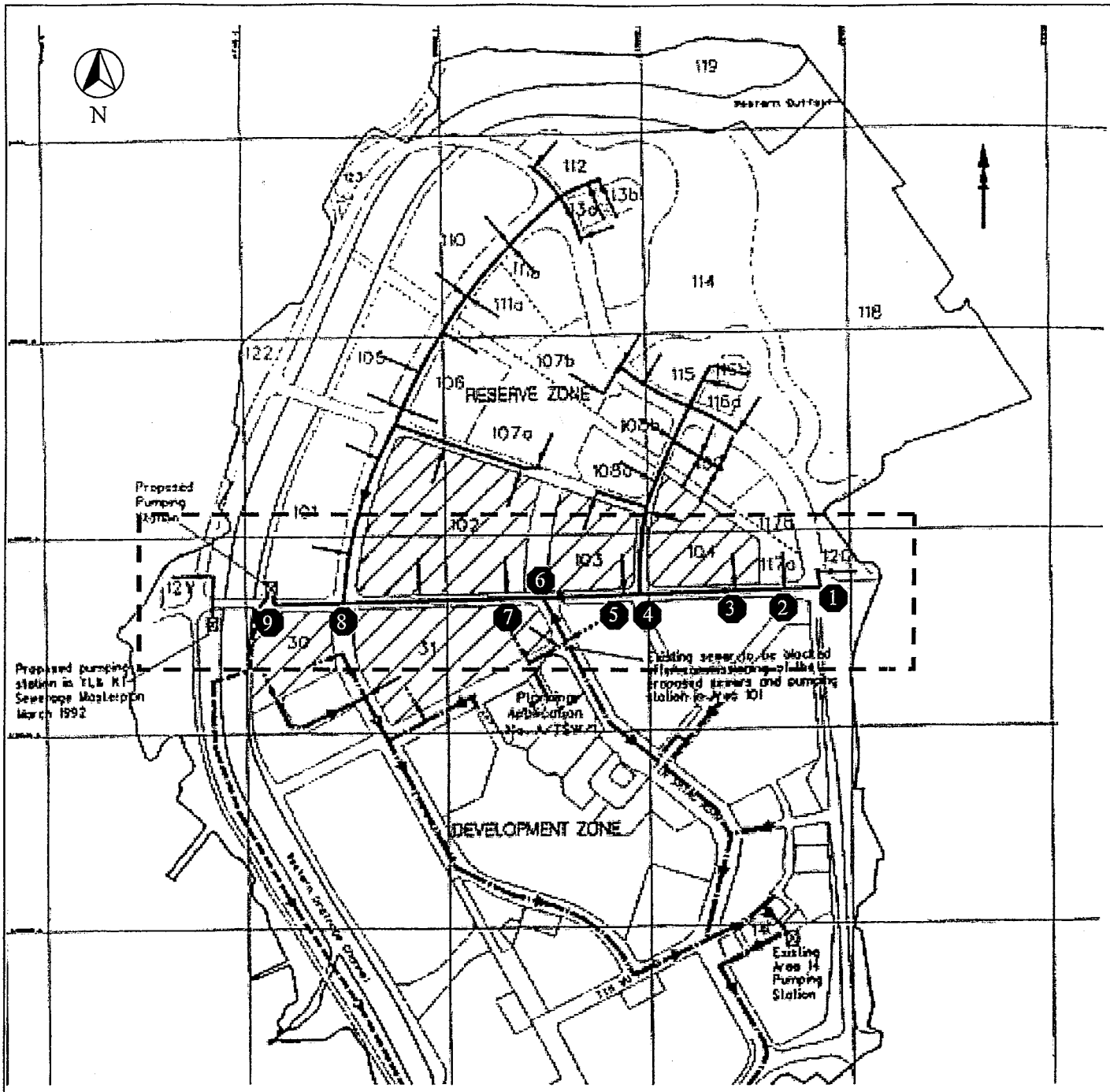
7.4.2 For Strategies A1 and A2, the findings have confirmed that no upgrading works on sewers are required for to cater for the additional flows from the FLW Developments. Owing to the declining industrial wastewater discharges, YLSTW will have adequate spare capacities to cope with the estimated additional residential sewage of 3,153 m3/day from the FLW Project

7.4.3 For Strategy B, the findings have confirmed that TWSPS, HTSPS and SWSTW will have adequate capacities to cope with the proposed additional discharges from the FLW Development. For the sewers under Tin Wah Road, the section of the existing pipes from manhole s11102 to s11121 will not be adequate. To minimize interruption to the existing operation of the insufficient sewerage, an alternative is to lay a new sewer alongside the existing one to cater for the additional flows from the FLW Project. All proposed sewerage works at Tin Wah Road will be programmed in such a way as to maintain the normal function of the existing sewer and normal traffic on the road.

7.4.4 From implementation point of view, Strategies A2 is more preferable to Strategies A1 and B.



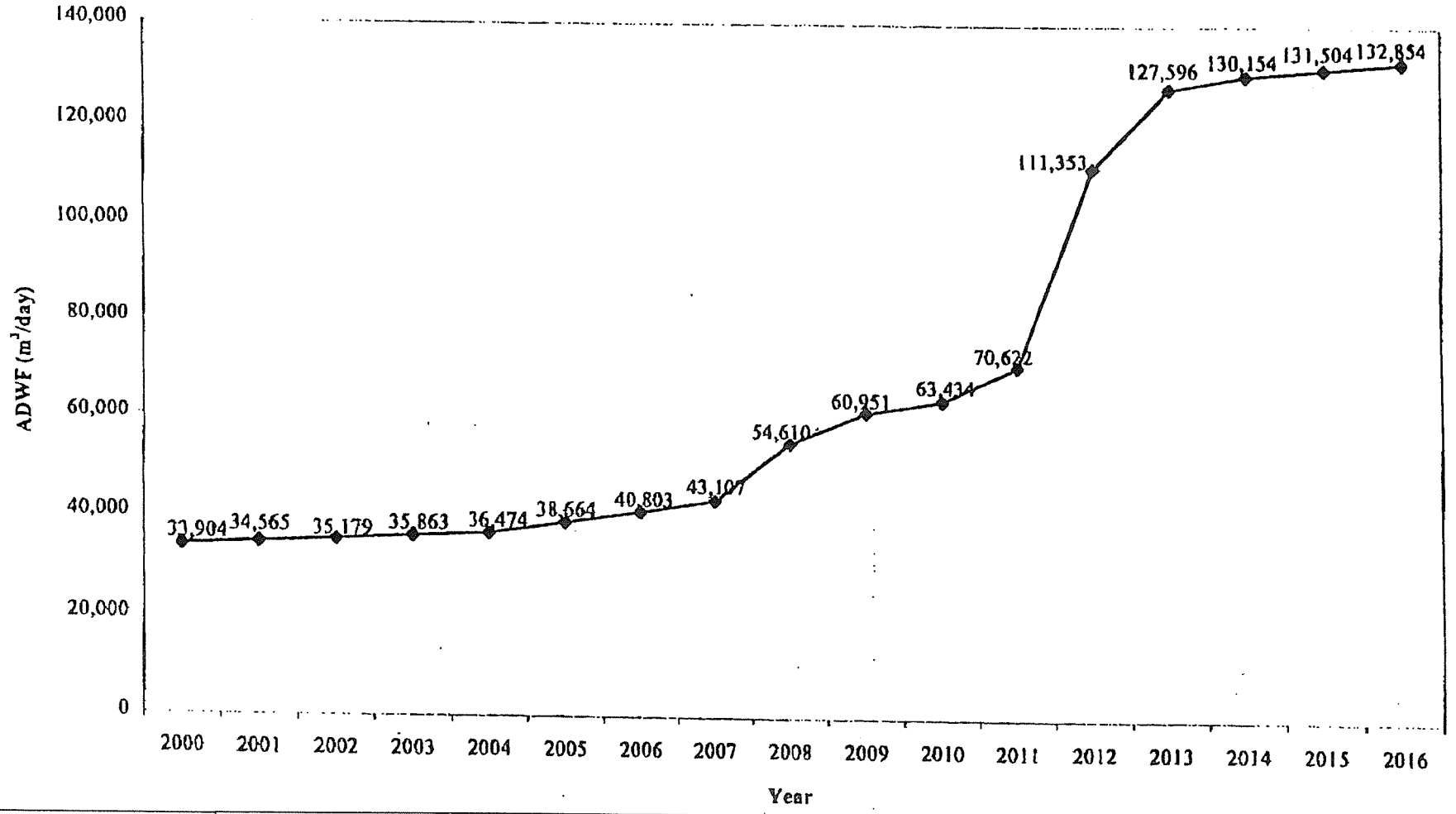
CH2M HILL Hong Kong Limited In association with RPS ADI Ltd. Archaeological Assessments MVA Hong Kong Limited	**Title: Alignment of Strategies A1 & A2**	**Scale: NTS**
	Project: EIA for Proposed Development at Fung Lok Wai, Yuen Long at Lot 1457 R.P. in D.D. 123	**Figure: A8-1**



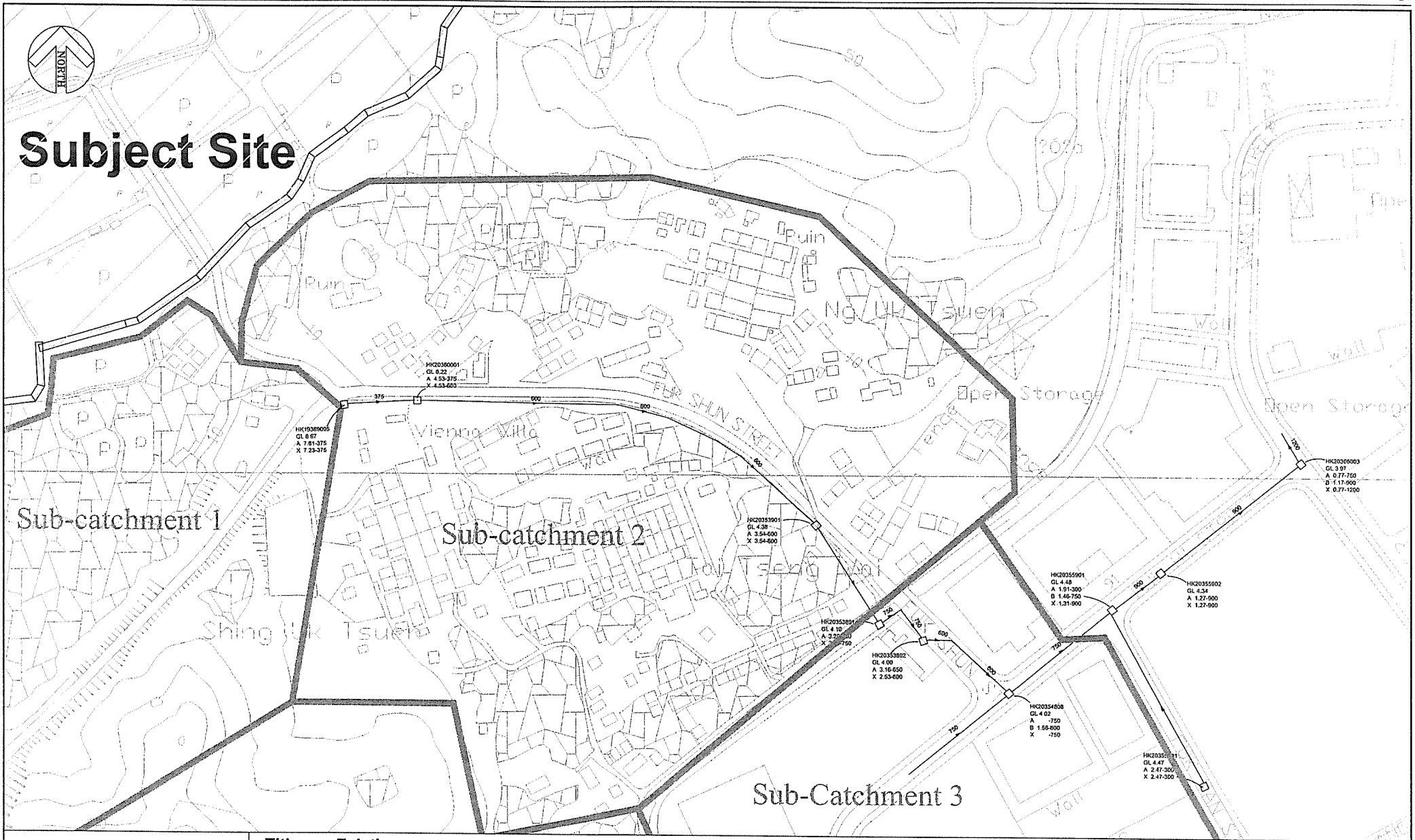
The existing sewerage network under Tin Wah Road

CH2M HILL Hong Kong Limited In association with RPS ADI Ltd. Archaeological Assessments MVA Hong Kong Limited KongmLimitedLAssessments	Title: The Sub-catchment of Strategy B	Figure: A8-2	Scale: -
	Project: EIA for Proposed Development at Fung Lok Wai, Yuen Long at Lot 1457 R.P. in D. D. 123		

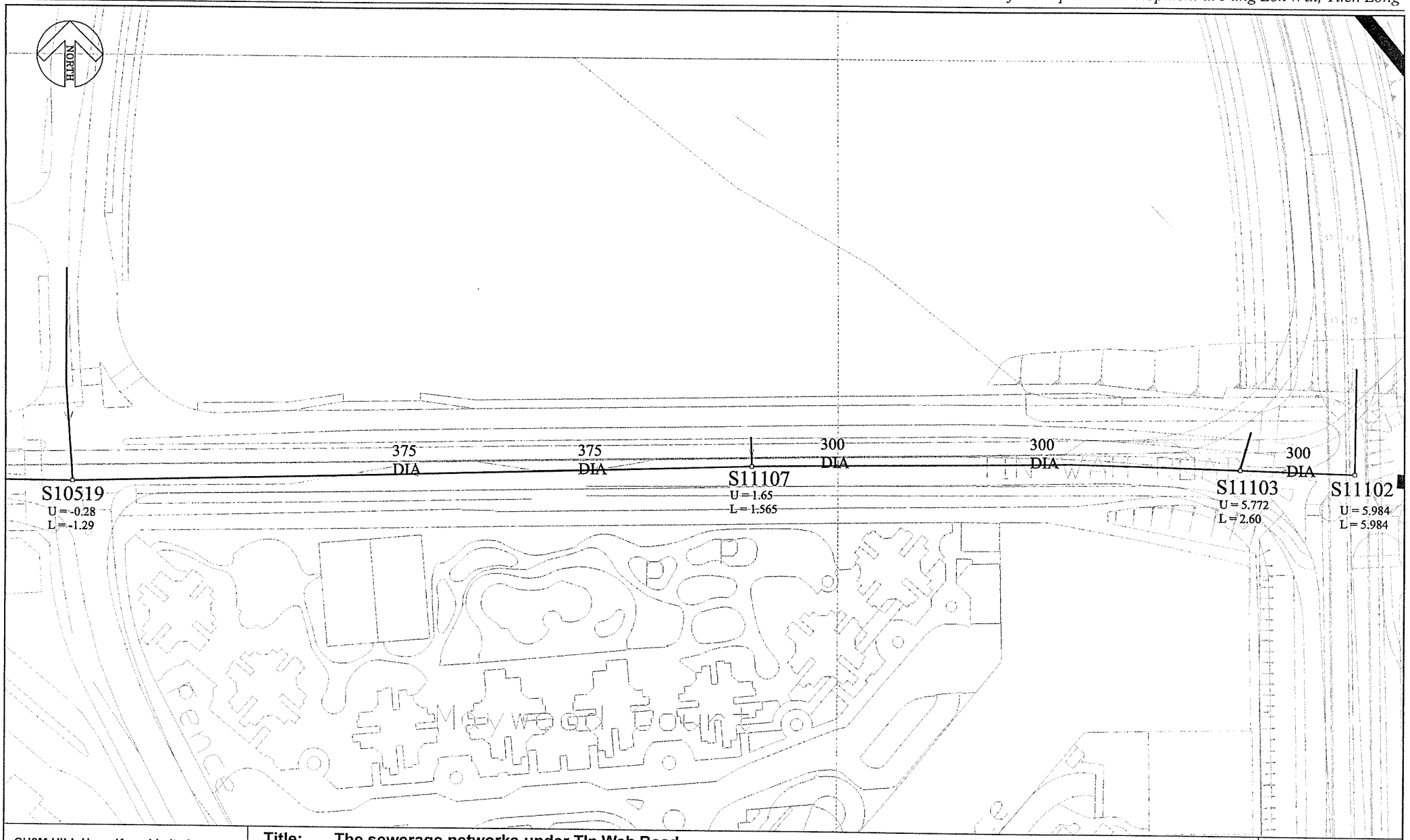
Total Flow to Yuen Long Sewage Treatment Works from 2000 to 2016



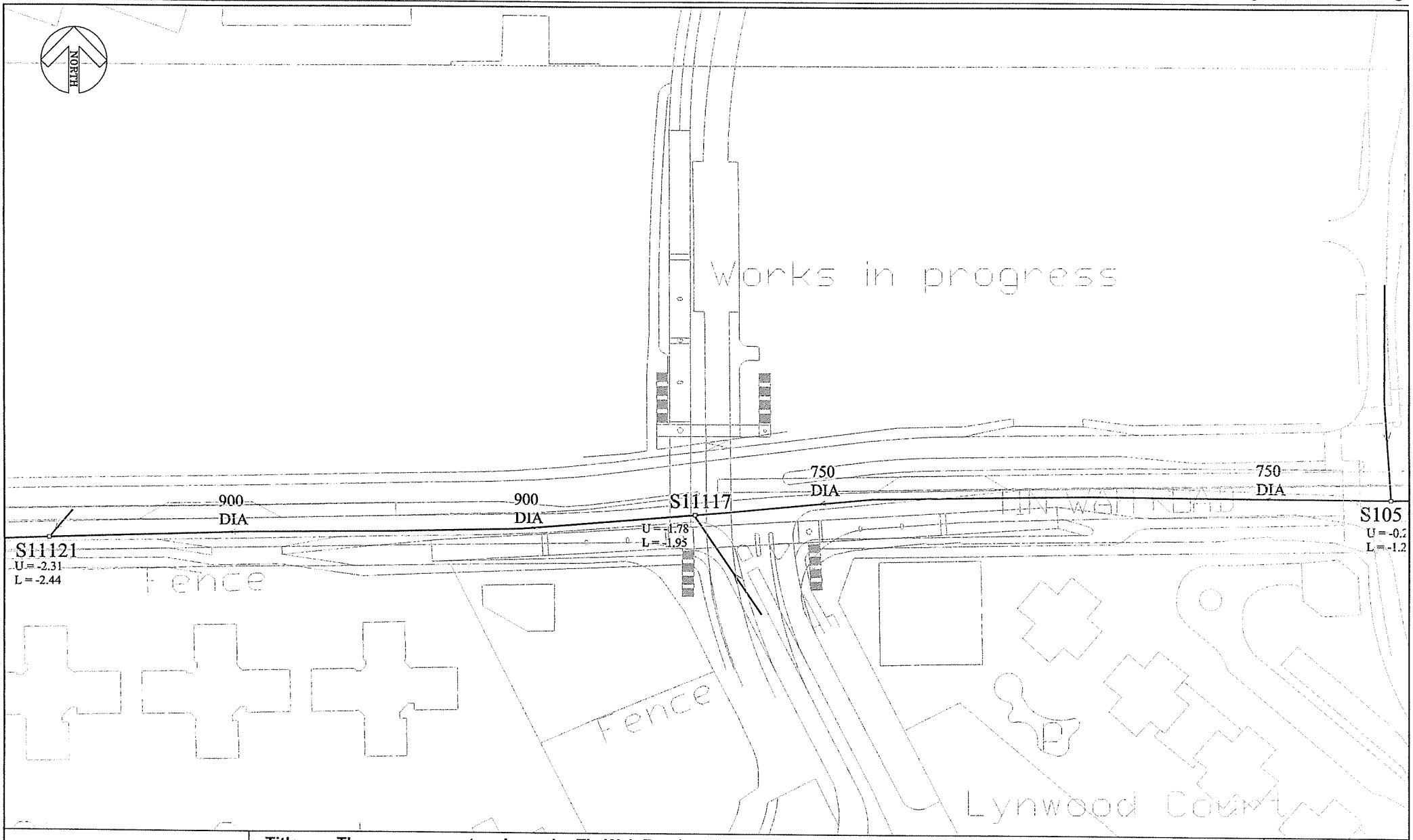
CH2M HILL Hong Kong Limited In association with RPS ADI Ltd. Archaeological Assessments MVA Hong Kong Limited	Title: Total flow to Yuen Long STW from 2000 to 2016	CH2M HILL Hong Kong Limited	
	Project: EIA for Proposed Development at Fung Lok Wai, Yuen Long at Lot 1457 R.P. in D.D. 123	Scale: NTS	Figure: A8-3



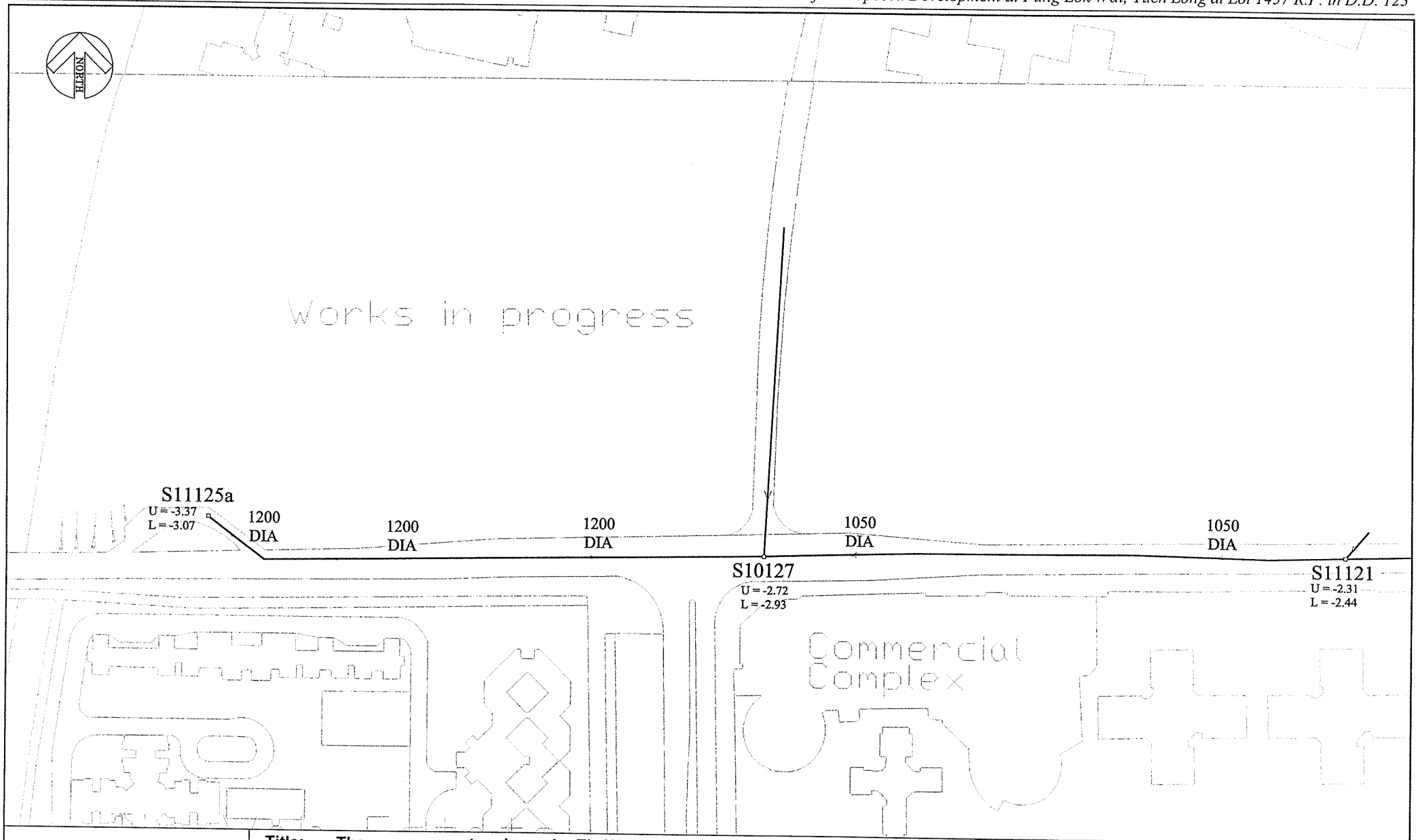
CH2M HILL Hong Kong Limited In association with RPS ADI Ltd. Archaeological Assessments MVA Hong Kong Limited	**Title:** Existing sewerage network and manholes relevant to the proposed Strategy A2	**Scale:** NTS
	Project: EIA for Proposed Development at Fung Lok Wai, Yuen Long at Lot 1457 R.P. in D.D. 123	**Figure:** A8-4



CH2M HILL Hong Kong Limited In association with RPS ADI Ltd. Archaeological Assessments MVA Hong Kong Limited	**Title:** The sewerage networks under Tln Wah Road	**Scale:** NTS
	Project: EIA for Proposed Development at Fung Lok Wai, Yuen Long at Lot 1457 R.P. in D.D. 123	**Figure:** A8-5a



CH2M HILL Hong Kong Limited In association with RPS ADI Ltd. Archaeological Assessments MVA Hong Kong Limited	**Title:** The sewerage networks under Tin Wah Road	**Scale:** NTS
	Project: EIA for Proposed Development at Fung Lok Wai, Yuen Long at Lot 1457 R.P. in D.D. 123	**Figure:** A8-5b



CH2M HILL Hong Kong Limited In association with RPS ADI Ltd. Archaeological Assessments MVA Hong Kong Limited	**Title:** The sewerage networks under Tln Wah Road	**Scale:** NTS
	Project: EIA for Proposed Development at Fung Lok Wai, Yuen Long at Lot 1457 R.P. in D.D. 123	**Figure:** A8-5c

Figure A8-6 Strategy A2 - Population and Flows for Ultimate Development at FLW, YLIE and environs

Sub-catchment Area	Ultimate Population			Ultimate Employment		Industrial										
	Modern Village [1]	R3	Population	Schools [3]	Employment	Industrial Flow (m3/d) [4]	Domestic Population	Equiv. Pop.* (employ)	Regional Pop	Total Pop. Incl. All up-stream	Peaking Factor	ADWF m^3/s	PWWF m^3/s	ADWF incl. All up stream	PWWF** including all up-stream	Corrected *** PWWF
Unit Flow (m3/d) [2]	0.240	0.370		0.025												
Fung Lok Wai Development		8490	8490				8,490	0	8,490	8,490	5.00	0.036	0.182	0.036	0.182	
Man Wa Garden +Surrounding houses	102		102		0		102	0	102	102	8.00	0.0003	0.002	0.0003	0.002	
1	102	8,490	8,592	0	0	0	8,592	0	8,592	8,592	5.00	0.037	0.183	0.037	0.184	0.184
Shing Uk Tsuen	714		714		0		714	0	714	714		0.002		0.002		
Lai Yin Garden + Jade Court + Vienna Villa	533		533		0		533	0	533	533		0.001		0.001		
Tai Tseng Wai + Carole Garden	1,996		1,996		0		1,996	0	1,996	1,996		0.006		0.006		
Ng Uk Tsuen + Tai Tseng Ng Uk Tsuen	1,168		1,168	500	500		1,168	52	1,220	1,220		0.003		0.003		
Leon Court	386		386		0		386	0	386	386		0.001		0.001		
2	4,797	0	4,797	500	500	0	4,797	52	4,849	4,849	5.00	0.013	0.067	0.050	0.251	0.066
Kyoma Industrial Co. Ltd.						149										
TDK Manufacturing (HK) Co. LTd.						198										
CME Agent						121										
Toppan Printing						904										
South China Paper Ltd.						1012										
La Win Lables Specialist Industrial Ltd.						154										
Yau Sang Galvanizers (Hot-Dip) Co.						137										
Yuen Long Textile Co. Ltd.						316										
Premier Printing Grcup Ltd.						316										
Yip Shing Diesel Engineering Co.						342										
Polarcup HK Ltd						435										
United laboratories						205										
The China Engineers Ltd						656										
3						4,945					5.00	0.06	0.286	0.107	0.537	0.286
Total	4,899	8,490	**13,389**	500	**500**	4,945				**4,849**		**0.107**	**0.537**	**0.050**	**0.251**	**0.537**

Note

* Equivalent population determined by multiplying employment population by its unit flow factor (0.250) and then dividing by product by unit flow factor of residential (0.240)

** PWWF including all up-stream is determined by multiplying ADWF including all up-stream by the corresponding peaking factor

*** Corrected PWWF is the difference between PWWF including all up-stream of this sub-catchment and the previous sub-catchment

(1) Every village house is assumed to be in 3 storeys high and has 3 persons per storey
With reference to the the Review and TDSR Scenario B for Yuen Long District, the projected ultimate population for the YLIE environs is 126% of existing population.

(2) Extracted from Table 2 of Sewerage Manual published by DSD

(3) The maximim number of persons of the school is assumed to be 500

(4) With reference to Table 2 of Sewerage Manual published by DSD, the industrial unit flow is assumed to be 660 m3/ d/ hectare of nett area

Figure A8-7 Population and Flows for Ultimate Development at TSWRZ and FLW

	Ultimate Population						Ultimate Employment					Others		Industrial										
Sub-catchment Area	PH (R1/SC) 100%	PH (R2) 100%	PRE 100%	HOS/PSPS 100%	PH (R3) / C/R	Population	GIC	Office	Retail in Housing Development	Hotel	Employment	Institution (schools)	Hotel/ Hospital	Industrial Flow (m3/d)	Domestic Population	Equiv. Pop.* (employ)	Regional Pop	Total Pop. Incl. All up-stream	Peaking Factor	ADWF m^3/s	PWWF m^3/s	ADWF incl. All up stream	PWWF** including all up-stream	Corrected *** PWWF
Unit Flow (m3/d) (1)	0.240	0.300	0.175	0.240	0.370		0.060	0.350	0.350	2.300		0.025	0.300											
FLW					8490	8490									8,490	0	8,490	8,490	5.00	0.0364	0.182	0.0364	0.182	
Area 120						0	300 (7)				300				0	75	75	75	8.00	0.0002	0.002	0.0002	0.002	
1	0	0	0	0	8,490	8,490	300	0	0	0	300	0	0	0	8,490	75	8,565	8,565	5.00	0.0366	0.183	0.0366 #	0.183 0	0.183
Area 117a						0					0				0	0	0	0		0.0001		0.0001		
Area 117b						0					0				0	0	0	0		0.0001		0.0001		
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8,565	5.00	0.0001	0.001	0.0367 #	0.183 #	0.000
Area 104a###		2850 (5)				2,850			750 (3)		750				2,850	1,094	3,944	3,944		0.013		0.013		
3	0	2,850	0	0	0	2,850	0	0	750	0	750	0	0	0	2,850	1,094	3,944	12,509	4.00	0.013	0.052	0.050 #	0.198 #	0.015
Area 104b###		2850 (5)				2,850			750 (3)		750				2850 (5)	1,094	3,944	3,944		0.013		0.013		
Area 103a###	6300 (5)					6,300			538 (3)		538	1500 (6)			6300 (5)	784	7,084	7,084		0.020		0.020		
Area 108a					750 (3)	750			1400 (4)		1,400				750 (5)	2,042	2,792	2,792		0.006		0.006		
Area 108b					750 (3)	750			400 (4)	700 (7)	1,100		1000 (4)		750	28,535	29,285	29,285		0.024		0.024		
Area 109a						0	224 (3)				224	1500 (6)			0	56	56	56		0.001		0.001		
Area 109b						0	225 (3)				225	3000 (6)			0	56	56	56		0.001		0.001		
Area 107b						0					0				0	0	0	0		0.0001		0.0001		
Area 114						0					0				0	0	0	0		0.0001		0.0001		
115					2650 (3)	2,650			1475 (3)		1,475				2650 (5)	2,151	4,801	4,801		0.006		0.006		
116						0					0	3000 (6)			0	0	0	0		0.001		0.001		
4	6,300	2,850	0	0	4,150	13,300	449	0	4,563	700	5,712	9,000	1,000	0	13,300	34,718	48,018	60,527	4.00	0.071	0.284	0.121 #	0.483 0	0.284
103b###	6300 (5)					6,300			538 (4)		538	1500 (6)			6300 (5)	784	7,084	7,084		0.020		0.034		
5	6,300	0	0	0	0	6,300	0	0	538	0	538	1,500	0	0	6,300	784	7,084	67,611	4.00	0.020	0.080	0.154 #	0.618 0	0.135
31b####				4622 (5)		4,622			119 (4)		119	1125 (6)			4622 (5)	174	4,796	4,796		0.014		0.014		
31d####				4622 (5)		4,622			119 (4)		119	1125 (6)			4622 (5)	174	4,796	4,796		0.014		0.014		
33b#####				4200 (5)		4,200	300 (3)		520 (4)		820				4200 (5)	833	5,033	5,033		0.014		0.014		
6	0	0	0	13,444	0	13,444	300	0	759	0	1,059	2,250	0	0	13,444	1,181	14,625	82,236	3.55	0.041	0.146	0.196 #	0.690 0	0.072
102a			15309 (9)			15,309			347 (4)		347				15309 (9)	506	15,815	15,815		0.032		0.032		
7	0	0	15,309	0	0	15,309	0	0	347	0	347	0	0	0	15,309	506	15,815	98,051	3.43	0.032	0.111	0.228 #	0.782 0	0.091
101				12737 (9)		12,737			211 (4)		211				12737 (9)	308	13,045	13,045		0.036		0.036		
102b				15565 (9)		15,565			353 (4)		353	7500 (6)			15565 (9)	515	16,080	16,080		0.047		0.047		
105			15310 (9)			15,310			9 (4)		9	1500 (6)			15310 (9)	13	15,323	15,323		0.031		0.031		
106				8755 (9)		8,755			292 (4)		292	1500 (6)			8755 (9)	426	9,181	9,181		0.026		0.026		
107a						0					0				0	0	0	0		0.0001		0.0001		
110				16538 (9)		16,538			290 (4)		290	3000 (6)			16538 (9)	423	16,961	16,961		0.048		0.048		
111a				5700 (9)		5,700			229 (4)		229				5700 (9)	334	6,034	6,034		0.017		0.017		
111b				5700 (9)		5,700					0	1500 (6)			5700 (9)	0	5,700	5,700		0.016		0.016		
112					3650 (3)	3,650			2025 (3)		2,025				3650 (5)	2,953	6,603	6,603		0.024		0.024		
113						0					0	3000 (6)			0 (9)	0	0	0		0.001		0.001		
8	0	0	15,310	64,995	3,650	83,955	0	0	3,409	0	3,409	18,000	0	0	83,955	4,972	88,927	186,978	3.08	0.246	0.758	0.474 #	1.461 0	0.679
Existing total	12,600	5,700	30,619	78,439	16,290	143,648	1,049	0	10,365	700	12,114	35,250	1,000	0				186,978	0	0.461	1.615	0.474 #	1.461 #	1.461

Note

* Equivalent population determined by multiplying employment population by its unit flow factor (0.350) and then dividing by product by unit flow factor of residential (0.240)

** PWWF including all up-stream is determined by multiplying ADWF including all up-stream by the corresponding peaking factor

*** Corrected PWWF is the difference between PWWF including all up-stream of this sub-catchment and the previous sub-catchment

~ Peaking factor of 2 is used for industrial flow while domestic and employmental flow uses a peaking factor based on the accumulated equivalent population including all up-stream

\# Industrial flow has been excluded when calculating the ADWF including all up-stream

Industrial flow with a peaking factor of 2 has been included when calculating the corrected PWWF

Assume the sewerage flow at (a) and (b) are at equal amount

Assume the sewerage flow at 31a, 31b, 31c and 31d are at equal amount

Assume the sewerage flow at 33b and 33c are at equal amount

(1) Extracted from Table 2 of Sewerage Manual published by DSD

(2) Table 7.5 of Report on Preparation of Layout Plans for Tin Shui Wai Reserve Zone (see Appendix G)

Development Proposal for Area 108

Use	Proposed Floorspace (m2)/Population	
Office	5000 m2	(Assume 0.2 employee/m^2)
Retail	20000 m2	(Assume 0.04 employee/m^2)
Hotel	500	rooms (2beds/room and 0.3m^2/bed/day)
Residential	1500	persons

The residential and retail development is divided equaly between areas 108a and 108b.

Area 108a includes office development and Area 108b includes hotel development.

(3) For area where non-domestic GFA is not available, assume 250 employee/ha of land

(4) For retail area (which comprises shopstalls, shops, restaurants, nusery, kindergartens, management offices etc) where non-domestic GFA is available, assume 0.04 employee/m2 of GFA

Ref: HD's letter ref HD(P) 7/2/Y_5/2 dated 31st January 1996 and

BCL's fax to PM/NTN ref JL/C018/350 dated 31st January 1996

(5) Table 1 of Working Paper on Development Logistics, Planning Data and Parameters for the Study

(6) The maximim number of persons of each school is assumed to be 1500

(7) For hotel, assume 0.7 employee/bed

(8) Nominal sewage flow is assumed in open space area to take account of the possibility of having latrines/RCPs

(9) Based on data for Housing Department's Traffic and Enviornmental Re-assessment Study

		ADWF	PWWF
Proposed pumping station at Area 101 will have an ultimate capacity for a peak flow (ADWF)		1284 l/s	3.417 m3/s
Global Peak Factor for Pumping Station=	2.66	110937.6 m3/day	

Source: Agreement No. CE 10/95 Tin Shui Wai Development Engineering Investigations For Development of Areas 3, 30 and 31 of the Development Zone and the Reserve Zone Final Investigation Report Volume 1 - March 1997