
Appendix I
Sewerage Impact Assessment

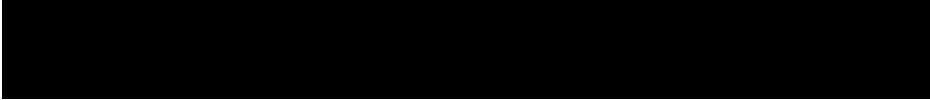
Section 12A Planning Application for Proposed Amendments to the Sha Tin Outline Zoning Plan to Rezone “Open Space” Zone to “Other Specified Use” annotated “Hotel Development” Zone in Support of Proposed Hotel Development at Various Lots in D.D. 184 and Adjoining Government Land, Sha Tin, New Territories

Sewerage Impact Assessment

June 2026

Prepared by:

AECOM Asia Company Limited



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1. Introduction

1.1 Background

- 1.1.1 AECOM Asia Company Limited (AECOM) was commissioned by the Applicant to conduct a Sewerage Impact Assessment (SIA) in support of a Section 12A Application under the Town Planning Ordinance (Cap. 131), to rezone the Application Site from "Open Space" ("O") to "Other Specified Use" annotated "Hotel Development" on the draft Sha Tin Outline Zoning Plan (OZP) No. S/ST/39.
- 1.1.2 The Application Site is bounded by Shing Mun River (SMR) to the north, Tai Chung Kiu Road to the south and Lion Rock Tunnel Road to the west. The location of the Application Site is indicated in **Figure 1**.
- 1.1.3 The subject planning application aims to make better use of the valuable land resources of the Application Site to facilitate a proposed hotel development (the Proposed Development) with an active public realm that contains retail/F&B, recreational elements, and the preserved Main Building of Ng Yuen.

1.2 Objective of this Submission

- 1.2.1 This report outlines the assessment results of the potential sewerage impacts caused by the Proposed Development at the Application Site. The main objectives of this assessment include the followings:
 - (i) Identify any increase in sewage flow due to the Proposed Development.
 - (ii) Review the existing sewerage condition of the Application Site based on available information.
 - (iii) Outline the methodology adopted in this assessment.
 - (iv) Assess any potential impact on the existing or planned sewerage facilities nearby due to the Proposed Development.
 - (v) Propose mitigation measures and/or improvement works to minimize any potential sewerage impact from the Proposed Development.
 - (vi) Discuss the responsibility of the construction and maintenance aspects of the proposed sewerage system.

1.3 Nomenclature

1.3.1 The following abbreviations and shortened expressions in **Table 1** are adopted in this report.

| | |
|--------|---|
| ADWF | Average Dry Weather Flow |
| AECOM | AECOM Asia Company Limited |
| CIF | Catchment Inflow Factor |
| CIFSUS | Commercial and Industrial Floor Space Utilization Survey (PlanD) |
| DSD | Drainage Services Department |
| EPD | Environmental Protection Department |
| F&B | Food and Beverage |
| GESF | Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning Version 1.0 (EPD) |
| GFA | Gross Floor Area |
| mPD | Metres above Principal Datum |
| PlanD | Planning Department |
| STSTW | Sha Tin Sewage Treatment Works |
| SIA | Sewerage Impact Assessment |
| THEES | Tolo Harbour Effluent Export Scheme |
| UFF | Unit Flow Factor |

Table 1 – Nomenclature

2. Development Proposal

2.1 The Indicative Development Proposal

- 2.1.1 The Application Site has an area of about 4,561.5 m² with a Plot Ratio of about 4.0. The total Gross Floor Area (GFA) is about 18,246 m² which included the Hotel development and the preserved Main Building of Ng Yuen for adaptive re-use.
- 2.1.2 The proposed hotel development consists of 443 hotel rooms, which provides accommodation for 886 guests based on 2 persons per room design ratio. For sewerage assessment purposes, it is assumed that each employee serves up to 3 rooms.
- 2.1.3 The Master Layout Plan (MLP) of the proposed hotel development is shown in **Figure 2**. The development schedule is summarized in **Table 2** below.

| Development Parameters | Proposed Development |
|---|--|
| Application Site Area (m ²) (about) | 4,561.5 ⁽¹⁾ |
| Total Non-domestic GFA (m ²) (about) | 18,246 ⁽²⁾ |
| <ul style="list-style-type: none"> • Hotel • Commercial Use ⁽³⁾ | <p>17,446</p> <p>800</p> |
| Total Non-domestic Plot Ratio | About 4.0 |
| Maximum Building Height (to the main roof) | Not more than 68mPD |
| No. of Storeys | 14 |
| Site Coverage | |
| <ul style="list-style-type: none"> • Height not exceeding 15m • Height Over 15m | <p>Not more than 100%</p> <p>Not more than 62.5%</p> |
| No. of Hotel Rooms | 443 |
| No. of Blocks | 2 |

Table 2 – Key Development Parameters

Remarks:

- (1) Subject to detailed land survey at subsequent detailed design and land grant stage.
- (2) Excluding GFA to be exempted under Building (Planning) Regulation such as back-of-house area to support the hotel, E/M plant rooms, car parking area, sky garden, etc.
- (3) Includes ‘Shop and Services’, ‘Eating Place’, ‘Place of Entertainment’ and ‘Place of Recreation, Sports or Culture’ uses at the commercial portion.

3. Assessment Methodology

3.1 Overview of Methodology

- 3.1.1 This assessment is carried out to assess the sewerage impact arising from the Proposed Development on the sewerage system.
- 3.1.2 The sewage generated from the Proposed Development is estimated according to “Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning” (GESF) published by Environmental Protection Department (EPD). The sewage calculation is in accordance with the Sewerage Manual published by Drainage Services Department (DSD).

3.2 Methodology and Assumptions

- 3.2.1 The adopted sewage unit flow factors for sewage estimation and calculation are summarized in **Table 3**.

| Development Type | Flow Type | Unit Flow Factor (UFF) (m ³ /head/day) |
|-----------------------------------|-----------|--|
| Retail (non-Food and Beverage) | J4 | 0.28 |
| Restaurants & Hotels | J10 | 1.58 |

Table 3 – Unit Flow Factors

- 3.2.2 For the non-domestic population, the worker density adopted for business use is made reference to Commercial and Industrial Floor Space Utilization Survey (CIFSUS) published by the Planning Department (PlanD). The adopted worker density are summarized in **Table 4**.

| Commercial Activities | Workers per GFA (in 100 m ²) |
|-----------------------|--|
| Restaurants & Hotels | 5.1 |
| Retail (Non-F&B) | 3.5 |

Table 4 – Worker Density

- 3.2.3 The peaking factor is made reference to Table T-5 of GESF. The adopted worker density are summarized in **Table 5**.

| Population Range | Peaking Factor (including stormwater allowance) for facility with existing upstream sewerage | Peaking Factor (excluding stormwater allowance) for facility with new upstream sewerage |
|------------------|--|---|
| 1,000 – 5,000 | 6 | 5 |

Table 5 – Peaking Factor

- 3.2.4 **Table 6** displays the Catchment Inflow Factor (CIF) used to calculate the sewage discharged to the 1,800mm diameter trunk sewer.

| Catchment | Catchment Inflow Factor (CIF) |
|-----------|-------------------------------|
| Sha Tin | 1.15 |

Table 6 – Catchment Inflow Factor

4. Review on Existing Sewerage System

4.1 Existing Sewerage Network

- 4.1.1 The Application Site is located within the Sha Tin sewerage catchment area. The sewage flows generated from the sub-catchments upstream of the Application Site are collected by the existing sewerage systems and be conveyed by Sha Tin Sewage Pumping Station for onward discharge to Sha Tin Sewage Treatment Works (STSTW) to carry out wastewater treatment. The treated effluent will be conveyed by Sha Tin Effluent Pumping Station through the Tolo Harbour Effluent Export Scheme (THEES).
- 4.1.2 According to the DSD record, there are existing 225 mm sewers and associated sewerage manholes located at the eastern side of the Application Site as shown in **Figure 3**. These sewers are then connected to the existing 1,800mm diameter trunk sewer located beneath Tai Chung Kiu Road. The trunk sewer collects the sewage flows generated from the upstream sub-catchments and the Application Site, conveying them to the existing Sha Tin Sewage Pumping Station (STSPS) at Yuen Wo Road, and ultimately discharging to STSTW.

4.2 Sewage Treatment Capacity

- 4.2.1 According to the public information from DSD, the STSTW has a maximum treatment capacity of 340,000 m³/day while the current actual sewage discharge into STSTW is around 260,000 m³/day; the remaining treatment capacity of about 80,000 m³/day for future developments. Since the proposed discharge of this application site is about 270.94 m³/day, the treatment capacity is much more than sufficient.

5. Proposed Sewerage System

5.1 Flow Estimation

- 5.1.1 The proposed hotel development comprises of 443 hotel rooms. A summary of total sewage flow to be discharged from the Proposed Development are presented in **Annex 1**. The flow estimation is based on GESF method using unit flow factors multiplied by designed population and peaking factor. There is no significance to compare the sewage flow before and after the Proposed Development. Instead, the focus should be on the adequacy of the existing sewerage network, the impact from the Proposed Development and to align with current standard of flow estimation to decide if upgrading work is required.
- 5.1.2 The estimated Average Dry Weather Flow (ADWF) generated from the Proposed Development is about 270.94 m³/d. The backwash of swimming pool included is presented in **Annex 2**. A 2m x 1m x 2.5m holding tank is designed to store the backwash, in which the peak flow of it is 1.95 L/s. **Table 7** below presents different types of sewage flow to be discharged from the Proposed Development.

| Flow Type | Average Dry Daily Flow (ADWF) (m ³ /day) |
|-----------------------------|---|
| Hotel | 233.84 |
| F&B | 33.18 |
| Retail | 3.92 |
| Swimming Pool Backwash | 3.52 |
| Total ADWF (excl. Backwash) | 270.94 |

Table 7 – Sewerage Estimation for the Proposed Development

- 5.1.3 Peaking factor is determined based on the contributing population. The contributing population is calculated according to GESF Section 12.1.

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

- 5.1.4 With catchment inflow factor of 1.15, the ADWF will be 311.58 m³/day. With a peaking factor of 6, the peak flow generated from the Proposed Development (including the 1.95 L/s peak flow of backwash for swimming pool mentioned above) is about 24 L/s.

5.2 Mitigation Measures

- 5.2.1 Due to the limited capacity of the existing 225mm sewer located to the west of the Proposed Development, the sewage generated from the Proposed Development would be discharged into the proposed manhole FMH1 from the proposed terminal manhole FTMH1 through a proposed 450mm diameter sewer pipe, and subsequently discharge into the existing 1,800mm diameter trunk sewer downstream located beneath Tai Chung Kiu Road by pipe jacking as shown in **Figure 4**. The sewage flow of the upstream and downstream catchments is estimated and shown in **Annex 4**.
- 5.2.2 Hydraulic calculation as shown in **Annex 3** confirmed that sewage discharged from the Proposed Development utilises less than 1% of the capacity of the existing 1,800mm diameter trunk sewer located beneath Tai Chung Kiu Road. Its utilisation including the upstream and downstream sewage flow, as well as the sewage discharged from the Proposed Development is around 70%, hence the sewerage impact of the Proposed Development is negligible.
- 5.2.3 Sewage discharged from the Application Site to STSTW is insignificant compared to its intake from the 1,800mm diameter trunk sewer. Hence, the impact is considered insignificant.

6. Maintenance Responsibility

- 6.1.1 The Applicant will be responsible for construction of the internal sewer and sewerage manholes within the Application Site. Future property management will be responsible for the maintenance of the internal sewer and manholes within the Application Site.
- 6.1.2 The Proposed Development will be responsible for construction of all necessary sewerage connection works to the public sewerage system. The sewerage systems outside the site boundary are proposed to be handed over to relevant government department for future maintenance.

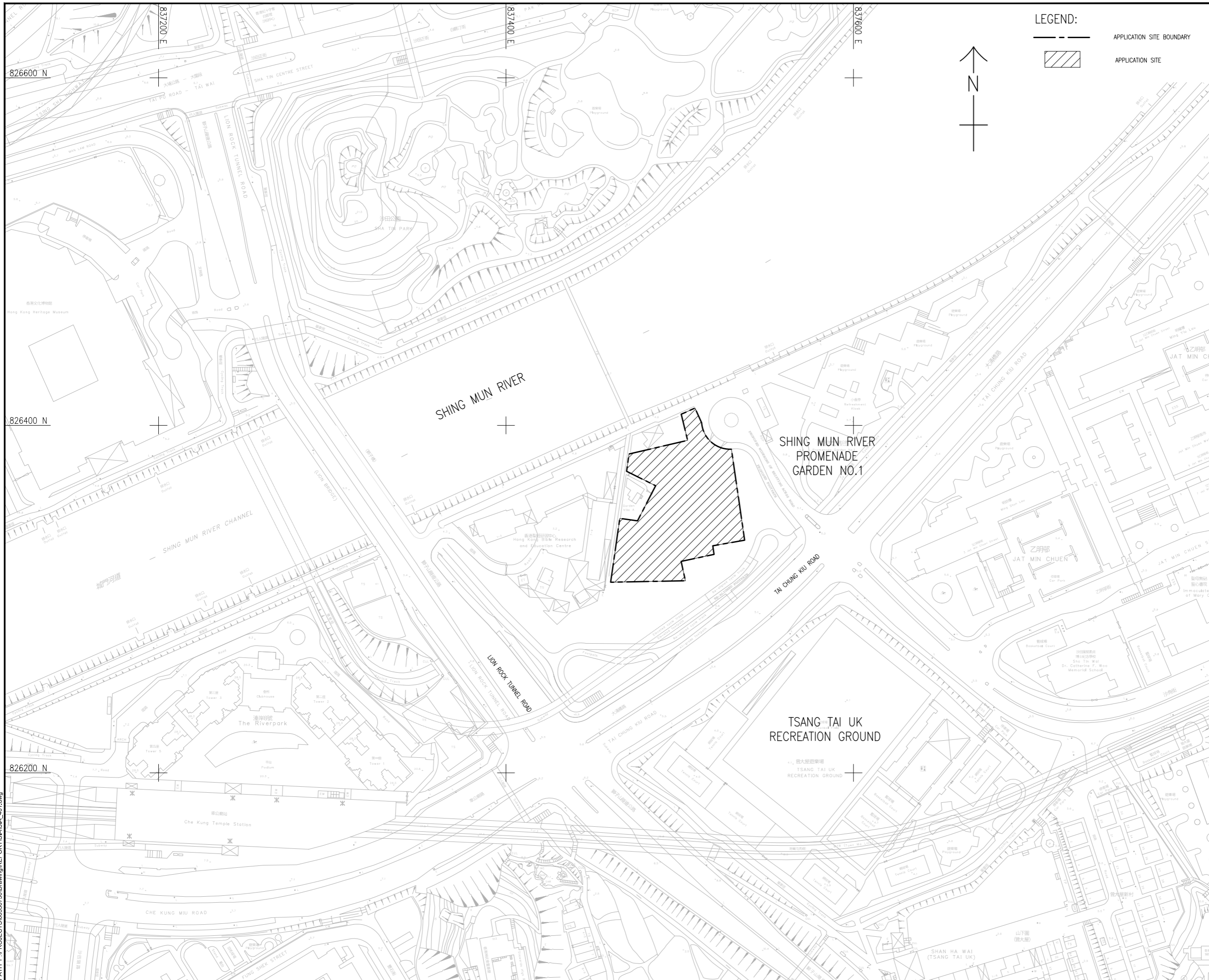
7. Conclusion

- 7.1.1 This SIA report serves as a supporting document for rezoning the Application Site from "Open Space" Zone to "Other Specified Use" annotated "Hotel Development" Zone to facilitate to a proposed hotel development. The SIA has been carried out to assess the potential sewerage impact due to the Proposed Development.
- 7.1.2 The ADWF generated from the Application Site is about 270.94 m³/day (excluding the backwash for swimming). After including the catchment inflow factor, the peak flow generated from the Proposed Development including the backwash for swimming pool is 24 L/s. The sewage generated from the Application Site will be conveyed to the proposed manhole FMH1 via the proposed 450mm diameter sewer pipe.
- 7.1.3 Sewage collected will then be subsequently discharged into the existing 1,800mm diameter trunk sewer located beneath Tai Chung Kiu Road. Sewage discharged from the Application Site to STSTW is insignificant compared to its intake from the 1,800mm diameter trunk sewer. Hence, the impact is considered insignificant.
- 7.1.4 The proposed sewerage layout is shown in **Figure 4**. With the implementation of the proposed sewerage arrangement, no insurmountable sewerage impacts are anticipated.

End of Report

Figures

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▨ APPLICATION SITE



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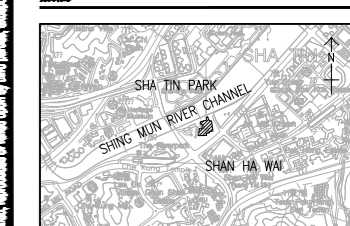
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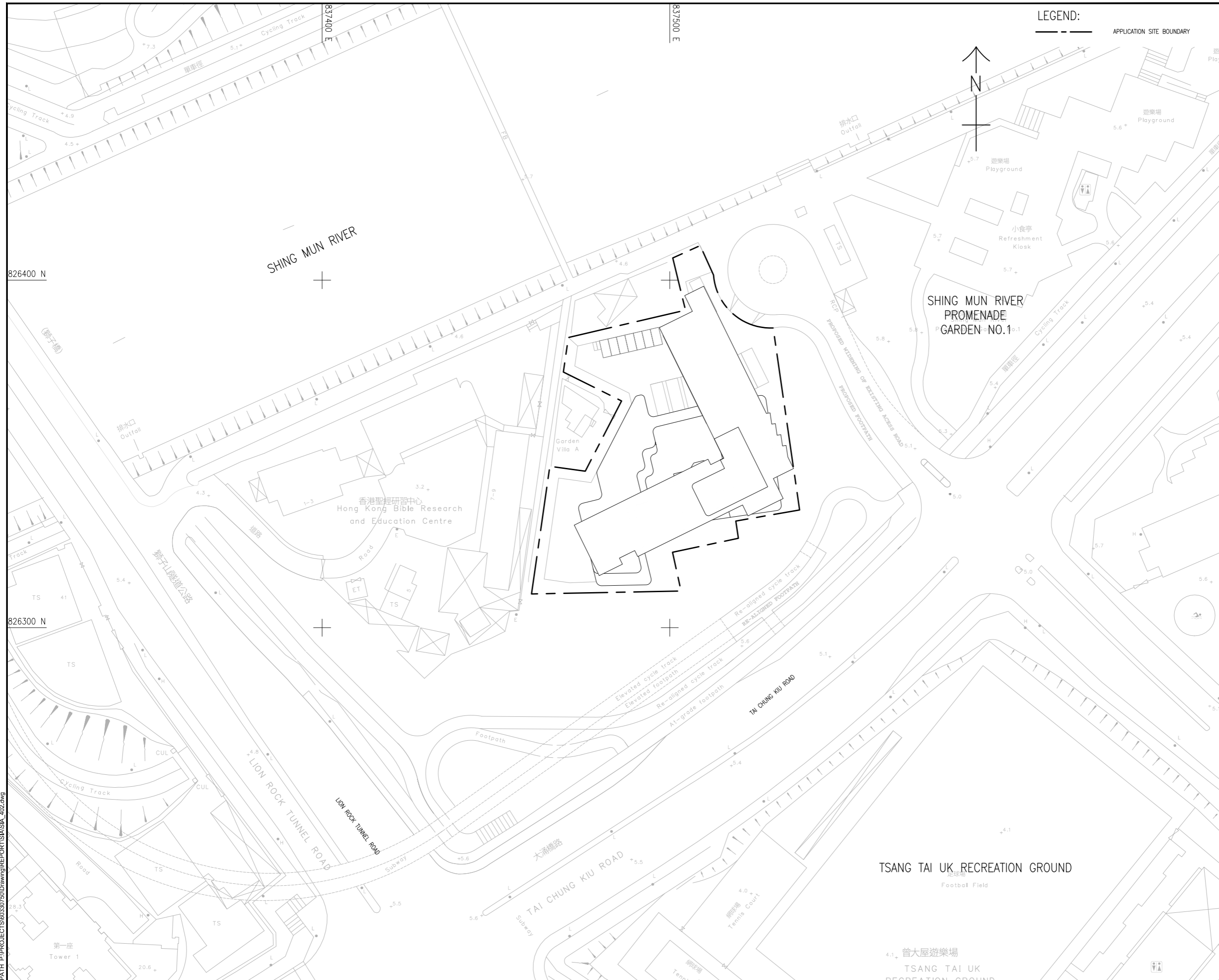
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SITE LOCATION PLAN

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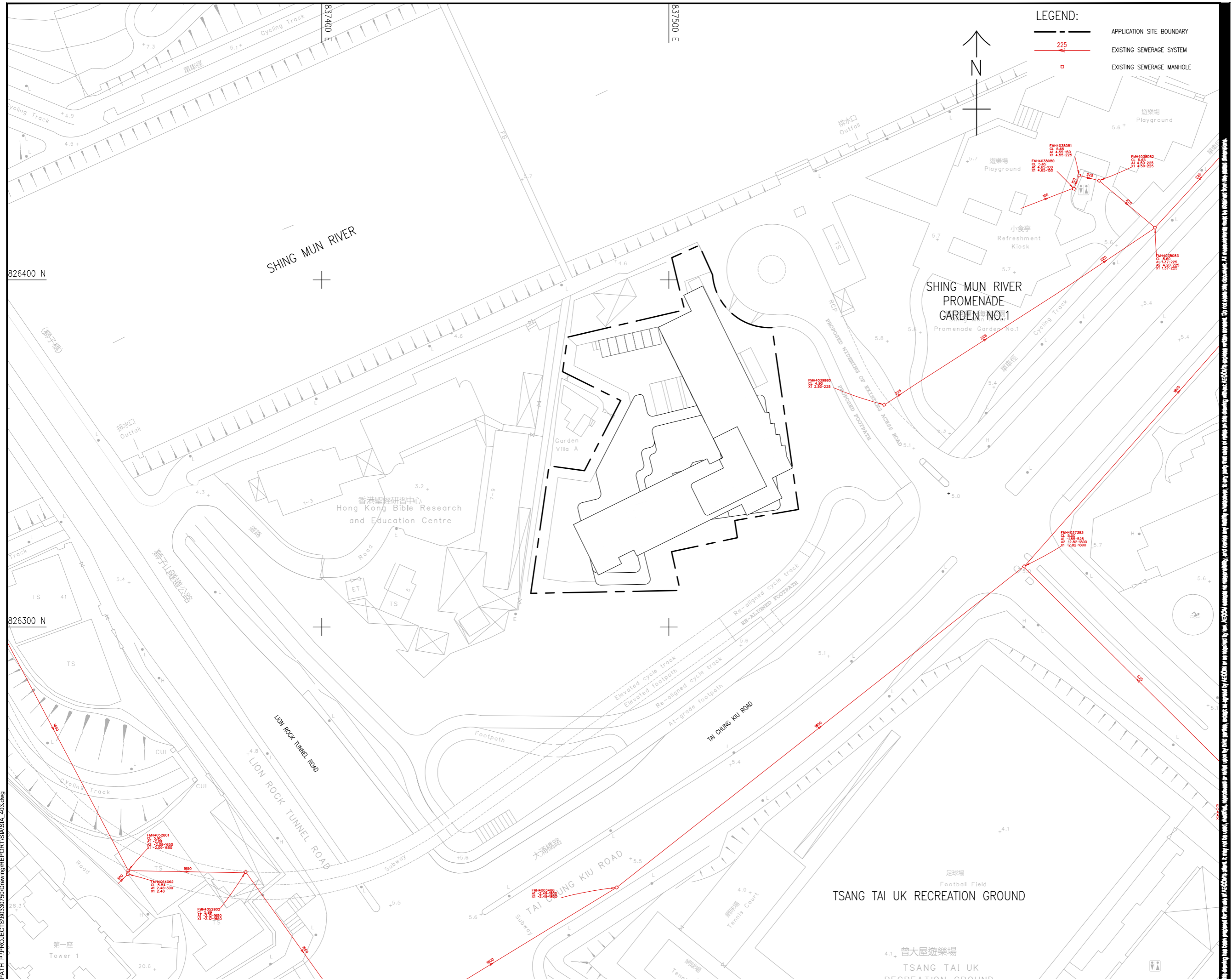
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- APPLICATION SITE BOUNDARY
- 225 EXISTING SEWERAGE SYSTEM
- EXISTING SEWERAGE MANHOLE

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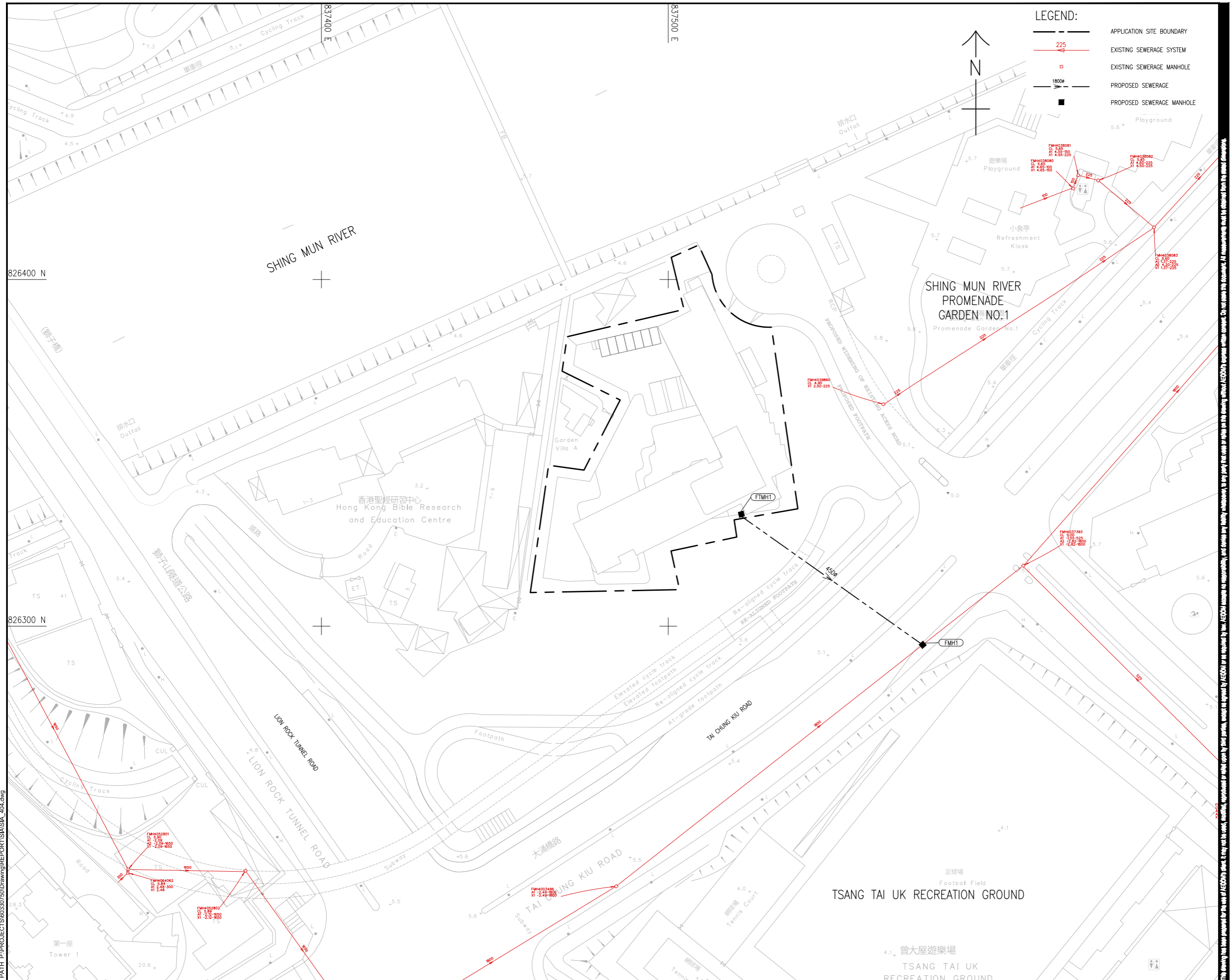
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- PROPOSED SEWERAGE
- EXISTING SEWERAGE MANHOLE
- PROPOSED SEWERAGE MANHOLE

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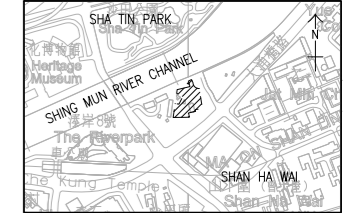
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Annex 1

Proposed Development Sewage Estimation

Current Scheme

| <u>Hotel</u> | No. of Rooms |
|--------------|--------------|
| No. of Rooms | 443 |

| <u>Workers</u> | Worker's Type | Employee | Unit Flow Factor | ADWF (m ³ /d) |
|------------------------|----------------------------|----------|------------------|--------------------------|
| Rooms per employee = 3 | Hotels and Boarding Houses | 148 | 1.58 | 233.84 |
| | J10 Restaurants & Hotels | | | |
| Sub-total | | | | 233.84 |

| <u>Workers</u> | GFA (m ²) | Worker's Type | Workers per GFA (in 100m ²) ⁽³⁾ | Employee | Unit Flow Factor | ADWF (m ³ /d) |
|---|-----------------------|--------------------------|--|----------|------------------|--------------------------|
| GFA for F&B (m ²) ⁽¹⁾ | 400 | Restaurants | 5.1 | 21 | 1.58 | 33.18 |
| | | J10 Restaurants & Hotels | | | | |
| GFA for Retail (m ²) ⁽²⁾ | 400 | Retail Trade | 3.5 | 14 | 0.28 | 3.92 |
| | | J4 Wholesale & Retail | | | | |
| Sub-total | | | | | | 37.10 |

Remarks:

⁽¹⁾ Assume 50% of the Commercial GFA is for F&B use

⁽²⁾ Assume 50% of the Commercial GFA is for Retail use.

| <u>Sewage Type</u> | ADWF (m ³ /d) | Catchment Inflow Factor | ADWF with Catchment Inflow Factor (m ³ /d) | Peaking factor | Peak flow (m ³ /s) |
|---|--------------------------|-------------------------|---|----------------|-------------------------------|
| Backwash for Swimming pool (m ²) ⁽³⁾ | 3.52 | 1.15 | 4.05 | - | 0.00195 |

⁽³⁾ Assume the backwash operation will be taken place only during non-peak hours, hence no peaking factor shall be included

| | ADWF (m ³ /d) | Catchment Inflow Factor | ADWF with Catchment Inflow Factor (m ³ /d) | Peaking factor incl. stormwater allowance | Peak flow (m ³ /s) |
|-----------------------------|--------------------------|-------------------------|---|---|-------------------------------|
| Total (excl. Pool Backwash) | 270.94 | 1.15 | 311.58 | 6 | 0.022 |
| Total (incl. Pool Backwash) | - | - | - | - | 0.024 |

Annex 2

Swimming Pool Backwash Calculation

Estimation of backwash

| | | |
|--|---|---------------------------------------|
| Pool area | = | 125 m ² |
| Pool depth | = | 1.5 m |
| Pool volume | = | 187.5 m ³ |
| Turnover rate | = | 4 hrs |
| Flow rate | = | 46.88 m ³ /hr |
| Surface loading rate of filter | = | 20 m ³ /m ² /hr |
| Filter Areas Required | = | 2.34 m ² |
| Assume backwash duration | = | 3 min/day |
| Assume backwash flow rate | = | 30 m ³ /m ² /hr |
| Volume of backwash | = | 3.52 m ³ /day |
| Peak flow | = | 0.02 m ³ /s |
| Assume proposed sewage holding tank volume for storing backwash: | | |
| Length | = | 2 m |
| Width | = | 1 m |
| Height | = | 2.5 m |
| Proposed sewage holding tank volume | = | 5 m ³ |
| Assumed duration of the Holding Tank | = | 0.5 hr |
| Peak flow of the Holding Tank | = | 0.00195 m ³ /s |

Annex 3

Hydraulic Checking

Annex 3

| AECOM | | Hydraulic Review | | | | | | | | | | | | |
|------------------------------|------------|-------------------------|--------------|--------------|-------|--------|--------|----------|----------------|----------|----------|--------------------|-----------------|------------------|
| Asia Co. Ltd. | | | | | | | | | | | | | | |
| Manhole | | Pipe | | | | | | | | | | | | |
| U/S | D/S | Size | No. of Pipes | Invert Level | | Length | Grad | Material | k _s | Velocity | Capacity | Upstream peak flow | Total Peak Flow | Utilisation Rate |
| | | | | U/S | D/S | | | | | | | | | |
| ⁽¹⁾ FMH4003474 | FMH4003475 | 1650 | 1 | -1.60 | -1.67 | 96.4 | 1377.1 | Conc | 3.0 | 1.01 | 2.164 | - | 2.164 | 100.00% |
| ⁽²⁾ FMH4003490 | FMH4003486 | 1800 | 1 | -2.33 | -2.49 | 83.5 | 521.9 | Conc | 3.0 | 1.74 | 4.424 | 2.164 | 3.006 | 68.0% |
| FTMH1 | FMH1 | 450 | 1 | -2.09 | -2.74 | 65.0 | 100 | Conc | 3.0 | 1.63 | 0.259 | - | 0.024 | 9.3% |
| FMH4003486 | FMH1 | 1800 | 1 | -2.49 | -2.82 | 148.9 | 451.2 | Conc | 3.0 | 1.87 | 4.758 | 3.01 | 3.006 | 63.18% |
| FMH1 | FMH4037393 | 1800 | 1 | -2.74 | -2.82 | 37.0 | 451.2 | Conc | 3.0 | 1.87 | 4.758 | 3.030 | 3.030 | 63.68% |
| ⁽³⁾⁽⁴⁾ FMH4037393 | FMH4070154 | 1800 | 1 | -2.82 | -2.84 | 10.7 | 451.2 | Conc | 3.0 | 1.87 | 4.758 | 3.030 | 3.387 | 71.19% |
| FMH4070154 | FMH4038085 | 1800 | 1 | -2.84 | -3.13 | 123.9 | 432.8 | Conc | 3.0 | 1.91 | 4.858 | 3.387 | 3.387 | 69.72% |
| FMH4038085 | FMH4038086 | 1800 | 1 | -3.13 | -3.48 | 162.8 | 465.2 | Conc | 3.0 | 1.84 | 4.686 | 3.387 | 3.387 | 72.29% |

Remarks:

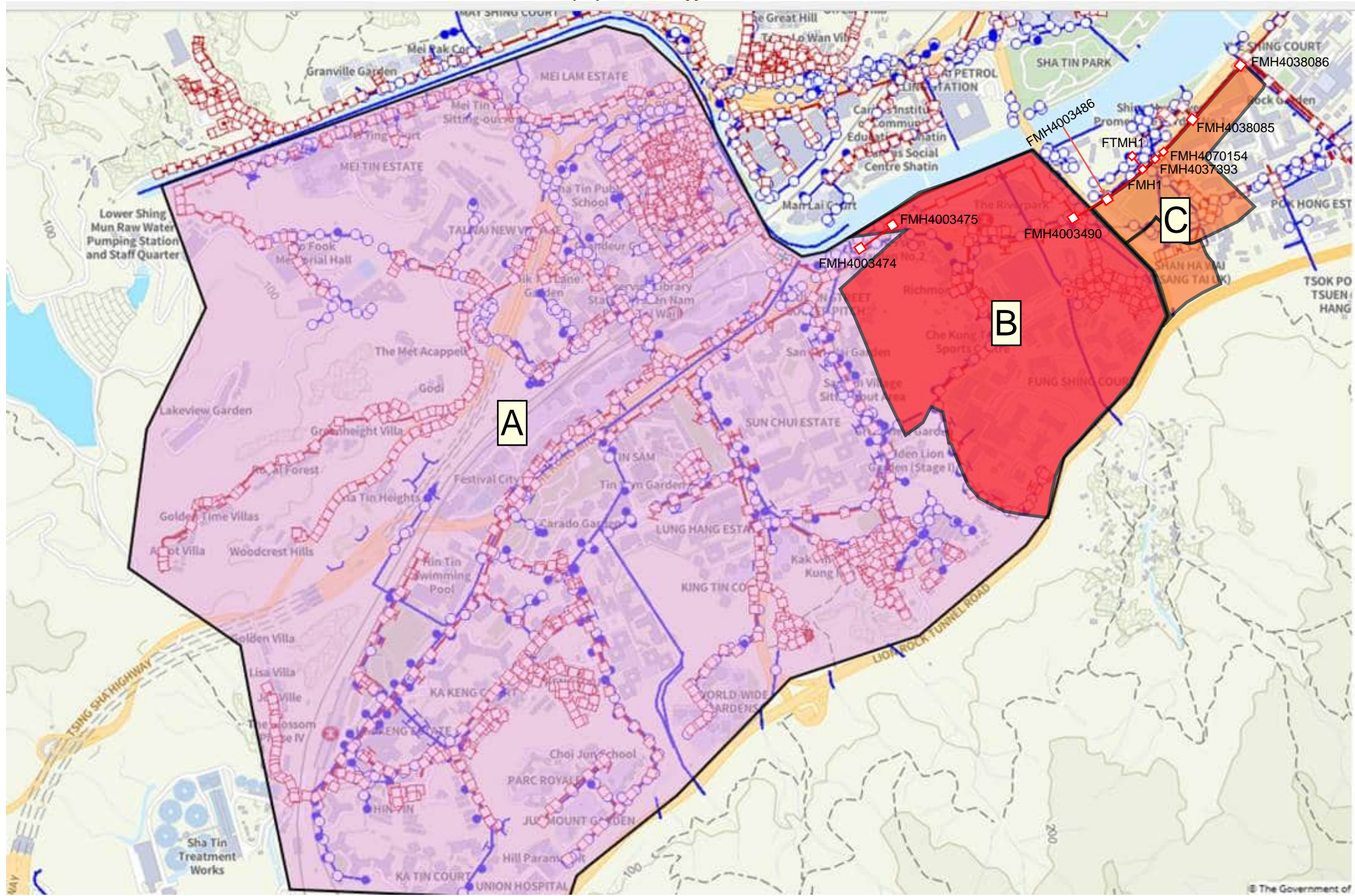
⁽¹⁾ Assume the pipe between FMH4003474 and FMH4003475 is fully bored (i.e. utilisation =100%), please refer to Annex 3(a) Sewage Catchment Area A in the next page for the corresponding sewage flow discharged to this pipe.

⁽²⁾ Please refer to Annex 3(a) Area B for the corresponding sewage flow discharged to the pipe between FMH4003490 and FMH4003486.

⁽³⁾ The downstream sewage from FMH4037393 flows through FMH4070154 to FMH4038085. However, as no recorded levels of FMH4070154 are found, it is assumed that the gradients between FMH4037393 and FMH4038085 are the same.

⁽⁴⁾ Please refer to Annex 3(a) Area B for the corresponding sewage flow discharged to the pipe between FMH4037393 and FMH4070154.

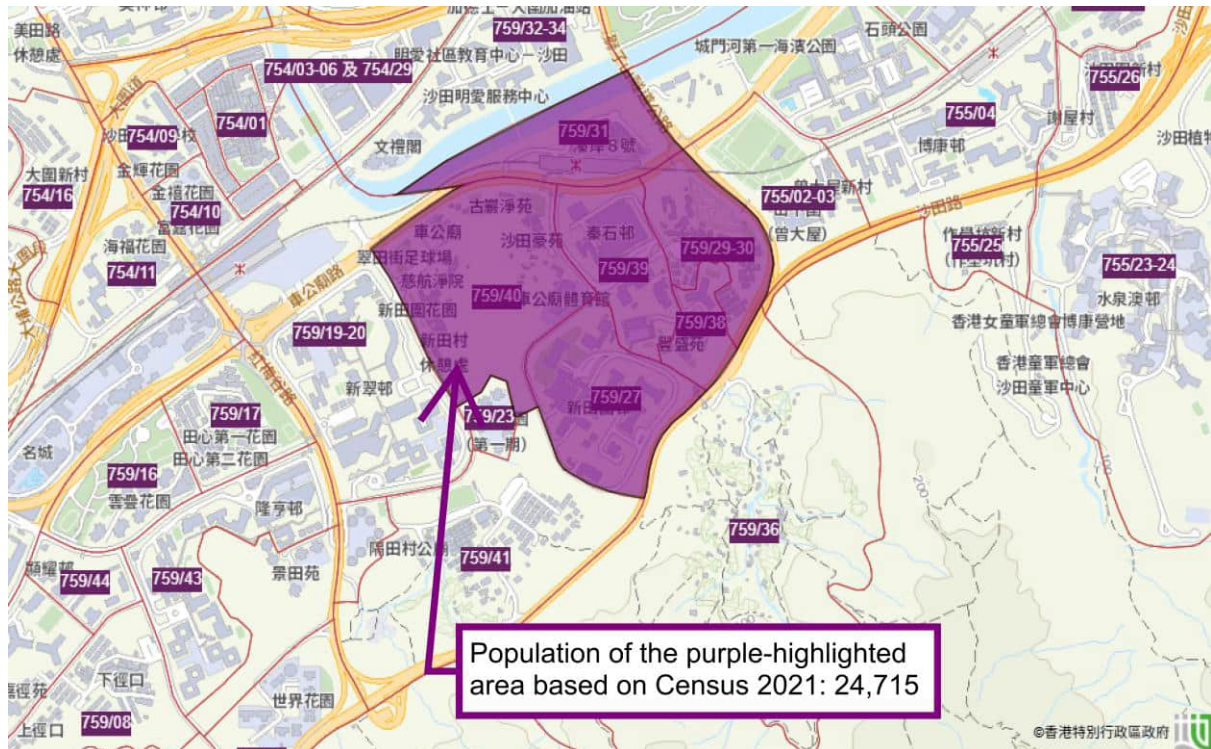
Annex 3(a) Sewage Catchment Area



Annex 4

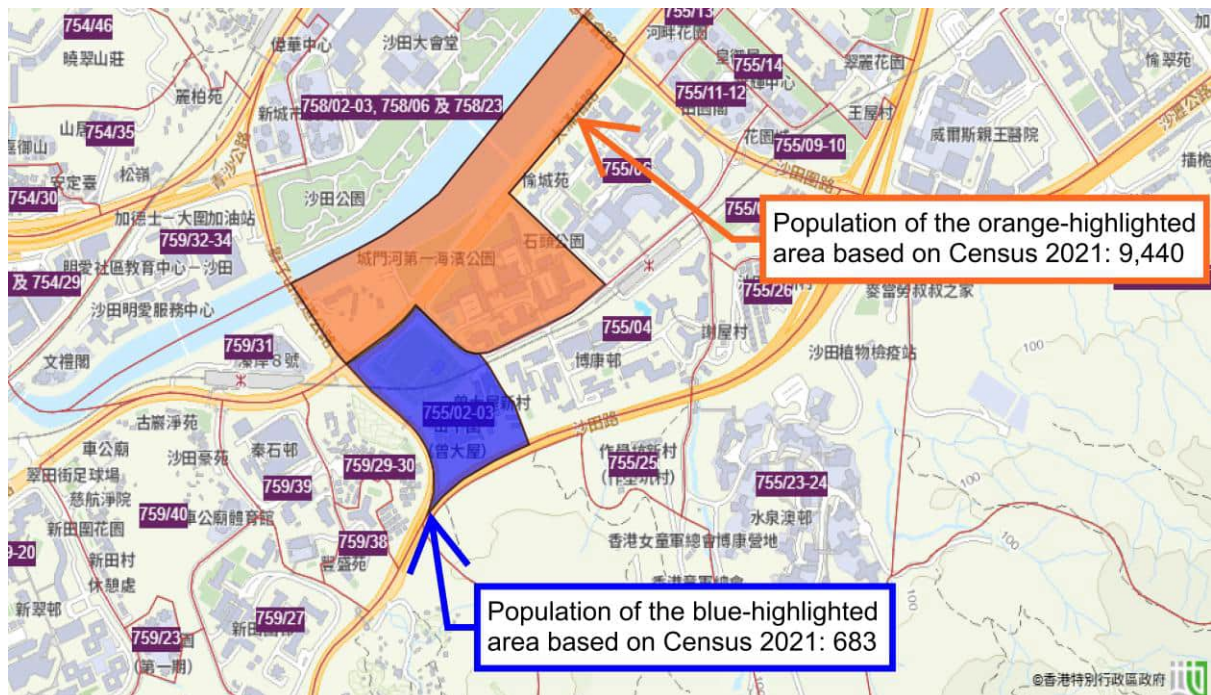
Upstream and Downstream Sewage Estimation

Upstream concerned area:



Subunits included: 759/31, 759/29-30, 759/38, 759/27, 759/39, and 759/40

Downstream concerned area:



Subunits included: 759/01, 759/05, and 759/02-03

Upstream sewage flow:

| | | | | |
|---|-----------|------------|-----------------------------------|---------------------|
| Upstream Population ⁽¹⁾ : | 24,715 | | | |
| Assume 30% of the population is F&B, | | | | |
| F&B Population: | 7,415 | UFF (F&B): | 1.58 | m ³ /h/d |
| Residential Population: | 17,300 | UFF (R2): | 0.27 | m ³ /h/d |
| CIF (Sha Tin): | 1.15 | | | |
| Total ADWF: | 18,844.71 | | | m ³ /day |
| Contributing Population: | 69,800 | | | |
| Peaking Factor (incl. stormwater allowance) | | : | Max (7.3/N ^{0.15} , 2.4) | |
| | | = | 3.86 | |
| Peak Flow: | 0.842 | | | m ³ /s |

Downstream sewage flow:

| | | | | | |
|--|----------|------------|------|---|---------------------|
| Downstream total population ⁽²⁾ : | 9,440 | + | 683 | = | 10,123 |
| Assume 30% of the population is F&B, | | | | | |
| F&B Population: | 3,037 | UFF (F&B): | 1.58 | | m ³ /h/d |
| Residential Population: | 7,086 | UFF (R2): | 0.27 | | m ³ /h/d |
| CIF (Sha Tin): | 1.15 | | | | |
| ADWF: | 7,718.28 | | | | m ³ /day |
| Contributing Population: | 28,590 | | | | |
| Peaking Factor (incl. stormwater allowance): | | | 4 | | |
| Peak Flow: | 0.357 | | | | m ³ /s |

Remarks:

(1) The population data is obtained from https://www.census2021.gov.hk/tc/district_profiles.html, please find the area concerned in the following page under upstream concerned area.

(2) The population data is obtained from https://www.census2021.gov.hk/tc/district_profiles.html, please find the area concerned in the following page under downstream concerned area.

[REDACTED]