
Appendix D
Water Supply Impact Assessment

Section 16 Planning Application for Proposed Mixed-Use Development (Proposed Flat with Permitted Commercial Uses) in Planning Area 32B, Hung Shui Kiu, New Territories (Application No.: A/HSK/619)

Water Supply Impact Assessment

August 2026

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1. Introduction

1.1 Background

- 1.1.1 AECOM Asia Company Limited (AECOM) has been commissioned by the project proponent to act as the engineering consultant to conduct a Water Supply Impact Assessment (WSIA) for a private mixed-use development in Hung Shui Kiu, New Territories.
- 1.1.2 The S16 Planning Application involves Area 32B with total area of 13,601 m²; referred as the "Application Site". The Site is located next to the Kong Sham Western Highway. Location plan of the Application Site refers to **AREA 32B/WSIA/Figure 1**.
- 1.1.3 The Application Site falls within "Commercial (1)" ("C(1)") zone on the Draft Hung Shui Kiu and Ha Tsuen OZP No. S/HSK/3 and lies within Hung Shui Kiu / Ha Tsuen (HSK/HT) New Development Area (NDA). According to the OZP, commercial uses including 'Hotel', 'Office', 'Eating Place', 'Shop and Services', etc. are always permitted in "C(1)" zone; while 'Flat' use is under Column 2, planning permission is therefore required for the proposed residential use in Site A of the Application Site.
- 1.1.4 This WSIA report serves as a supporting document for the S16 Planning Application.

1.2 Objective of this Submission

- 1.2.1 This report outlines the assessment results of the potential water supply impacts caused by the Proposed Development at the Application Site. The main objectives of this assessment include the followings:
 - (i) Review the existing water supply condition of the Application Site;
 - (ii) Estimate the water demand of the proposed development;
 - (iii) Identify any potential impact on the current water supply system due to the additional water supply demand from the proposed development;
 - (iv) Propose water supply mitigation measures where appropriate to mitigate the potential water supply impact.

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
CIFSUS	Commercial and Industrial Floor Space Utilization Survey (PlanD)
DSD	Drainage Services Department
EPD	Environmental Protection Department
GFA	Gross Floor Area
PPoF	People Per Unit
mPD	Metres above Principal Datum
PlanD	Planning Department
UFF	Unit Flow Factor
TMF	Temporary Main for Flushing
UDD	Unit Daily Demand
WSD	Water Supplies Department
WSIA	Water Supply Impact Assessment

Table 1 – Nomenclature

2. Development Proposal

2.1 The Proposed Development

- 2.1.1 The Application Site area is approximately 13,601 m². Under the Proposed Development, the total plot ratio is not more than 9.5. (i.e. the total GFA is not more than 129,210 m²) The Applicant proposed 71,066 m² as non-domestic GFA which is designated for the permitted commercial use as of right, whereas the remaining 58,144 m² domestic GFA would be used for the proposed residential development.
- 2.1.2 The Proposed Development consists of Site A and Site B. Site A includes 1,240 residential units and recreational facilities, as well as some permitted commercial use (e.g. retail). Site B contains retail and hotel/office development which provides 924 rooms. The anticipated completion year of the Application Site (except for the remaining non-domestic GFA to be implemented at a later stage under the arrangement of "Pay for What You Build" Pilot Scheme) is 2033. Details refers to **Remark (3)** of **Table 2**.

2.1.3 The Master Layout Plan (MLP) of the Proposed Development is shown in figure no. **AREA 32B/WSIA/Figure 2**. The proposed development schedule is summarised in **Table 2** below.

	Overall	Proposed Development (Site A)	Proposed Development (Site B)
Site Area	13,601m ²	8,967m ²	4,634m ²
Total PR (not more than)	9.5	7.1	14.2
Total GFA (not more than)	129,210m ²	63,365m ²	65,845m ²
Domestic Portion			
Total Domestic GFA (not more than)	58,144m ²	58,144m ²	-
No. of Units	1,240	1,240	-
Population ⁽¹⁾	3,348	3,348	-
Domestic Portion – Resident's Recreational Facilities ⁽²⁾	2,325m ²	2,325m ²	
Non-Domestic Portion – Retail			
Total Non-Domestic GFA	5,575m ²	5,221m ² ⁽³⁾	354m ² ⁽³⁾
Non-Domestic Portion – Hotel			
Total Non-Domestic GFA	27,871m ² ⁽³⁾	-	27,871m ² ⁽³⁾
No. of Hotel Rooms	924	-	924
Non-Domestic Portion – Office (Completed in 2033)			
Total Non-Domestic GFA	9,290m ² ⁽³⁾	-	9,290m ² ⁽³⁾
Non-Domestic Portion – Office (Remaining)			
Total Non-Domestic GFA	28,330m ²	-	28,330m ²

Table 2 – Key Development Parameters

Remarks:

- (1) A person per flat of 2.7 is assumed.
- (2) Or such other areas of clubhouse as may be approved by the Buildings Department based on the total permissible domestic GFA for individual land parcel (site under the Buildings Ordinance) at the future General Building Plans.
- (3) Drawing upon the spirit of the "Pay for What You Build" Pilot Scheme, about 60% of the non-domestic GFA in Area 32B (i.e. about 42,736m²) will be implemented first by the target completion year 2033. The GFA to be distributed in both Site A and Site B are 5,221m² and 37,515m² respectively.

3. Assessment Methodology

3.1 Unit Demand

- 3.1.1 Assumptions have been made for the unit daily demand (UDD) for each type of land use, for both fresh water and flushing water. The UDD is used for estimating the total demand of the proposed development and the required water supply capacity to support the development.
- 3.1.2 The water supply demand estimation is presented in **Annex 1**.
- 3.1.3 The unit flow factors adopted for water demand estimation and calculation are summarised in **Table 3**.

Development Type	Flow Type	Fresh Water UDD (L/head/day)	Flushing Water UDD (L/head/day)
Domestic	Private Residential	300	70
Non-domestic - Retail	Retail	230	50
Non-domestic - Restaurant	Restaurant	1,310	270
Resident's Recreational Facilities	Community, Social & Personal Services	230	50
Hotel	Hotel Room	1 m ³ /room/day	0.36 m ³ /room/day
Office	Finance, Insurance, Real Estate & Business Services	30	50

Table 3 – Unit Daily Demand adopted in Water Supply Impact Assessment

3.2 Peaking Factors

3.2.1 The peaking demand factors below shall be adopted for design:

- Peak flow rate in fresh water distribution mains = 3 x mean daily demand
- Peak flow in flushing water distribution mains = 2 x mean daily demand
- Peak flow rate in fresh water trunk mains = 1.5 x mean daily demand
- Peak flow rate in flushing water trunk mains = 1.2 x mean daily demand

3.3 Fire-Fighting

3.3.1 In addition to the aforementioned facilities of the Proposed Development, water supply for fire-fighting service has been considered in this WSIA. Fire-fighting requirement for residential zone is 6,000m³/day with discharge pressure of 17m head. The fire hydrant should be of standard pattern with minimum output pressure of not less than 25 psi. With multiple hydrants operating at the same time, total output of not less than 4,000L/min shall last for 60 minutes. Table 4 summarizes the fire-fighting requirements.

Requirements	Minimum Values
Minimum fresh water supply	6,000 m ³ /day
Discharge pressure	17m
Minimum output not less than 25 psi	4,000 L/min to last for an hour

Table 4 – Fire-Fighting Requirement

3.4 Residual Heads

3.4.1 The minimum residual heads at extremity of the fresh water and flushing water supply systems for the Proposed Development are adopted as follow:

- Fresh water: 20m
- Flush water: 15m

3.5 Design Velocity

3.5.1 The desirable flow velocities for hydraulic checking are as follows:

Maximum velocity (under peak flow condition)

Fresh water mains:

>DN700	≤ 3 m/s
DN700 – DN525	≤ 2.5 m/s
DN450 – DN375	≤ 2 m/s
DN300 – DN200	≤1.5 m/s

Flushing water mains:

≥DN1000	≤ 3 m/s
DN900 – DN800	≤ 2.5 m/s
DN700 – DN300	≤ 2 m/s
DN450 – DN300	≤ 1.5 m/s

Minimum velocity (under peak flow condition)

Fresh water mains: ≥ 0.9 m/s

Flushing water mains: ≥ 0.9 m/s

3.5.2 The pipeline shall have a minimum gradient of 1:400. Pipes shall be laid at a minimum separation of 300mm away from existing utilities and underground structures.

4. Review on Existing Water Supply System

4.1 Existing Water Supply System

- 4.1.1 There is a series of existing DN100 and DN50 PE fresh water distribution main running at the north of the Application Site.
- 4.1.2 Currently, there is no salt water supply system for flushing water supply at the Application Site and nearby area.

4.2 Impact on Existing Water Supply System

- 4.2.1 The estimated daily fresh water demand for Application Site is 2,054m³/day and the estimated daily flushing water demand is 684 m³/day. Detailed water demand estimation refers to **Annex 1** and **Annex 2**.
- 4.2.2 The peaking factor adopted for the sizing of fresh water distribution main is 3, such that the required peak flow rate for the Application Site is 0.076m³/s.
- 4.2.3 The peaking factor adopted for the sizing of flushing water distribution main is 2, such that the required peak flow rate for the Application Site is 0.019m³/s.
- 4.2.4 A section of existing DN50 PE pipe and exposed DN50 GIL pipe crossing Site B is proposed to be diverted to existing public road. The proposed diversion of existing DN50 PE pipe refers to the **AREA 32B/WSIA/Figure 3**.

5. Proposed Water Supply System

5.1 Fresh Water Supply System

- 5.1.1 According to CEDD information provided, a series of NS315 PE fresh water main is planned and constructed by CEDD in the vicinity of the Application Site to provide fresh water for the future development.
- 5.1.2 NS250 lead-in pipe is proposed to be tee-off from the planned NS315 fresh water main for fresh water supply to the Proposed Development. The indicative planned fresh water main alignment refers to figure no. **AREA 32B/WSIA/Figure 3** refers. Detailed calculation refers to **Annex 3** and **Annex 4**.
- 5.1.3 According to hydraulic checking result, the fresh water demand of Proposed Development will utilize 46% of the planned NS315 fresh water main constructed by CEDD.

5.2 Flushing Water Supply System

- 5.2.1 Currently there is no salt water supply system for flushing water supply to the Application Site.
- 5.2.2 According to CEDD information provided, a series of NS250 PE flushing water main is planned and constructed by CEDD in the vicinity of the Application Site to provide flushing water for the future development.
- 5.2.3 NS125 lead-in pipe is proposed to be tee-off from planned NS250 PE flushing water main to provide flushing water to the Proposed Development. The indicative planned flushing water main alignment refers to figure no **AREA 32B /WSIA/Figure 4**. Detailed calculation refers to **Annex 3** and **Annex 4**.

- 5.2.4 According to hydraulic checking in **Annex 3**, the fresh water demand of Proposed Development will utilize 21% of the planned NS250 PE flushing water main constructed by CEDD.

6. Maintenance Responsibility

- 6.1.1 The Applicant is responsible for the construction and maintenance of all water supply facilities within the Application Site boundary, including all internal watermains and water supply lead-in valves.
- 6.1.2 The proposed fresh water main tee-off from planned fresh water main is proposed to be handed over to the government after construction. The Applicant is responsible for the construction.
- 6.1.3 The proposed flushing water main tee-off from planned flushing water main is proposed to be handed over to the government after construction. The Applicant is responsible for the construction.

7. Conclusion

- 7.1.1 The WSIA has been carried out to assess the impact on the existing water supply system due to the proposed development.
- 7.1.2 The estimated daily fresh water demand for the Application Site is 2,054m³/day and the estimated daily flushing water demand is 684 m³/day.
- 7.1.3 According to CEDD information provided, a series of NS315 PE fresh water main is planned and constructed by CEDD in the vicinity of the Application Site to provide fresh water for the future development. NS250 lead-in pipe is proposed to be tee-off from the planned NS315 fresh water main for fresh water supply to the Proposed Development.
- 7.1.4 According to CEDD information provided, a series of NS250 PE flushing water main is planned and constructed by CEDD in the vicinity of the Application Site to provide flushing water for the future development. NS125 lead-in pipe is proposed to be tee-off from planned NS250 PE flushing water main to provide flushing water supply to the Proposed Development.
- 7.1.5 The proposed arrangement is acceptable to the proposed water supply system under CEDD's HSK/HT NDA. Therefore, no adverse impact is anticipated.

End of Report

Figure

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PROJECT
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PROPOSED RESIDENTIAL
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USES IN PLANNING AREA 32B,
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HUNG SHUI KIU

AGREEMENT NO.
協議編號

SHEET TITLE
圖紙名稱
MASTER LAYOUT PLAN

SHEET NUMBER
圖紙編號
AREA 32B/WSIA/FIGURE 2

AREA 32B/WSIA/FIGURE 3

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Annex 1

Proposed Development Population

Population

Site A					
<u>Residential</u>					
No. of Units	1,240				
<u>PPoF</u> ⁽¹⁾		Development Type			Population
2.7		Private R2			3,348
<u>Workers</u>	GFA (m ²)	Worker's Type		Workers per GFA (in 100m ²) ⁽³⁾	Employee
GFA for Clubhouse (m ²)	2,325	Community, Social & Personal Services		3.3	77
<u>Workers</u>	GFA (m ²)	Worker's Type		Workers per GFA (in 100m ²) ⁽³⁾	Employee
GFA for Restaurant (m ²) ⁽²⁾	2,611	Restaurants		5.1	134
		J10 Restaurants & Hotels			
GFA for Retail (m ²) ⁽³⁾	2,611	Retail Trade		3.5	92
		J4 Wholesale & Retail			
Site B					
<u>Hotel</u>		No. of Rooms			
No. of Rooms	<u>Phase 1</u>	924			
	<u>Phase 2</u>	-			
<u>Workers</u>		Worker's Type		Employee	
Rooms per employee = 2		Hotels and Boarding Houses		<u>Phase 1</u>	462
		J10 Restaurants & Hotels		<u>Phase 2</u>	-
GFA for Office (m ²)	<u>Phase 1</u>	9,290	J6 Finance, Insurance, Real Estate & Business Services	Workers per GFA (in 100m ²) ⁽⁴⁾	<u>Phase 1</u>
	<u>Phase 2</u>	28,330		5.5	<u>Phase 2</u>
GFA for Restaurant (m ²)	354	Restaurants		5.1	19
		J10 Restaurants & Hotels			

Remarks:

⁽¹⁾ A person per flat of 2.7 is assumed.

⁽²⁾ Assume 50% of the Non-domestic GFA at Site A is for Restaurant use

⁽³⁾ Assume 50% of the Non-domestic GFA at Site A is for Retail use.

⁽⁴⁾ Worker Density is in GFA per worker according to T-8 CIFSUS are assumed.

Annex 2

Water Demand Estimation of the Proposed Development

Annex 2 - Water Demand Estimation of the Proposed Development

Population	No. of Rooms	Supply	Type	Unit Demand (L/h/d)						Fresh Water Demand (m³/d)	Flush Water Demand (m³/d)
				Domestic	School	Hotel (m³/rom/day)	Restaurants	Office	Retail and Resident's Recreational Facilities		
3,348 (Private Housing Site A)	-	Fresh Water	Residential	300	-	-	-	-	-	1,004.40	-
	-	Flushing Water		70	-	-	-	-	-	-	234.36
77	-	Fresh Water	Resident's Recreational Facilities	-	-	-	-	-	230	17.71	-
	-	Flushing Water		-	-	-	-	-	50	-	3.85
-	924 (Phase 1)	Fresh Water	Hotel	-	-	1	-	-	-	924.00	-
-		Flushing Water		-	-	0.36	-	-	-	-	332.64
2,070 (Phase 1 +2)	-	Fresh Water	Office	-	-	-	-	30	-	62.10	-
	-	Flushing Water		-	-	-	-	50	-	-	103.50
92 (Phase 1 +2)	-	Fresh Water	Non-domestic (Retail)	-	-	-	-	-	230	21.16	-
	-	Flushing Water		-	-	-	-	-	50	-	4.60
19 (Phase 1 +2)	-	Fresh Water ⁽³⁾	Non-domestic (Restaurant)	-	-	-	1,310	-	-	24.89	-
	-	Flushing Water ⁽⁴⁾		-	-	-	270	-	-	-	5.13
							Total			2054.26	684.08

Note:

(1) Fresh and Flushing water demand estimation is referenced to DI1309.

(2) For flushing water unit water demands not provided in DI1309, GESF App III and V are referred.

(3) The fresh water unit water demand adopted is referenced from GESF App V, which the restaurant employee is 1,310 L/h/day (i.e. 1,280 + 30), and the office employee fresh water consumption is 30L/h/d.

(4) The flushing water unit water demand adopted is referenced from GESF App V, which the restaurant employee is 1,580L/h/d - 1,310L/h/d (Fresh Water Unit Water Demand) equals 270L/h/d.

Annex 3

Hydraulic Review of CEDD Planned Water Main for HSK/HT NDA

Annex 3 - Hydraulic Review of Planned Water Main

Fresh Water Demand

Estimated Fresh Water Demand	2054.3	m ³ /day
	0.0238	m ³ /s

Flushing Water Demand

Estimated Flushing Water Demand	684.1	m ³ /day
	0.0079	m ³ /s

Hydraulic Review for Proposed NS315 Fresh Water Main by CEDD

Total water demand	2054.3	m ³ /day
Peak factor ⁽¹⁾	3.0	
Peak flow rate from development site	0.071	m ³ /s
Size of proposed water main	315	mm
Cross section area	0.078	m ²
Flow velocity limit for NS315 ⁽²⁾	2	m/s
Flow capacity for NS315	0.156	m ³ /s
Capacity checking	46	%

Hydraulic Review for Proposed NS250 Flushing Water Main by CEDD

Total water demand	684.1	m ³ /day
Peak factor ⁽¹⁾	2.0	
Peak flow rate from development site	0.016	m ³ /s
Size of proposed water main	250	mm
Cross section area	0.049	m ²
Flow velocity limit for NS250 ⁽²⁾	1.5	m/s
Flow capacity for NS250	0.074	m ³ /s
Capacity checking	21	%

Remark:

(1) Peak factor for distribution main refers to Departmental Instruction No. 1309 from Water Supplies Department

(2) Velocity limit of water main refers to Departmental Instruction No. 1309 from Water Supplies Department

Annex 4

Hydraulic Review of Proposed Lead-in Pipe

Annex 4 - Hydraulic Review of Proposed Lead-in Pipe

Fresh Water Demand

Estimated Fresh Water Demand	2054.3	m ³ /day
	0.0238	m ³ /s

Flushing Water Demand

Estimated Flushing Water Demand	684.1	m ³ /day
	0.0079	m ³ /s

Hydraulic Review for Proposed DN250 Fresh Water Lead-in by this Application		
Total water demand	2054.3	m ³ /day
Peak factor ⁽¹⁾	3.0	
Peak flow rate from development site	0.0713	m ³ /s
Size of proposed fresh water lead-in	250	mm
Cross section area	0.049	m ²
Flow velocity for DN250	1.46	m/s
Flow velocity limit for DN250 ⁽²⁾	1.5	m/s

Hydraulic Review for Proposed DN125 Flushing Water Lead-in by this Application		
Total water demand	684.1	m ³ /day
Peak factor ⁽¹⁾	2.0	
Peak flow rate from development site	0.0158	m ³ /s
Size of proposed flushing water lead-in	125	mm
Cross section area	0.012	m ²
Flow velocity for DN125	1.32	m/s
Flow velocity limit for DN125 ⁽²⁾	1.5	m/s

Remark:

- (1) Peak factor for distribution main refers to Departmental Instruction No. 1309 from Water Supplies Department
 (2) Velocity limit of water main refers to Departmental Instruction No. 1309 from Water Supplies Department

