Annex J

Replacement Pages of the Revised Water Supply Impact Assessment

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Drawings

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3. Water Supply Impact Assessment

3.1 Existing Fresh and Salt Water Supply

3.1.1 The subject site is located within the fresh water distribution zone of Tuen Mun North FWSR located in Por Lo Shan, Tuen Mun, New Territories, Hong Kong. According to WSD, the Tuen Mun North FWSR has capacity of 60,564m^3 and is currently having an average consumption of 63 MLD. Existing salt water is supplied by Lok On Pai SWPS and Tan Kwai Tsuen SWSR.

3.1.2 According to WSD, there are existing fresh water and salt water mains identified near the vicinity of the Site, see Drawing No. 1. Existing fresh watermains are located along Ng Lau Road, San Hing Road, west bank of nullah and Castle Peak Road. Existing salt watermains are located along Ng Lau Road, San Hing Road and Castle Peak Road.

3.1.3 The WSD mains record plan in the vicinity of the proposed development and location for measured water pressure are shown in Appendix A.

3.1.4 Existing water pressures at two fire hydrants, PH10620 and PH2744, for both fresh water and saltwater, respectively, were obtained from WSD and summarized in Table 4.

Table 4. Existing Water Pressure Measured by WSD

Fire Hydrant	psi	Bar
PH10620	95	6.55
PH2744	75	5.17

3.2 Proposed Fresh / Salt Water Demand

3.2.1 With reference to Table 1 of DI No. 1309 and WSD's advice, the water demand for the proposed development is estimated in Table 5 below. It is expected that the proposed development will generate 1265m^3/day and 389m^3/day of MDD fresh and salt water.

Table 5. Estimated Daily Water Demand (m^3/day) from the Proposed Development

(a1) Population (Person)	3740	Estimated population in the proposed development
(a2) Workers (Person)	16	Estimated workers in the clubhouse of proposed development
(b1) Domestic Fresh Water Unit Demand (m^3/person/day)	0.30	Residential - R2 in Table 1 of DI No. 1309
(b2) Service Trade Unit Demand (m^3/person/day)	0.035	New Town - Tuen Mun in Table 2 of DI No. 1309
(c) Planting Area (m^2)	1,660	
(d) Irrigation consumption (litres/d/m^2)	7	WSD Technical Specification on Grey Water Reuse and Rainwater Harvesting
(e) Fresh Water Mean Daily Demand (m^3/day)	1265	(a1) x (b1 + b2) + (c) x (d)
(f) Salt Water Unit Demand (m^3/person/day)	0.104	Advised by WSD
(g) Salt Water Mean Daily Demand (m^3/day)	389	(a) x (f)

3.2.2 The total peak flow arising from the proposed development is <mark>3794</mark> m^3/day and 778 m^3/day for fresh water and salt water respectively as shown in Table 6.

Table 6. Estimated Peak Flow (m^3/day) from the Proposed Development

Water	Peaking Factor	Peak Flow (m^3/day)
Fresh water	3	3794
Salt water	2	778

3.3 Proposed Water Supply Scheme

3.3.1 Existing fresh and salt water supply systems are found next to the proposed development. As per discussion with WSD, proposed watermains shall be tee-off from existing fresh watermain and salt watermain for the water supply to the proposed development. Proposed watermain alignment is shown in Drawing No. 2. Location of proposed water meter room is attached in Appendix B.

3.3.2 Proposed watermains located at public road with free access will be government watermains and to be handed over to, operated and maintained by WSD. Proposed watermains located within site boundary will be maintained by the private developer.

3.3.3 The development ground levels are similar to the existing ground levels, thus the existing water supply systems shall be able to supply fresh and salt water to the proposed development with sufficient residual heads.

3.3.4 Residual head assessment for the proposed fresh and salt watermains are shown in Appendix C.

3.3.5 Fresh water demand from the development will be supplied by Tuen Mun North FWSR, while salt water demand will be supplied by Lok On Pai SWPS and Tan Kwai Tsuen SWSR.

Proposed Fresh Water Supply System

3.3.6 Proposed fresh watermain of DN200 is proposed to tee-off from existing DN450 fresh watermain at road junction of Ng Lau Road. It is proposed to run along proposed new road and along the utility trough of the proposed nullah crossing bridge and enter the proposed site area.

3.3.7 Existing fresh water street fire hydrants are observed near the proposed development area. The distribution main is considered designed with sufficient fire-fighting capacity for the proposed development.

3.3.8 In view of the existing vicinity, existing fresh water SFH are not able to provide service for the proposed development within 100m distance requirement, additional fresh water SFH are required. Two swan neck fresh water SFH are proposed for the development. Further discussion with FSD would be carried out.

Proposed Salt Water Supply System

3.3.9 Proposed salt watermain of DN100 is proposed to tee-off from existing DN250 salt watermain at road junction of Ng Lau Road, at the similar location of the proposed tee-off location of proposed fresh watermain. Similar to proposed fresh watermain, proposed salt watermain is proposed to run along proposed new road and along the utility trough of the proposed nullah crossing bridge and enter the proposed site area.

3.3.10 Existing salt water street fire hydrants are identified near the proposed development, however, no new salt water fire hydrant is considered necessary in the proposed scheme.

Appendix C

Residual Head Calculation Assessment for Proposed Water Supply System

Estimation of Hydraulic Gradient and Headloss
by using Hazen-Williams Equation

$V = 0.85\ C_{hw}\ R^{0.63}\ S_f^{0.54}$

Location: Fresh Water Supply from Existing Watermain to Proposed Development
Water Type: Fresh Water

Measurement of water pressure at fire hydrant	psi	bar	m
PH10620	95	6.55	66.81

From the Existing Watermains to the supply zone

Parameters	Unit	Existing Watermains			Proposed Watermains	
		DN150	DN300	DN450	DN200	
Total MDD/ fire fighting requirement for the proposed development	m³/d				1265	
Assumed Actual Pipe Diameter, D	mm	138	282	424	200	
Assumed Velocity Under Peak Flow Condition, V	m/s	1.5	1.5	2.0		
Design Peak Flow	L/s				43.92	
Velocity Under Design Peak Flow	m/s				1.40	OK
Design Pipe Capacity	L/s				43.92	
Hydraulic Radiu, R	m	0.035	0.071	0.106	0.050	
Hazen-Williams Coefficient, C_{hw}		110	110	110	110	
Hydraulic Gradient, Sf		0.024	0.011	0.011	0.014	
or 1 in		41	95	90	73	
Travel Distance	m	19	135	19	185.0	
Estimated Headloss	m	0.5	1.4	0.2	2.5	
Frictional Loss	m				4.6	
Minor Loss*	m				0.9	
Total Head loss	m				5.5	
*Assumed as 20% of Frictional Loss						
Measured existing residual head at PH10620	m				66.8	
Level of Proposed Fresh Water Mains	m				1.6	
Residual Head at Existing and Proposed Water Mains	m				59.7	

>20m, OK

Note:
1. Assume Velocity for Hydraulic Assessment (For proposed pipes, velocity is calculated by water demand)

Pipe Diameter (mm)	Max. Flow Velocity (m/s)
>DN700	3.0
DN525 - DN700	2.5
DN375 - DN450	2.0
<= DN300	1.5

2. Design peak flow is 3xMDD, since there are existing fire hydrants nearby the proposed development.

3. Measured existing residual head is advised by WSD.

Estimation of Hydraulic Gradient and Headloss
by using Hazen-Williams Equation

$V= \quad 0.85\ C_{hw}\ R^{0.63}\ S_f^{0.54}$

Location: Salt Water Supply from Existing Watermain to Proposed Development
Water Type: Salt Water

Measurement of water pressure at fire hydrant	psi	bar	m
PH2744	75	5.17	52.74

From the Existing Watermains to the supply zone

Parameters	Unit	Existing Watermains			Proposed Watermains
		DN150	DN300	DN250	DN80
Total MDD/ fire fighting requirement for the proposed development	m^3/d				389
Assumed Actual Pipe Diameter, D	mm	138	282	236	100
Assumed Velocity Under Peak Flow Condition, V	m/s	1.5	1.5	1.5	
Design Peak Flow	l/s				9.00
Velocity Under Design Peak Flow	m/s				1.15 OK
Design Pipe Capacity	l/s				9.00
Hydraulic Radiu, R	m	0.035	0.071	0.059	0.025
Hazen-Williams Coefficient, C$_{hw}$		90	90	90	90
Hydraulic Gradient, Sf		0.035	0.015	0.019	0.031
or 1 in		29	66	53	32
Travel Distance	m	15	5	30	185.0
Estimated Headloss	m	0.5	0.1	0.6	5.7
Frictional Loss	m				6.9
Minor Loss*	m				1.4
Total Head loss	m				8.3
*Assumed as 20% of Frictional Loss					
Measured existing residual head at PH10620	m				52.7
Level of Proposed Fresh Water Mains	m				1.6
Residual Head at Existing and Proposed Water Mains	m				42.9

                                                       >15m, OK

Note:
1. Assume Velocity for Hydraulic Assessment (For proposed pipes, velocity is calculated by water demand)

Pipe Diameter (mm)	Max. Flow Velocity (m/s)
>=DN1000	3.0
DN800 - DN900	2.5
DN525 - DN700	2.0
<=DN450	1.5

2. Design peak flow is 3xMDD, since there are existing fire hydrants nearby the proposed development.

3. Measured existing residual head is advised by WSD.