

Section 12A Application from “Recreation” and “Green Belt” to “Government, Institution or Community” for Proposed Religious Institution (the Supreme Kwan Ti Temple), at Various Lots in D.D. 117 and Adjoining Government Land, Tai Tong, Yuen Long, New Territories

S.16 Planning Application for Proposed Religious Institution (the Supreme Kwan Ti Temple) and Improvements to the Tai Tong Kwan Ti Square and the Associated Existing Access Road at Tai Tong, Yuen Long

Water Supply Proposal And Fire Services Provisions

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Figure

Figure 1	Development Site – Fresh Water Supply Pipe Layout Plan
Figure 2	Not used
Figure 3	Not used
Figure 4	Water Supply Proposal – Schematic Diagram

Chapter 1 Introduction and Objectives

1.1 Introduction

1.1.1 This Section 12 Application Site will fall mainly within an area zoned Recreation (REC) and Green Belt (“GB”) on the Approved Tai Tong Outline Zoning Plan (OZP) No. S/YL-TT/20.

1.1.2 The Application Site comprises the following two parts:

a. The Application Site area (the Supreme Kwan Ti Temple site) will be a standalone religious institution. It is the main Temple site which includes a new Kwan Ti Temple, supporting religious facilities, and ancillary facilities. It is made up of about 18,325 m² area with 12,756 m² GFA.

 The Application Site will not be provided with canteen nor place of entertainment to the visitors with payment.

b. The existing Tai Tong Kwan Ti Square area. It is an existing area for the celebration of Kwan Ti with cultural events. It will be open to the public (i.e. school activities).

1.2 Objectives

 Upon WSD’s request, we are commissioned to assess the availability of the government water supply mains in the vicinity of the Application Site and propose the feasible water supply scheme.

Chapter 2 Design Criteria and Parameters

2.1 Design Criteria

2.1.1 Reference is made to the relevant unit water demand in WSD’s DI No. 1309.

2.2 Design Parameters

2.2.1 Water Velocity and Pressure Loss

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2.2.1.1 Hydraulic equation – Hazen-Williams ($V = 0.85 C R^{0.63} S^{0.54}$) will be used to calculate the water velocity in the proposed pipe.

2.2.1.2 Re-arranging Hazen-Williams Equation to express S in terms of V, C and R

$$H_f = S/L = 7.8828 Q^{1.852} L / (K^{1.852} C^{1.852} d^{4.8704})$$

Where H_f = Total head loss over whole pipe length (in meter H₂O)

S = Head loss per unit pipe length (in meter H₂O / m)

L = Total pipe length (in meter)

Q = Water flow (in m³/s)

$K = 0.85$

d = Pipe diameter (in meter)

C = Roughness coefficient assumed as follows:

For DI with internal cement lined pipe and external epoxy coating

Fresh water pipe (<600mm diameter) 110

Salt water pipe 90

For PE pipe 155

2.2.1.3 The total pressure loss of the whole length of water supply mains alignment will include the pressure loss of longitudinal pipe length plus the minor head losses due to the bends, tees and valves. The minor head loss is assumed to be 30% of that of longitudinal pipe length.

The pipe diameter will be designed on basis of the flow velocity not being less than 0.9 m/s preferably to avoid stagnant water problem.

The pipe mains will be designed and installed at a minimum gradient of 1:400, and will be laid at a minimum distance of 300mm away from the existing utilities and underground structures

2.2.1.4 The water mains will be designed and installed with adequate brackets, thrust blocks and maintenance and access provisions as would be required by WSD.

The materials of the water mains, bends, and valves will be selected in compliance with WSD's requirements.

2.2.2 Residual Pressure Heads

The fresh water supply system for the Development Area will be designed to provide at least 17m head for fire services installations and 20m head for other inside services for both visitors/staff use.

2.2.3 Fire Services Water Demand

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Fresh water will be used for the street fire hydrants, sprinkler system and fire hydrant/hose reel system. As the proposed water supply main will be connected to the one feed (single source) WSD water main, full capacity sprinkler water tank will be installed, which shall need to be refilled from empty situation to full capacity within not more than 6 hours.

2.2.4 Irrigation Demand

The daily water consumption for the landscape irrigation system will be 7 litres/m²/day.

2.3 Calculation of Water Users

The development site will be operated as a religious institution open to public visitors. The maximum number of visitors during peak festival days will be as follows:

1. Within five hours in the morning session, there will be 2000 visitors and 150 staff.
2. Within five hours in the afternoon, it is estimated 2000 people will visit the Supreme Kwan Ti Temple with 150 staff on duty.

Chapter 3 Proposal of the Water Supply System

3.1 Existing Condition and Available Government Water Mains

3.1.1 In reply to the Formal Pre-submission dated 26th July, 2024, Water Supplies Department requested for a Water Supply Proposal.

As revealed by the “Fresh Water Mains Record Plan” dated 2nd July, 2024 and issued by Water Supplies Department, there is currently one DN80 WSD fresh water mains in the vicinity of the Development Site, but no salt water (for flushing) mains near the Development Site.

It is proposed that one DN50 pipe will be connected from the existing 80PE main to supply water to the inside services of the Development Site as shown in Figure 1.

3.1.2 In reply to WSD’s comments issued by Planning Department’s in its email to Toco Planning Consultants Ltd on 3 Dec 2025, WSD advised due to the remoteness of the site, the residual head at the connection point may fall below the pledged supply pressure with even zero-flow condition at peak hours. WSD further advised that an average flow rate of around 3,500 Litres/hour will be provided to the Development Site.

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3.2 Estimated Future Water flow

- 3.2.1 In accordance with Sub-section 4.3 – Operation of the Temple in the Planning Statement submitted with the Planning Application, during each the festival days, there will be 150 staffs employed to serve 2000 worshippers from 8:00am to 12:00pm and another 2000 visitors who will join the non-worshipping activities between 12:00pm and 6:00pm.

According to Table 4.2 – Breakdown of GFA Calculation in the Planning Statement, there will be office for security, office for Religious Facilities, and security room.

- 3.2.2 On basis of these architectural design parameters, during each the festival event days the total water consumption demand and peak flow rate, including those for the fresh water and flush water and that for cleansing and irrigation is estimated to be 182 m³/day and 15.17 Litres/sec respectively as tabulated in Table 1.

- 3.2.3 While WSD advised a limited flow rate of around 3,500 Litres/hour (1 Litre/sec) can only be provided to the Development Site, it will be much less than the peak flow rate demanded during each of the festival event days. It is proposed that a dual compartment water storage water of capacity 182 m³ will be provided within the Development Site to cater for the total water demand for one festival event day.

3.3 Calculation of Residual Head

- 3.3.1 If a water supply pipe of 50 mm diameter is considered, the pipe head loss and water velocity incurred by the 1 Litres/s average water flow will be 0.78 mH₂O and 0.51 m/s respectively as illustrated in Table 2.

3.4 Schematic Design of Water Supply Pipeline to the Application Site

3.4.1 Existing Condition and Available Government Water Mains

The Fresh Water Mains Record Plans (WSD drawing nos. W67880_06-SW-04B and W67880_06-NW-24D) reveal that there is currently one DN80 WSD fresh water mains in the vicinity of the Development Site as shown on Figure 1.

- 3.4.2 It is proposed that the applicant shall be responsible to construct a 50mm diameter fresh water pipe from the existing DN 80 fresh water town mains to the fresh water, flush water tank, sprinkler water tank, street FH tank and FS tank in the Development Site. The schematic design of the pipeworks, tanks and pumps system is displayed in Figure 1 and Fig 4.

Chapter 4 Proposal of Fire Services Provision

4.1 Existing Condition of Street Hydrant

As revealed by the “Fresh Water Mains Record Plan” dated 2nd July, 2024 and issued by Water Supplies Department, there is currently no government fresh water mains nor street fire hydrant in the vicinity of the Application Site.

4.2 Proposal of Fire Services Installations

Fresh water will be used for the street fire hydrants, sprinkler system and fire hydrant/hose reel system. Design of these fire services installations will comply with Code of Practice for Minimum Fire Services Installations and Equipment 2022, Technical Guidance for Automatic Sprinkler Installations 2015, and BS EN 12845:2015 Automatic sprinkler systems.

Verbal advice from FSD/New Projects was sought on 26th June, 2025. As the proposed water supply main will be connected to the one feed (single source) WSD water main, one 84 m³ sprinkler tank which is equal to 2/3 of full capacity sprinkler water tank for OH2 hazard with height of the highest sprinkler above the lowest being less than 30 m will be constructed in the development site. Direct connection to Services Provider’s Computerized Fire Alarm Transmission System will be provided. Two sprinkler pump (one duty and one standby) and one jockey pump will be installed in the Development site.

One 36 m³ FS water tank with two fire pumps (one duty and one standby) and one jockey pump will be installed in the Development site.

One street hydrant water tank of 245 m³ capacity with two supply pumps (one duty and one standby) will be provided in the Development site to supply water to the street fire hydrants to be installed on the access road around the Development site.

4.3 Schematic Design of Water Supply System for Fire Services

The water consumption for fire services installations is calculated as shown in Table 3.

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According to CoP for Minimum Fire Services Installations and Equipment, the street fire hydrant water tank, sprinkler water tank and FS water tanks will have to be refilled to full capacities in six hours. While WSD advised a limited flow rate of around 3,500 Litres/hour (1 Litre/sec) can only be provided to the Application Site, an additional water storage of total capacity 343.4 m³ (245 m³ + 84 m³ + 36 m³ - 21.6 m³ (a litre/s x 6 hours x 3600 sec/hr)) will be provided to re-fill these three water tanks in six hours.

The schematic design of the water supply system for fire services installations is illustrated in Fig. 4.

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Table 1 Calculation of Total Water Consumption Flow Rate

Potable and Flush Water Consumption

Total number of staff and the temporary volunteers	=	150	persons	
Water Usage Factor for staff working day time (FW 50L/person, flush water 50L/person)	=	80	Litres/p/day	Refer to WSD's DI No. 1309
Total Water Usage per day for staff working day time	=	150×80	= 12000	Litres/day
Total number of visitors in one of the festival days in a year	=	4000	persons	
Water Usage Factor for visitors (FW 20 L/person, flush water 20 L/person)	=	40	Litres/p/day	Refer to WSD's DI No. 1309
Total Water Usage per day for visitors	=	4000×40	= 160000	Litres/day
Total Water Consumption per day for day time staff and visitors	=	$12000 + 160000$	= 172000	Litres/day
Peak flow rate (peak flow factor = 3)	=	$172000 \times 3 / (10 \times 3600)$	= 14.33	Litres/sec

Cleansing Water Usage

There will be about 6 cleansing water taps, each using 0.15 Litres/s for 30 minutes per day.

Daily cleansing water consumption	=	$6 \times 0.15 \times 1800$	= 1620	Litres/day
Peak flow rate (peak flow factor = 3, water used in 10 hrs per day)	=	$1620 \times 3 / (10 \times 3600)$	= 0.135	Litres/sec

Irrigation Water Usage

There will be about 1200 m² landscape, requiring 7 Litres/m² per day

Daily irrigation water consumption	=	1200×7	= 8400	Litres/day
Peak flow rate (peak flow factor = 3, water used in 10 hrs per day)	=	$8400 \times 3 / (10 \times 3600)$	= 0.7	Litres/sec

Total water consumption for the whole Development Site (including potable water, non-potable water and flush water consumption) (which will occur from 8:00am to 6:00pm)	=	$172000 + 1620 + 8400$	= 182020	Litres/day
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**Calculation of Maximum Water
Flow Rate (Potable, Flushing,
and non-potable)**

$$\begin{array}{lclclcl} \text{Maximum water flow rate} & = & 14.33 & + & 0.135 & = & 15.17 & \text{Litres/s} \\ & & & & + 0.7 & & & \end{array}$$

Table 2 Calculation of Residual Head of the Proposed Water Supply System

Calculation of water pressure loss from the connection to the existing government water mains to the proposed Development by using Hazen-Williams Equation,

$$V = 0.85 C R^{0.63} S^{0.54}$$

Where V = water velocity (m/s) in a pipe

C = Roughness coefficient

R = Hydraulic radius (in metre)

S = Frictional hydraulic gradient

Re-arranging Hazen-Williams Equation to express S in terms of V, C and R

$$H_f = S \cdot L = 7.8828 Q^{1.852} L / (k^{1.852} C^{1.852} d^{4.8704})$$

Where H_f = Total head loss over whole pipe length (in meter H₂O)

S = Head loss per unit pipe length (in meter H₂O / m)

L = Total pipe length (in meter)

Q = Water flow (in m³/s)

K = 0.85

C = Roughness coefficient

d = Pipe diameter (in meter)

Parameters of Calculation	Calculated Parameter of Proposed Supply pipe			Remark
DN 50 pipe Connection to WSD existing DN150 mains				
Average Water flow, Q	=	0.001	m ³ /s	
Pipe length, L (plus 10% allowance)	= 50 x 1.1	= 55	m	
k	=	0.85		
Roughness coefficient, C	=	110		
Internal diameter of uPVC or PE lined GS pipe, d	=	0.049	m	
Head loss over whole pipe length, H _f	=	0.6	m	
Minor head loss (30% of pipe length head loss)	=	0.18	m	
Total head loss	= 0.6+0.18	= 0.78	m	
Velocity under average water flow	=	= 0.51	m/s	

Table 3 Calculation of Water Consumption for Fire Services Installations

Street Fire Hydrants Water Consumption

The total output of two 65 mm fire hydrant outlets shall be 66.7 Litres/s

Street fire hydrants water tank capacity	=	66.7 x 3600	=	240120 Litres	
				, say	
				245000	
Water flow rate (refilling in 6 hours)	=	245000/ (6 x 3600)	=	11.35 Litres/s	

Sprinkler System Water Usage

Sprinkler tank Full capacity (OH 2) with height of the highest sprinkler above the lowest being equal to or less than 30 m automatically by two pumps (one duty and one standby)	=	125 m ³	=	125000 Litres	Table 9-Minimum water volume for pre-calculation LH and OH systems in BS EN 12845_2015 Auto Sprinkler Systems Technical Guidance for Sprinkler Installations incorp. BS EN 12845_2015 OH2 hazard class is considered
With provision of direct connection to Service Provider's Computerized Fire Alarm Transmission System, Minimum tank capacity	=	125 x 2/3	=	84 M3	
Water flow rate delivered by the sprinkler pumps	=	1000 Lit /min	=	16.67 Litres/s	
Water flow rate (refilling in 6 hours)	=	84000/ (6 x 3600)	=	3.89 Litre/s	

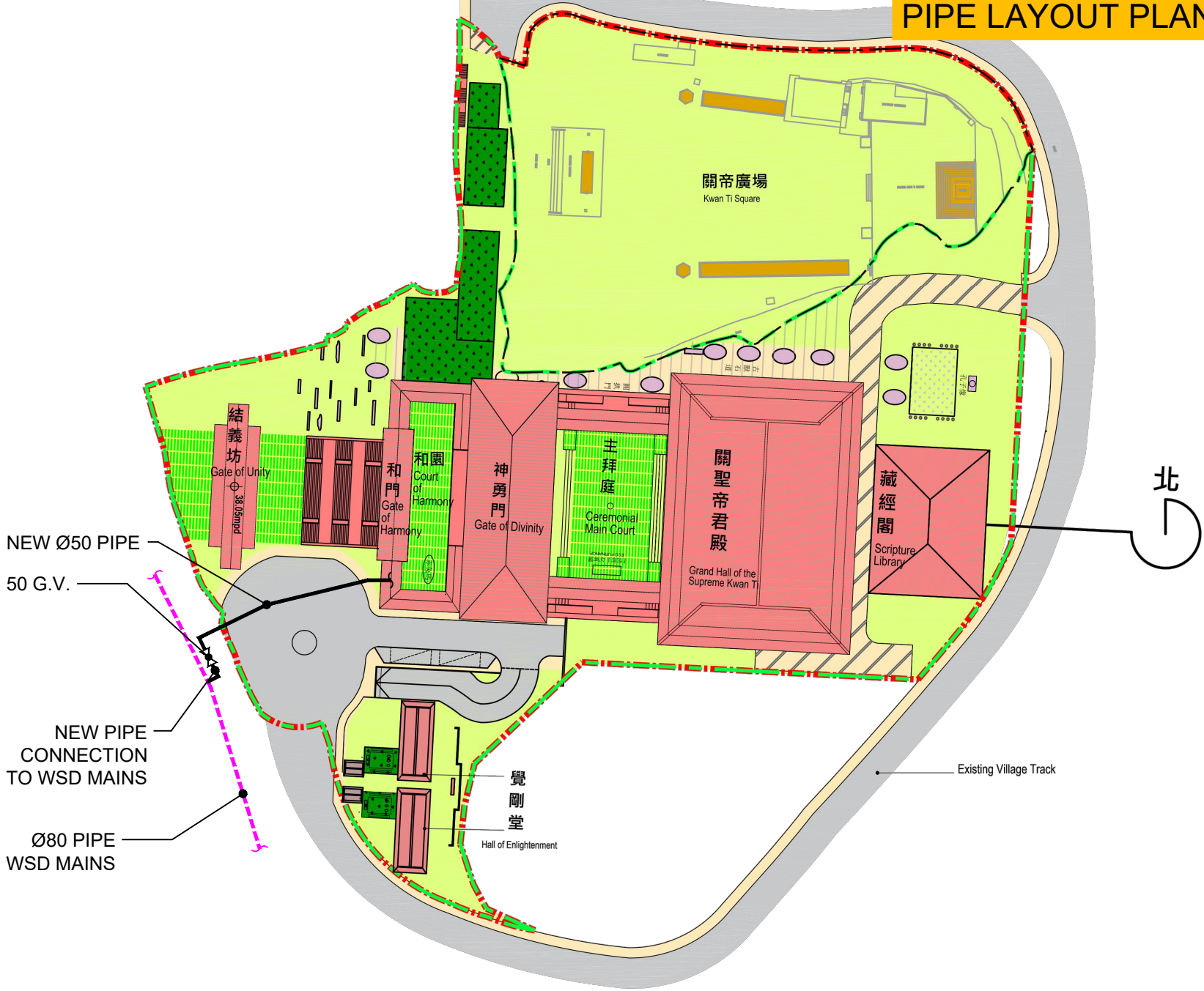
Fire Hydrant and Hose-reel System Water Usage

Fire Services water tank capacity on roof of the highest building	=	36 m ³	=	36000 Litres	
Water flow delivered by the fixed fire pumps for two hydrant outlets with running pressure at any hydrant outlet	=	7.5 x 2	=	15 Litres/s	
Water flow rate (refilling in 6 hours)		36000/ (6 x 3600)	=	1.67 Litres/s	

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Total capacity of the three FSI water tanks	$245 + 84 + 36$	$=$	365	m^3
Water volume refilled by WSD's town mains in six hours	$= 1 \times 6 \times 3600 / 1000$	$=$	21.6	m^3
Additional water storage tanks for refilling the three FSI water tanks in six hours	$= 365 - 21.6$	$=$	343.4	m^3

FIGURE 1
APPLICATION SITE -
FRESH WATER SUPPLY
PIPE LAYOUT PLAN



LEGEND

- GREEN COVERAGE
- GREEN ROOF
- TEMPORARY RELIGIOUS DECORATION
- PROPOSED NEW BUILDINGS/ STRUCTURES
- LANDSCAPE STONE CARVED STATUE
- CARPARK AND ACCESS ROAD
- PEDESTRIAN CIRCULATION
- CEREMONIAL COURTS AND PIAZZA
- EVA
- PROPOSED REZONING SITE BOUNDARY
- BOUNDARY OF KWAN TI SQUARE (ONLY USED FOR LANDSCAPING AND REPLANTING TREE)
- PROPOSED MAIN DEVELOPMENT SITE BOUNDARY

Figure 4 Water Supply Proposal – Schematic Diagram Sheet 2

