

Provision of Cremators at Wo Hop Shek Crematorium

Environmental Impact
Assessment Report

Executive Summary

February 2008

Report no: 01256R0031



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1 Introduction

- 1.1.1 The existing Wo Hop Shek Crematorium is a coffin crematorium with two twin cremators. A skeletal cremator building with a single cremator operates nearby for the cremation of skeletal remains from burial. The skeletal cremator and the coffin cremators were commissioned in the 1960's and 1991 respectively.
- 1.1.2 The five existing cremators are approaching the end of their serviceable life. They are beyond economic repair and further restoration work is not considered cost-effective or sustainable. They should therefore be replaced and the capacity of the crematorium facilities should be expanded to meet increasing public demand.

2 Project Description

2.1 The Need and Justification for the Project

- 2.1.1 The number of cremations has been rising steadily in the last 30 years and the existing public cremators in the territory are operating at almost their full capacities. In 2006, 86% of dead bodies were cremated. Although the pledge of undertaking the cremation within a maximum waiting time of 15 days after application could be fully met, the present provisions would not be sufficient to cater for any increase in demand of the cremation in the coming years.
- 2.1.2 The Food and Environmental Hygiene Department (FEHD) therefore proposes to demolish the existing coffin crematorium and the skeletal cremator building at Wo Hop Shek and to construct a new crematorium in the existing site. The current Wo Hop Shek site is already established and the use of an existing site is a more sustainable approach than using a greenfield site – due to environmental concerns and general public's resistance against cremators in their neighbourhood, it is extremely difficult to identify suitable new land for crematorium development.
- 2.1.3 New cremation technology will be used to enhance throughput and to improve the control on air emissions from the cremators to meet the latest “Best Practicable Means for Incinerators” BPM 12/2 (06). This will improve the air quality in the vicinity of the Wo Hop Shek Crematorium.
- 2.1.4 If the existing cremators are not replaced and upgraded in time, or if sufficient numbers of additional cremators were not provided, a majority of the applications for cremation sessions will not be met within the present pledge of 15 days. An extended waiting time for the bereaved family would not be acceptable to the community.

2.2 Consideration of Alternative Options

- 2.2.1 The following alternative options were considered for the new crematorium: new sites in more remote areas outside the Wo Hop Shek Cemetery; alternative site at Tuen Mun; alternative extension in other existing crematorium sites at Kwai Chung,

Fu Shan, Diamond Hill and Cape Collinson; expansion of the existing Wo Hop Shek site; and alternative extension options such as expansion by in-situ development of the existing Wo Hop Shek Crematorium Site. Table 2-1 summarises the environmental benefits and dis-benefits of the afore-mentioned alternative extension options.

Extension Options	Environmental Benefits	Environmental Dis-benefits	Reasons for Not Selected as Preferred Option
New sites in more remote areas outside the Wo Hop Shek Cemetery	The development will not be constrained by existing building structures or establishments. There is more scope for more flexible planning.	Main environmental dis-benefits are identified as follows: 1 Depending on site location, potential impact to environment would be imposed on a greenfield site; 2 Vehicular emission and traffic noise brought about by construction traffic movement during construction phase; 3 Traffic noise and vehicular emissions brought about by traffic generated during operation phase; 4 New air emission source into the remote area; 5 Potential visual impact by a new crematorium; and 6 Access road construction, site formation and tree felling work may be involved.	It would take many years to develop adequate supporting transport network and infrastructural facilities in these areas before they are ready for development. Depending on the land use zoning, it would also take time to resolve the non-compatibility of crematorium development proposal with the planning intention of these areas, assuming that they have not previously been zoned for crematoria. Not able to meet the current and increasing demand for public cremation service.
Alternative site at Tuen Mun Area 46	Same as above.	Main environmental dis-benefits are identified as follows: 1 Potential visual impact by a new crematorium; 2 Vehicular emission and traffic noise brought about by construction traffic movement during construction phase; 3 Traffic noise and vehicular emissions brought about by traffic during operation phase; and 4 New air emission source into the area.	Parts of the site are currently on lease as private golf driving range and EPD's works site. The latter lease will expire by 2009. The Government is considering the possibility of inviting the non-Government and/or private sector to participate in C&C development. It is expected to take time to come to a view. It is highly likely that the development scale, delivery schedule and mode of operation for any C&C development at this potential site can only be drawn up at a later stage. As such, the site is regarded as a potential site for planning of crematorium in the long term.
Further extension in other existing crematoria at Kwai Chung, Fu Shan, Diamond Hill and Cape Collinson in addition to the already implemented / being implemented	Human activities and activities relating to the operation of crematoria already exist in these sites. Impact on the local ecosystem arising from further extension will be marginal.	Air and noise emissions to these areas brought about by increasing traffic and cremation emissions will be increased though marginally.	Most of the existing crematoria were developed to the maximum site utilization. Further extension would be hindered by physical constraints. Very limited expansion may be possible at certain sites but not sufficient to meet the rising public demand for cremation service.

Extension Options	Environmental Benefits	Environmental Dis-benefits	Reasons for Not Selected as Preferred Option
development plans			
Expansion of the Existing Wo Hop Shek Site			
Site to the west of the existing crematorium site (Site A)	---	---	It has been allocated as private lots and is not available for public project.
Narrow strip of land to the east of the existing crematorium (Site B)	Improve local air quality with the replacement of new cremators with advanced emission control technology.	Insufficient flat area and requires extensive site formation works. Generation of noise and air quality impacts during construction.	Part of the site overlaps with the concurrent project site.
Site to the northeast of the existing crematorium (Site C)	Improve local air quality with the replacement of new cremators with advanced emission control technology.	Access road widening will be required. This would have associated noise, air quality and ecological impacts during the construction phase as this site is closer to the sensitive receivers.	The site is smaller and does not meet the requirements.
Expansion by in-situ development of the existing Wo Hop Shek Crematorium Site			
Preferred Option in this EIA study	Improve local air quality with the replacement of new cremators with advanced emission control technology. Environmental assessment indicates that there would be no adverse air quality and noise impacts due to the construction and operation of the new crematorium. Human disturbance already exist in the Wo Hop Shek Site, impact of the proposed new crematorium in the current site on the local environment	Some site formation works will be required but environmental impact can be minimised to acceptable levels through mitigation measures.	Not applicable

Extension Options	Environmental Benefits	Environmental Dis-benefits	Reasons for Not Selected as Preferred Option
	will be marginal.		
Alternative in-situ extension arrangements			
Retaining of the existing crematorium building	Less demolition works.	This will make the planning of the building inflexible and resulting in a bigger site area required. Consequently, giving rise to a larger extent of construction dust impacts and disturbance to the existing trees.	It is not feasible in view of the additional large building area required to accommodate the air filtration system of the new cremator design. It is not possible to incorporate the new facilities within the existing building envelope.
Setting back of the building from the main road	Emissions and bulk buildings further away from sensitive receivers. However, given the nearest air sensitive receivers are located approximately 330m away from the site and the majority of the building bulk will be screened by natural topography, the benefits will be marginal.	This requires more extensive cutting of natural slope at the southern boundary of the site and undesirable disturbance to the existing trees and natural streams abutting the site.	The dis-benefits will significantly outweigh the minor benefits.
Locating of chimneys to the opposite end of the site	No obvious benefit	This would make the chimneys nearer and visually more conspicuous to the sensitive receivers.	Visual impact to highrise visual sensitive receivers due to existing topography would be imposed if chimneys are located at Location A, and a more bulky appearance viewed from pedestrian level would be caused if chimneys are located at Location B as shown in Figure 2-2 of the EIA Report.
Sinking of the whole building below ground	Reduce visual impact to the surrounding. However, given the majority of visual impact will be screened by natural topography, the benefits will be marginal.	Deep basement construction involving grouting and major dewatering works would impose significant engineering difficulties and would increase overall environmental impact during construction phase.	The dis-benefits (in terms of engineering difficulties and environmental impact) will significantly outweigh the minor visual benefits.

Table 2-1 Environmental Benefits and Dis-benefits of Feasible Extension Options

2.2.2 The preferred scenario is to expand the existing Wo Hop Shek Crematorium site to re-provision four existing coffin cremators and one existing skeletal cremator in-situ and to provide four additional coffin/dual-purpose cremators in three phases , because:

- It is the most suitable option ready for early implementation;
- Human disturbance already exists at the current site, therefore the environmental impact of the expanded project on the local environment will be marginal;
- The existing cremators can be upgraded using the latest cremation technology, thereby addressing the local concern and improving the air quality; and
- The existing crematorium site is fully enclosed by hillside and the surrounding landform, which helps to reduce the visual impact to the surrounding areas.

2.3 Project Location

2.3.1 The Project Site is shown in Figure 2-1 **Location Plan**, below. It falls within the Wo Hop Shek Cemetery area which has been allocated to FEHD under Government Land Allocation No. DN 81. The Site does not currently fall into any Outline Zoning Plan.

2.4 Construction and Demolition Programme

2.4.1 The construction phase will be divided in the three phases outlined below:

- **Phase I (Year 2009 to Year 2011).** Demolition of the existing coffin crematorium building, transformer room and pump room and provision of five new coffin cremators, one dual-purpose cremator, one new skeletal cremator, one cremation plant room with sufficient space for housing nine single cremators and other ancillary facilities such as service halls. The new crematorium will provide seven cremators upon completion of Phase I.
- **Phase II (Year 2012).** The existing skeletal cremator building will be demolished upon completion of Phase I (i.e. there will be no overlapping between Phases I and II).
- **Phase III: Future Expansion Phase (for completion by around 2014).** Two additional cremators and one additional service hall will be provided upon completion of Phase II to allow future expansion.

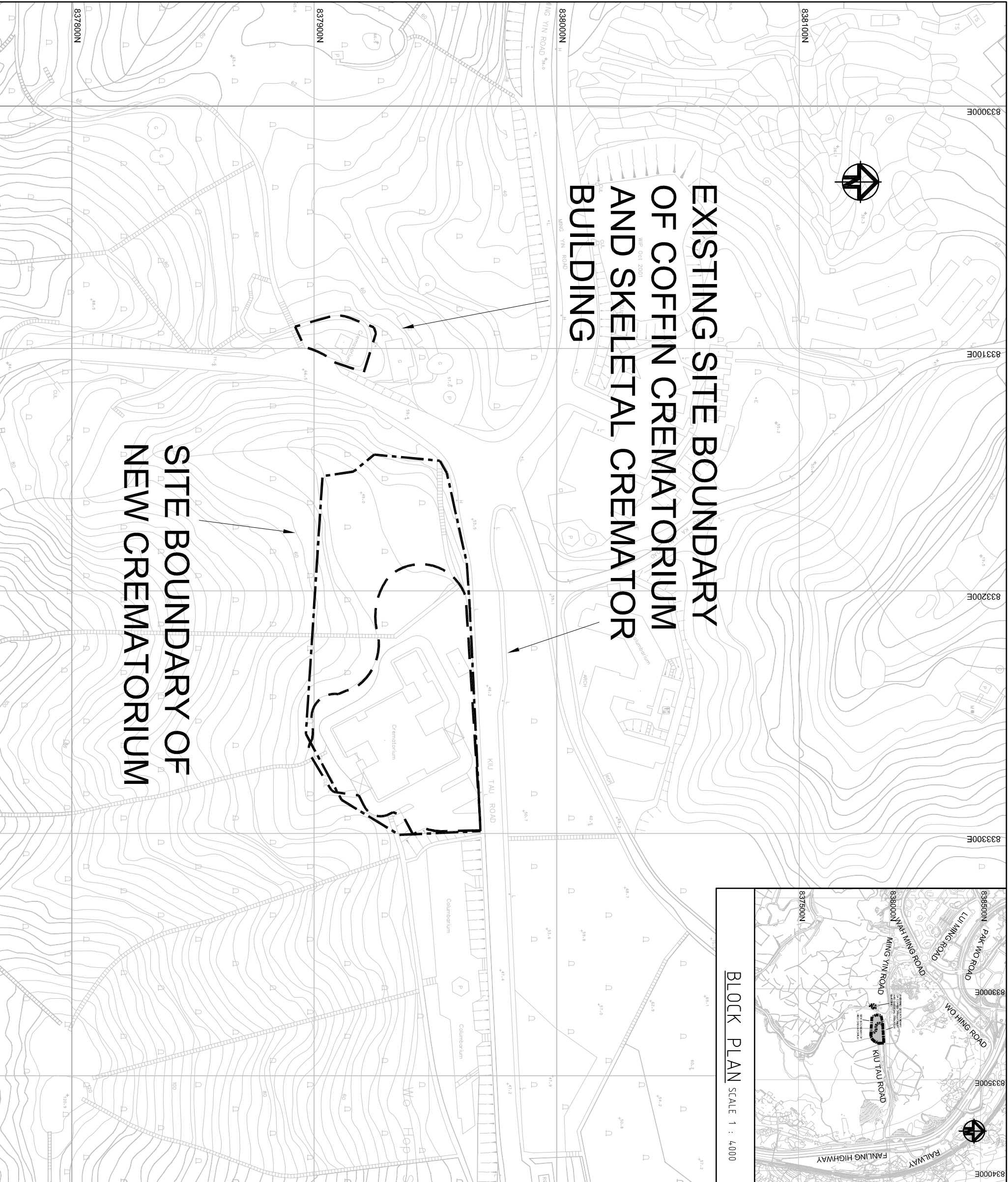
2.5 Benefits of the Project

2.5.1 The major benefits of the Project include:

- Replacement of the existing crematorium by a new one with cremators of improved design and improved air pollution control technologies would improve the air quality in the vicinity of the Wo Hop Shek Cemetery within the shortest possible time;
- Air emissions by using either Towngas or ultra-low sulphur diesel could meet all the BPM12/2(06) requirements. Nonetheless, in order to further reduce

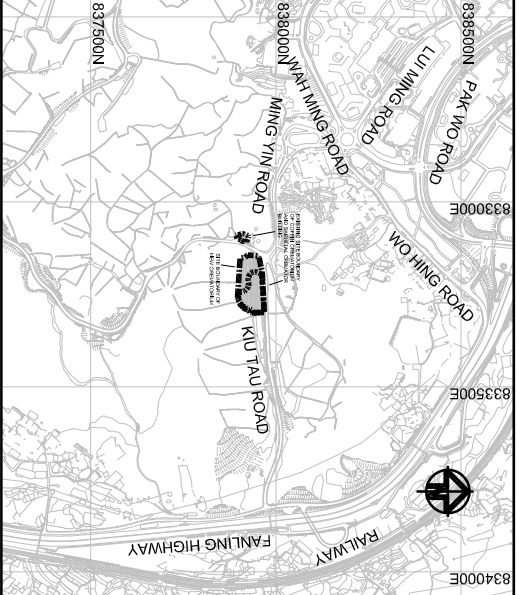
emissions of air pollutants from fuel combustion thereby to be more environmentally-friendly, Towngas has been selected as burning fuels for the new cremators instead of ULSD which has been using for the existing cremators in Wo Hop Shek, despite the higher operation cost of using Towngas; and

- The Project will help meet the increasing public demand for cremation services. The total annual public cremation capacity in the territory will be increased by 2014 and this will ensure that the current pledge of a maximum waiting time of 15 days be met.



**EXISTING SITE BOUNDARY
OF COFFIN CREMATORIUM
AND SKELETAL CREMATOR
BUILDING**

**SITE BOUNDARY OF
NEW CREMATORIUM**



BLOCK PLAN SCALE 1 : 4000

LEGEND :

- SITE BOUNDARY OF NEW CREMATORIUM
- EXISTING SITE BOUNDARY OF COFFIN CREMATORIUM AND SKELETAL CREMATOR BUILDING

01	FIRST ISSUE	01DEC06
Issue	Description	Date

Status
PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Original Size	A3	Checker	A. LEE
Height Datum	DATUM	Approver	A. LEE
Grid	GRID	© Copyright reserved	

Filename: 1256-FIG_1-1-DWG

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Project
PROVISION OF CREMATIORS
AT WO HOP SHEK CREMATORIUM

Title
LOCATION PLAN

Figure No.	2-1	Issue	-
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3 Summary of Potential Impacts and Recommendations

3.1 Air Quality Impact

- 3.1.1 The major air quality impacts at Air Sensitive Receivers (ASRs) will be fugitive dust from the demolition and construction and gaseous emissions from the cremators during operation. An air quality impact assessment was carried out to assess the air quality impact during both construction and operation phases of the Project.
- 3.1.2 Dry type air pollution control units will be adopted for the new cremators which are designed with equivalent specifications as for the recent crematoria projects at Fu Shan and Diamond Hill with adoption of new technology to meet all the BPM12/2 (06) requirements at full load conditions.
- 3.1.3 With the implementation of dust control measures for the dusty construction works and unpaved haul roads and areas, no unacceptable construction dust impact to the nearby ASRs during the construction phase of the Project is anticipated.
- 3.1.4 There will be no adverse odour impact due to operation of the Project and no adverse impact to the nearby ASRs due to the chimney emissions.
- 3.1.5 High temperature inside the secondary combustion chamber of the new cremators will destroy all pathogens and so there are no health concerns relating to pathogens.
- 3.1.6 Advanced joss paper burners with high dust and smoke removal efficiency will be used to minimise the air pollutant emissions from joss paper burning. Furthermore, in view of the nearest ASR is located far away from the new crematorium, impact on ASRs will be minimal.
- 3.1.7 Confirmatory test of dioxins in the depositions on the interior surface of chimneys, flue gas ducting and combustion chambers of the existing cremators shall be carried out after decommissioning but prior to the demolition.

3.2 Noise

- 3.2.1 Noise impact assessment was carried out to assess the noise impact during both construction and operation phases of the Project.
- 3.2.2 Construction noise impact assessment was conducted for the three phases of construction activities based on standard acoustic principles and the methodologies. Potential construction noise impacts to the Noise Sensitive Receivers (NSRs) will be mainly from the use of Powered Mechanical Equipment (PME) during construction activities. Use of quiet PME is recommended as the mitigation measure during construction phase. Good site practice is also recommended to further minimise the noise nuisance.
- 3.2.3 Noise generated from operation of the fixed plants during operation phase of the Project was assessed. The assessment results showed there will be no adverse noise impact from the operation of the new crematorium.

3.3 Land Contamination

- 3.3.1 A land contamination assessment was undertaken and the Interim Contamination Assessment Report (CAR) indicates that no significant soil contamination was detected in the soil samples collected.
- 3.3.2 The CAR stated that there is no historical evidence indicating that there were any contaminating landuses on the site prior to the existing crematorium operations. It is considered that soil contamination is unlikely at most of the areas within the site.
- 3.3.3 Further site investigations in areas that are currently in continuous operation and cannot be accessed for investigation will be carried out after decommissioning but prior to demolition. These areas include the transformer room, dangerous goods stores and cremator.

3.4 Waste Management

- 3.4.1 The key waste materials to be generated during construction phase of the Project will include excavated materials, construction and demolition materials, contaminated materials, if any, (including ash waste, building structures and contaminated soil), chemical waste and general refuse. Ash and non-combustible residues, chemical waste and general refuse are expected to be the major types of waste arising from the operation of the new crematorium.
- 3.4.2 It is anticipated that all excavated materials will be re-used and backfilled on site during construction. There will be no surplus of excavated materials that will require off-site disposal, unless significant volumes of contaminated soils are detected.
- 3.4.3 Contaminated materials will include those contaminated by asbestos, dioxins, heavy metals and hydrocarbons (such as polyaromatic hydrocarbons, total petroleum hydrocarbons and polychlorinated biphenyls).
- 3.4.4 With effective implementation of the recommended good practice and mitigation measures, it is anticipated that the associated impacts on the environment and the potential impacts on the capacity of waste collection, transfer and disposal facilities will be insignificant during both construction and operation.

3.5 Landscape and Visual Impact

- 3.5.1 The impact on landscape resources after mitigation is in general acceptable. Impacts on landscape resources are mainly due to the removal of trees. Amenity planting, woodland mix planting and tree compensation will mitigate the impact to an acceptable level.
- 3.5.2 The landscape character will be benefited by the better aesthetic outlook of the proposed crematorium and its external landscaping areas.
- 3.5.3 Since the majority of visual impact of the new crematorium will be screened by natural topography, the most adverse visual impact will be to occasional visitors of the cemetery during the construction phase.

3.6 Water Quality

- 3.6.1 The water sensitive receivers (WSRs) are the two streams to the south of the Site. However, since the two streams are ephemeral, the potential water quality impact likely to be induced is anticipated to be minimal. No effluent will be discharged from the air pollution control system and scrubbing system in the new crematorium as “dry” process will be adopted. Hence, adverse water quality impact during operation phase of the Project is not expected.
- 3.6.2 The major impacts associated with construction include demolition and construction runoff and drainage, sewage generated from the on-site construction workers and groundwater from basement formation.
- 3.6.3 Sheet piling shall be provided at suitable location around the basement excavation to minimise the effect of lowering the water table from any dewatering process. Other mitigation measures are recommended during construction to handle the construction run-off.
- 3.6.4 Only a small amount of sewage will be generated from the public and general cleaning from the new crematorium. Sewage will be diverted to communal sewer and directed to government sewage treatment facilities.

3.7 Ecology

- 3.7.1 Potential ecological impacts arising from construction activities include habitat loss. This is only anticipated during Phase I of the Project with a loss of 0.25ha of semi-natural woodland and 0.3ha of scrubland. Together, these represent only 0.42% of the total woodland within the Study Area and the impact is considered insignificant.
- 3.7.2 Construction will require removal of an individual of *Aquilaria sinensis* and a colony of *Cibotium barometz*, however, these will be transplanted to similar habitat nearby. Some individual of *Fraxinus* spp. will also be affected and, together with other trees in the semi-natural woodland, will be transplanted if applicable. Felled trees, which are unavoidable, will be compensated by planting trees within or outside Study Area.
- 3.7.3 As habitats surrounding the Site are mainly semi-natural woodland growing on slopes, slight variation in underground water table during the dewatering work for basement excavation should not have significant impact on the existing vegetation. Nevertheless, sheet-piling, or any similar method, will be provided during basement formation to minimize the variation in water table.
- 3.7.4 Indirect impact from construction activities such as increased human activities or disturbance is considered minor in view of the existing level of disturbance.
- 3.7.5 Some disturbances to adjacent habitats may arise due to noise and activity associated with an increased number of visitors during operation of the new crematorium. The Site and surrounding areas, however, have already been subjected to considerable human disturbance due to the presence of graves, crematorium and columbaria. The minor increase in number of visitors will have minimal impact.

- 3.7.6 Overall, the Project is not likely to cause any significant additional disturbance impact on the valuable habitats within and around the Site during its operation.

3.8 Environmental Monitoring and Audit

- 3.8.1 Environmental monitoring and audit (EM&A) is recommended for the Project, in particular, environmental monitoring during construction phase is recommended for air quality, landscape and visual impact, water quality and ecology.
- 3.8.2 Site audit is recommended to be undertaken routinely during construction to ensure that appropriate environmental protection and pollution control mitigation measures are properly implemented.
- 3.8.3 Operation phase monitoring is recommended for air quality. Details of the EM&A programme, including monitoring methodologies, procedures, locations, and frequencies, are documented in the stand-alone EM&A Manual for the Project.

4 Conclusions

- 4.1.1 This EIA has considered the environmental impacts from the demolition of the existing crematorium as well as the construction and operation of the new crematorium.
- 4.1.2 In general, the environmental impacts arising from the Project are either considered minimal or can be mitigated to an extent where the impacts on the sensitive receivers are acceptable. No significant residual impacts are anticipated, provided that the recommended mitigation measures are properly implemented.
- 4.1.3 An environmental monitoring and audit (EM&A) programme is therefore recommended to ensure that the mitigation measures have been properly implemented and environmental quality has not been seriously affected throughout the Project.