

15 Conclusion

15.1 General

15.1.1.1 An Environmental Impact Assessment (EIA) Report has been prepared for Site Formation and Associated Infrastructural Works for Development of Columbarium, Crematorium (C&C) and Related Facilities at Sandy Ridge Cemetery to satisfy the requirements given in the EIA Study Brief ESB-271/2014 and the Technical Memorandum (TM) on Environmental Impact Assessment Process. All the current design information has been incorporated into the EIA process. Aspects that have been considered in this EIA Report include:

- Project Introduction;
- Consideration of Alternative Design and Layout;
- Consideration of Alternative Construction Methods and Sequence of Works;
- Air Quality;
- Noise;
- Water Quality;
- Waste Management;
- Land Contamination;
- Ecology;
- Fisheries;
- Landscape and Visual;
- Cultural Heritage; and
- Environmental Monitoring and Audit.

15.1.1.2 As the crematorium is a Designated Project under Item N.4 of Schedule 2 of TM-EIAO, a separate EIA study would be conducted by respective project proponent to fulfil all the statutory requirements and procedures under the EIAO.

15.1.1.3 All the existing and planned environmental sensitive receivers in the vicinity of the C&C facilities development and associated works have been identified by conducting site surveys and reviewing relevant planning information. The receivers identified include existing village houses and planned residential development. These receivers have all been considered in this EIA study.

15.1.1.4 The key assessment assumptions, limitation of assessment methodologies and all related prior agreements with Environmental Protection Department (EPD) on assessment of different environmental aspects are given in **Appendix 15.1**.

15.2 Alternative Design and Layout

15.2.1.1 The previous feasibility study had recommended a layout for both the platform for columbarium and the associated access roads, which had been adopted in the subsequent Environmental Impact Assessment (EIA) Study Brief (ESB-271/2014) under the Environmental Impact Assessment Ordinance (EIAO). However, throughout the design process, a number of optimizations has been identified for both the platform configuration and road layout such that the current design has obvious environmental improvements over the original design (shown in Appendix A in the EIA Study Brief (ESB-271/2014)). A summary of the overall environmental improvements of the current design over the original design is given below:

- The area of woodland directly affected would be decreased from 2.0ha to 1.0ha, by a reduction of 1.0ha which is equivalent to a 50% reduction;
- The area of wet woodland affected by slope works would be decreased from 0.0017ha to 0.0ha with at least 15m separation distance, by a reduction of 0.0017ha which is equivalent to a 100% reduction;
- Avoidance of 4 affected clan graves in the original layout;
- Avoidance of 4 seasonal watercourses that directly feed into the wet woodland;
- The total surplus inert construction and demolition (C&D) material generation would be decreased from about 706,000m³ to 481,800m³, by a reduction of 222,800m³; and
- The road widening works for a section of Choi Yuen Road are no longer required. Hence, noise and air quality impacts arising from the construction and operation along a section of Choi Yuen Road are not anticipated. And the secondary impacts induced from provision of noise barrier are also avoided. No major road improvement works and no excavation works are required for the proposed pick-up / drop-off points.
- As the platform and works area have been significantly reduced, the environmental impacts such as air quality, noise, waste management, ecological, landscape and visual impacts to the nearby sensitive receivers are anticipated to be significantly reduced.

15.3 Alternative Construction Methods and Sequence of Works

15.3.1.1 After considering all the alternative design and layout in the feasibility study, the design has therefore been taken forward as the basis for this EIA to demonstrate that all statutory requirements under the Environmental Impact Assessment Ordinance (EIAO) are compiled with. Where necessary, mitigation measures will be proposed to mitigate the adverse impacts.

15.3.1.2 In conclusion, the construction of the proposed works elements within the Project boundary would involve relatively more extensive construction activities due to the construction of site formation work and associated infrastructure such as site

clearance, construction of haul road, earth filling and excavation, retaining wall for the road works and platform foundation. In particular, alternative construction method of bored pile wall construction has been considered for the platform foundation to allow passage of groundwater to the wet woodland.

15.3.1.3 In comparison, the works for the off-site pick-up and drop-off points of shuttle buses for the MTR stations would be very minor and only involve some retrofitting of existing facilities such as rearrangement of facilities, bus routes. Major excavation works etc. would not be required. In addition, minor construction for the tipping halls and new ramps would be required for the operation of barging point at Siu Lam for the reuse of surplus inert C&D materials in other concurrent projects.

15.4 Air Quality

15.4.1.1 Air quality impact assessment has been conducted for both construction and operational phases of the Project. Potential dust impact would be generated from the site formation, slope works, road works, stockpiling, and operation of barging point at Siu Lam etc. during construction phase. Qualitative / Quantitative construction dust assessment has been conducted. Results have concluded that there will not be any adverse residual air quality impact during construction phase provided that appropriate mitigation measures are implemented such as frequent watering on all worksites once per hour during working hours (7am – 7pm).

15.4.1.2 Operational air quality assessment has concluded that the predicted air quality impact on all air sensitive receivers would comply with Air Quality Objective (AQO), and hence no adverse residual air quality impact during operational phase is anticipated.

15.5 Noise

15.5.1.1 Construction noise assessment has been conducted. All the practicable mitigation measures including use of quiet plant, scheduling of works, adoption of acoustic mat, movable noise barrier, full enclosure for various PMEs for workfronts for construction of viaduct, widening of Sha Ling Road and Lin Ma Hang Road, utility laying works along Man Kam To Road, construction of platform for crematorium at Sandy Ridge, minor slope work required at Lin Ma Hang Road, construction of new ramp and tipping hall to facilitate the barging point operation etc. have been exhausted to minimise the noise impacts. With the implementation of all proposed mitigation measures, all representative NSRs would comply with the construction noise criterion and adverse construction noise impact is thus not anticipated.

15.5.1.2 For the operational phase, noise barriers and low noise surfacing materials are required to fulfill the EIAO criteria. **Tables 15.1a** and **15.1b** summarise the proposed type, length, location and height of the mitigation measures for road traffic noise impact.

Table 15.1a Summary of noise barriers for road traffic noise impact (Existing NSRs)

Mitigation Measure ID	Location	Type of Noise Barrier ^[1]	Benefited NSRs
MM1	Along Sha Ling Road	Approx. 12m long, 2.5m high ANB	N5-2
MM2	Along Sha Ling Road	Approx. 92m long, 2.5m high ANB	N5-5 and N5-6
MM3	Along Project Road near Sha Ling Road	Approx. 28m long, 3m high ANB	N9-1
MM4	Along Project Road near Sha Ling Road	Approx. 51m long, 3m high ANB	N9-1
MM5	Along Lin Ma Hang Road near San Uk Ling	Approx. 25m long, 4m high ANB	N18-1, N18-2, N18-3, N18-4, N18-5, N18-6
MM6	Along Lin Ma Hang Road near San Uk Ling	Approx. 21m long, 4m high ANB	N18-1, N18-2, N18-3, N18-4, N18-5, N18-6
MM7	Along Lin Ma Hang Road near San Uk Ling	Approx. 14m long, 4m high ANB	N18-1, N18-2, N18-3, N18-4, N18-5, N18-6
MM8	Along Lin Ma Hang Road near San Uk Ling	Approx. 18m long, 3m high ANB	N18-5, N18-6
MM9	Along temporary pullover space opposite San Uk Ling	Approx. 42m long, 3m high ANB	N19-1
MM10	Along Lin Ma Hang Road opposite San Uk Ling	Approx. 93m long, 3m high ANB	N19-1
MM11	Along Lin Ma Hang Road near San Uk Ling	Approx. 185m long, Low Noise Surfacing Materials	N18-1, N18-2, N18-3, N18-4, N18-5, N18-6

Note:

[1] ANB – Absorptive noise barrier (About 1m of lower portion will be absorptive).

Table 15.1b Summary of mitigation measures for road traffic noise impact (Planned NSRs)

Mitigation Measure ID	Location	Type of Noise Barrier ^[1]	Benefited NSRs
MM12	Along Lin Ma Hang Road near Muk Wu Nga Yiu ^[2]	Approx. 36m long, 5m high ANB	N23-P1, N23-P2
MM13	Along Lin Ma Hang Road near	Approx. 47m long, 5m high ANB	N23-P1, N23-P2, N23-P3

Mitigation Measure ID	Location	Type of Noise Barrier ^[1]	Benefited NSRs
	Muk Wu Nga Yiu ^[2]		
MM14	Along Lin Ma Hang Road near Muk Wu Nga Yiu ^[2]	Approx. 31m long, 5m high ANB	N23-P1, N23-P2, N23-P3
MM15	Along Lin Ma Hang Road near Muk Wu Nga Yiu ^[2]	Approx. 31m long, 5m high ANB	N23-P4
MM16	Along Lin Ma Hang Road near Muk Wu Nga Yiu ^[2]	Approx. 41m long, 5m high ANB	N23-P5
MM17	Along Lin Ma Hang Road near Muk Wu Nga Yiu ^[2]	Approx. 340m long, Low Noise Surfacing Materials	N23-P1, N23-P2, N23-P3, N23-P4, N23-P5

Note:

[1] ANB – Absorptive noise barrier (About 1m of lower portion will be absorptive).

[2] Planned NSRs are assigned within the "V" zone in Muk Wu Nga Yiu.

15.6 Water Quality

- 15.6.1.1** Potential water pollution sources have been identified as construction site runoff, sewage from the workforce, etc. in construction phase. Sewage generated by visitors and workers in the development, and non-point source pollution in operational phase.
- 15.6.1.2** Beside the pollution sources, the hydrological impact to the wet woodland near the Conservation Area located at the north of the Project has been evaluated, specifically for: i) change in groundwater hydrology from Sandy Ridge slope to wet woodland using in-situ ground water monitoring data; ii) water quality impact due to non-point source pollution from the proposed platform; and iii) potential erosion due to increased runoff in high momentum from the proposed platform to wet woodland through the seasonal watercourses.
- 15.6.1.3** By optimizing the design of the platform, foundation design and the drainage system, hydrological impact including groundwater and surface water to the wet woodland located at the north of the Project has been minimised.
- 15.6.1.4** With full implementation of the mitigation measures including proper sewerage and drainage systems, tight bottom seals, etc., adverse water quality impact is not anticipated during both the construction and operational phases of the Project.

15.7 Waste Management

- 15.7.1.1** Potential waste management implications from the generation of waste during the construction phase have been evaluated. Measures including the opportunity for on-site sorting, reusing C&D materials etc., are devised in the construction methodology to minimise the surplus materials to be disposed. Recommendations have been made for implementation by the Contractor during the construction period to minimise waste generation and off-site disposal.
- 15.7.1.2** It is estimated that 397,300m³ of inert C&D material would be generated in which 232,490m³ would be reused on-site and the remaining 164,810m³ would be reused off-site in other concurrent projects. A total of 493,000m³ of rock would be generated in which 179,010m³ would be reused on-site and the remaining 313,990m³ would be reused off-site in other concurrent projects. Besides, 3,700m³ of AHM would be generated in which 700m³ would be reused on-site and the remaining 3,000m³ would be reused off-site in other concurrent projects. The total inert C&D material (includes inert C&D material, rock and AHM) to be generated would be 894,000m³, in which 412,200m³ of them will be reused on-site and the remaining 481,800m³ will be reused in other concurrent projects. It is estimated that 21,300m³ of top soil and 700m³ of vegetation would be generated and all of them will be disposed to NENT Landfill.
- 15.7.1.3** It is estimated that 140 tonne of general refuse, paper, metals, plastics, etc. would be generated, in which 15 tonne will be reused on-site and the remaining 125 tonne will be collected by recycler and/or disposed to NENT Landfill. A few hundred litres / kilograms of chemical waste will be generated per month and it would be recycled by licensed facility as far as possible. The remaining chemical waste would be disposed of at CWTC. 45m³/day of sewage will be generated and the chemical toilets will be collected and disposed by licensed collector.
- 15.7.1.4** During operational phase, it is anticipated that an insignificant amount of general refuse would be generated from the routine road cleaning activities along the roads network for the C&C facilities and Lin Ma Hang Road.

15.8 Land Contamination

- 15.8.1.1** A land contamination assessment examined the potential contaminative land uses within the Project and their potential impacts to future use. The assessment involved desktop review, site survey and proposed environmental Site Investigation (SI) etc.
- 15.8.1.2** Based on the findings in desktop study and site survey, one potentially contaminated site (SRC-1) within the Area has been identified. According to the latest land resumption programme as advised by Engineer, only the western portion of SRC-1 with an area of approximate 1,200m² inside private lot would require land resumption for the road widening work at Sha Ling Road and utilities construction works nearby. For the portion of the site (~620m²) which falls within government lot (to the southeast of SRC-1), only paved ground was observed and neither concrete & asphalt production nor open storage activities were observed during the site survey. In addition, review of historical aerial photos (since Year

1973) also revealed no sign of land contamination. As such, SI is considered not required for this strip of land and the necessity of SI should focus on the western portion of SRC-1 once the land is resumed and free for access.

- 15.8.1.3** Since approximate 92 % of the site (~7,700m²) is located within a private land lot and it is currently under operation, it is recommended that re-appraisal should be carried out by the Project Proponent (PP) once the works area for the Project is confirmed and site access is available (e.g. after land resumption), in order to identify any hot spots for SI within the southeast and western portions of SRC-1. Should the findings of the re-appraisal identify signs of land contamination potential, the PP would need to prepare a Contamination Assessment Plan (CAP) presenting the findings of the re-appraisal and strategy of the recommended SI, if required, and submit to EPD for review and approval.
- 15.8.1.4** Following the submission of Contamination Assessment Plan (CAP), if required, a Contamination Assessment Report (CAR) needs to be prepared to present the findings and evaluate the level and extent of potential contamination. If land contamination is identified and remediation is required, a Remediation Action Plan (RAP) will be prepared to recommend specific remediation measures. Upon completion of the remediation works, if any, a Remediation Report (RR) that demonstrates the clean-up works are adequate would also be prepared. CAR, RAP and RR would be submitted to EPD for approval prior to commencement of any construction.

15.9 Ecology

- 15.9.1.1** The C&C development facilities avoided impacts on recognized sites of conservation importance (e.g. Site of Special Scientific Interest SSSIs or Country Parks), and other ecological sensitive areas (e.g. mature native woodland). Literature reviews of existing information with supplementing findings from recent field surveys identified that most of the terrestrial habitats within the Assessment Area are of varying ecological value and a mosaic of good quality, and relatively undisturbed, habitats are present. Terrestrial habitats lost will include seasonal watercourse, upland grassland, plantation, woodland, wasteland, village area and developed area.
- 15.9.1.2** Species diversity and abundance in these habitats were moderate and several rare or restricted species have been identified. Direct and indirect ecological impacts arising from the Project during the construction and operational phase have been identified and evaluated. Several mitigation measures will need to be implemented in order to reduce any potential impacts to habitats and fauna present.
- 15.9.1.3** As discussed in **Section 9.7**, a significant portion of grassland will be lost as part of the work for columbarium. While the platform will be stabilized by cut and filled slopes, some of the cut and filled slopes will be proposed for grassland reinstatement by collecting topsoil or turves from the development area and storing during construction phase. The reinstated grassland will be formed on the slopes once constructed. A grassland reinstatement plan (for an area of approximately 0.9ha) will be agreed with EPD. These locations will also provide

suitable habitat for other grassland species, including orchids, should they need transplanting.

15.9.1.4 Woodland enhancement planting will be provided through a Enhancement Woodland Proposal to create an additional area of about 0.6ha to mitigate the loss of several fragments of woodland and woodland edge due to the proposed road and to provide more opportunities for species of conservation importance. A comprehensive survey identifying any potential presence of floral of conservation importance within the inaccessible secondary woodland and habitats to be directly impacted by the proposed development, as well as transplantation of the affected individuals will be conducted prior to the construction phase.

15.9.1.5 Indirect impacts to aquatic and wetland-associated fauna (notably Two-striped Grass Frog, Pigmy Scrub Hopper, Small Snakehead, *S. zanklon*) will be reduced by maintenance of hydrological linkages and water quality through a carefully designed drainage system from the platform and roads networks of the columbarium. Precautionary checks by a suitably experienced ecologist of the vegetation for the presence of nesting birds should be carried out in the breeding season (February to July) before vegetation clearance. These impacts can be avoided by conducting vegetation clearance during the non-breeding season (tentatively August-January) and phased through the project period to minimise impacts. Overall, no significant and unacceptable ecological impacts to terrestrial or freshwater resources were anticipated in this assessment.

15.10 Fisheries

15.10.1.1 Since there are no pond areas to be lost for the construction and operation of C&C facilities, the fisheries impact is not considered to be significant. Indirect impacts arising from construction activities and operation of the proposed development would be properly mitigated through standard practices and thus no significant fisheries impact will appear. Overall, no unacceptable fisheries impact is predicted from this project.

15.11 Landscape and Visual

15.11.1.1 The proposed development and associated works follow in principle the planning intentions from the Approved Man Kam To Outline Zoning Plan (No.S/NE-MKT/2) and Approved Fu Tei Au and Sha Ling Outline Zoning Plan (No.S/NE-FTA/14). The proposed work will not encroach in any Amenity Area (A), Conservation Area (CA), and Country Park (CP). The proposed barging point at Siu Lam will fall within Tuen Mun Outline Zoning Plan (No. S/TM/33), the works area will encroach the future Comprehensive Development Area (CDA) and Open Space (O), however, those zoning areas are not developed yet and the existing landscape value is considered to be low.

- 15.11.1.2** Based on the broad-brush tree survey report, approximately 1,300 nos. of trees will be affected within the works area. Due to construction of the site formation and associated road widening works and footpath, it is unavoidably considered to remove the affected trees. Affected trees with high to medium amenity value and high to medium survival rate are proposed to be transplanted as far as possible. Trees surveyed within the proposed works boundary are primarily common species. There are no LCSO Registered Old and Valuable Trees. Two mature trees and two rare species trees are found within the works area. For the two mature trees, one of them are unavoidably affected by the road works, and the other one will be retained. The two rare species trees will be relocated as far as technically feasible.
- 15.11.1.3** There are two number of *Aquilaria sinensis* (土沉香), which listed under the Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586) are proposed to be relocated as far as technically feasible. One number of mature *Bombax ceiba* (木棉) found within the works area and will unavoidably be affected by the proposed new road and viaduct section. The alignment of the proposed road and viaduct had considered the constraints of land resumption, engineering technical feasibility, existing topography, etc., the site formation layout and road alignment are considered to be optimised.
- 15.11.1.4** As the principle of the project is minimising the site formation works and the affecting trees, limited land will be available for tree planting. It is expected approximately 200 light standard sized trees and whips planting will be planted as compensatory tree planting at proposed slope with gentler than 35 degree. Approximately 10 to 15 nos. of heavy standard sized trees will be planted as compensatory tree planting along Lin Ma Hang road and approximately 130 nos. of heavy standard sized trees will be planted within Sandy Ridge. In addition, woodland mix species whips will be proposed along the hillsides for the woodland compensation. Any other off-site compensatory planting area will be further agreed with relevant government departments. The overall residual impact on trees is considered as acceptable with mitigation measures.
- 15.11.1.5** The proposed works will cause slight adverse landscape impact on the Hillside Woodland Distribute at Valley and along the toe of Upland (LR1.1 and LR1.2), Hillside Shrubby Grassland (LR2.1 and LR2.2), and some portion of Plantation (LR19) and relevant upland and hillside landscape character area within the development site (LCA1) after appropriate mitigation measures applied. The mitigation measures include large amount of woodland mix species whips planted along the hillsides, and grass hydroseeding and climbers planting to compensate the lost greenery. In addition, landscape design treatment on the platform will also be implemented on the platform while the columbarium buildings and facilities are being built, the overall landscape aesthetic would be enhanced. Therefore, it is considered that the overall residual landscape impact at Year 10 operation is acceptable with mitigation measures.

- 15.11.1.6** The proposed site formation work is far away from existing residential uses, and building blocks of the worst case scenario which would be under other project scopes, it is considered that the proposed works will only cause small to negligible visual impact to most of the VSRs. Only the VSRs located close to the Sha Ling Road upgrading road section will suffer more visual impact. It is considered that the residual visual impact at Year 10 operation is acceptable with mitigation measures.
- 15.11.1.7** The proposed barging point at Siu Lam is currently used by Express Rail Link project, and the baseline condition of such area remained unchanged. Considered that the landscape and visual impact of the area has been assessed in the approved EIA report (AEIAR-143/2009), the landscape and visual impact of the proposed barging point is acceptable with mitigation measures applied.
- 15.11.1.8** The landscape and visual impact assessment has been conducted according to the criteria and guidelines for evaluating and assessing impacts as stated in Annex 10 and 18 of the TM-EIAO, it is considered that the identified residual impacts, taking account of both importance and degree of compliance, will be acceptable with mitigation measures.

15.12 Cultural Heritage

- 15.12.1.1** A built heritage survey has been conducted. One Graded Historic Building, 11 Historic Clan Graves and 7 Nil Graded Built Heritages Items have been identified in the vicinity of the assessment area. Several buildings and structures will require mitigation, such as Grade 2 MacIntosh at Nam Hang, Earth God Shrine, Tin Hau Temple, etc. Mitigation measures including condition survey, vibration monitoring, relocation, etc. have been proposed during construction phase.
- 15.12.1.2** During operational phase, no adverse impacts have been identified and no residual impacts have been identified.
- 15.12.1.3** Areas of archaeological potential were identified in the desk-based review. Pleistocene debris flow lower slopes of southeast Sandy Ridge and Pleistocene debris flow and terraced alluvium along Lin Ma Hang Road.
- 15.12.1.4** An archaeological field survey conducted at the former area indicated that the area was disturbed to a greater extent than previously understood, possibly during the construction of the water pipes. While auger tests and a test pit excavation to the west of the turning point indicate that this area has a natural sterile stratigraphy, a test pit within the turning point revealed a sterile cultural deposit.
- 15.12.1.5** An Archaeological Watching Brief (AWB) is recommended near the crossing at the south of the proposed connection road to Man Kam To Road (southeast within the assessment area) to add to the understanding of this cultural soil without material findings.
- 15.12.1.6** For Lin Ma Hang Road, it is recommended that the engineer inform the Antiquities and Monuments Office (AMO) if any antiquities or supposed antiquities are unearthed during the construction phase.

15.13 Environmental Monitoring and Audit

- 15.13.1.1** It is recommended to implement an Environmental Monitoring & Audit (EM&A) programme throughout the entire construction period to regularly monitor the environmental impacts on the neighbouring sensitive receivers. All the requirements (including dust, airborne noise, water quality, waste management, land contamination, ecology, landscape & visual, and cultural heritage) in the EM&A Manual shall be complied with.
- 15.13.1.2** An Environmental Mitigation Implementation Schedule (EMIS) has also been included in the **Appendix 13.1** to summarise all the measures, the implementation location, time frame, agency etc.

15.14 Overall

- 15.14.1.1** The EIA has been conducted based on the best and latest available information during the course of the EIA study. The findings of this EIA have provided information on the nature and extent of environmental impacts arising from construction and operation of the Project. The EIA has, where appropriate, identified mitigation measures to ensure compliance with environmental legislation and standards.
- 15.14.1.2** This EIA has demonstrated general compliance with the environmental standards and legislation with the implementation of the proposed mitigation measures during the construction and operational phases. This EIA has also demonstrated general acceptability of the adverse residual impacts and thus the population and environmentally sensitive receivers in the vicinity of the site would be sufficiently protected. Environmental monitoring and audit mechanisms have been recommended for the construction of the Project, where necessary, to verify the effectiveness of the recommended mitigation measures.