3. NEEDS OF PROJECT AND CONSIDERATION OF ALTERNATIVES

3.1. INTRODUCTION

3.1.1. This Section provides a detailed description of the Project and the need for the Project, describes scenarios with and without the Project as well as alternative options considered.

3.1.2. This Section is prepared in accordance with *Section 3.3 of* the EIA Study Brief.

3.2. PURPOSES, OBJECTIVE AND ENVIRONMENTAL BENEFITS OF THE PROJECT

3.2.1. The Project is for the construction of a new Annex Block, and refurbishment of the existing Red House at HKO Headquarters in Tsim Sha Tsui to:

- meet the existing shortfall in office space and functional areas for operation needs of the HKO;
- provide space for developing HKO's essential operation and services; and
- provide space for organising public education and outreach activities relating to HKO's work.

3.2.2. The environmental benefit of the Project is that the new Annex Block can accommodate the new facilities such as IFWC and PIEC and hence avoid significant alteration at the existing historic buildings. Environmental considerations have been the key factors in the planning and design stage of the Project. The environmental impacts as well as benefits are both identified and critically considered. The Project offers potential environmental initiatives both to conserve existing environmental resources and, where opportunities exist, to enhance and upgrade the environment on various fronts. The key environmental benefits and achievements of the Project are listed below.

<u>Maintain and Promote Natural Habitats Existing on Site</u>

3.2.3. Various greening strategies including ground landscape, roof terraces and vertical green and concept of urban sponge will be incorporated in the design to maintain and enrich the existing natural context and enhance biodiversity on site if practicable. Biophilic design will also be applied in the design which enables a closer relationship between building users/visitors and nature.

3.2.4. A small-scaled sponge city concept functioning like a sponge would be implemented to enhance "resilience" to environmental changes and natural disasters. The stormwater could be absorbed, infiltrated and cleaned during rainy days, and could be 'released' and utilised as needed to enhance the ecological function of the surrounding context and reduce the flooding risk. As the proposed building will offset some of the existing greenery, the design aims to maintain and enhance water holding capacity of the area. Rainwater collected will be recharged back to the Site for irrigation for the growth of the existing natural vegetation.

Promote Environmentally Friendly Designs

3.2.5. The Project not only provides spaces for public engagement and also aims to become an education tool itself, allowing the public to visit, to interact and learn about climate response design, green technologies and their application, stimulating and promoting the public knowledge towards environmental-friendly living. To echo to the HKO's Vision of "Be a model of excellence in protecting lives and building together a better society through science", various environmental-friendly designs are to be adopted in the design of the Project as far as practical. Advancing net zero carbon strategies will be explored and applied to the building design for demonstration of response to climate if practicable.

3.2.6. Options for façade material have been explored. Prefabrication, solar reflective materials, low embodied carbon materials, smart glass/ solar glass will be adopted if practicable.

Conserve and Promote the Existing Heritage Buildings

3.2.7. The Project also covers the refurbishment works to convert the existing Red House into a History Room for telling the heritage story of HKO and showing records of past extreme weather events. It can enhance the public understanding of the cultural significance of HKO as well as raising awareness on weather hazards, while the Red House will be renovated and upgraded to meet the needs of HKO and conserve the Red House condition without compromising the conservation principles.

3.3. CONSIDERATION OF SCENARIOS WITH AND WITHOUT THE PROJECT

Scenario "without" the Project

3.3.1. HKO is the only government department responsible for monitoring and forecasting weather, as well as issuing warnings on weather-related hazards. It also monitors and assesses radiation levels in Hong Kong, and provides other meteorological and geophysical services to meet the needs of the public and the shipping, aviation, industrial and engineering sectors. HKO's critical forecast and warning services activate government's contingency plan for natural disasters which helps protect public safety and minimize impacts of natural disasters.

3.3.2. The major target of the Project is to provide functional areas and necessary facilities for supporting and upgrading HKO's essential operation of critical services so as to strengthen HKO's weather monitoring and forecasting capability to cope with more extreme weather under climate change. The enhanced infrastructure and facilities will also equip HKO to enhance and develop new public weather services to reduce risk of natural disasters by making use of new technologies.

3.3.3. Without the Project in place, the existing buildings within the HKO Headquarters will be inadequate to support and upgrade the HKO's essential operation of critical services. The possible consequences of not implementing the Project will include the lowering of the HKO's operational efficiency and tolerance of inadequate facilities to support the effective operation of forecast and warning services, and will hinder the development and enhancement of public weather services to cope with more frequent extreme weather under

climate change, thereby causing negative impacts on the disaster risk reduction and public safety which is undesirable to the society.

Scenario "with" the Project

3.3.4. The new Annex Block which comprises various functional areas will meet the existing shortfall in office space and functional areas, providing space for supporting and further developing HKO's essential operation and services as mentioned in *Section 3.3.2* and enhancing HKO's public education and outreach efforts.

3.3.5. The Project also covers the refurbishment works to convert the existing Red House into a History Room for showing the heritage story of HKO and records of past extreme weather events so as to promote public awareness of hazardous weather. The refurbishment works will include enhancement works for preserving the Red House and restoring its original state and historic fabrics as well as maintaining proper functional performance of the Red House for serving its new use.

3.3.6. The refurbished Red House will help to enhance the community's awareness of and capability in hazard and natural disaster prevention and response, which will in turn reduce the loss of life and damage to property, and minimise disruptions to economic and social activities during hazards and disasters under climate change.

3.4. CONSIDERATION OF ALTERNATIVE OPTIONS

Location of the New Annex Block

3.4.1. The suitable location in the HKO Headquarters for constructing the new Annex Block should be away from (1) the meteorological equipment/instruments in operation at the grasslands in front of the 1883 Building; and (2) historic buildings/structures as far as practicable so as to reduce the possible adverse impacts upon them. Two alternatives within HKO Headquarters have been proposed for the location of the new Annex Block and shown in ***Plate 3-1***. The two locations are as follows:

- Location A – Existing open car park and its vicinity area located at the southern side of the HKO Headquarters; and
- Location B – Green area situated on a slope. Located at the northern side of the HKO Headquarters.

3.4.2. Location A is selected instead of Location B as the location for the new Annex Block due to the following reasons:

- Impact to the existing trees would be minimized at Location A as it is an open car park and access road, with more paved area and less vegetation;
- The green area at Location B is known as one of the few remaining semi-natural woodlands in urban Kowloon and should be preserved; and
- As the green area at Location B is situated on a slope, it is technically more complicated and of a higher cost for constructing a building on a slope.

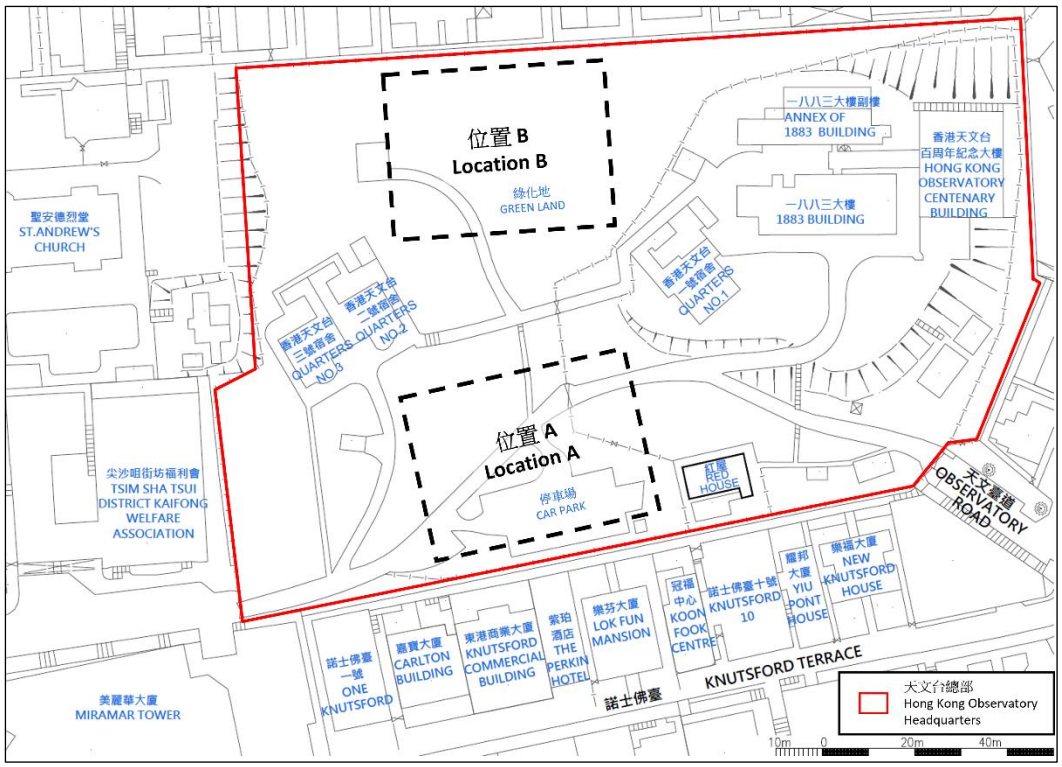

Plate 3-1 Alternative Locations of the New Annex Block

Design Alternatives

3.4.3. The following design options were considered and reviewed in order to optimise the operational and environmental benefits of the facilities:

Form & Scale

3.4.4. The Project aims to provide the new Annex Block for office and institution uses. The form and scale of the Project were reviewed to examine whether a new Annex Block or discrete facilities at different locations would be a preferred option.

3.4.5. The new Annex Block enables HKO to perform their duties within HKO Headquarters relieving the pressure on land resources, reducing the quantity of building construction materials, giving rise to a more efficient transportation planning, and minimising the overall

impacts on landscape resources and visual amenity by the avoidance of establishing multiple buildings or at multiple locations, etc.

Building Design

3.4.6. Different design features were considered. The preferred design option adopted was optimised from the original design that it has retained beneficial features of the original design and could improve the overall environmental performance. The preferred design option has also incorporated with other advantageous features in order to minimise the potential environmental impacts on the nearby sensitive receivers to the maximum practicable extent. The rendering diagrams of the building designs for Option A and Option B are given in ***Appendix 3.1***. Key design features considered and adopted in preferred design option are described below. The design options that were considered include:

- Option A – One block scheme; and
- Option B – One block scheme with a wide atrium at 1/F.

3.4.7. Option A consists of one block with the building capped at +45mPD. The new Annex Block with no atrium in Option A may cause obstruction to visual context of the building users and visitors. The ventilation flow within HKO Headquarters may be affected by the Option A.

3.4.8. Option B consists of one block with the building height of +45mPD with a wide east to west aligned atrium which is beneficial to the visual context of the visitors. The atrium will act as air path and enhance the natural ventilation thereby, reducing the electricity demand of mechanical ventilation system and air conditioning. Also, Option B will provide footpaths and encourage pedestrian movement within the HKO Headquarters.

3.4.9. Moreover, the central void above the atrium within the 2/F to R/F in Option B would allow the natural daylight entering the rooms on lower floors and hence reduce the energy consumption in interior lighting.

3.4.10. From cultural heritage perspective, Option B can provide a more articulated and dynamic form with reduced building mass to minimise visual intrusion and preserve sight lines to the existing historic buildings within HKO Headquarters.

3.4.11. Under Option B, the eastern portion of the Project Site will be preserved for landscape planting and outdoor space for better compatibility of the Project and the surrounding.

3.4.12. In view of the preferred design will be more beneficial to visual impact, reduction in energy consumption and providing an outdoor space to building users, Option B is considered to be the preferred design option for the Project.

Siting and Layout Design

3.4.13. The existing location of new Annex Block has been converted as an open carpark and access road, with relative more paved area and less vegetation, comparing to other portions within HKO Headquarters. As such, impact to the existing trees would be minimized. Centralizing all HKO's necessary services within HKO Headquarters is also considered to be a suitable

development as this can enhance operational efficiency and strengthen manpower especially during inclement weather or natural disaster situation. It is justifiable from land-use suitability and technical sustainability perspectives to optimize utilization of HKO Headquarters for comprehensive development purpose.

3.4.14. For developing Annex Block's internal layout, considerations of engineering constraints and environmental factors have been made as below:

- The location, size and arrangement of new Annex Block is bounded by operation needs of HKO. The scale and size of above-ground structures are determined by striking a balance between accommodating HKO's operation needs and visual impacts to the surroundings; and
- Setback has been maximized as far as practicable to reduce impact to nearby residence as shown in ***Appendix 3.1***.

EVA Alignment

3.4.15. The Project also covers the road widening works for EVA at the existing access road. Due to the space constraints, operation needs and fulfilment of relevant guidelines or regulations for the design of EVA, including the requirement on EVA gradient, there is not much room for exploring different EVA alignment options. Nevertheless, the current EVA alignment is following the existing access road as far as practicable so as to minimize the portion encroaching in the existing green area within the HKO Headquarters, while fulfilling relevant requirement on EVA gradient and connecting to existing entrance, which can also minimize the works at other existing structures.

Construction Sequence

3.4.16. Construction programme was developed in order to strike a balance between operation needs and environmental considerations. In view of close proximity to existing nearby residences, sufficient time is allowed for the construction works so as to avoid concurrent works to be carried out on-site where practicable and thus minimize the noise impact to the residence, while not over-prolonging the duration of construction.

Construction Alternatives

3.4.17. For the construction of the Project, the major construction activities comprise the following:

- Site preparation and road works;
- Excavation and Foundation; and
- Construction of Annex Block and Refurbishment of Red House.

3.4.18. The following factors have to be taken into account for the consideration of different feasible construction methods and sequence of works:

- Severity and duration of the construction impacts on nearby environmental sensitive receivers;

- Satisfaction to the design and functional requirements of the Project, such as loading requirement and the space requirement for the Project facilities;
- Site constraints, such as limited working space, potential impacts to adjacent facilities and ground profiles; and
- Coordination with concurrent interfacing projects and the future developments within and/or adjacent to the area.

Foundation Works

3.4.19. Foundation works are required for the construction of the Project. The selection of foundation schemes is based on the following criteria:

- Type of structure to be supported;
- Load carrying capacity required;
- Availability of materials and plants;
- Local experience;
- Site constraints; and
- Construction schedule.

3.4.20. The piling options that were considered include:

- Option A –Socketed H-Piles; and
- Option B – Driven H-Piles.

3.4.21. Both of the technologies for socketed H-Piles and driven H-Piles are commonly found in Hong Kong. The advantages and disadvantages of these two piling methods are summarized in ***Table 3.1***.

Table 3.1 Advantages and Disadvantages of Socketed H-Piles and Driven H-Piles

	Socketed H-Piles	Driven H-Piles
Mechanism	Pile installation by drilling	Pile installation by impact hammering
Applicability	Suitable for medium to high rise building due to its high pile capacity	Suitable for low rise building due to higher flexibility in the pile arrangement, enabling higher load/ capacity
Construction Period	Relatively long in comparison to other pile types (especially in rock)	Shorter construction time to minimize prolong adverse environmental impacts, e.g. fugitive dust, noise, site effluent, visual, C&D materials, etc. during construction phase. However, the strict control on the use of percussive piling method may limit the time for carrying out piling works, which poses implications on programme
Noise Nuisance	Less vibration and noise nuisance No construction noise permit to be required	Nuisances arouse from piling works including noise, vibration and ground movement Construction noise permit to be required and piling works to be carried out within the restricted hours
Waste Generation	Pile borehole diameter is normally large in size; Prior excavation is normally required and hence substantial excavation materials would be generated	Minimal waste is generated
Cultural Heritage Impact	Less indirect vibration on historic buildings that may lead to the structural damage	Vibration arouse from piling works
Visual Impact	Greater visual disturbance due to the need of more plants and the substantial amount of stockpiles of excavated materials	Visual disturbance is relatively less

3.4.22. Although the driven H-piles requires shorter construction time, it would induce a relatively high disturbance in term of noise level and vibration during the construction stage. In view of avoiding and minimising prolonged adverse environmental impact especially in noise impact, socketed H-Piles method is considered more suitable for the Project which is close to the residential development nearby.

Site Formation, Excavation and Filling

3.4.23. The construction methods to be adopted for site formation are all conventional methods which include site clearance, excavation and backfilling of topsoil, construction of haul road and utilities laying and finally the landscape works. For these works, the methods are well established and there are limited alternatives.

Main Building Construction

3.4.24. Main building construction will likely be taken from the following forms:

- Conventional cast in-situ reinforced beam-slab system
- Precast concrete construction/MiC method;
- Steelwork construction much of which will be in the form of prefabricated steelwork elements.

3.4.25. In general, the aforementioned superstructure construction options will not present significant differences in terms of the environmental impacts to the nearby sensitive receivers. Conventional cast in-situ reinforced beam-slab system will be adopted based on latest design.

3.4.26. Innovative construction methods are encouraged in the Project. Reinforced concrete MiC by fully making use of Building Information Modelling (BIM) tool, will be adopted where applicable for staff offices, rest rooms, lavatories and pantries at 2/F and 3/F. It will be sub-divided into pre-finished modules with building services provisions by means of off-site prefabrication.

Preferred Option

3.4.27. The preferred options should introduce minimal environmental impacts and present environmental benefits when compared to other options and alternatives. With due considerations on alternatives, a preferred option has been selected for the Project and summarised below, based on which the detailed design phase will be proceeded and this EIA study was carried out:

- Optimum location: at the existing open car park and its vicinity area located at the southern side of the HKO Headquarters;
- Optimum design: One block scheme with a wide atrium at 1/F at the existing carpark within the HKO Headquarters; and
- Optimum construction method: socketed H-piling and conventional cast in-situ reinforced beam-slab system, with MiC method where applicable.

3.5. SUSTAINABILITY CONSIDERATION

3.5.1. To promote HKO's Vision of "Be a model of excellence in protecting lives and building together a better society through science", the adoption of various sustainable features will be explored to reduce the new Annex Block's impact on the environmental and natural resources through design and construction. A series of sustainable considerations are under evaluation and will be incorporated in the design if practicable.

- Biophilic design (vertical greenery, terraces, green roof etc.): to enhance passive cooling and biophilic, soundscape and natural daylight;
- Rainwater harvesting system: to collect and reuse the rainwater for the fittest ways in order to achieving water conservation;
- Renewable and alternative energy systems:
  - Solar PV panel at roof top
- Selection of sustainable façade materials.

3.5.2. For the design of water saving features, such as rainwater harvesting system, the Technical Specifications on Grey Water Reuse and Rainwater Harvesting issued by Water Supplied Department (WSD) shall be strictly followed for rainwater harvesting and reuse, and the water quality of the treated effluent shall meet the standards stipulated in Table 1-1 of the Technical Specifications.