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2 Project Description

2.1 Purposes and Objectives of the Project

2.1.1 Support Government Policy on Housing Supply

2.1.1.1 The 2013 Policy Address has stipulated that the top priority of the Government is to tackle the housing problem. In the Long Term Housing Strategy promulgated in December 2014, one of the strategic directions is "to stabilise the residential property market through steady land supply". To meet the housing and other development needs of the society, the Government has been adopting a multi-pronged approach to increase land supply in the short, medium and long terms.

2.1.1.2 The Project Proponent supports the Government's initiative to make better use of railway land by commissioning a multi-disciplinary consultant team to review the development potential of SHD, with the aim to optimising housing provision (The Project).

2.1.1.3 The Project is also in line with the planning theme of "Strategic Economic and Housing Development" proposed by the Lantau Development Advisory Committee (LanDAC), which has been earmarked as one of the medium-term projects in their First-term Work Report published in January 2016.

2.1.2 Align with Strategic Planning Framework

2.1.2.1 The Hong Kong 2030+: Towards a Planning Vision and Strategy Transcending 2030 (HK2030+) is a comprehensive strategic study undertaken by Government to update the territorial development strategy and provide a spatial planning framework to guide the future planning, land and infrastructure development and the shaping of the built environment of Hong Kong.

2.1.2.2 Under the key strategic direction of "Underscoring Compact Development", the HK2030+ public engagement document (October 2016) has proposed to underscore transit-oriented, compact development with railway as the backbone of the public transport system. It has also proposed to explore more topside development under the key strategic direction of "Optimising Land Uses".

2.1.2.3 There are currently over 90,000 employment opportunities in Lantau, with about 65,000 in the existing Hong Kong International Airport (HKIA). The planned three-runway system (3RS) at HKIA will increase the number of direct job opportunities to about 123,000, with more than 40,000 created by the commercial developments proposed in the Tung Chung New Town Extension (TCNTE) study. Together with the planned developments at the Airport North Commercial District (NCD) and topside commercial development at the Hong Kong Boundary Crossing Facilities (HKBCF) Island of the Hong Kong-Zhuhai-Macao Bridge (HZMB) etc., coupled with the "bridgehead economy" generated by the HZMB, significant number of job opportunities will be created at North Lantau in the medium term.

2.1.2.4 The Project supports the strategic planning objective of building a sustainable community served by environmentally friendly rail transport. It also contributes housing accommodation to the workforce at a convenient location which aligns with the key strategic direction of "Reshaping Travel Pattern" to promote smart urban growth with jobs closer to home as promulgated by HK2030+.

2.1.3 Optimize Use of Housing Land Resource

2.1.3.1 Property development atop railway facilities has long been a popular source of private housing supply in Hong Kong since the first topside development at Telford Gardens completed in 1980. Since then other railway depots have been used for comprehensive development, e.g. Chai Wan, Tsuen Wan, Tseung Kwan O, Tai Wai, Wong Chuk Hang, etc. Topside development has been regarded as an efficient way to optimise land utilization while containing the depot/railway operation within a landscaped podium deck to enhance the local environment.

2.1.3.2 SHD, located in Northshore Lantau at approximately 5km east of HKIA, is conveniently served by road network with its western access connected to the Tai Ho Interchange linking with the North Lantau Highway (NLH) and the planned Road P1 (Tung Chung to Tai Ho Section). With the proposed Siu Ho Wan Station (SHO) for Tung Chung Line (TCL), the Project will be served by the MTR network. A public transport interchange (PTI) with provisions for franchised bus, taxi, coach and shuttle services etc. has been planned adjacent to the integrated station concourse for convenient interchange. Adequate utility services have been identified by relevant authorities to support the Project.

2.1.3.3 Apart from the adequacy of transport and utility infrastructure, the Project is also demonstrated to be sustainable in other technical aspects. With the closest residents at Pak Mong Village located at some 1.2km away, no major concern from local and green groups due to unacceptable impact is anticipated. The Project therefore is justifiable from land use suitability and technical sustainability perspectives to optimise utilization of railway land for comprehensive development purpose.

2.1.4 Quality Built Environment for a Sustainable Community

2.1.4.1 The Project supports Government's transport sustainability initiatives by adopting the transit-oriented development concept which is widely accepted as a sustainable form of urban development to minimize reliance on road transport, thereby reduce vehicular trip generation, rationalize traffic flows and minimize the level of traffic-induced pollution. An integrated entrance has been planned at podium deck level to provide seamless connection to the future residents and visitors.

2.1.4.2 Development scheme design of the Project has made reference to the Sustainable Building Design (SBD) Guidelines promulgated by Buildings Department to create a sustainable community with supporting commercial/retail, educational, recreational and supporting facilities. With the substantial commercial/retail facilities planned at other projects in North Lantau, the proposed neighborhood shopping facilities is considered appropriate to serve the local community. Sufficient schools and kindergartens have been reserved for provision in tandem with the population build-up, as agreed with Education Bureau.

2.1.4.3 To create a pedestrian friendly environment, all-weather pedestrian links would be provided at both podium deck and podium levels of the Project. At podium level, the elongated shopping mall connecting to the station concourse would provide an air-conditioned passageway, with all the residential towers generally located within 500m from this corridor. At podium deck level, covered walkway would be provided with landscaping and street furniture to enhance pedestrian experience. Further, an internal cycle track network would be provided primarily at the podium deck level to facilitate east-west movement within the Project particularly to access SHO.

2.2 Environmental Benefits of the Project

2.2.1.1 Environmental benefits of the Project are summarized below:

2.2.2 Improved Local Environment

2.2.2.1 The existing SHD is of open air design with maintenance workshops and facilities, e.g. paint shop and traction substation etc., housed within isolated steel frame structure buildings. Most of the stabling tracks and train washing facilities are located outdoor.

2.2.2.2 The Project involves the construction of a podium deck over the depot which will contain the potential environmental and visual impacts due to its 24-hour operation. By isolating the existing industrial interface, the Project would allow the opportunity of environmentally sensitive land uses, such as educational institutions, at the potential Siu Ho Wan (SHW) Reclamation under study by the Government.

2.2.3 Building a Sustainable Community

2.2.3.1 The Project is built on existing railway depot land with no natural habitat of flora and fauna. Sewage generated from the Project will be conveyed to the nearby Siu Ho Wan Sewage Treatment Works (SHWSTW) for treatment and disposal. With the closest residents at Pak Mong Village located at some 1.2km away, no adverse environmental impact is anticipated from construction and operation of the Project to the nearest residential community.

2.2.3.2 The Project would provide home to about 37,800 population served by MTR to reduce reliance on road traffic. With the new job opportunities gradually materialised at various developments in North Lantau, the Project would contribute to bringing more homes closer to work to reduce time and distance for commuting, thereby reduce energy and emission from transportation, and enhance the quality of life of a sustainable community.

2.2.3.3 With reference to the SBD Guidelines, about 30% of the podium deck will be planted with trees, shrubs or other plants. The Project would gradually transform SHW from low-rise industrial to an urban node with greening.

2.2.3.4 In addition to making reference with the SBD Guidelines, the Project would apply for registration of the Building Environmental Assessment Method (BEAM) Plus certification in the detailed design stage. Well-designed BEAM Plus buildings aim to reap the benefits of better indoor environment, minimized pollution to the external environment, energy-efficient buildings and reduction of unsustainable consumption of scarce resources through good designs and planning of site, materials, energy use, water use and indoor environmental quality. The opportunities for provision of environmentally friendly measures such as food waste recycling facilities and electrical charging facilities for electric vehicles would also be explored in the detailed design stage.

2.3 Scenario "with" and "without" the Project

2.3.1.1 The Project would optimise the use of an existing 30-ha depot site to create a sustainable community to be implemented in phases. This would help balancing the spatial development pattern of Lantau by bringing jobs closer to home, which would reduce impacts on the public transportation system and the environment due to commuting. Apart from providing the much needed housing land for the community, the Project would contribute to strengthening the "Strategic Economic and Housing Development" planning theme proposed by the LanDAC, and the "Western Economic Corridor" proposed under HK2030+.

2.3.1.2 With the Project, the existing depot operation would be covered by a landscaped deck after replanning to contain any noise nuisances during 24-hour operation to allow flexibility for future planning of environmentally sensitive uses in the vicinity. The Project would act as a focal point for developments at the SHW area by providing new public transport facilities to serve the local community.

2.3.1.3 The Project is mainly within the existing depot site and railway tracks hence off-site environmental impact is negligible. With the provision of breezeways/visual corridors and building gaps at strategic locations, potential visual impact due to the medium-rise residential towers is mainly confined to viewers that are short-term and transient in nature. Efforts would be made to create an interesting and modern façade design for towers along the NLH and the Lantau Airport Railway (LAR) in the detailed design stage.

2.3.1.4 Without the Project, SHW will remain as a low-rise industrial area with an open air depot on site. The proposed SHO and PTI would not be built. The development potential of the Government's SHW Reclamation would be significantly deprived. The outcome would be wasting of valuable land resources proven to be technically feasible and suitable for housing development.

2.4 Consideration of Development Options

2.4.1 Development Mix

2.4.1.1 The Project supports Government's housing policy initiative by optimising the residential development potential of SHD served by MTRCL. Technical assessments performed have ascertained the feasibility of the proposed development scheme based on available information on transport and utility infrastructure capacities.

2.4.1.2 Alternative land use options such as offices or large-scaled commercial/retail uses are considered not suitable, as the Project is located far away from the existing and planned/proposed central business districts, lacking the critical mass of business services to support office development. Also, significant commercial/retail and office facilities have already been planned at TCNTE, NCD and HKBCF topside development.

2.4.2 Development Scheme Design

2.4.2.1 A number of planning and design considerations have been duly considered in formulation of the proposed development scheme. Technical studies on SHD replanning works, SHO design, urban design and engineering have been undertaken to support the scheme design process. The following key design considerations have been identified with elaborations provided in the following sections.

- SHD Replanning and SHO Location;
- Sustainable Building Design Guidelines;
- Urban Design Guidelines;
- Siu Ho Wan Water Treatment Works (SHWWTW) Consultation Zone;
- Provision of Schools;
- Collating and Addressing Public Views;

SHD Replanning Works and SHO Location

2.4.2.2 SHD replanning works and migration would be commenced by converting the strip of open storage area along the southern boundary into train stabling area to optimise the stabling capacity and depot reconfiguration.

2.4.2.3 Accordingly, Phase 1 of the Project would be situated on top of the podium deck over the train stabling tracks and depot facilities. The design and disposition of the towers has to take into account locations of the property enabling works constructed between the stabling tracks.

2.4.2.4 As an indicative reference for this Environmental Impact Assessment, population intake for the topside development (Phase 1) will begin in 2026 while depot replanning works is in progress and partially under open-air operation. Temporary mitigation measures including noise barriers of about 12m high and canopies at the podium edge have been proposed to mitigate noise impact from the existing SHD operation at Stages 3 and 4 areas during the interim interfacing period of maximum 30 months. Stage 3 of the reprovisioned depot would be completely decked in about 54 months after initial population intake. No major fixed noise source has been identified with current operation of the Stage 4 depot.

2.4.2.5 Phase 2 of the Project would occupy the north-western portion of the site after migration of the main depot building and other facilities. Again, as an indicative reference for this Environmental Impact Assessment, population intake for Phases 2 to 4 is targeted from 2030 to 2038 when the open-air depot operation is diminishing hence no significant industrial interface is anticipated.

2.4.2.6 The proposed SHO location at the western portion of the Project has taken into consideration limited space available between NLH and Tuen Mun – Chek Lap Kok (TM-CLK) Link and the depot operation with a test track along its southern boundary. The integrated station concourse would be located at the podium level between the PTI and the commercial/retail facilities.

Sustainable Building Design Guidelines

2.4.2.7 The Project has made reference to the SBD Guidelines promulgated by Buildings Department with respect to building separation, building setback and site coverage of greenery to enhance the living environment.

2.4.2.8 In accordance with the Practice Notes for Authorized Persons, Registered Structural Engineers and Registered Geotechnical Engineers PNAP APP-152, the objectives of SBD Guidelines are to achieve better air ventilation, enhance the environmental quality of our living space, particularly at pedestrian level, provide more greenery and mitigate the heat island effect.

2.4.2.9 In fulfilling the building separation requirements, the residential towers have been broken down into clusters to allow sufficient permeability. Minimum 30% site coverage of greenery would be provided with landscaped open space and tree planting located primarily at podium deck level which is the primary (pedestrian) zone of the Project.

Urban Design Guidelines

2.4.2.10 The Project has made reference to the urban design concepts and principles as stipulated in Chapter 11 of the Hong Kong Planning Standards and Guidelines (HKPSG). Specifically, the proposed development scheme has incorporated urban design features including building height profile, terraced podium, curvilinear building disposition, and enhanced air ventilation and visual permeability with due consideration of the local environment.

2.4.2.11 Breezeways/air paths and visual corridors have been planned at strategic locations based on air ventilation and visual assessments to enhance air circulation and visual permeability (see **Figure 2.1** for proposed breezeways and air paths). Specifically, four 30m-wide main corridors running diagonally and six horizontal NW-SE running supplementary corridors of minimum 15m-wide have been introduced across the Project to facilitate penetration of annual and summer prevailing winds above the podium. The four 30m-wide main corridors are diagonally arranged which improve the effectiveness as visual corridors for the passengers running along the NLH. This has resulted in dividing the site into 11 areas of about 0.8 to 6 hectare, most of which in irregular shape (see **Section 2.4.5** and **Appendix 2.1**). No residential tower or school would be located within the prominent corridors.

2.4.2.12 To further break down the length of the continuous building façade along the southern site boundary, maximum 4 towers have been adopted per cluster separated by gaps of 5 to 10m.

2.4.2.13 Building height of the Project is controlled by the current Airport Height Restrictions stipulated under the *Hong Kong Airport (Control of Obstructions) Ordinance* with maximum height of +106mPD at the eastern portion, progressively decrease to +86mPD at the western portion. The deployment of medium-rise towers with building height diminishing gradually towards the Tai Ho Estuary creates a harmonious profile across the Project.

2.4.2.14 Terraced podium with levels at approximately +20.1mPD and +26.5mPD stepping towards the waterfront has been incorporated to break down the physical bulk, promote wind circulation and enhance visual interest from the waterfront.

Facade Treatment

2.4.2.15 To minimize the impacts of road traffic noise and rail noise, for the buildings of self-protecting building design along the southern site boundary fronting NLH (i.e. the southernmost row of buildings), the current design has located all the openable windows of living rooms and bedrooms facing to the north. Innovative façade treatment could therefore be applied to the southern façade of these buildings More than 2/3 of the southern facades are for rooms that would have fixed windows / curtain wall (living rooms / bedroom etc.) and the other 1/3 of the facade can be glazed / solid wall, allowing solid and void (glazing) articulation in facade design. Together with the use of suitable colour tone and gaps between the building clusters, the façade along the southern site boundary would provide visual interests and permeability, which would benefit the visually sensitive receptors from the south including those on NLH, TM-CLK Link and those on the trails in the Country Park.

SHWWTW Consultation Zone

2.4.2.16 SHWWTW, situated at approximately 740m southeast, is classified as Potential Hazardous Installations (PHI) due to its chlorine storage with a consultation zone (CZ) of 1km-radius (**Figure 1.1**). About 8,600m^2 of the eastern of SHD is located within the CZ. There is a general presumption under the HKPSG that population within any CZs should be minimized to as low as reasonably practicable. Accordingly, only amenity area and plant room not accessible by the public has been planned within the CZ.

Provision of Schools

2.4.2.17 As agreed with Education Bureau, three 30-classroom schools and four 6-classroom kindergartens have been reserved on podium deck and podium level respectively for provision in tandem with the population build-up. One secondary school and two primary schools have been assumed for technical assessment purpose. General school block layout as stipulated in the HKPSG has been adopted as summarized in **Table 2.1**, subject to review in the detailed design stage.

Table 2.1 Reference site area for education facilities

School Type	General Requirements as stipulated in the HKPSG
30-classroom primary school	Site area of 6,200m^2 with a minimum width of 65m
30-classroom secondary school	Site area of 6,950m^2 with a minimum acceptable width of 65m

2.4.2.18 Based on the general school block layout, areas at Phases 2 to 4 of the Project have been identified with sufficient space to accommodate the schools. The kindergartens would be located at the podium level across Phases 1 to 4 of the Project. Standard design with openable windows for ventilation has been assumed in the noise impact assessments.

Collating and Addressing Public Views

2.4.2.19 During the course of the EIA study, comments from public have been duly revisited and were incorporated in the design and construction of the Project where appropriate. The following table summarises all these comments and how the Project Proponent has addressed them suitably.

Table 2.1a Summary of key comments and approaches adopted to address comments collated

Issues	Comments	Responses & Approaches Adopted
Interface between the SHD Topside Development and SHO and SHD Preplanning Works	It is essential to ensure that all the project elements of both projects are fully addressed.	The 2 EIAs for the SHD Topside Development and SHO and SHD Replanning Works would be submitted under the EIAO. All the requirements in the respective EIA SBs would be fully complied with. (see **Section 1.3** of this EIA).
Design	Suggested the development design to incorporate low carbon design and smart city element, and also make reference to smoke-free design of Discovery Bay to make the community more livable.	Scheme detailed design would make reference to the Sustainable Building Design Guidelines and Building Environmental Assessment Method (BEAM). Besides, traffic is mainly contained under the podium deck such that less traffic would take place on podium deck during normal operation.
Cumulative Impacts	The cumulative impacts from the construction and operation of the Tung Chung New Town Extension shall be considered as appropriate.	Tung Chung New Town Extension has been identified as one of the concurrent projects for the consideration of cumulative impacts (see **Section 1.7** of this EIA).
	The air quality assessment of this Study should cover Siu Ho Wan.	A comprehensive assessment has been conducted to demonstrate that all the neighbouring air sensitive receivers would not be exposed to adverse cumulative air quality impacts after taking into account of TCNTE and the proposed development in this Study (see **Section 3.5** of this EIA).

Issues	Comments	Responses & Approaches Adopted
	The Siu Ho Wan Reclamation Project shall be considered in the cumulative impacts.	As advised by CEDD, Siu Ho Wan (SHW) Reclamation and Road P1 (SHW Section) are in feasibility stage and has no implementation programme, thus not considered as concurrent project (see **Section 1.7**). These future projects, if proceed, will observe requirements in EIAO and take the SHD development as a committed project for the purpose of assessing cumulative impacts as appropriate.
Noise	The worst case Noise Exposure Forecast (NEF) 25 contour shall be adopted in the noise assessment, and any health risks associated with the noise exposure.	The predicted NEF25 contours with and without the 3RS presented in the approved Environmental Impact Assessment (EIA) for the Hong Kong International Airport (HKIA) Three-Runway System (3RS) have represented the worst case scenario for the planned airport operation. (see **Section 4.6** of this EIA).
	Uncertainty in the worst case NEF 25 presented in the approved EIA report of 3RS.	As confirmed with Airport Authority Hong Kong (AAHK), the NEF 25 contours are the up-to-date information.
	Residential units shall not be fully sealed with fixed glazing since it would be unfavourable to energy consumption for air-conditioning units and resident's health.	According to the current design, all the residential units would rely on openable windows for ventilation.
Water	It is advised to provide and encourage the use of wastewater and waste recycling facilities for the proposed development, especially for collecting organic waste to nearby Organic Waste Treatment Facilities (OWTF).	This will be further explored in the detailed design, particularly for food wastes from the proposed commercial/retail facilities. Sewage arising from the proposed development would be conveyed to Siu Ho Wan Sewage Treatment Works for treatment and disposal (see **Section 6** of this EIA).

Issues	Comments	Responses & Approaches Adopted
Waste	Concern on possibility by nearby villagers/topside development to construct public access road connect from SHD to Tai Ho. This might subsequently provide easier access and trigger illegal dumping at Tai Ho area	No external road passing through North Lantau Highway (NLH) to the south has been proposed under this project. Project Proponent would involve in overall design, coordination, monitoring and execution of construction works. Tight control would be implemented to ensure proper disposal of construction wastes.
Marine Ecology	While there are neither reclamation works nor marine works, the impacts (including underwater noise due to piling on the neighbouring marine park at Brothers Islands, and those on Chinese White Dolphins) shall be considered.	According to the current design, percussive piling would be avoided totally. Only bored piling would be adopted. This will minimize the generation of impulsive vibration to the practicable extent and hence the generation of underwater noise. (see **Section 9.7.2** of this EIA).
Landscape and Visual	The landscape and visual impacts to country park hikers should be addressed.	The landscape and visual impact as presented in **Section 11** has included North Lantau (Extension) Country Park as one of the Landscape Resources and Visual Sensitive Receivers.
Others	The environmental impacts caused by the construction of the foundations works shall be addressed.	This has been included in SHO and SHD Preplanning Works and as cumulative impacts in various chapters as appropriate.
	The environmental impacts caused by the temporary construction traffic management shall be addressed.	This has been included in various chapters as appropriate.
	The environmental monitoring data shall be made available in the public domain.	Environmental monitoring data will be made available in the public domain according to EIAO requirement.
	The Project shall provide enough public facilities, open space, shops and restaurants to cater for the planned population.	The current design has included facilities including commercial/retail facilities, schools, transportation facilities, etc. within the podium. (see **Section 2.4** of this EIA).

Issues	Comments	Responses & Approaches Adopted
	The connectivity of the Project and surrounded community should be considered, such as the cycling and pedestrians links connecting to Tung Chung, Penny Bay and Siu Ho Wan.	An internal cycle track network would be provided within the proposed development particularly to access the SHO Station, with routing to be determined at the detailed design stage.
	Information on the estimated job opportunities should be identified.	There are currently over 90,000 employment opportunities in Lantau, with about 65,000 in the existing Hong Kong International Airport (HKIA). The planned three-runway system (3RS) at HKIA will increase the number of direct job opportunities to about 123,000, with more than 40,000 created by the commercial developments proposed in the Tung Chung New Town Extension (TCNTE) study. Together with the planned developments at the Airport North Commercial District (NCD) and topside commercial development at the Hong Kong Boundary Crossing Facilities (HKBCF) Island of the Hong Kong-Zhuhai-Macao Bridge (HZMB) etc., coupled with the "bridgehead economy" generated by the HZMB, significant number of job opportunities will be created at North Lantau in the medium term.

2.4.3 Environmental Design

2.4.3.1 Due consideration has been given in formulation of the scheme design options to overcome the inherent environmental conditions following the hierarchy of "Avoid, Minimize and Mitigate" for environmental protection. Traffic noise from the NLH and railway noise from the LAR along the southern site boundary have been identified as major environmental considerations for the Project.

2.4.3.2 NLH is a dual-3 highway running along the north shore of Lantau between Sunny Bay and HKIA with a speed limit of 110 km/hour at the Siu Ho Wan section. It is situated at about 30m from the southern site boundary separated by the LAR. Peak traffic flow in Year 2053 (15 years after completion of the Project) is predicted as up to about 14,000 vehicle/hour (two-way). Road traffic noise level at the southern façade of the Project directly facing NLH is therefore up to 84 dB(A) (L_{10} 1 hr).

2.4.3.3 **Noise Barrier/Enclosure At-Source:** The option of constructing noise barriers/enclosures at existing roads and LAR has been explored. Over 2km noise barrier/enclosure at NLH, coupled with retrofitted installation at the viaducts of TM-CLK Link and Tai Ho Interchange after structural strengthening, is required to shield the significant traffic noise. Given that NLH and TM-CLK Link are the only external road links for Lantau/HKIA, extensive construction works required would cause unacceptable disturbance to the traffic on those strategic highway.

2.4.3.4 The option to enclose the some 2km of the LAR is also found to be technically not feasible. During the planning and preliminary design stage of SHO and SHD Replanning Works, the provision of noise enclosure on TCL/AEL tracks was reviewed. Review findings indicate only limited clearance at the either side of TCL/AEL tracks with existing depot facilities to the north, NLH and Tuen Mun Chek Lap Kok Link Road on the south. Such site constraints greatly reduce the constructability of noise enclosure on TCL/AEL tracks due to potential disturbance to existing SHD operation and also road traffic network of which temporary road closure required for supporting the construction. In addition, due to proximity of running tracks, the stringent railway protection measures for running tracks restricts the allowable working hour for the enclosure construction to less than 2 hours each night, leading to prolonged construction period of the noise enclosure which may affect other maintenance activities. Building structures close to high speed rail with speed about 130kph also introduce high suction force on objects in the vicinity, together with the prolonged construction period, construction of noise enclosure on TCL/AEL tracks create undesirable high risk affecting the normal service of TCL/AEL. It is therefore concluded that based on current design and operational information, the provision of noise enclosure on TCL/AEL tracks is not a practical and feasible mitigation proposal. In view of these, alternative

noise mitigation measures with efficient and practicable construction method have been explored to be provided at the above ground structures of SHD Topside Development for protecting the future residents.

2.4.3.5 **Low Noise Road Surface (LNRS):** LNRS is an effective measure for traffic noise reduction by absorbing tyre/road interaction noise or reducing tyre tread impact and shock noise. Both NLH and TM-CLK Link have already been equipped with LRNS.

2.4.3.6 **Building Setback:** About 200m setback from NLH is required for noise sensitive receivers (NSR) to satisfy the traffic noise criterion. The long trapezoidal shape of SHD with a maximum width of 240m has made building setback an impractical noise mitigation option.

2.4.3.7 In accordance with Chapter 9 of HKPSG, in situations where adequate separations between sensitive uses and noise emitters cannot be provided, the following methods should find applications in the Hong Kong context:

- Integrated building and noise source design;
- Purpose-built noise barriers;
- Self-protecting building design and arrangement; and
- Acoustic insulation of buildings.

2.4.3.8 **Noise Tolerant Building:** The option of using noise tolerant uses, i.e. the schools (with air-conditioning) and car parks, for noise shielding has been explored (**Figure 2.2**). Noise tolerant buildings of about 9-storey high along the 1.6km southern site boundary are required to shield the traffic noise from NLH hence is considered not a practicable option. Further, there would not be enough students in Phase 1 of the Project to sustain the school operation.

2.4.3.9 **Increased Podium Level:** Notwithstanding the design consideration to minimize the podium bulk by space optimization, e.g. double-storey car park and shared use of retail loading/unloading bays etc., the option of increasing the podium height for noise shielding has been explored but is considered ineffective. Increasing the podium height would affect housing supply as the building height is controlled by Airport Height Restriction (AHR).

2.4.3.10 **Purpose-Built Noise Barriers:** Despite noise barrier along the southern podium boundary is considered not effective for shielding of road traffic noise, a 15m-wide canopy for shielding of railway noise has been proposed at strategic locations, with due considerations given to the smoke extraction and ventilation requirements from the depot.

2.4.3.11 **Self-Protecting Building Design and Arrangement:** To enhance the living environment, prescribed windows of the towers along the southern site boundary have been designed to face the open spaces to the north. Fixed glazing would be provided at the habitable rooms at the southern façade facing NLH/LAR to provide lighting and views, while ventilation is also maintained. Utility platform/ balcony has also been incorporated at end units to provide further noise protection where necessary.

2.4.3.12 **Acoustic Window/Balcony:** The use of acoustic window and balcony could provide noise mitigation up to 8 and 10 dB(A) respectively, based on precedent cases presented in EPD's website and the assumption adopted in the *Hung Shui Kiu New Development Area EIA*. Acoustic windows have been adopted as a noise mitigation measure in the proposed development scheme for road traffic noise. Further use of acoustic window/balcony as a noise mitigation measure would also be reviewed in the detailed design stage if necessary.

2.4.3.13 **Acoustic Insulation of Buildings:** Although the Project is located at more than 1km away from the Noise Exposure Forecast (NEF) 25 contour of the HKIA under the 3RS hence is suitable for noise sensitive uses, the use of acoustic insulation in form of well-gasketted window to enhance the indoor living environment could be reviewed in the detailed design stage. Building design features such as architectural fin/canopy are considered less effective due to low frequency nature of aircraft noise.

2.4.3.14 **Reducing traffic on podium level**: To create a pleasant environment for walking on podium deck with reduced roadside air and noise pollution, the topside development would be designed in a way that the traffic is mainly contained under the podium deck such that less traffic would take place on podium deck.

2.4.4 Building Layout/Orientation

2.4.4.1 Building layout and orientation options have been considered in the development scheme design process.

2.4.4.2 Typical 4-unit-per-floor layout of about 20m-wide, namely Type B tower (**Figure 2.3b**), has been adopted for towers along the southern site boundary facing the LAR and NLH. This would allow the opportunity for curvilinear disposition of the towers with shorter façade length to enhance air flows and visual interest, as well as landscape treatment along the southern podium edge. Alternative design of Type B towers (**Figure 2.3c**) with the use of utility platform/ balcony at end units have been adopted in the proposed development scheme to further optimise noise shielding effect where necessary. The option of using other building layout, such as typical 6-unit-per-floor design, is found to be less adaptable to the curvilinear layout and building separation.

2.4.4.3 To enhance visual effect of the façade facing NLH/LAR, about two-thirds of the southern façade of Type B tower has been designed as habitable rooms with fixed glazing. The opportunity to allow maintenance window (openable with key) or further acoustic window/balcony would be explored at the detailed design stage, as discussed in **Section 2.4.3.12**.

2.4.4.4 For Phases 2 to 4 of the Project, typical 10-unit-per-floor layout, namely Type A tower (**Figure 2.3a**), has been adopted to allow more open space, as compared with typical 8-unit-per-floor layout.

2.4.5 Building Disposition

2.4.5.1 The provision of prominent breezeways and visual corridors discussed in **Section 2.4.2** has divided the site into 11 areas as summarized in **Appendix 2.1**. Options considered in building disposition to optimise land use are discussed in the following section, with due consideration of the *Building (Planning) Regulations*.

2.4.5.2 **Area A (1.6ha):** Maximum two layers of building can be accommodated within this area. Within the Phase 1 area, two clusters of Type B towers have been aligned in curvilinear disposition. Two Type A towers have been located at the northernmost position to optimise the distance between towers.

2.4.5.3 **Areas B and J (2.6ha):** Maximum two layers of building and one primary school can be accommodated within these areas. As locating the school along the southern site boundary is not preferred (see below), the only option is to fit it within the Phase 2/4 area, in between the Type B towers in concave curvilinear alignment and the Type A towers in convex curvilinear alignment along the diagonal boundary of the area.

2.4.5.4 **Areas C and I (2.0ha):** Maximum two layers of building can be accommodated within these areas. Four Type A towers have been aligned along the northern site boundary. Two Type A towers have been placed at the southernmost position to optimise the distance between towers.

2.4.5.5 **Areas D and H (0.8ha):** Maximum two Type A towers can be accommodated within these areas due to limited space available.

2.4.5.6 **Areas E and G (2.2ha):** Maximum two layers of building can be accommodated within these areas. Within the Phase 1 area, Type B towers have been aligned in curvilinear disposition. Four Type A towers have been placed within the Phase 2/3 site along the diagonal boundary to optimise the distance between towers.

2.4.5.7 **Area F (5.9ha):** Maximum three layers of building and one secondary school can be accommodated within this area. The option of locating the school within the Phase 3 area, in between Type B towers in concave curvilinear alignment and the Type A towers in convex curvilinear alignment is preferred due to the following reasons:

- Insufficient student to sustain its operation at Phase 1 of the Project;
- Minimize traffic emission by confining the school traffic mainly within the southern perimeter road;
- Shielded by the towers from noise impacts hence comply with relevant criteria even with open-window design; and
- Require less structural support hence improve the layout and efficiency at the commercial/retail facilities below deck.

2.4.5.8 **Area K (1.5ha):** Design consideration similar to that of Area A has been given. No tower has been located within the SHWWTW consultation zone to minimize contribution to societal risk.

2.4.6 Proposed Development Scheme

2.4.6.1 Based on the abovementioned design considerations, a proposed development scheme has been formulated comprising 52 Type A (10-unit-per-floor) and 56 Type B (4-unit-per-floor) towers to provide some 14,000 residential units. Commercial/retail facilities of about 30,000m^2 GFA has been planned to serve the local community.

2.4.6.2 A building podium, with terraced platforms at +20.1mPD and +26.5mPD, has been incorporated for commercial/retail, kindergarten, PTI, access roads, car parking, SHO concourse, private recreational facilities (clubhouses), and utility plant room uses. Three schools are also proposed the podium platform of +26.5mPD. The development schedule is summarized in **Table 2.2** and is illustrated in **Figure 2.3**.

Table 2.2 Development schedule of the Project

Parameter	Proposed Schedule
Development Site Area	About 30ha
Number of Flats	About 14,000
Number of Blocks	108
Building Height	+86 to +106 mPD
Podium Height	+20.1 and +26.5 mPD
Design Population	37,800
Open Space	About 75,600 m^2
Commercial/Retail Gross Floor Area (GFA)	30,000 m^2
Educational Uses	3 x 30-Classroom Schools 4 x 6-Classroom Kindergartens
Transportation Facilities	Integrated SHO Concourse Public Transport Interchange

2.4.6.3 The proposed development scheme, including but not limited to building disposition, floor layout and implementation programme, is indicative subject to change in the project implementation stage. Notwithstanding, the above discussions have provided guiding principles on the design for future reference on mitigating potential environmental impacts and enhancement of living conditions. In the project implementation stage, alternative measures/approaches may be explored to achieve comparable environmental performance in an environmental assessment study.

2.4.7 Sewerage Network

Options considered on Sewer Alignment

2.4.7.1 Sewage from the Project would be conveyed to the existing SHWSTW for treatment and disposal, as agreed with Government. An ultimate sewage pumping station (SPS) with retention tank would be constructed at the eastern end of the site, with a new sewer connection (450mm diameter twin rising mains) to the SHWSTW.

2.4.7.2 Two alignment options of sewerage connection, both with a total length of about 900m, have been explored, as presented in **Figure 2.4**. The main characteristics of these two options are described below:

- **Option 1:** the new rising mains would cross the LAR/NLH immediately south of the ultimate SPS via a new underground trench, then follow the hillside to the inlet of the SHWSTW; and
- **Option 2:** the new rising mains would run along the Sham Shui Kok Drive for about 350m before crossing the NLH/LAR via an existing DSD's box culvert (which currently serves for conveying treated effluent from SHWSTW to the existing outfall), and then the rising mains would run within SHWSTW for connection to its inlet.

2.4.7.3 Construction of the rising mains would require site clearance, breaking of existing concrete pavement, rising mains installation and then reinstatement of the concrete paving. Pipe jacking underneath NLH/LAR would be required for construction of the new trench under Option 1.

2.4.7.4 As both alignment options would be running along existing roads/footpaths, there will not be direct impact on natural habitat. With no noise sensitive receivers and limited air sensitive receivers in the vicinity of the sewers, adverse environmental impact due to construction and operation is not anticipated. However, given Option 2 is more likely to create operational impacts to the existing outfall, Option 1 is therefore selected as the preferred sewage connection option for the proposed development and is adopted for the assessment in the current study.

2.5 Key Element of Works

2.5.1.1 As discussed in **Section 2.4**, environmental constraints and considerations have been taken in devising the proposed layout. The Project includes the following major elements of works:

- Topside development including podium deck, residential towers, schools, transport, utility and other supporting facilities;
- Ultimate sewage pumping station and sewerage connection to SHWSTW for topside development; and
- Eastern Access connection to future Road P1 (SHW Section) or Sham Shui Kok Drive during interim period;
- Western Access connection access via Tai Ho Interchange.

2.5.1.2 A separate EIA Study is being conducted on SHO and SHD Replanning Works under the EIA Study Brief No. ESB-296/2016, which comprises mainly the following works:

- Railway depot replanning works within the existing boundary;
- Podium deck and property enabling works (including piling) for the topside development;
- SHO and the associated track works, as well as local access roads and emergency vehicular access; and
- Reprovision of the sewerage network with sewage pumping station to cater for sewage generated by the depot and SHO.

2.5.2 Topside Development

2.5.2.1 Construction of SHD Topside Development within the site boundary would involve mainly the following works:

- Superstructure including podium deck, towers, PTI, commercial/retail facilities, Government, Institution and Community (GIC) facilities, recreational facilities and open space, car parking and loading/unloading facilities, internal roads and pedestrian linkages, landscaping and amenity areas, and utilities and supporting facilities; and
- Ultimate sewage pumping station with design capacity of about 12,100m^3/day at the eastern end of the Project to serve the topside development.

2.5.3 Utilities Outside Site Boundary

2.5.3.1 The new sewerage connection to the SHWSTW, as discussed in **Section 2.4.7**, is the only off-site utility infrastructure to be constructed under the Project. New storm drains would be constructed to collect surface runoff from the topside development, with connection to the communal stormwater drains.

2.5.3.2 New fresh and saltwater supply connection points would be available at both ends of the site to serve the Project, as discussed with Water Supplies Department, subject to detailed design. New electricity cable would also be provided from the Shum Shui Kok substation to serve the Project, as discussed with CLP Power Hong Kong Limited.

2.5.4 Vehicular Access for the SHD Topside Development

2.5.4.1 Two vehicular accesses have been planned at both ends of the SHD Topside Development. The western vehicular access is the main one connecting the Phase 1 of the Project to Tai Ho Interchange with slip roads connecting both directions of the NLH. A viaduct of approximately 50m would be constructed as part of the Railway EIA Project. Part of the western access road bridge may be constructed under the Project and Railway EIA which would be further delineated in the detailed design stage. Both Railway EIA and Topside Development EIA assessed relevant impact from construction and operation of the western access road bridge as worst case scenario.

2.5.4.2 An alternative vehicular access has been planned at the eastern end of the SHD Topside Development connecting to the future Road P1 (SHW Section) which is under study. As the implementation programme for Road P1 (SHW Section) is currently not available according to the Civil Engineering and Development Department (CEDD), it is possible that the existing eastern connection to the Sham Shui Kok Drive would continue to be used for a period of time if the connection to Road P1 is not available when the Phase 4 of the Project is implemented in 2034-2038. Local widening/enhancement to standard road, i.e. about 7.3m-wide, would be required, subject to Transport Department's requirement. The Traffic Impact Assessment has predicted less than 200 vehicle/hour would be using the eastern access during peak hours during the temporary period of connecting to the Sham Shui Kok Drive.

2.6 Consideration of Alternative Construction Methodologies

2.6.1.1 **Section 2.5** has described the key elements of works required for the SHD Topside Development. In order to develop these elements in an environmentally friendly manner, a number of alternative construction methods and sequences including the following have been considered:

2.6.2 Avoid Use of Concrete Batching Plant

2.6.2.1 While having concrete batching plant on site would provide certain benefits to facilitate the construction process, the associated dust and noise emissions from their operations on neighbouring residential developments during phased implementation have been duly considered. Although there are engineering measures to ensure that the impacts could be properly managed, it is considered more prudent to avoid having any concrete batching plant so that its associated dust and noise are minimised throughout the construction period.

2.6.3 Minimise In-situ Concreting

2.6.3.1 Precast method would be adopted as far as practicable instead of in-situ concreting for SHD Topside Development construction to reduce construction activities and duration on site hence minimizing the associated dust and noise impacts, as well as the generation of construction and demolition (C&D) materials.

2.6.4 Avoid Marine Transportation

2.6.4.1 Due to its proximity to The Brothers Marine Park, marine transportation for construction of the SHD Topside Development and marine traffic would be avoided to minimize impacts on water quality and marine ecology.

2.7 Preferred Construction Methodologies

2.7.1.1 As part of the SHD Replanning Works project, the tracks and facilities within the existing SHD would be suitably rearranged to facilitate the construction of the property enabling works for supporting of the concrete slab above. The concrete slab would also support for the podium deck, and the towers and facilities to be constructed above. In order to maintain safe and uninterrupted operation of the depot, replanning works will be implemented in 4 major stages over a period of about 18 years. This arrangement has governed the size and location of the topside development phasing.

2.7.1.2 According to the preliminary design, the columns would be constructed by bored piling method. All the bored piling works required for foundation of the proposed topside development would be conducted by the Railway EIA, and hence bored piling work is not required under this EIA study.

2.7.1.3 After completion of piling works, the concrete slab and podium decking above would be constructed accordingly. The construction method would more likely be in-situ casting approach to suit site conditions. As discussed above, the concrete slab and podium decking would accommodate various facilities including the commercial/retail facilities, car parking and loading/unloading facilities, utility rooms (e.g. pump rooms, transformer rooms, electrical rooms etc), PTI etc. Besides, the concrete slab and podium decking would also be designed to support the future residential buildings to be built atop. In order to achieve this, a number of reinforcement starter provision points would be allowed on the top of the concrete slab to enable the future building construction.

2.7.1.4 Each development phase would be subdivided into self-contained development packages in the implementation stage. It is assumed, for noise and sewerage and sewage implication assessment purposes, that there would be a total of 10 topside development packages (see **Section 2.8**). For Phases 1 to 4, future design of the residential towers and schools will take into consideration the reinforcement starter provision points constructed under the SHD Replanning Works project. For residential towers, it is anticipated that in-situ casting method would be adopted for the core walls to address shear load issues. For typical floors and non-structural elements, a combination of in-situ and pre-cast method would be adopted (see also **Section 2.6**). Each typical floor would take some 2 weeks to complete the structural frameworks.

2.7.1.5 Concrete batching plant and designated stockpiling areas are not anticipated to be required on site for the Project at this stage. Construction plant including bored piling machines, excavators, cranes, concrete lorry mixers, dump truck, water pump, etc would be required during various periods of the construction phase.

2.7.1.6 A new sewerage system will be constructed to support the SHD Topside Development. Wastewater generated from the SHD Topside Development, except the integrated station concourse, will be conveyed either by pumps or by gravity to the ultimate SPS with a design capacity of about 12,100m^3/day located mainly underground at the Phase 4 development area. The ultimate SPS will then convey the wastewater to the SHWSTW for treatment via new twin rising mains of about 450mm diameter sewer (see **Figure 2.4** for the sewage pipe alignments and location of the pumping station). The rising mains would generally be laid by open trench excavation method, except for the section across NLH which would be constructed by trenchless construction method. For rising main constructed by open excavation method, while excavation is conducted, shoring with struts (including waling) would be installed to ensure safe construction. Once the pipe sections are laid, backfilling would be conducted to restore to the required finished level. Construction plant including excavators, breakers, generator, compactor, etc would be required during installation of rising mains. For rising main to be constructed by trenchless method, jacking and receiving pits will be excavated on both ends and the rising mains will be installed by construction plant including tunneling machine, etc. The works for the ultimate SPS will include construction of foundation, sub-structure and superstructure. Construction method of the ultimate SPS would be by open excavation and with structure casting in-situ. Construction plants include bored piling machine, excavators, mobile crane, concrete lorry mixer, dump truck and water pump, etc.

2.8 Tentative Implementation Programme

2.8.1.1 The Project will be implemented by phase based on SHD Replanning Works progress and market conditions. As an indicative reference for this Environmental Impact Assessment, SHO and SHD Replanning Works is anticipated to commence in 2019 for completion in 2036. Construction works for the topside development is anticipated to commence in 2023 with population intake begins in 2026. The Project is expected to be completed in 2038 based on an outline development replanning strategy and development sequencing, subject to review in the detailed design stage. The indicative implementation programme is presented in **Appendix 2.2** and **Table 2.3** below.

Table 2.3 Summary of key construction dates (as indicative reference for this Environmental Impact Assessment)

SHD Replanning Works (Under ESB-296/2016)				SHO (Under ESB-296/2016)	SHD Topside Development (Under ESB-294/2016)		
Item	Works Programme		Completion of Works & Operation	Works Programme	Item	Tentative Implementation Programme	
	Start	Deck Completion [2]				Commencement	Population Intake /Completion
Stage 1[1]	2019	2023	2024	2019 - 2026 [3]	Phase 1	2023	2026 - 2027
Stage 2[1]	2024	2026	2028	-	Phase 2	2027	2030
Stage 3[1]	2028	2030	2032	-	Phase 3	2031	2034
Stage 4[1]	2032	2034	2036	-	Phase 4	2032 for Phase 4a[4] 2035 for Phase 4b & 4c	2035 - 2038
-	-	-	-	-	Ultimate Sewage Pumping Station	2023	2024
-	-	-	-	-	Utilities Outside Subject Site	2024	2025
-	-	-	-	-	Western access via Tai Ho Interchange	2024	2025
-	-	-	-	-	Eastern connection access on Sham Shui Kok Drive	2036	2038

Notes:

[1] The construction stages for SHD Replanning Works are as presented in **Appendix 2.3**.

[2] Upon completion of podium deck in respective stage, the contractor(s) of SHD Topside Development would be on board to commence the superstructure works.

[3] Civil construction works for SHO will be completed in 2024 while building services (BS) and electrical and mechanical (E&M) works will be conducted in 2024-2026. Operation of SHO would commence in 2026.

[4] Phase 4a SHD Topside Development is located above Stage 3 SHD Replanning Work.

2.9 Reference

[2-1] Transport and Housing Bureau – Long Term Housing Strategy Annual Progress Report 2015

http://www.thb.gov.hk/eng/policy/housing/policy/lths/LTHS_Annual_Progress_Report_2015.pdf

[2-2] Lantau Development Advisory Committee First-term Work Report

http://www.devb.gov.hk/filemanager/en/content_872/LanDAC_First_term_Work_Report_(English).pdf

[2-4] HKGBC – Beam Plus New Buildings

https://www.hkgbc.org.hk/eng/NB_Intro.aspx

[2-5] BD – Sustainable Building Design Guidelines

http://www.bd.gov.hk/english/documents/pnap/APP/APP152.pdf