

Specialist Consultancy Services for Environmental Impact Assessment (EIA) at Sembawang Neighbourhood 4 (Part)

Executive Summary

Housing & Development Board (HDB)

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1 Executive Summary

Project Description and Objectives

AECOM Singapore Pte. Ltd. was appointed by the Housing & Development Board (HDB), through the Letter of Acceptance dated 27 December 2022 (Contract Number L/468/22), to provide *Specialist Consultancy Services for Environmental Impact Assessment at Sembawang N4 (Part)*. An Environmental Impact Assessment (EIA) is essential for establishing the current environmental baseline conditions, inclusive of topography, biodiversity, water resources (i.e. hydrology, surface water quality and groundwater level) and airborne noise. This EIA will also evaluate the potential direct impacts (e.g. habitat degradation, mortality, accidental injury, mortality, etc.) and indirect impacts (i.e. due to changes in hydrology, surface water quality, groundwater level and airborne noise) resulting from the construction and operational phases of the proposed developments in Sembawang Neighbourhood 4 (N4) (hereafter referred to as 'the Project').

The Project site spans approximately 53 hectares (ha), and currently consisting of urbanised areas, construction worksites, managed turf vegetation and forested area (i.e. N4 Forested Area). It is bounded by Admiralty Road West and Admiralty Street to the north, Canberra Road to the east, residential areas to the south and Sungei Sembawang to the west.

According to the gazetted URA Master Plan 2019, the Project site is zoned for Residential, Commercial, Civic and Community Institution, Educational Institution, Place of Worship, Road and Waterbody (refer to Figure 1.1). Note that the N5 Forested Area, though zoned for "Residential", is not part of the Project site. Details of its development were not known at the time of writing the Report and was not included in this Study. Based on the latest land use plan provided by HDB, the developments within the Project site will also include a park spanning from Admiralty Road West to Admiralty Lane. HDB shared a working draft of the plan for the Project with AECOM to facilitate the environmental impact assessment. However, since the plan is subject to change and refinements, it will not be disclosed in this Report.

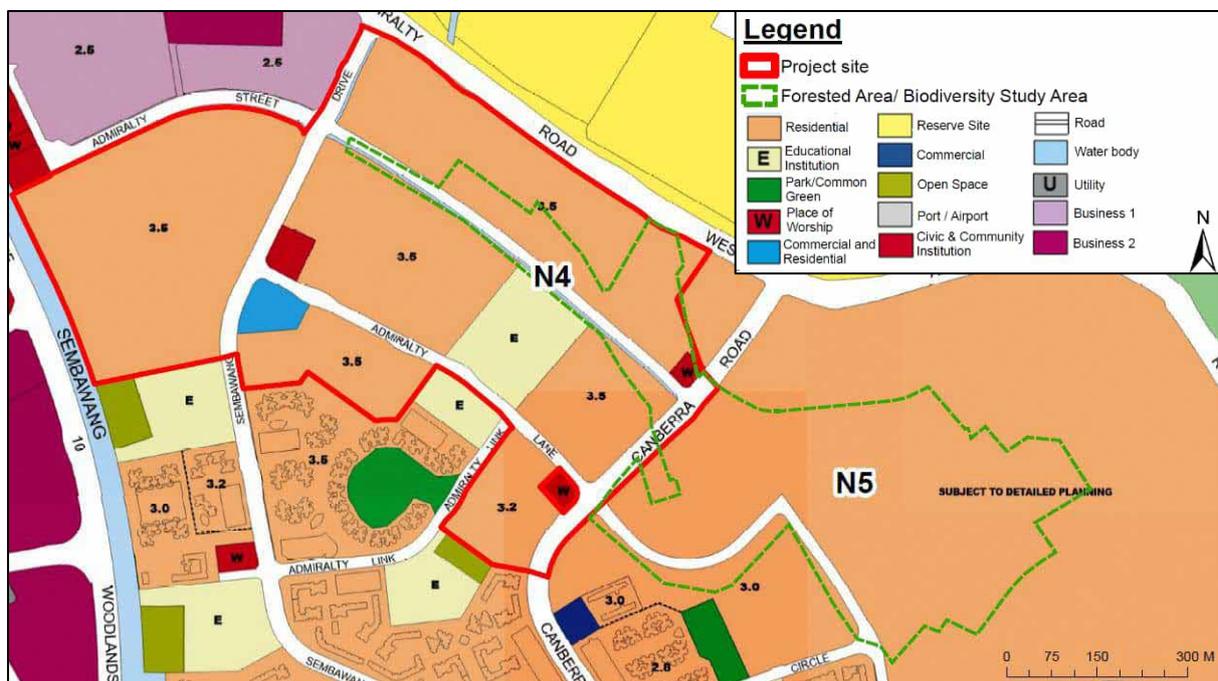


Figure 1.1 Proposed land use of Project site and its surroundings

This EIA, therefore, includes the findings of the following study:

- (1) Identification and understanding of baseline conditions of biodiversity, water resources (i.e. hydrology, surface water quality and groundwater level) and airborne noise, as well as topography of the Study Area (i.e. N4 and N5 Forested Areas);
- (2) An assessment of potential direct impacts on identified ecological receptors within the Study Area;

- (3) An assessment of potential indirect impacts (i.e. due to changes in water resources and airborne noise) on biodiversity and identified ecological receptors within the Study Area;
- (4) Proposed mitigation measures to minimise potential significant adverse impacts; and
- (5) Development of a Preliminary Environmental Management and Monitoring Plan (EMMP).

Findings from each of the steps above are summarised in the sections below.

Environmental Baseline Findings

Baseline studies on biodiversity, water resources (i.e., hydrology, surface water quality and groundwater level) and airborne noise were conducted for the respective Study Areas. A summary of the findings is provided below, with detailed information available in Section 6 of the Report.

(1) Habitats and Vegetation Distribution (see Figure 1.2) – Generally, the Study Area is dominated by exotic-dominated secondary forest which occupies around one third of the Study Area (33.5%). N4 Forested Area consists of four (4) different habitat types, namely exotic-dominated secondary forest, scrubland, grassland, and semi-naturalised drain, from the most dominant to the least dominant habitat. Within N5 Forested Area, five (5) different habitats have been identified – abandoned-land forest, scrubland, exotic-dominated secondary forest, grassland, and urban vegetation.

(2) Biodiversity, Flora, Large Plant Specimens and Other Specimens of Value (see Figure 1.2) – In total, more than 240 species were found across the N4 and N5 Forested Area. Out of 128 species found within N4 Forested Area, 57 were found to be native (44.5%), 66 were exotic (i.e. 51.6%) and 5 were cryptogenic (3.9%). Five species within N4 Forested Area were of conservation significance (i.e. *Calophyllum inophyllum*, *Cyperus compressus*, *Macaranga griffithiana*, *Tectaria cf semipinnata*, *Trema tomentosum*).

In the N5 Forested Area, 198 species were identified: 98 native species (49.5%), 95 exotic species (48%) and 5 cryptogenic species (2.5%). Seventeen (17) species in the N5 forested area were of conservation significance (i.e. *Adenia cordifolia*, *Callicarpa longifolia*, *Calophyllum inophyllum*, *Cissus repens*, *Cnestis palala*, *Goniophlebium percussum*, *Horsfieldia crassifolia*, *Horsfieldia polyspherula* var. *polyspherula*, *Lindera lucida*, *Litsea umbellata*, *Macaranga griffithiana*, *Melicope lunu-ankenda*, *Microlepia speluncae*, *Neoscortechinia sumatrensis*, *Pittosporum ridleyi*, *Santiria laevigata*, *Uncaria cordata*).

Additionally, 28 large plant specimens were recorded within N4 Forested Area and 112 within N5 Forested Area. Noteworthy specimens in the N4 Forested Area include a single record of small Malayan banyan (*Ficus microcarpa*). In the N5 Forested Area, 11 valuable plant specimens include five albizia trees (*Falcataria falcata*) with a raptor's nest, three weeping fig (*Ficus benjamina*) stranglers, two Malayan banyan (*Ficus microcarpa*) and a cluster of golden bamboo (*Bambusa vulgaris*).

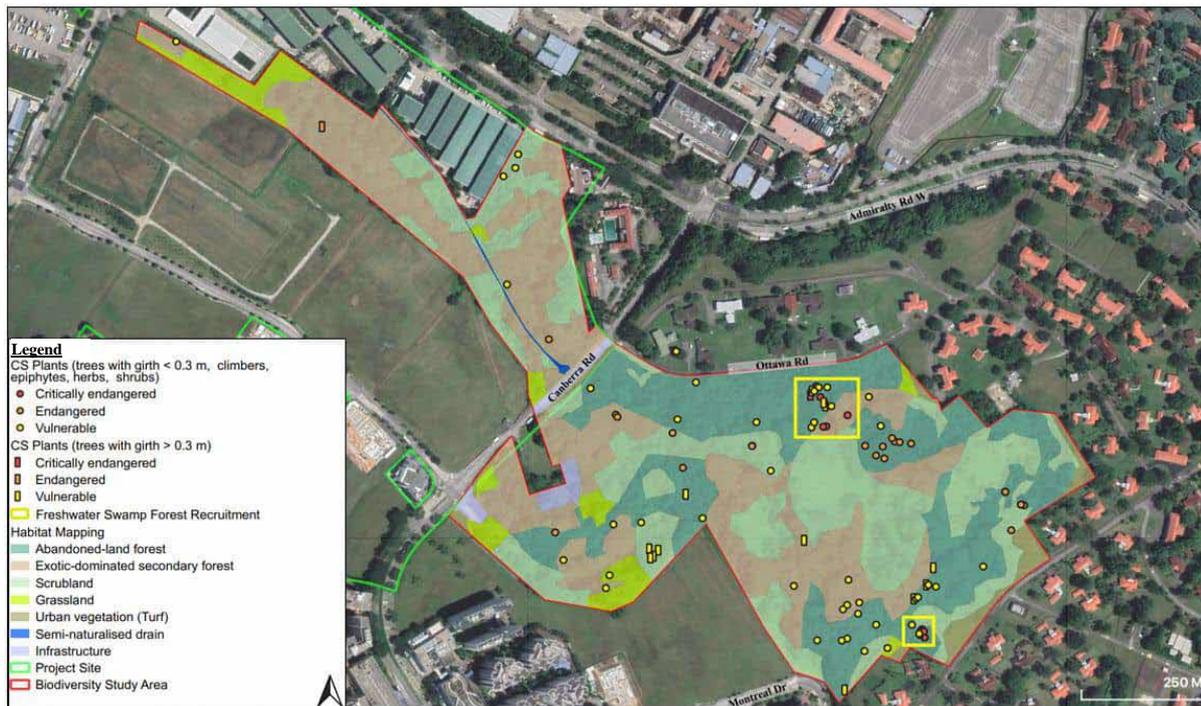


Figure 1.2 Habitat map with distribution of plant specimens of conservation significance within N4 and N5 Forested Area

(3) Biodiversity, Fauna (see Figure 1.3 and Figure 1.4) – The field assessment recorded a total of 212 species, with birds (61 species) and butterflies (56 species) comprising more than half of the species assemblage. The recorded fauna included 20 species of odonates (dragonflies and damselflies), 29 species of aculeate hymenopterans (bees and stinging wasps), 17 species of mammals, three (3) species of molluscs and 21 species of herpetofauna (amphibians and reptiles). Additionally, four (4) species of freshwater fish and one (1) species of decapod crustaceans were also documented. A total of 13 species of conservation significance were identified, all of which are birds and mammals.

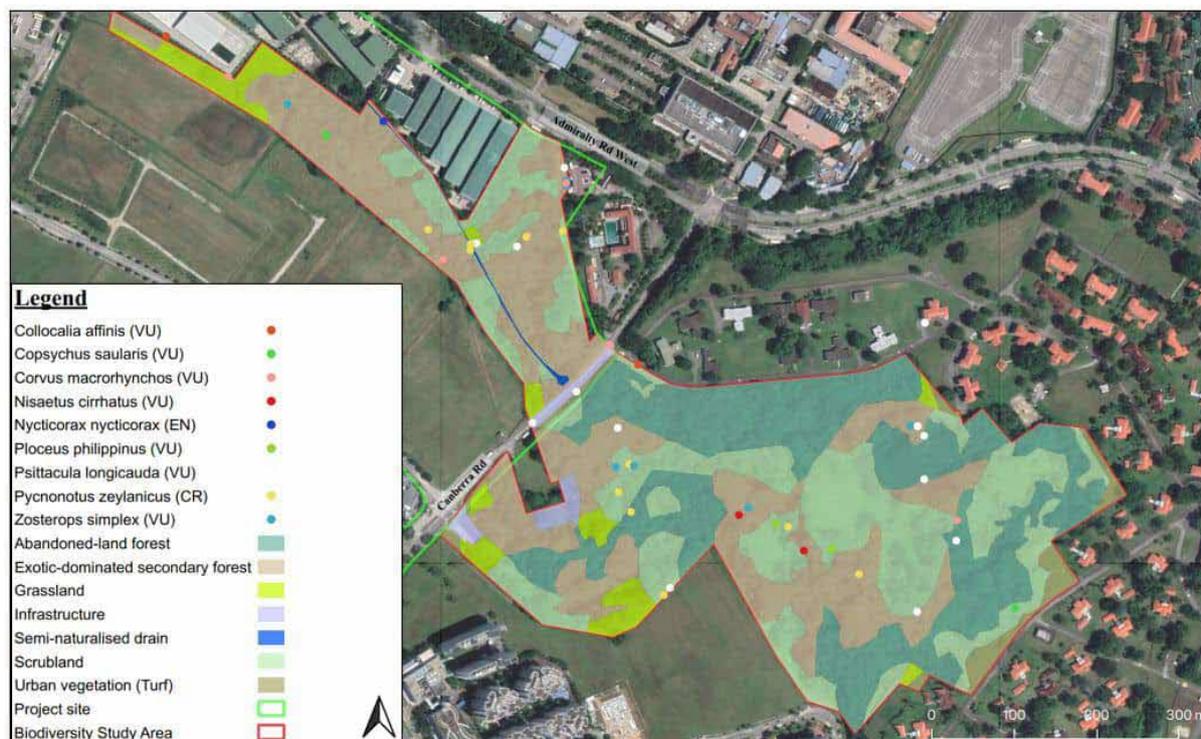


Figure 1.3 Birds of conservation significance within N4 and N5 Forested Area

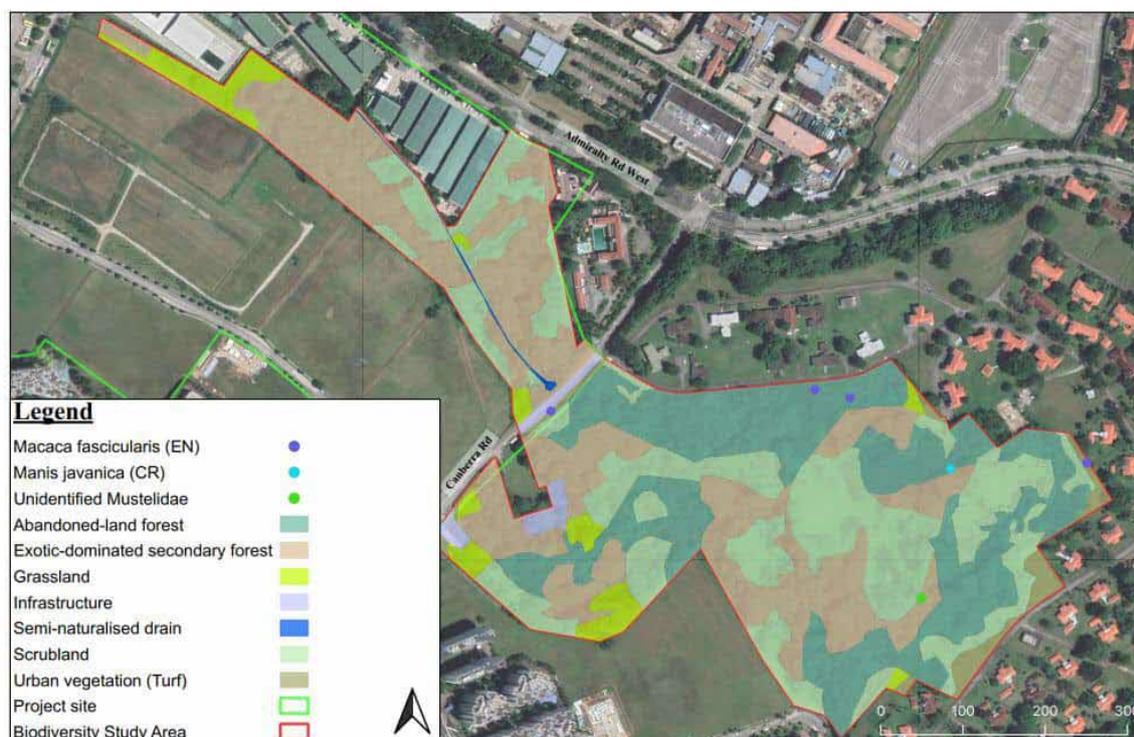


Figure 1.4 Non-volant mammals of conservation significance within N4 and N5 Forested Area

The biodiversity Study Area, which comprises of N4 and N5 Forested Area, is one of a few remaining large and continuous vegetated patches in the urban matrix of Sembawang region. The larger size and position of N5 Forested Area makes this forest patch a much more effective stepping-stone habitat. As such, N4 forested area will be cleared during the construction phase as it resides within the Project Site whereas N5 development is not included in this Study. However, a small portion of the N5 Forested Area will be within the impact zone, after accounting for the existing 'setback' provided by Canberra Road.

The main impacts on the N4 Forested Area were assessed to be due to inevitable loss of habitats and plant species. More specifically, the impact due to the loss of habitats was assessed as Major, while the plant mortality impacts were assessed as Moderate to Major. As such, compensatory measures such as habitat creation using native planting with Active, Beautiful, Clean Water features running through the future park within the Project Site will be explored. The degradation of habitats within N5 Forested Area as well as decline in plant health were assessed Negligible as only the fringes of it facing the Canberra Road will be affected.

- (4) Hydrological Conditions** (see Figure 1.5) – One concrete drain (D1) and one semi-naturalised drain (D2) have been identified as key watercourses within N5 and N4 Forested Areas, respectively. Other watercourses within the future N4 development area consist of smaller, roadside concrete drains with ephemeral flow. The N5 Forested Area can be divided into 4 smaller catchments with the largest (C4) discharging water into a concrete drain. This concrete drain subsequently releases the water into a semi-naturalised drain via a culvert below Canberra Road. In addition to the water discharge from N5, the semi-naturalised drain also collects water from the largest catchment area within N4. All water from the Project site eventually discharges into the sea.

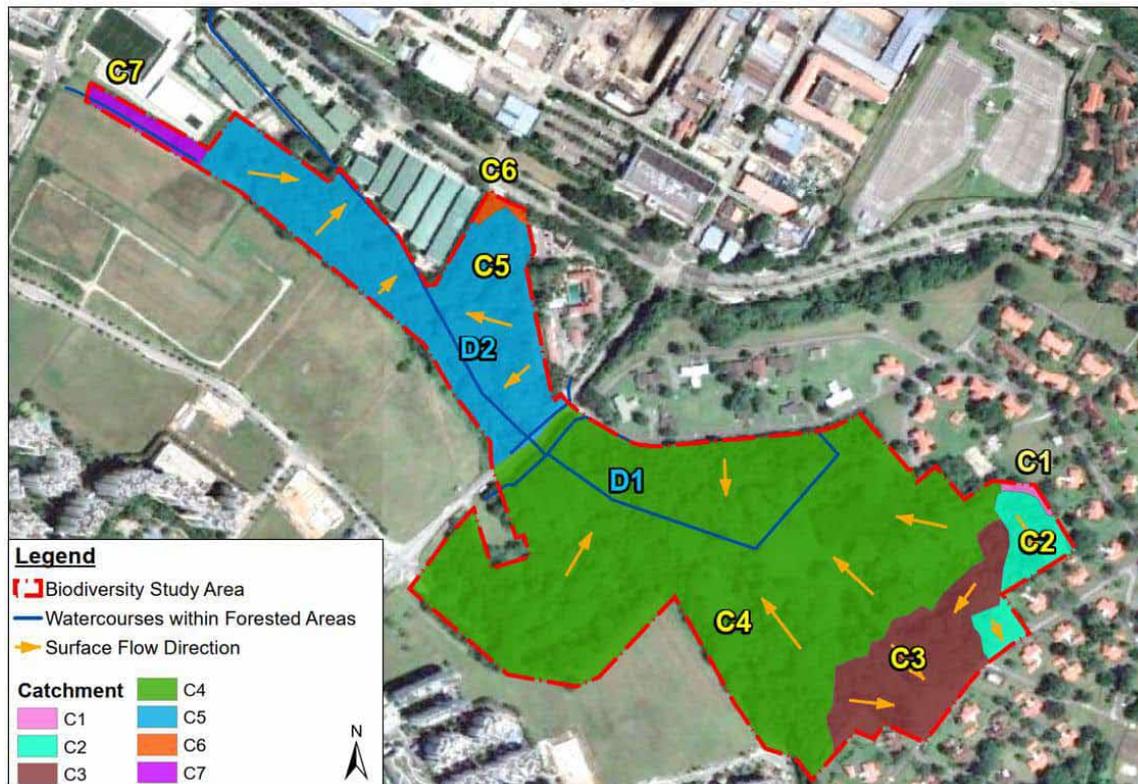


Figure 1.5 Catchment map of N4 and N5 Forested Area

(5) **Surface Water Quality** – The surface water quality conditions were established based on surface water sampling events conducted at 11 locations during both dry and wet weather conditions and across 3 watercourses (i.e. concrete drain within N5 Forested Area, semi-naturalised drain within N4 Forested Area and Sungei Sembawang). Generally, slight exceedances of nutrients such as phosphorous and nitrogen were noted along the watercourses which is commonly documented in heavily vegetated areas due to dead and decomposing matter from vegetation in the water courses, releasing the nutrients in the water body.

(6) **Airborne Noise** – Based on the baseline monitoring results, the airborne noise levels recorded in the N5 Forested Area are considerably low ranging from 44 – 54 dB(A) and are below the most-stringent NEA construction noise criteria. This is reflective of an isolated and vegetated nature of this area. One exceedance (i.e. max L_{Aeq} (5 mins) 7pm-10pm) was observed over the course of one week, which was potentially due to air traffic noise from the nearby Sembawang Air Base.

Impact Assessment Methodology

Section 5 of this EIA Report discuss the methodologies used for impact identification, prediction and assessment on environmental parameters including biodiversity, water resources (i.e. hydrology, surface water quality and groundwater level) and airborne noise during the construction and operational phases of the Project.

Minimum controls and recommended mitigation measures

Table 1.1 summarises the mitigation measures and best management practices to minimise the adverse impacts throughout the course of the Project. More details can be found in Section 7 and 8 of the Report for proposed mitigation measures during the construction and operational phase respectively.

Table 1.1 Summary of minimum controls and recommended mitigation measures

Environmental Parameter	Minimum Controls and Key Recommended Mitigation Measures	
	During Construction Phase	During Operational Phase
Biodiversity	<ul style="list-style-type: none"> Establish Tree Protection Zones (TPZs) around trees or other plant specimens that are to be retained within the worksites. No construction activities are allowed within these zones. This should be executed by certified arborists and in accordance with NParks' guidelines (NParks, 2019). Develop a Light Management Plan for night works to minimise light disturbance to sensitive receptors and obtain NParks' approval. Prior to vegetation clearance, conduct a pre-felling fauna inspection by an Ecologist capable of identifying wildlife or active nesting structures, such as bird nests, tree hollows, burrows, and bamboos clusters; in compliance with Section 10 Wildlife Act. Implement soil erosion control measures, such as biodegradable erosion control blankets, ECM tanks immediately after vegetation has been removed and soil is exposed for the purpose of installing these, as described in Section 7.3.2 under Water Resources. Store materials that could leach harmful chemicals and fuel-powered equipment away from waterbodies or sensitive habitats as described in Section 10 of Wildlife Act. Install hoarding to clearly delineate worksite boundaries. Execute Wildlife Response Plan when a trapped, injured, dead, dangerous animal is encountered around or within the worksite according to Section 10 of the Wildlife Act. Implement preventive measures to limit mosquito breeding by removing sources of stagnant water and water-bearing receptacles. Measures include maintaining pitched roofs, clearing discarded items daily, storing materials appropriately, levelling up ground depression/ uneven surfaces. These actions reduce the need for fogging. Conduct daily checks by an Environmental Control Officer (ECO) on site for trapped fauna and roadkill. 	<ul style="list-style-type: none"> Ensure noise levels are within noise criteria set for ecological receptors in this report. Refer to Section 8.5 under airborne noise-related impacts for details. Ensure dust levels are within approved limits as defined by NEA's regulated Environmental Protection and Management Act and its regulations.
Impacts on Biodiversity due to Changes in Other Environmental Parameters		
Water Resources	<ul style="list-style-type: none"> Finalise a complete inventory of all anticipated wastewater streams and volumes before the onset of construction phase works. Maintain daily records of wastewater volume, as well as the volumes of sludge and other produced onsite. Ensure containment ponds are made 	<ul style="list-style-type: none"> Implement a storage system for stormwater. The storage system needs to be in place to reduce the peak flow at the operational phase to be the same or less than that of the existing condition. Geotechnical aspect of site's slope stability (such as Earth Retaining

Environmental Parameter	Minimum Controls and Key Recommended Mitigation Measures	
	During Construction Phase	During Operational Phase
	<p>of impervious material and designed with sufficient capacity to hold the volumes of wastewater produced on site, accounting for stormwater runoff and firefighting needs as well.</p> <ul style="list-style-type: none"> • Provide temporary storage volumes for overflow situations of untreated wastewater. This temporary storage should have sufficient capacity to capture any unexpected additional volumes, ensuring that untreated wastewater is not released to watercourses unless it complies with NEA guidelines on trade effluent discharge concentrations. • Equip containment ponds, as well as wastewater generating areas on site with spill clean-up kits. • Design adequate drainage systems, including cut-off drains, sump pit, road kerb, piping and toe walls to channel construction process wastewater streams (e.g. wash water) and stormwater runoff separately through detailed design for capture and treatment in the containment pond(s)/kerb(s). Where applicable, include oil-water separators. • Seek approval from relevant authorities (i.e. PUB and NEA) in accordance with PUB Sewerage and Drainage (Trade Effluent) Regulations, if the wastewater is planned to be disposed to public sewer, or NEA's Trade Effluent Discharge Limits to watercourse if disposal to surface watercourses is intended. If such discharges are not approved, the trade effluent will be stored, treated or recycled on site and finally disposed off-site. • Obtain comments and approval from relevant authorities (e.g., Singapore Civil Defence Force [SCDF] and NEA) for the use of treated wastewater for firefighting purposes. • Provide appropriate concrete washout areas, ensuring these are not located near watercourses. • All vehicles are to undergo a wheel washing process before leaving the site to prevent earth, mud, and debris from being disposed of on surrounding roads. The wastewater generated from this activity should be stored and removed for treatment and disposal offsite by an approved Waste Management Contractor. • Establish regular and dedicated procedures for the inspection and maintenance of wastewater collection, storage, and treatment infrastructure (e.g., pipes, oil-water separators). • Implement regular and dedicated 	<p>Stabilising Structure [ERSS]) will be included in detailed design engineering for the operational phase.</p> <ul style="list-style-type: none"> • Providing more softscape area should be considered in the design of the development which will help to reduce the peak flow and reduce flood risk at downstream area. Active, Beautiful, Clean (ABC) Water design approach can be considered to reduce the peak flow. • Provide more pervious areas to increase the seepage of surface water into the soil. • Installation of recharge wells, if necessary. • Adequate drainage, piping and/ or channelling of stormwater runoff to be assured through detailed design [e.g. ABC Water design approach] for capturing and treatment before discharge into receiving watercourses. • Regular and dedicated procedures for the inspection and maintenance of stormwater collection, storage, and treatment infrastructure, such as pipes, oil water separation and silt screens etc. • Regular and dedicated procedures for the management of stormwater collection, settling, testing and eventual discharge of 'clean' water to surface waters, including associated measures required to prevent high sediment concentration stormwater drainage to surface waters. • Prepare sufficient disposal bins surrounding the Project to avoid improper disposal of waste. • Conduct regular inspection on wastes' storage system of the Project. • Monitor the proposed watercourses and its surroundings with CCTV surveillance regularly to ensure no contamination occurred. • Develop an Emergency Response Plan and conduct adequate training to maintenance workers to cope the accidental contamination of water. • Raise awareness of various stakeholders with community/ stakeholder engagement (e.g. signage boards, warning signs, etc.). • No vehicles allowed within the future managed vegetation (i.e. proposed park) at development area.

Environmental Parameter	Minimum Controls and Key Recommended Mitigation Measures	
	During Construction Phase	During Operational Phase
	<p>procedures for the management of stormwater collection, settling, testing, and eventual discharge to watercourses.</p> <ul style="list-style-type: none"> • Develop a training program for all onsite workers, including subcontractors, to educate them on their obligations regarding proper water quality management. • Prohibit the discharge of pumped groundwater from soil dewatering and other wastewaters into aquatic habitats. • Prohibit the unmanaged discharge of any wastewater stream. • No trade effluent other than the nature or type approved by the NEA Director-General will be discharged into any watercourse or soil. • Apply the principles of reduce, reuse, and recycle to wastewater management onsite. • Store hazardous wastewater, such as oil water, thinners, solvents, or paints, on a hard stand under shelter with a curb around the storage area. Ensure this wastewater is removed for treatment and disposed of offsite by an approved Waste Management Contractor. Handle hazardous liquids as Hazardous Waste. • Implement a construction Environmental Management and Monitoring Plan (EMMP) and ensure full preparation of associated plans and procedures. 	
Airborne Noise	<ul style="list-style-type: none"> • Label all machinery and equipment with a weather-proof sticker clearly indicating its noise emission level (at source) under normal operating conditions. • All machinery and equipment used onsite are sound-reduced as much as practicable. • House stationary noisy equipment in enclosures onsite where necessary. • Train and brief machine operators and workers on quieter work techniques. • Conduct ad-hoc noise monitoring during noisy operations as work progresses. • Install noise barriers to minimise noise pollution affecting biodiversity within the biodiversity Study Area (see Section 7.3.3 for more details). • Limit construction works involving noisy machinery to daylight hours, from 8 am to 6 pm and minimise noisy construction activities during night works period. • Implement additional noise measures 	<ul style="list-style-type: none"> • Consider using low-noise pavement mix for sections of new road networks near existing residential buildings. • If new road networks are in proximity to areas with noise-sensitive receptors (NSRs), consider providing park areas or ecological setbacks between the roads and these areas.

Environmental Parameter	Minimum Controls and Key Recommended Mitigation Measures	
	During Construction Phase	During Operational Phase
	<p>when noise monitoring indicates that levels are approaching or exceeding permissible limits.</p> <ul style="list-style-type: none"> Avoid shouting, whistling, sirens, or similar loud intermittent noises, especially in construction zones near ecologically sensitive receptors (e.g., N5 Forested Area), which can be impacted by such disturbances. 	

Summary of Impact Assessment

With the implementation of key mitigation measures, the overview of impact evaluation for both construction and operational phases are summarised in Table 1.2.

Table 1.2 Summary of impact significance for construction and operational phases (range, if applicable)

Environmental Parameter	Impact Significance (with Minimum Controls/Best Practices)	Residual Impact Significance (with Mitigation Measures)
Biodiversity	<p><u>Construction Phase</u> Habitat: N4 Forested Area: Major N5 Forested Area: Negligible</p> <p>Flora: N4 Forested Area: Negligible – Major N5 Forested Area: Negligible</p> <p>Fauna: Negligible – Major</p> <p><u>Operational Phase</u> Habitat: Negligible Flora: Not assessed Fauna: Negligible – Moderate</p>	<p><u>Construction Phase</u> Habitat: N4 Forested Area: Major N5 Forested Area: Negligible</p> <p>Flora: N4 Forested Area: Negligible – Minor N5 Forested Area: Negligible</p> <p>Fauna: Negligible – Major</p> <p><u>Operational Phase</u> Habitat: Negligible Flora: Not assessed Fauna: Negligible – Minor</p>
<i>Impacts on Biodiversity due to Changes in Other Environmental Parameters</i>		
Water Resources (Hydrology)	Negligible – Minor	Negligible – Minor
Water Resources (Surface Water Quality)	Negligible – Minor	Negligible – Minor
Airborne Noise	<p><u>Construction Phase</u> Major</p> <p><u>Operational Phase</u> Minor</p>	<p><u>Construction Phase</u> Major</p> <p><u>Operational Phase</u> Minor</p>

