



GAMUDA PARKS

A SUSTAINABLE LANDSCAPE INITIATIVE

**JADE
HILLS**

BIODIVERSITY ASSESSMENT

FOR
**JADE HILLS,
KAJANG**

10.2019

OWNERSHIP OF :

GAMUDA LAND

PREPARED BY :



BIODIVERSITY AUDIT AND ASSESSMENT for GAMUDA JADE HILLS KAJANG, SELANGOR

Findings Report



Submitted by:

16 October 2019



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Findings Report

Project Code EJ669
Issue No. 1.0
Issue Date October 2019
Prepared by ZUL / SAB
Approved by CDF

Files \\192.168.1.7\ere\ERE Projects\EJ 669 Ecological Survey
Gamuda Jade Hills\Reports

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Section 1

INTRODUCTION

1.1 Introduction

This study is a biodiversity audit and assessment of the Jade Hills township development in Kajang, Selangor commissioned by Jade Homes Sdn. Bhd. by the recommendations of Gamuda Parks. The overall aim of this study is to construct a flora and fauna inventory as well as to recommend mitigation actions to prevent habitat and environmental degradation, and to prescribe habitat enrichment options and recommendations to attract more wildlife in Jade Hills township. ERE Consulting Group was appointed to undertake this study, which was conducted over a period of two weeks in September 2019. This report intends to present the findings of the assessment.

1.2 Scope of Work

This assessment covers two major ecological aspects of Jade Hills township which are as follows:

- i. *Flora composition* – Assessment of the existing flora composition in Jade Hills include a quick survey of the trees planted, which includes measurements of DBH and height of trees, species of trees in scientific and vernacular names, locations of trees planted as well as identifying species of trees that are of conservation interest.
- ii. *Fauna composition* – Assessment of the existing fauna composition include a rapid survey and camera trapping to document of the various types of wildlife presently occur in within Jade Hills, which includes mammals, birds, herpetofauna (amphibians and reptiles), and insects.

1.3 Study Area

The Gamuda Jade Hills is a 338-acres self-contained, premium, low density residential development with a focus on green-living environment located in Kajang. About 20% of land area at Jade Hills is dedicated to green spaces including ponds and 12 thematic gardens that are integrated into the different neighbourhoods, while the remaining 80% is a development area, with remaining four phases including the Central Park area are yet to be developed. Jade Hills is surrounded by a mixture of residential developments and a secondary forest with natural undulating terrain.

In the heart of Jade Hills lies the planned Central Park area of more than 50 acres comprising of terrestrial vegetation and four ponds, of which two of the four ponds (Ponds C and D) are developed with landscape trees and shrubs. The Central Park area of Jade Hills will be the heart of the township where residents can enjoy greeneries with presence of wildlife species mainly birds and insects frequenting the area. The strong presence of biodiversity in Jade Hills will make Jade Hills a unique township that harbours a myriad of flora and fauna species as with all other Gamuda Land townships, in-line with Gamuda Land and biodiversity into its townships.

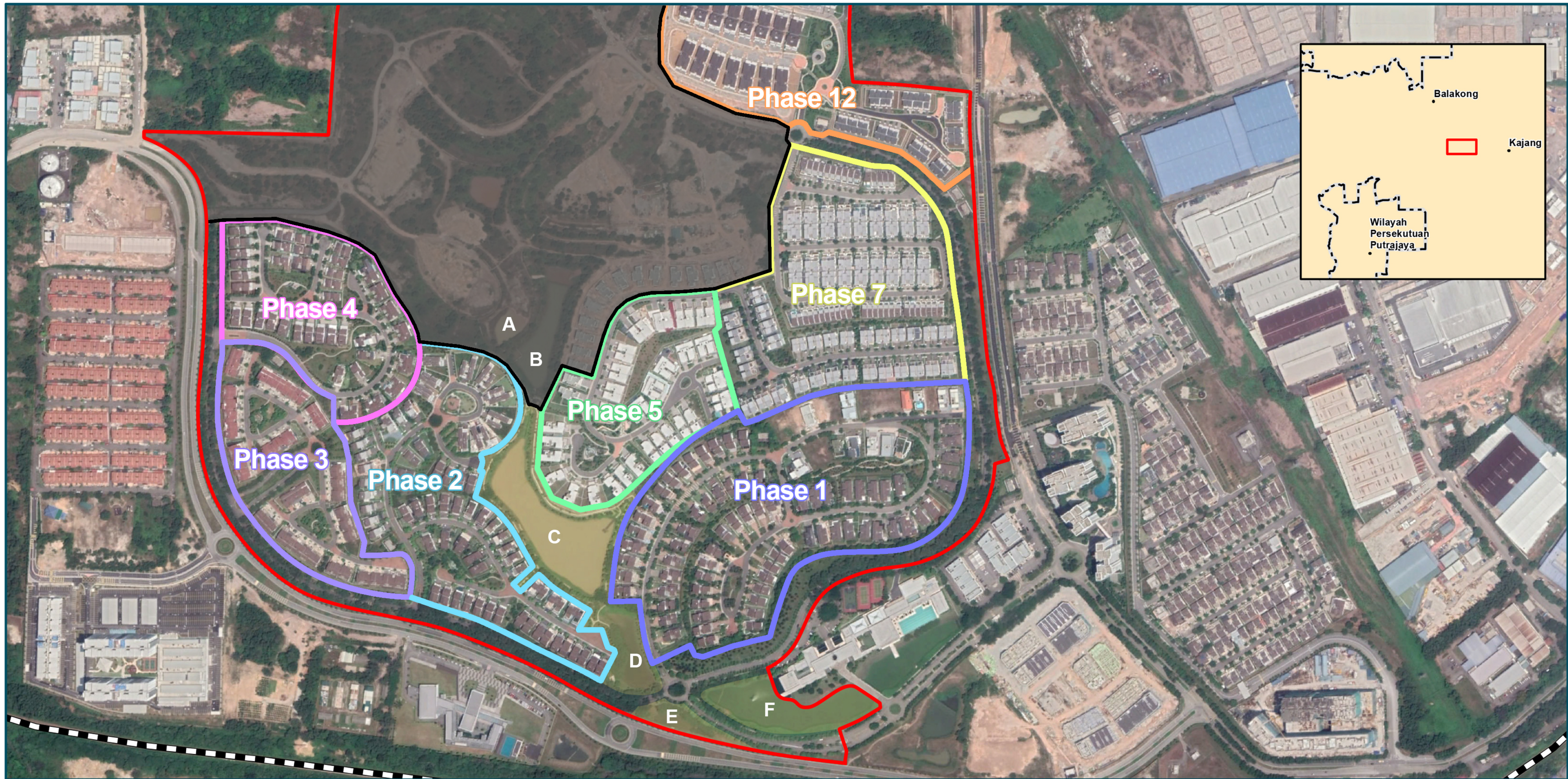
Gamuda Parks have also collaborated with the Forest Research Institute of Malaysia (FRIM) and Wetlands International Malaysia (WIM) as advisors to the initiative in their areas of expertise.


To-date, out of the total 2,832.86 ha Gamuda Land developments, 647.5 ha are dedicated to green space. This has resulted into crafting 135.37 ha of waterscapes, including lakes, ponds, wetlands and streams and planted close to 250,000 trees into all of





1.4 Report Format

Apart from the introductory section, this report contains the following sections:

- Section 2: Survey Methodology** This section describes the objectives of each assessment and briefly documents the methods used.
- Section 3: Survey Results** This section presents the results from both flora and fauna survey, together with a brief description of results obtained and species occurrence in the study area, and a summary of the findings.
- Section 4: Way Forward** This section summarises the assessment with some preliminary conclusions and recommendations to further enrich and strengthen the habitat presently available in Jade Hills.




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 km
 Coordinate System: GCS WGS 1984
 Units: Degree

LEGEND
 Railway
 Township Border
 Partition
 Development Area



Jade Hills
Study Area

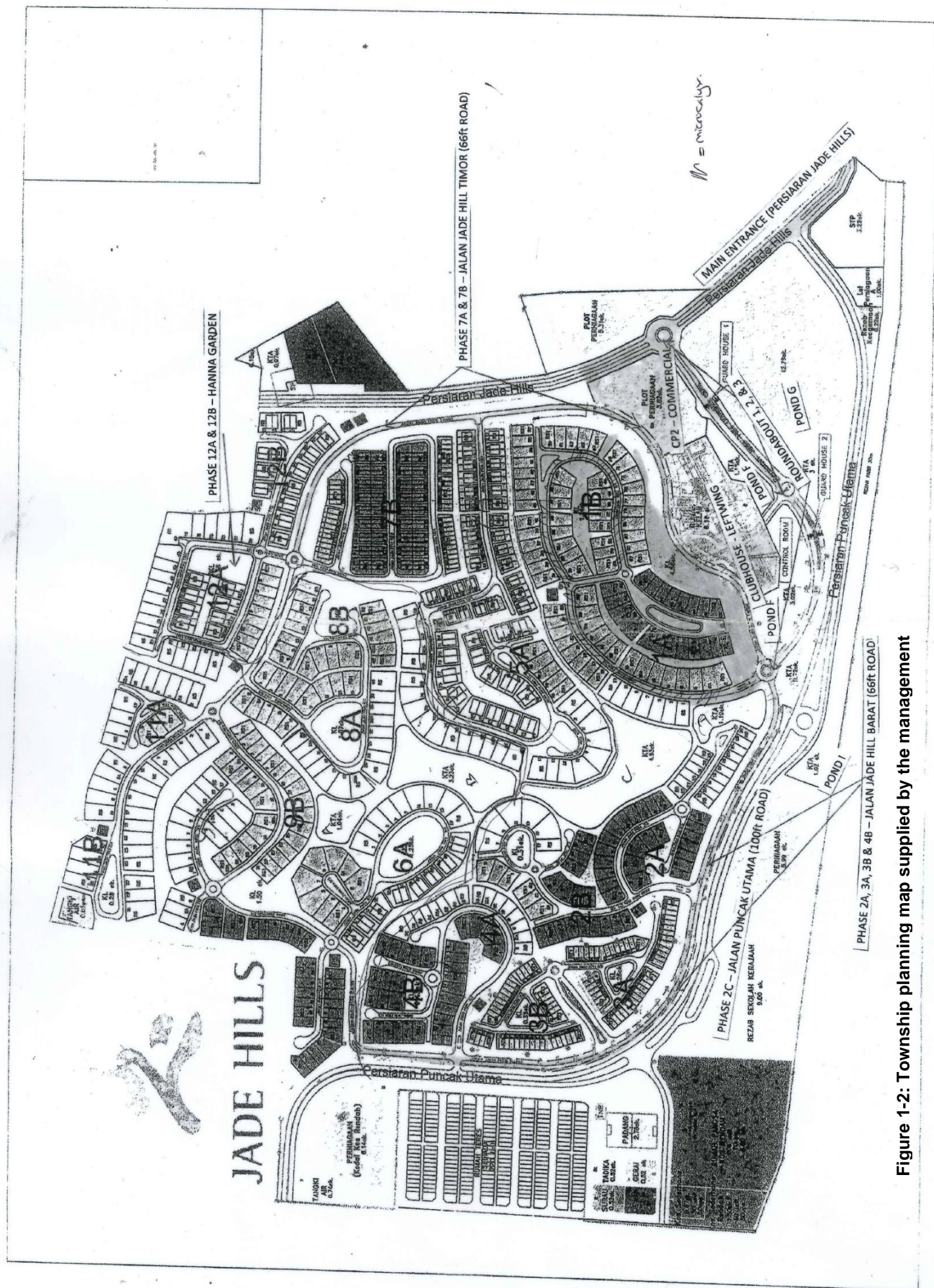
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Project No	EJ 669
Produced by	HMZ
Revision	A

Figure 1-1

Disclaimer: This map is produced solely for its intended purpose only. All reasonable care has been taken to ensure that the information presented here is accurate, subject to the availability and quality of data sources used. There is however no guarantee that this map is free from errors or omissions. Its use for any other purposes is therefore at the sole risk of the user.

Source: ERE Consulting Group (2019).

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Section 2

METHODOLOGY

2.1 Introduction

The biodiversity audit and assessment were conducted throughout a period of seven days i.e. on 23rd August, 24th to 27th of September, and 2nd to 3rd October. This assessment generally comprised of rapid surveys on the flora and wildlife components within the Jade Hills township. This section briefly describes the approach and techniques used in the field.

2.2 Flora Survey

The objective of the flora survey is to assess the general composition of the planted trees and shrubs in Jade Hills township. This is to determine areas where there are any important species of flora planted that will need to be conserved and important habitats for wildlife i.e. wildlife hotspots and if



Figure 2-1: ERE staff measuring DBH of a tree

specific mitigation measures are required to conserve these habitats, and recommendations to further enrich these habitats.

2.2.1 Methodology

The flora survey was conducted using both randomised plot and line transect methods, allowing for both qualitative and quantitative assessment of trees in Jade Hills. The survey included recces to determine areas of trees planted and

height) at the built-up areas.

Since the trees in Jade Hills are planted by landscape architects hired by the township management, trees are distributed systematically where there are rows and patches of trees of the same species planted along the roads and green pockets in the township. Therefore, plots are established at each concentration of species to obtain

the average DBH and height of each tree species that is then used to estimate the number of trees planted in the township. Identification of trees were done using an inventory of trees species planted in the township supplied by the landscape architect that was initially given to the township management. Conservation status of each species of trees were checked using online databanks such as the IUCN Red List, Global Biodiversity Information Facility (gbif.org) and the Malaysia Biodiversity Information System (mybis.gov.my).

Results are then tabulated according to species and the location of each species according to the township map (development phases). Location of trees are described with GPS coordinates of green pockets and parks where the trees are located, while trees that are planted along roads in Jade Hills will be described with

2.3 Wildlife Survey

The objective of the wildlife survey is to quickly document and assess the general composition and diversity of terrestrial wildlife within Jade Hills township. The findings from the survey would serve as a mean to determine the current presence of wildlife in the township area and if there are any sensitive species that may reside in the township that requires specific actions to conserve that species and its habitats.

2.3.1 Methodology

The survey was conducted through direct and indirect assessments at specific days throughout the township. Direct assessments involved trail walks with two sessions a day: 0700-1100hrs and 1900-2300hrs on the 23rd August, and on the 26th and 27th September. Experienced wildlife surveyors were hired to accompany in the trail walks for a more accurate and complete listing of wildlife sighted in in the township. Direct assessment was supported by the set-up of 10 camera traps (**Table 2-1**) placed at strategic locations (**Figure 2-4**). Cameras were left in position for 10 days from 23rd September to 3rd October.

Camera Trap	Location	Camera Trap	Location
F1	3° 0'7.85"N 101°45'4.78"E	C3	2°59'42.65"N 101°45'16.68"E
F2	3° 0'8.82"N 101°45'7.79"E	D1	2°59'35.71"N 101°45'15.77"E
PG1	2°59'53.38"N 101°45'4.55"E	D2	2°59'38.08"N 101°45'15.34"E
C1	2°59'41.22"N 101°45'11.23"E	R1	2°59'33.67"N 101°45'18.09"E
C2	2°59'46.33"N 101°45'11.78"E	JH1	2°59'47.15"N 101°45'26.10"E

Table 2-1: GPS locations of camera traps deployed

Camera traps (**Figure 2-2**) was used for this survey instead of collapsible traps for the wider range of fauna species that the cameras can capture. This flexibility is useful in identifying as many species of wildlife as possible, as collapsible traps are more effective in targeting mainly medium-sized wildlife. More focus was given to insects such as butterflies, stingless bees, beetles, and spiders, and birds as these species are important in pollinating and dispersing urban landscape and domesticated fruit trees seeds.



Figure 2-2: One of the camera traps installed in Jade Hills

Indirect methods included recognising noise and calls, nests, tracks, scratches, carcasses and droppings. This data as well as secondary data from published information in and around the development area will be included.

2.4 Statistical Indices

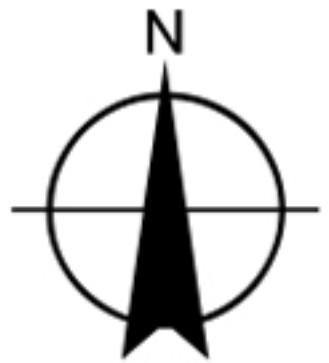
Statistical indices were not applied in this survey as all the wildlife recorded are Diversity

present in a sampling, therefore no calculations were performed due to insufficient data in terms of individual counts for each species observed.



Figure 2-3: Wildlife survey being carried out in Jade Hills









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0 0.1 0.2 km

Coordinate System: GCS WGS 1984
Units: Degree

LEGEND

-  Railway
-  Township Border
-  Partition
-  Development Area
-  Camera Traps



Jade Hills
Camera Traps Locations

Date	16-10-2019
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Figure 2-4

Section 3

SURVEY RESULTS

3.1 Survey Findings

In general, the vegetation composition throughout the study area mainly comprises of landscape trees and plants planted according to design set by the landscape architects hired by the township. These 54 species of trees comprise mainly of fruiting trees both native and non-native species which are aesthetically attractive during its flowering period. These trees also provide food for wildlife that feed on the fruits and this is evident by the large number of bird species at 46 species that frequents Jade Hills. Second to the birds are insects at 17 species which are found residing in the garden bushes found around the township, followed by amphibians and reptiles at eight species and lastly mammals at three species. The following is a breakdown of assessment findings.

3.2 Flora Composition

During the duration of this study, a total of 57 species from approximately 7258 trees were enumerated in Jade Hills. 10 species of shrubs and hedges were identified throughout the township.

Amongst the observed tree species, 33 were native species while 14 were non-native species. Three of 10 observed shrubs and hedges were native species while the other 7 were non-native. Native species here are defined as species which naturally occur within Peninsular Malaysia. Meanwhile, non-native species originating from



Figure 3-1: Row of north Indian rosewood (*Dalbergia sissoo*) at Jalan Jade Hills Barat

other locations or countries were introduced either unintentionally or intentionally to Peninsular Malaysia for purposes such as landscaping. Non-native species that are successful in establishing themselves in a foreign environment pose a risk of becoming an invasive species. Invasive species have been known to cause harm to the environment, economy, and even human health. Therefore, the identified 13 non-native species need to be further studied and monitored to ensure they do not pose

a threat to our local communities and environment. Dispersal of non-native tree seeds should also be prevented and if they are identified to pose a risk to the surrounding environment, non-native species may have to be removed from the town.

	Scientific name	Common name	Status	Estimated no. of trees	Tree size	
					DBH (cm)	Height (m)
Native	<i>Antidesma ghaesembilla</i>	Nyantok	-	45	29.24	2.07
	<i>Buchanania arborescens</i>	Otak Udang	-	8	20.15	2.49
	<i>Cinnamomum iners</i>	Kayu Manis	LC	209	9.90	1.98
	<i>Cratoxylum Cochinchinense</i>	Kayu Arang	LC	105	12.31	2.56
	<i>Elaeocarpus grandiflorus</i>	Ceylon olive	-	79	21.66	5.28
	<i>Eugenia glauca/ Syzygium glaucum</i>	Kelat	LC	154	14.00	1.80
	<i>Eugenia longifolia</i>	Tongkat Ali	-	424	16.22	2.00
	<i>Eugenia microcalyx</i>	Bullate Eugenia	-	469	17.62	2.61
	<i>Eugenia polyantha</i>	Indonesian bay leaf	-	311	13.25	3.25
	<i>Fagraea fragrans</i>	Tembusu	-	152	18.85	1.75
	<i>Hopea odorata</i> (young)	Merawan Siput Jantan	VU	42	11.20	3.52
	<i>Hopea odorata</i> (mature)			42	23.50	6.16
	<i>Ilex cymosa</i>	Timah Timah	-	36	18.18	2.83
	<i>Kopsia arborea</i>	Penang Sloe	CE*	40	12.85	1.83
	<i>Lagerstroemia speciosa</i>	Pride of India	-	4	24.20	2.20
	<i>Podocarpus polystachyus</i>	Sea Teak	VU	5	17.97	1.23
	<i>Podocarpus rumphii</i>	Kayu Cina	NT	241	17.97	3.39
	<i>Shorea macroptera</i>	Meranti Melatai	LC	118	21.02	5.19
	<i>Tristania whiteana</i>	Palawan	-	231	14.62	1.82
	<i>Tristaniaopsis obovata</i>	Sea Tristania	-	6	15.92	3.30
	<i>Dillenia suffruticosa</i>	Simpoh Air	-	11	10.30	1.68
	<i>Syzygium leucoxylon</i>	Kelat Putih	-	447	14.00	1.80
	<i>Syzygium polyanthum</i>	Indian bay leaf	-	188	13.38	2.64
	<i>Dalbergia latifolia</i>	East Indian Rosewood	VU	134	11.21	2.90
	<i>Garcinia subelliptica</i>	Happiness Tree	-	25	17.97	1.34
	<i>Michelia alba</i>	Cempaka Putih	LC	414	18.61	2.05
	<i>Samanea saman</i>	Rain Tree	LC	7	56.00	3.67
	<i>Ficus Celebensis</i>	Weeping Tree	-	53	20.38	2.14
	<i>Saraca Cauliflora</i>	Saraca	-	34	16.85	2.19

	<i>Arfeuillea arborescens</i>	Hop Tree	-	79	17.55	2.73
	<i>Suregada multiflora</i>	False Lime Merlimau	-	227	9.86	1.90
	<i>Hibiscus rosa sinensis</i>	Bunga Raya	-	-	-	-
	<i>Eugenia Oleina</i>	Eugenia shrub	-	-	-	-
	<i>Murraya paniculata</i>	Orange Jessamine	-	-	-	-
Non-Native	<i>Eucalyptus smithii</i>	Gully Peppermint	-	20	14.08	3.76
	<i>Jacaranda obtusifolia</i>	Jambul Merak	-	12	10.71	3.09
	<i>Libidibia ferrea</i>	Brazilian Ironwood / Leopard Tree	-	58	12.17	2.77
	<i>Psidium guajava</i>	Common Guava	LC	55	6.93	2.30
	<i>Xanthostemon chrysanthus</i>	Golden Rende	-	91	18.41	1.40
	<i>Melaleuca quinquenervia</i>	Gum Tree	-	46	18.31	2.99
	<i>Pimenta racemosa</i>	West Indian bay tree	VU	28	6.69	1.84
	<i>Elaeocarpus hainanensis</i>	Hainan Oil-Fruit Tree	-	54	26.75	2.64
	<i>Ligustrum lucidum</i>	Glossy privet	LC	30	13.38	2.65
	<i>Dalbergia sissoo</i>	North Indian Rosewood	-	1974	21.42	3.58
	<i>Ravensara aromatica</i>	Clove nutmeg	-	143	6.00	1.59
	<i>Leptospermum brachyandrum</i>	Tea Tree	-	143	30.89	2.58
	<i>Bucida buceras</i>	Black Olive Tree	-	160	18.24	1.99
	<i>Citharexylum spinosum</i>	Florida Fiddlewood	LC	13	12.26	2.10
	<i>Bambusa multiplex</i>	Bamboo	-	-	-	-
	<i>Ruella simplex</i>	Mexican petunia	-	-	-	-
	<i>Ophiopogon jaburan</i>	Lilyturf	-	-	-	-
	<i>Portulaca grandiflora</i>	Moss-rose purslane	-	-	-	-
	<i>Acalypha siamensis</i>	Wild tea	-	-	-	-
	<i>Lythrum portula</i>	Water Purslane	-	-	-	-
	<i>Nerium oleander</i>	Oleander	LC	-	-	-
	<i>Brunfelsia latifolia</i>	Yesterday, Today, and Tomorrow Plant	-	-	-	-

Table 3-1: List of flora species identified in Jade Hills

Jade Hills harbours four tree species listed as **Vulnerable (VU)** on the IUCN Red List of Endangered species. Of these four, three of them are native species namely the East indian rosewood (*Dalbergia latifolia*), Merawan Siput Jantan (*Hopea odorata*), and sea teak (*Podocarpus polystachyus*), while one is non-native which is the west indian bay tree (*Pimenta racemosa*). The township also hosts Kayu Cina (*Podocarpus rumphii*) trees which are categorised as **Near Threatened (NT)**.

Additionally, the Penang Sloe (*Kopsia arborea*) is listed as **Critically Endangered (CE)** on the Peninsular Malaysia Plant Red List*. The tree species with the highest average height is the mature Merawan Siput Jantan (*Hopea odorata*) at 6.16 metres tall while the tree species with the largest Diameter at Breast Height (DBH) recorded is the Rain Tree (*Samanea saman*) at 56cm.

3.2.1 Species Hotspot

The area with the highest tree diversity is at Phase 5 with 19 species of trees recorded. However, the most number of trees recorded is along the main roads where the species composition is made up of mostly North Indian Rosewood (*Dalbergia sissoo*).

Area	No. of Species	No. of Trees
Phase 1	11	1323
Phase 2	13	493
Phase 3	10	313
Phase 4	9	489
Phase 5	19	852
Phase 7	11	285
Phase 12	15	328
Pond C	13	195
Pond D	5	137
Main Road	12	2887

Table 3-2: Number of species and trees at each Phase in Jade Hills

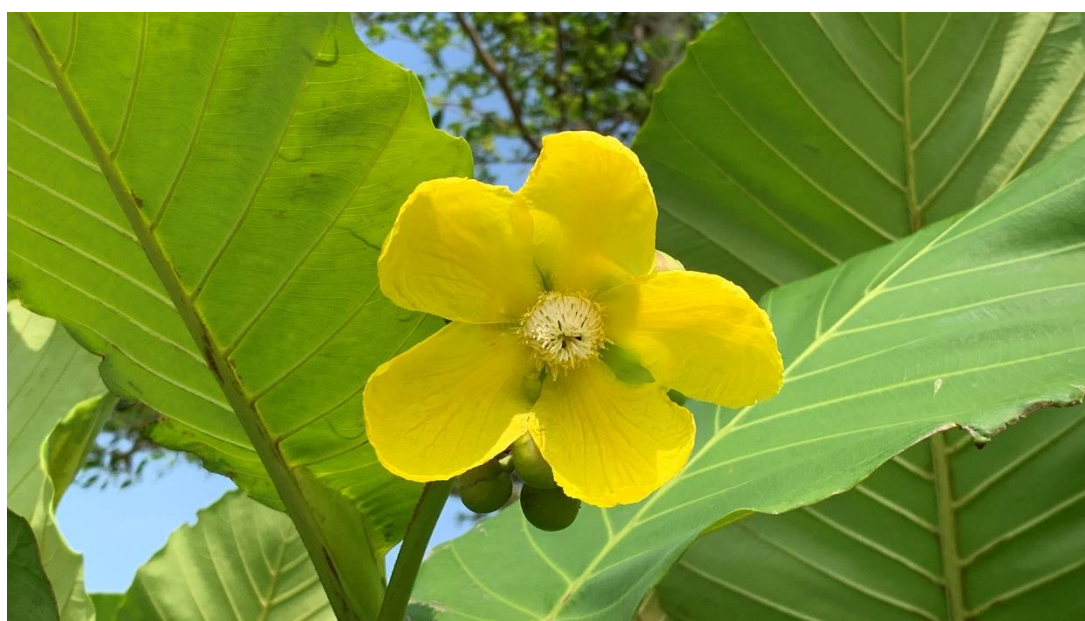


Figure 3-2: A simpor air flower at Pond C



Figure 3-3: A Mexican petunia (*Ruella simplex*) flower



Figure 3-4: Row of kayu cina (*Podocarpus rumphii*) found at Jalan Jade Hills 4

3.3 Fauna Composition

The survey recorded a total of 70 known and three non-determined (*non det.*) species (identified up to its genus level) from 43 families and two orders comprising of mammals, birds, herpetofauna (reptiles and amphibians), and insects.

All of these were recorded through observations with no individuals captured.

3.3.1 Mammals

A total of three species of mammals were recorded based on the fauna surveys conducted in Jade Hills (**Table 3-1**). These listed mammal species are commonly sighted in urban and suburban settings due to their diets and adaptability to build environments. The common palm civet is a protected species while the common treeshrew is a **totally protected** species under the **Malaysia Wildlife Conservation Act 2010 (WCA2010)**. All of the species recorded are categorised as **Least Concerned** species under the **IUCN Red List**.

The common treeshrew (*Tupaia glis*) (**Figure 3-5**) can be seen frequenting trees and areas from the Jade Hills Gallery to the residential areas and the ponds. As for the common palm civet (*Paradoxurus hermaphroditus*), only the droppings (**Figure 3-6**) observed at Pond C from one of the surveys conducted. No photographic evidence of the civet was recorded through the camera traps installed at the pond area. Bats were recorded by sightings in-flight and calls at the residential areas during dusk period. It is inferred that the bats that frequents Jade Hills are fruit bats based on the location of fruiting trees located along the streets in the residential side of Jade Hills, droppings left on the walls of their houses. A video evidence of a bat in-flight is supplied with this report through electronic submission.



Figure 3-5: A common treeshrew (*Tupaia glis*) seen foraging on the ground

Family	Scientific Name	Common Name	Protection Status	
			WCA 2010	IUCN Red List
Unk. (Order: Chiroptera)	Unk.	Bats		
Viverridae	<i>Paradoxurus hermaphroditus</i>	Common palm civet	P	LC
Tupaiidae	<i>Tupaia glis</i>	Common treeshrew	TP	LC

Table 3-3: List of mammals observed in Jade Hills

Note: Unk. Unknown, P Protected, TP Totally Protected, LC Least Concerned, Unk. Unknown/Unidentified species

3.3.2 Birds

Jade Hills harbours a total of 46 species from 24 families of birds. From the 46 listed species, 26 are **totally protected**, 5 are **protected**, 14 are **unprotected**, and 1, the rock pigeon is a **controlled species** under the **WCA2010 (Table 3-4)**. From the IUCN Red List, 45 species are **Least Concerned** species, while 1 which is the Javan Myna is a listed **Vulnerable** species.



Figure 3-6: A common palm civet (*Paradoxurus hermaphroditus*) droppings

Family	Scientific Name	Common Name	Protection Status	
			WCA 2010	IUCN Red List
Accipitridae	<i>Haliastur Indus</i>	Brahminy Kite	TP	LC
Alcedinidae	<i>Halcyon smyrnensis</i>	White-throated Kingfisher	TP	LC
Apodidae	<i>Aegithina tiphia</i>	Common Iora	TP	LC
	<i>Apus pacificus</i>	Fork-tailed Swift	TP	LC
	<i>Apus affinis</i>	House Swift	TP	LC
Ardeidae	<i>Egretta eulophotes</i>	Chinese Egret	TP	LC
	<i>Ardea purpurea</i>	Purple Heron	TP	LC
	<i>Butorides striata</i>	Striated Heron	TP	LC
Campephagidae	<i>Lalage nigra</i>	Pied Triller	TP	LC
Caprimulgiformes	<i>Caprimulgus macrurus</i>	Large-tailed Nightjar	TP	LC
	<i>Caprimulgus affinis</i>	Savanna Nightjar	TP	LC
Charadriidae	<i>Vanellus indicus</i>	Red-wattled Lapwing	P	LC
Columbidae	<i>Chalcophaps indica</i>	Green-winged Pigeon	P	LC
	<i>Treron vernans</i>	Pink-necked Green Pigeon	P	LC
	<i>Columba livia</i>	Rock Pigeon	CS	LC
	<i>Spilopelia chinensis</i>	Spotted Dove	UP	LC
	<i>Geopelia striata</i>	Zebra Dove	UP	LC
Corvidae	<i>Corvus splendens</i>	House Crow	UP	LC
	<i>Corvus macrorhynchos</i>	Large-billed Crow	UP	LC
Dicaeidae	<i>Dicaeum cruentatum</i>	Scarlet-backed Flowerpecker	TP	LC
	<i>Prionochilus maculatus</i>	Yellow-breasted Flowerpecker	TP	LC
Estrildidae	<i>Lonchura malacca</i>	Black-headed Munia	UP	LC
	<i>Lonchura punctulata</i>	Scaly-breasted Munia	UP	LC
Hirundinidae	<i>Hirundo rustica</i>	Barn Swallow	TP	LC
	<i>Hirundo tahitica (javanica)</i>	Pacific Swallow	TP	LC
Meropidae	<i>Merops philippinus</i>	Blue-tailed Bee-Eater	TP	LC
Nectariniidae	<i>Anthreptes malacensis</i>	Brown-throated Sunbird	TP	LC
	<i>Cinnyris jugularis</i>	Olive-backed Sunbird	UP	LC
	<i>Anthreptes simplex</i>	Plain Sunbird	TP	LC
	<i>Arachnothera magna</i>	Streaked Spiderhunter	TP	LC
Notacillidae	<i>Anthus novaeseelandiae</i>	Australasian Pipit	TP	LC
Oriolidae	<i>Oriolus chinensis</i>	Black-naped Oriole	TP	LC
Passeridae	<i>Passer montanus</i>	Eurasian Tree-Sparrow	UP	LC
Ploceidae	<i>Ploceus philippinus</i>	Baya Weaver	P	LC
Pycnonotidae	<i>Pycnonotus simplex</i>	Cream-vented Bulbul	TP	LC
	<i>Pycnonotus goiavier</i>	Yellow-vented Bulbul	UP	LC
Rallidae	<i>Amauornis phoenicurus</i>	White Breasted Waterhen	P	LC
Rhipiduridae	<i>Rhipidura javanica</i>	Pied Fantail Flycatcher	TP	LC
Scolopacidae	<i>Actitis hypoleucos</i>	Common Sandpiper	TP	LC
Sturnidae	<i>Aplonis panayensis</i>	Asian Glossy Starling	UP	LC

	<i>Acridotheres tristis</i>	Common Myna	UP	LC
	<i>Acridotheres javanicus</i>	Javan Myna	UP	VU
	<i>Acridotheres fuscus (mahrattensis)</i>	Jungle Myna	UP	LC
Sylviidae	<i>Orthotomus sutorius</i>	Common Tailorbird	TP	LC
	<i>Orthotomus atrogularis</i>	Dark-necked Tailorbird	TP	LC
Turdidae	<i>Copsychus saularis</i>	Oriental Magpie Robin	UP	LC

Table 3-4: List of birds observed in Jade Hills

Note: P Protected, TP Totally Protected, UP Unprotected, CS Controlled Species, LC Least Concerned, VU Vulnerable

Most of the birds recorded for this survey were seen frequenting trees at Ponds C and D while some were observed frequenting fruiting trees along the streets and around green spaces in Jade Hills. Among all of the species, two migratory species namely the fork-tailed Swift (*Apus pacificus*) and barn swallow (*Hirundo rustica*) were found during the observation. It is also observed that there is a shift of bird species frequenting these areas from day time till night time. While the oriental magpie-robin



Figure 3-7: An olive-backed sunbird (*Cinnyris jugularis*) observed in Jade Hills

can be seen and heard in numbers on fig trees and willow trees by Pond D throughout the day, the brahmny kite (*Haliastur indus*) as well as the purple heron (*Ardea purpurea*) were seen gliding above Pond C in the evening. Striated herons (*Butorides striata*) were seen resting on the willow trees by Pond D in the evening. Other birds such as the rock pigeon (*Columba livia*) and zebra dove (*Geopelia striata*) are commonly found at the green spaces in Jade Hills.

Some birds were seen specifically at an area in Jade Hills. The Savana Nightjar (*Caprimulgus affinis*) were seen and heard at Phase 12A at night time, while the asian glossy starling (*Aplonis panayensis*) were seen in large numbers at by the roundabout at Phase 3 in the afternoon. The crows and asian glossy starling are the dominant species found whithin Jade Hills. Both species can be seen frequently

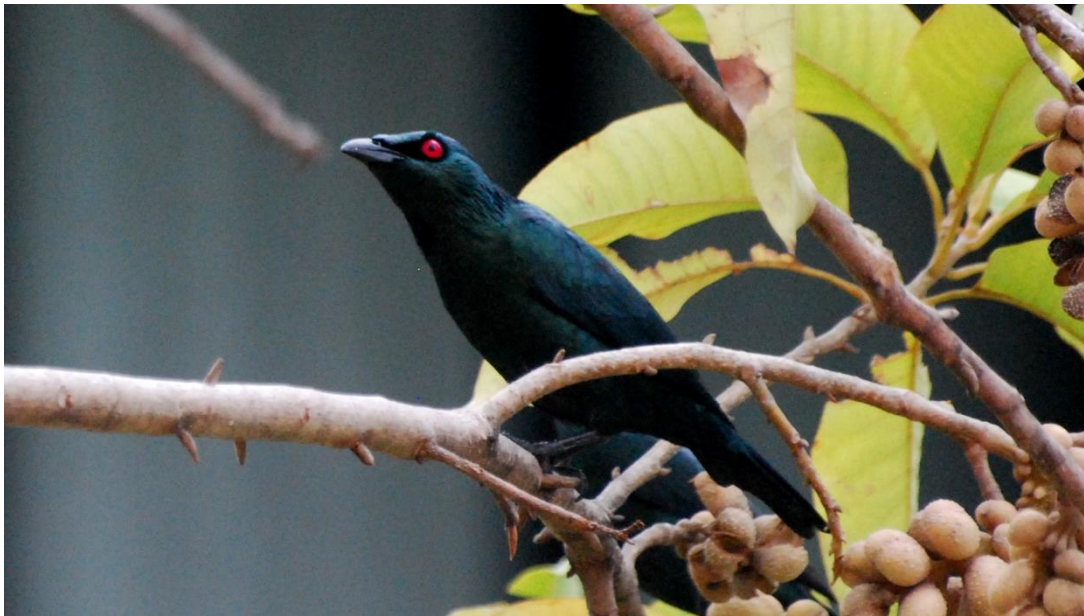


Figure 3-8: An Asian glossy starling (*Aplonis panayensis*) at Phase 3 Jade Hills

compared to other species due to its behaviour of travelling in a huge group. Apart from these two species, Mynas, Scaly-breasted Munias, swallows and Eurasian Tree Sparrows can also be found frequently, in almost all parts of the residential areas.

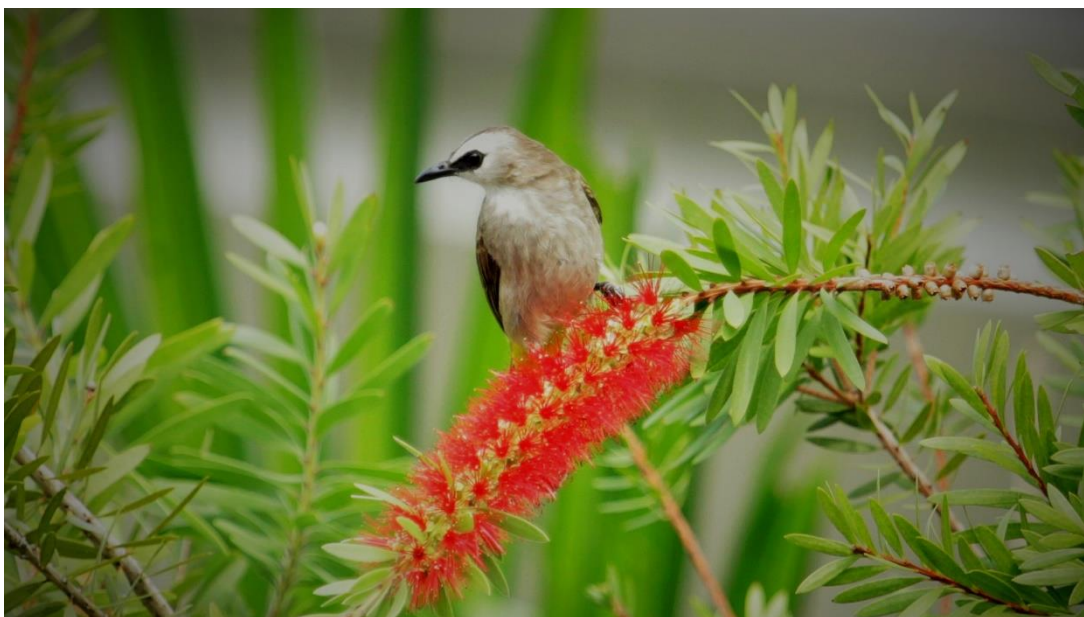


Figure 3-9: A yellow-vented bulbul (*Pycnonotus goiavier*) at Phase 1 Jade Hills

3.3.3 Herpetofauna

As for amphibians and reptiles, eight species from five families and one order were recorded (**Table 3-5**). Only two species – the oriental garden lizard (*Calotes versicolor*) and the Asian water monitor lizard (*Varanus salvator*) are designated as **protected** species under the WCA2010, while the others are **not listed**. All of these

species are **Least Concerned** species under the IUCN Red List. Two individuals of the red-ear slider (*Trachemys scripta elegans*) an **introduced** species also known as an **invasive alien species**, were seen in Ponds C and D. This species must be given attention and properly controlled before it dominates the ponds.

Family	Scientific Name	Common Name	Protection Status	
			WCA 2010	IUCN Red List
Agamidae	<i>Calotes versicolor</i>	Oriental garden lizard	P	-
	<i>Bronchocela cristatella</i>	Green-crested Lizard	-	LC
Anura (Order)	<i>Polypedates leucomystax</i>	Common tree frog	-	LC
	<i>Duttaphrynus melanostictus</i>	Asian common toad	-	LC
Varanidae	<i>Varanus salvator</i>	Asian water monitor lizard	P	LC
Gekkonidae	<i>Hemidactylus frenatus</i>	Common house gecko	-	LC
Emydidae	<i>Trachemys scripta elegans</i>	Red-ear slider	-	LC
Achatinidae	<i>Achatina fulica</i>	African giant snail	-	-

Table 3-5: List of amphibians and reptiles observed in Jade Hills

Note: P Protected, LC Least Concerned, - Not Listed



Figure 3-10: An asian water monitor lizard (*Varanus salvator*) seen crossing at Pond E



Figure 3-11: A common tree frog (*Polypedates leucomystax*)

3.3.4 Insects

There are 17 species of insects, of which three are non-determined, from 11 families recorded (**Table3-6**). None of these species are protected under the WCA2010 and are listed under the IUCN Red List. These species were seen hovering and residing at flowering bushes in Jade Hills, except for species such as the housefly (*Musca domestica*), and the fire ants (*Genus solenopsis*) which were found in colonies on many trees in Jade Hills. The fire ants is an undesirable species which needs to be



Figure 3-12: A common grasshopper (*Omocestus viridulus*)

controlled as there are residents complaining of this species invading the privacy of their homes causing discomfort. Crickets were recorded based on its distinct calls heard at night time.

Family	Scientific Name	Common Name	Protection Status	
			WCA 2010	IUCN Red List
Gryllidae	<i>Unk.</i>	Crickets	-	-
Pieridae	<i>Leptosia nina malayana</i>	Psyche butterfly	-	-
	<i>Hebomoia glaucippe aturia</i>	Great orange-tip butterfly	-	-
Pieridae	<i>Catopsilia pomona pomona</i>	Common emigrant butterfly	-	-
Nymphalidae	<i>Junonia almana Javana</i>	Peacock Pansy butterfly	-	-
	<i>Unk.</i> (Genus: <i>Hesperiidae</i>)	Skipper butterfly	-	-
	<i>Mycalesis sp.</i>	Bushbrown butterfly	-	-
	<i>Eurema hecabe</i>	Common grass yellow butterfly	-	-
Formicidae	<i>Unk.</i> (Genus: <i>Solenopsis</i>)	Fire ants	-	-
	<i>Oecophylla smaragdina</i>	Tree ants	-	-
Vespidae	<i>Vespa affinis</i>	Common hornet	-	-
Apidae	<i>Apis sp.</i>	Honey bees	-	-
Xylocopinae	<i>Xylocopa latipes</i>	Carpenter bees	-	-
Tettigonidae	<i>Omocestus viridulus</i>	Common grasshopper	-	-
Muscidae	<i>Musca domestica</i>	Housefly	-	-
Libellulidae	<i>Crocothemis servilia</i>	Scarlet skimmer dragonfly	-	-
	<i>Neurothemis fluctuans</i>	Common parasol	-	-

Table 3-6: List of insects observed in Jade Hills

Note: '-' – Not Listed, Unk. – Unknown/Unidentified species



Figure 3-13: A scarlet skimmer dragonfly (*Crocothemis servilia*)

3.3.5 Wildlife Hotspots

Based on the three wildlife surveys conducted, there are three areas that can be considered as wildlife hotspots identified in Jade Hills. These are:

Pond C

There are at least two species of mammals, 22 species of birds, three species of reptiles, and 13 species of insects recorded at Pond C area. The large number of species recorded at this area indicates that Pond C is a habitat for wildlife. The brahminy kite (*Haliastur indus*) and the purple heron (*Ardea purpurea*) were seen circling above this area.

Pond D

As Pond D area is neighbouring to Pond C, species that frequents Pond C will alternately frequent Pond D. The striated heron (*Butorides striata*) were observed only at Pond D in the evening. Other bird species such as the oriental-magpie robin (*Copsychus solaris*), the black-naped oriole (*Oriolus chinensis*) and the sunbirds (*Cinnyris jugularis* and *Anthreptes malacensis*) were seen frequenting the fig trees by Pond D.

Hana Gardens

Located at Phase 12A, Hana Gardens is a hotspot for wildlife. The savanna nightjar (*Caprimulgus affinis*) and the large-tailed nightjar (*Caprimulgus macrurus*) can only be found here sitting on the roads at night. The olive-backed sunbird (*Cinnyris jugularis*), the scarlet-backed flowerpecker (*Dicaeum cruentatum*) and the plain sunbird (*Anthreptes simplex*) were also seen frequenting the Garden.

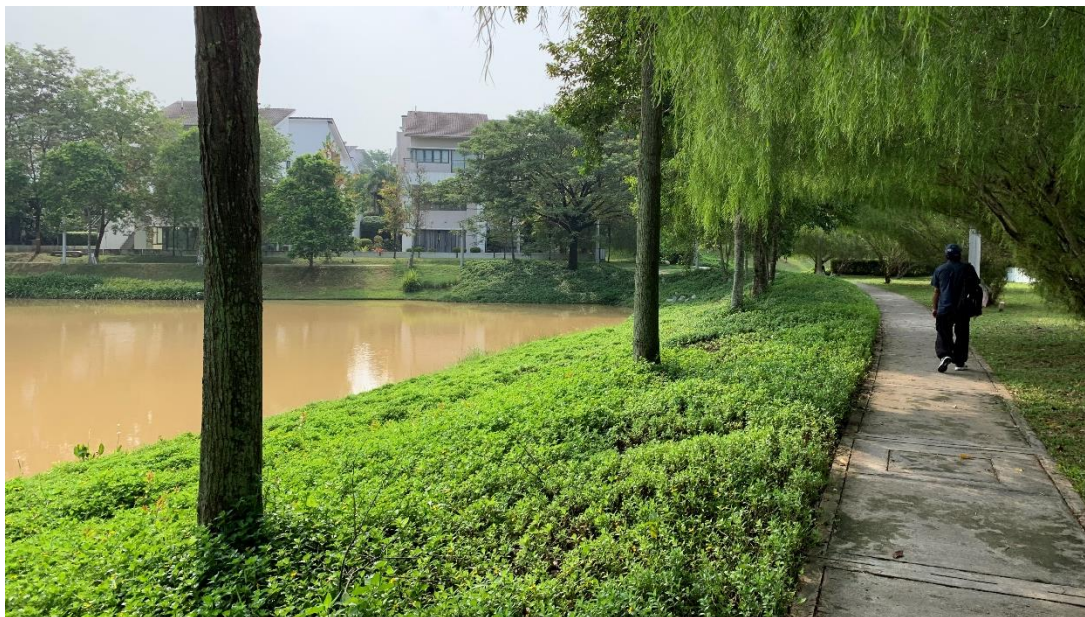
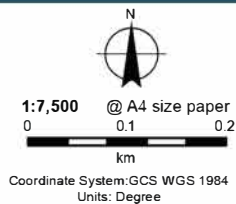


Figure 3-14: A view of Pond C, Central Park Jade Hills



LEGEND

- | | |
|------------------|-------------------|
| Railway | Mammals sighting |
| Township Border | Birds sighting |
| Partition | Insects sighting |
| Development Area | Wildlife hotspots |



Jade Hills Wildlife Sightings and Hotspots

Date	16-10-2019
Project No	EJ 669
Produced by	HMZ
Revision	A

Figure 3-15

Disclaimer: This map is produced solely for its intended purpose only. All reasonable care has been taken to ensure that the information presented here is accurate, subject to the availability and quality of data sources used. There is however no guarantee that this map is free from errors or omissions. Its use for any other purposes is therefore at the sole risk of the user.

Source: ERE Consulting Group (2019).

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Section 4

WAY FORWARD

1. All in all, Jade Hills is a fairly densely foliated township with a large number of tree species, some identified as species requiring conservation, complemented by a fair number of plants species mainly shrubs and bushes. Although most of the trees planted are still young, the quality of these trees is good with potential to grow into mature trees over time. Most of the trees planted are flowering trees which bear fruits that attracts wildlife, especially birds and insects, to feed on. With large numbers of these trees planted, it is certain that Jade Hills will attract wildlife to feed and reside in the township.
2. Jade Hills at present is being frequented by a considerably large number of wildlife species mostly deemed as resident such as the oriental-magpie robin (*Copsychus saularis*), the black-nape oriole (*Oriolus chinensis*) and the striated heron (*Butorides striata*) identified in the township, although nesting sites for these birds are yet to be identified. This is inferred based on the frequency of sightings of these bird species and the number of individuals recorded from the fauna surveys.
3. Therefore, it is important for the management to maintain the quality and condition of the habitats and wildlife hotspots identified throughout the township to retain the current wildlife species that reside and frequents the township, and possibly attract more species into the township that are desirable and well accepted by the residents of Jade Hills. Special attention should be given when pruning activities are being carried out on fruiting trees to avoid cutting off fruiting branches that may cut food supplies to wildlife that feeds on the fruits. Labelling of trees should be done using appropriate materials such as steel plaques for identification and steel spring cables to tie the plaque to a tree. This will allow the cable to expand as the tree bark expands, to avoid damaging the tree bark as seen in **Figure 4-1**.
4. Undesirable species such as the fire ants and house crows (**Figure 4-2**) should be controlled and managed to accommodate the privacy and comfort of Jade Hills residents. House crows in large numbers may cause discomfort due to their loud calls, their tendency on scavenging, and their presence usually in large numbers that may intimidate residents as much as it causes a visual pollution.
5. Since Ponds A and B are in the pipeline on being developed as the final component to the Central Park area of Jade Hills, these areas have the potential to be developed to attract more desirable species to further enrich Jade Hills and to become a crucial biodiversity reservoir. To achieve this, careful planning and design considering biodiversity aspects should be applied in ensuring an effective landscape and habitat.

6. As development is still on-going at the northern part of the township, water quality is affected downstream (mainly Ponds C and D), affecting the aesthetics of the ponds (**Figure 4-3**). This is due to the sediment run-offs from the developing side of the township especially after rainfall. Although there are already measures to mitigate sediments from flowing further downstream, siltation and sedimentation is still occurring when discharge volume is high. This issue will resolve by itself when the township is fully developed, but this requires a long period of time (until Jade Hills is fully developed). Therefore, installing a temporary plug-and-play active filtration systems could be an option to filter much of the stormwater before discharging into Pond C, until development is completed.
7. Personal rearing and owning of exotic wildlife species (**Figure 4-4**) may attract presence of predators such as monitor lizards (**Figure 3-10**) and snakes into the township. This evident by complaints received from residents of snake and monitor lizards' sightings in the compound. This have caused discomfort among the residents that may affect the quality of living in Jade Hills. Apart from that, individuals who keep exotics would need a permit by the Department of Wildlife and National Parks or face a hefty find if found owning exotics without permits. An awareness programme could be done on the need for permits to keep exotics personally and the consequences of it.



Figure 4-1: Inappropriate tree labelling material causing damage to tree bark



Figure 4-2: Fire ants (Genus *Solenopsis*) and house crows (*Corvus splendens*) in colonies inhabiting trees



Figure 4-3: Siltation of Pond C at entry point from Pond B.



Figure 4-4: Exotic bird species kept as pets seen in some house

APPENDIX A

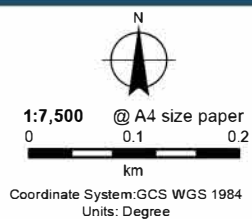
Table of tree species by location in Jade Hills

Area	Location	Scientific name	Common name
Phase 1	Along Jalan Jade Hills 1/1	<i>Eugenia longifolia</i>	Tongkat Ali
		<i>Eugenia microcalyx</i>	Bullate Eugenia
		<i>Fagraea fragrans</i>	Tembusu
		<i>Shorea macroptera</i>	Meranti Melatai
	2°59'43.41"N 101°45'24.50"E	<i>Antidesma ghaesembilla</i>	Nyantok
		<i>Cinnamomum iners</i>	Kayu Manis
	2°59'41.01"N 101°45'19.68"E	<i>Bucida buceras</i>	Black Olive Tree
		<i>Cinnamomum iners</i>	Kayu Manis
		<i>Melaleuca quinquenervia</i>	Gum Tree
	2°59'39.06"N 101°45'21.15"E	<i>Cratoxylum Cochinchinense</i>	Kayu Arang
		<i>Melaleuca quinquenervia</i>	Gum Tree
	2°59'40.38"N 101°45'19.40"E	<i>Antidesma ghaesembilla</i>	Nyantok
		<i>Dalbergia latifolia</i>	East Indian Rosewood
		<i>Shorea macroptera</i>	Meranti Melatai
	2°59'46.57"N 101°45'7.56"E	<i>Leptospermum brachyandrum</i>	Tea Tree
		<i>Michelia alba</i>	Cempaka Putih
		<i>Samanea saman</i>	Rain Tree
Phase 2	2°59'49.00"N 101°45'8.56"E	<i>Bucida buceras</i>	Black Olive Tree
		<i>Hopea odorata</i>	Merawan Siput Jantan
		<i>Melaleuca quinquenervia</i>	Gum Tree
	2°59'45.11"N 101°45'8.63"E	<i>Bambusa multiplex</i>	Bamboo
		<i>Bucida buceras</i>	Black Olive Tree
		<i>Kopsia arborea</i>	Penang Sloe
		<i>Leptospermum brachyandrum</i>	Tea Tree
		<i>Libidibia ferrea</i>	Brazilian Ironwood / Leopard Tree
	2°59'39.78"N 101°45'8.15"E	<i>Saraca Cauliflora</i>	Saraca
		<i>Xanthostemon chrysanthus</i>	Golden rende / Golden Penda
	2°59'37.66"N 101°45'11.53"E	<i>Saraca Cauliflora</i>	Saraca
		<i>Xanthostemon chrysanthus</i>	Golden rende / Golden Penda
	2°59'38.91"N 101°45'11.89"E	<i>Ficus Celebensis</i>	Weeping Tree
	Along Jalan Jade Hills 2/1, 2/4, 2/5	<i>Michelia alba</i>	Cempaka Putih
Phase 3	Along Jalan Jade Hills 3/3	<i>Arfeuillea arborescens</i>	Hop Tree
		<i>Samanea saman</i>	Rain Tree
	2°59'48.98"N 101°45'0.21"E	<i>Antidesma ghaesembilla</i>	Nyantok
		<i>Dalbergia sissoo</i>	North Indian Rosewood
	2°59'46.11"N 101°45'0.60"E	<i>Fagraea fragrans</i>	Tembusu
		<i>Dalbergia latifolia</i>	East Indian Rosewood
	2°59'44.74"N 101°45'3.75"E	<i>Hibiscus rosa sinensis</i>	Bunga Raya
		<i>Hopea odorata</i>	Merawan Siput Jantan
		<i>Michelia alba</i>	Cempaka Putih




Phase 4	2°59'40.08"N 101°45'5.29"E	<i>Dalbergia sissoo</i>	North Indian Rosewood
		<i>Cratoxylum Cochinchinense</i>	Kayu Arang
	Along Jalan Jade Hills 4/1, 4/2, 4/3	<i>Dalbergia sissoo</i>	North Indian Rosewood
		<i>Eugenia glauca/ Syzygium glaucum</i>	Kelat
		<i>Samanea saman</i>	Rain Tree
		<i>Syzygium leucoxylon</i>	Kelat Putih
	2°59'51.77"N 101°45'1.72"E	<i>Libidibia ferrea</i>	Brazilian Ironwood / Leopard Tree
		<i>Tristaniaopsis obovata</i>	Sea Tristania
	2°59'50.99"N 101°45'4.31"E	<i>Kopsia arborea</i>	Penang Sloe
		<i>Libidibia ferrea</i>	Brazilian Ironwood/ Leopard Tree
	2°59'48.42"N 101°45'2.99"E	<i>Antidesma ghaesembilla</i>	Nyantok
		<i>Kopsia arborea</i>	Penang Sloe
		<i>Lagerstroemia speciosa</i>	Pride of India
Phase 5	Along Jalan Jade Hills 12/1	<i>Eugenia polyantha</i>	Indonesian bay leaf
		<i>Cratoxylum Cochinchinense</i>	Kayu Arang
		<i>Eucalyptus smithii</i>	Gully Peppermint
		<i>Eugenia longifolia</i>	Tongkat Ali
	2°59'44.52"N 101°45'14.81"E	<i>Eugenia microcalyx</i>	Bullate Eugenia
		<i>Melaleuca quinquenervia</i>	Gum Tree
		<i>Murraya paniculata</i>	Orange Jessamine
		<i>Xanthostemon chrysanthus</i>	Golden rende / Golden Penda
	2°59'44.95"N 101°45'16.27"E	<i>Libidibia ferrea</i>	Brazilian Ironwood / Leopard Tree
	2°59'47.44"N 101°45'18.83"E	<i>Eugenia Oleina</i>	
		<i>Fagraea fragrans</i>	Tembusu
		<i>Lagerstroemia speciosa</i>	Pride of India
	2°59'48.48"N 101°45'23.00"E	<i>Libidibia ferrea</i>	Brazilian Ironwood / Leopard Tree
		<i>Melaleuca quinquenervia</i>	Gum Tree
		<i>Michelia alba</i>	Cempaka Putih
		<i>Cinnamomum iners</i>	Kayu Manis
		<i>Elaeocarpus grandiflorus</i>	Ceylon olive
		<i>Elaeocarpus hainanensis</i>	Hainan Oil-Fruit Tree
	Along Jalan Jade Hills 12/1	<i>Eugenia longifolia</i>	Tongkat Ali
		<i>Fagraea fragrans</i>	Tembusu
		<i>Ligustrum lucidum</i>	Glossy privet
		<i>Melaleuca quinquenervia</i>	Gum Tree
		<i>Syzygium polyanthum</i>	Indian bay leaf
	Along the back lane between Phases 1B & 7A	<i>Cinnamomum iners</i>	Kayu Manis
		<i>Michelia alba</i>	Cempaka Putih
		<i>Syzygium leucoxylon</i>	Kelat Putih
Phase 7	2°59'50.14"N 101°45'26.25"E	<i>Syzygium leucoxylon</i>	Kelat Putih
	Along the back lane between Phases 1A & 5A	<i>Cinnamomum iners</i>	Kayu Manis
		<i>Syzygium leucoxylon</i>	Kelat Putih
Phase 7		<i>Bucida buceras</i>	Black Olive Tree
		<i>Elaeocarpus grandiflorus</i>	Ceylon olive

	Along the roads of Phase 7B	<i>Elaeocarpus hainanensis</i>	Hainan Oil-Fruit Tree
		<i>Eugenia longifolia</i>	Tongkat Ali
		<i>Fagraea fragrans</i>	Tembusu
		<i>Melaleuca quinquenervia</i>	Gum Tree
		<i>Michelia alba</i>	Cempaka Putih
		<i>Saraca Cauliflora</i>	Saraca
		<i>Syzygium leucoxydon</i>	Kelat Putih
		<i>Syzygium polyanthum</i>	Indian bay leaf
		<i>Xanthostemon chrysanthus</i>	Golden rende / Golden Penda
Phase 12	Along the roads of Phase 12	<i>Melaleuca quinquenervia</i>	Gum Tree
		<i>Psidium guajava</i>	Common Guava
		<i>Ravensara aromatica</i>	Clove nutmeg
		<i>Samanea saman</i>	Rain Tree
	3° 0'1.45"N 101°45'24.53"E	<i>Bucida buceras</i>	Black Olive Tree
		<i>Cratoxylum Cochinchinense</i>	Kayu Arang
		<i>Melaleuca quinquenervia</i>	Gum Tree
		<i>Pimenta racemosa</i>	West Indian bay tree
		<i>Podocarpus polystachyus</i>	Sea Teak
		<i>Psidium guajava</i>	Common Guava
	2°59'59.95"N 101°45'25.76"E	<i>Cratoxylum Cochinchinense</i>	Kayu Arang
		<i>Pimenta racemosa</i>	West Indian bay tree
		<i>Psidium guajava</i>	Common Guava
	2°59'59.25"N 101°45'24.53"E	<i>Bucida buceras</i>	Black Olive Tree
		<i>Cratoxylum Cochinchinense</i>	Kayu Arang
		<i>Pimenta racemosa</i>	West Indian bay tree
		<i>Psidium guajava</i>	Common Guava
			ophiophogon shrub
			eugenia shrub
			wild tea shrub
	Along the perimeter behind Phase 12B	<i>Cratoxylum Cochinchinense</i>	Kayu Arang
		<i>Psidium guajava</i>	Common Guava
	2°59'58.41"N 101°45'29.24"E	<i>Cratoxylum Cochinchinense</i>	Kayu Arang
			lythrum portula shrub
			oleander bushes
Main Roads	Along Jalan Jade Hills Barat	<i>Dalbergia sissoo</i>	North Indian Rosewood
		<i>Garcinia subelliptica</i>	Happiness Tree
		<i>Podocarpus rumphii</i>	Kayu Cina
	Along Jalan Jade Hills 4/1	<i>Podocarpus rumphii</i>	Kayu Cina
	Along the road between phases 3A & 3B	<i>Bucida buceras</i>	Black Olive Tree
	Along Jalan Jade Hills 2/1	<i>Michelia alba</i>	Cempaka Putih
	Along Jalan Jade Hills Timur	<i>Dalbergia latifolia</i>	East Indian Rosewood
		<i>Dalbergia sissoo</i>	North Indian Rosewood
		<i>Fagraea fragrans</i>	Tembusu

	Along Persiaran Jade Hills Utama	<i>Suregada multiflora</i>	False Lime Merlimau
		<i>Syzygium leucoxylon</i>	Kelat Putih
		<i>Leptospermum brachyandrum</i>	Tea Tree
		<i>Samanea saman</i>	Rain Tree
		<i>Tristania whiteana</i>	Palawan
Pond C	Surrounding Pond C	<i>Buchanania arborescens</i>	Otak Udang
		<i>Bucida buceras</i>	Black Olive Tree
		<i>Citharexylum spinosum</i>	Florida Fiddlewood
		<i>Dalbergia sissoo</i>	North Indian Rosewood
		<i>Eugenia glauca/ Syzygium glaucum</i>	Kelat
		<i>Dillenia suffuticosa</i>	Simpoh Air
		<i>Ilex cymosa</i>	Timah Timah
		<i>Jacaranda obtusifolia</i>	Jambul Merak
		<i>Leptospermum brachyandrum</i>	Tea Tree
		<i>Michelia alba</i>	Cempaka Putih
		<i>Samanea saman</i>	Rain Tree
		<i>Xanthostemon chrysanthus</i>	Golden rende / Golden Penda
Pond D	Surrounding Pond D	<i>Citharexylum spinosum</i>	Florida Fiddlewood
		<i>Cratoxylum Cochinchinense</i>	Kayu Arang
		<i>Ficus Celebensis</i>	Weeping Tree
		<i>Leptospermum brachyandrum</i>	Tea Tree
		<i>Xanthostemon chrysanthus</i>	Golden rende / Golden Penda



LEGEND

-  Railway
-  Township Border
-  Partition
-  Development Area
-  GPS Track



Jade Hills Survey Tracks

Date	16-10-2019
Project No	EJ 669
Produced by	HMZ
Revision	A

Appendix B