

# Executive Summary

## Environmental Impact Assessment (Second Schedule)

Projek Pembangunan Lapangan Terbang Antarabangsa Kulim (KXP) dan Kedah Aerotropolis, Mukim Sidam Kiri, Daerah Kuala Muda, Kedah Darul Aman

Proponent

### KXP Airport City Holdings Sdn. Bhd.

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EIA Consultant

## Overview

### Project Overview

- Development of an airport consisting of an airport and taxiway system, passenger terminals, cargo terminals and supporting facilities.
- Development of an Aerotropolis consisting of aviation-linked businesses and associated residential development
- Development of SLAM Hub which is an economic industrial transformation project .

### Location

The Project site is located in Mukim Sidam Kiri, in Kuala Muda, Kedah

### Landuse Zoning

Transportation

## Legal Requirement

| Schedule | Prescribed Activity                        | Description   |
|----------|--|---|
| Second   | 2 (Aerodrome)                              | (a) Construction of a new aerodrome involving a runway of 1000 meters or longer.  |
| First    | 11 (Power generation and Transmission)     | Construction of transmission line in environmentally sensitive area.  |
|          | 14 (Waste Treatment and Disposal) (Sewage) | (i) Construction of sewage treatment plant with 20,000 population equivalent or more.<br>(ii) Sludge treatment facilities         |
|          | 17 (Industrial Estate Development)         | Development of industrial estate covering an area of 20 hectares or more  |
|          | 18 (New Township)                          | Construction of new township consisting of 2,000 housing accommodation units or more or covering an area of 100 hectares or more. |

## Project Coordinates

| Point | Direction  | Coordinates   |                |
|-------|------------|---------------|----------------|
|       |            | Longitude (N) | Latitude (E)   |
| A     | North-West | 5°36'40.24"N  | 100°34'18.98"E |
| B     | North-East | 5°36'24.65"N  | 100°37'29.31"E |
| C     | South-East | 5°32'55.41"N  | 100°35'36.46"E |
| D     | South-West | 5°33'45.64"N  | 100°32'10.79"E |

## First Development Thrust of Kuala Muda Local Plan

- The Project will bring an increase in inter- and intra-district accessibility and urban mobility;
- Increase the marketability of Kedah as the next air shipment and cargo hub as well as a tourism hotspot for the northern region and;
- A new getaway for the products to be exported and raw materials to be imported for the manufacturers within Sungai Petani, Kulim, Seberang Perai, northern Perak and southern Thailand.

### Economic Boost and Advancement

- The Project will bring an approximated RM3.8 billion in private investment and this amount is expected to be injected into the local economy by the provision of jobs and infrastructure.
- An additional 18,000 new employment opportunities for the local community.

## Statement of Need

### Sustainability and Air Travel Demand

- The airport will be constructed in a manner that minimises the impact produced on the existing natural and human environment while promoting the aspects of industrial and commercial development.
- The airport will be able to accommodate the demand within its own natural catchment area as well as the over spilling traffic from the existing Penang International Airport (PEN) once PEN reaches its optimum capacity.

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## Project Location



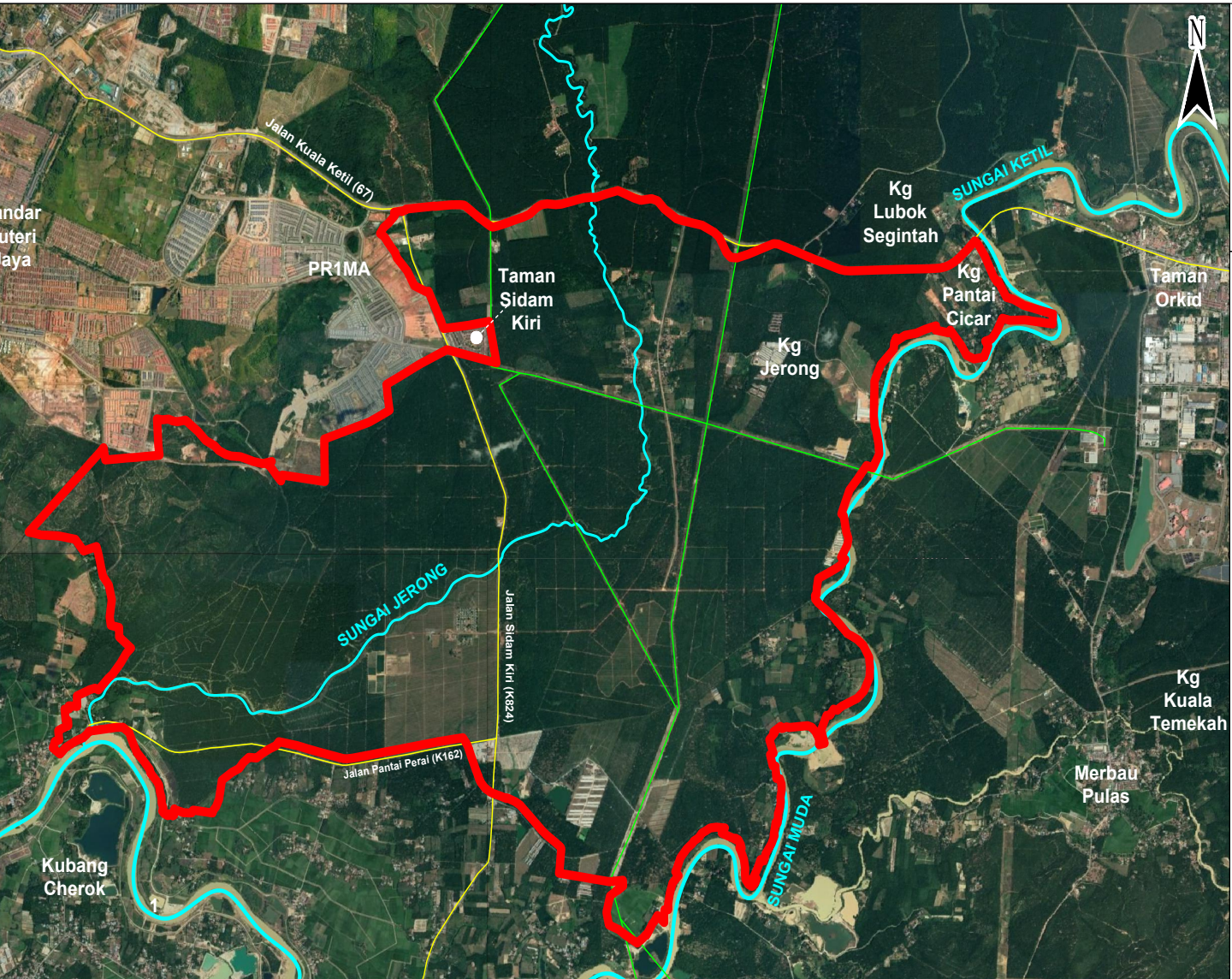
Source: Google Map (2021)

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## Aerial Image of Project site

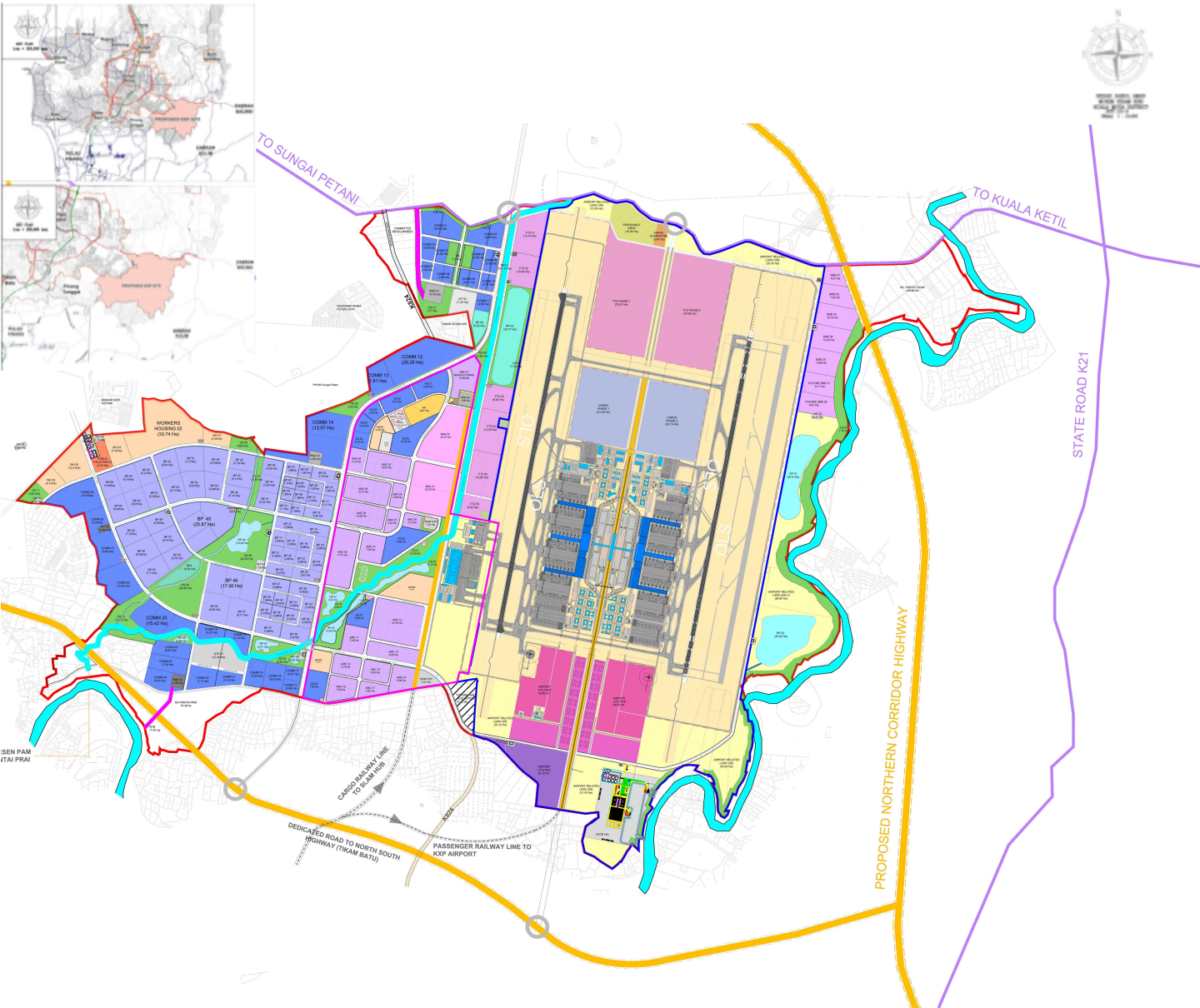


# Executive Summary

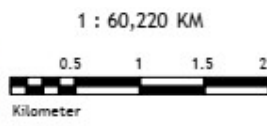
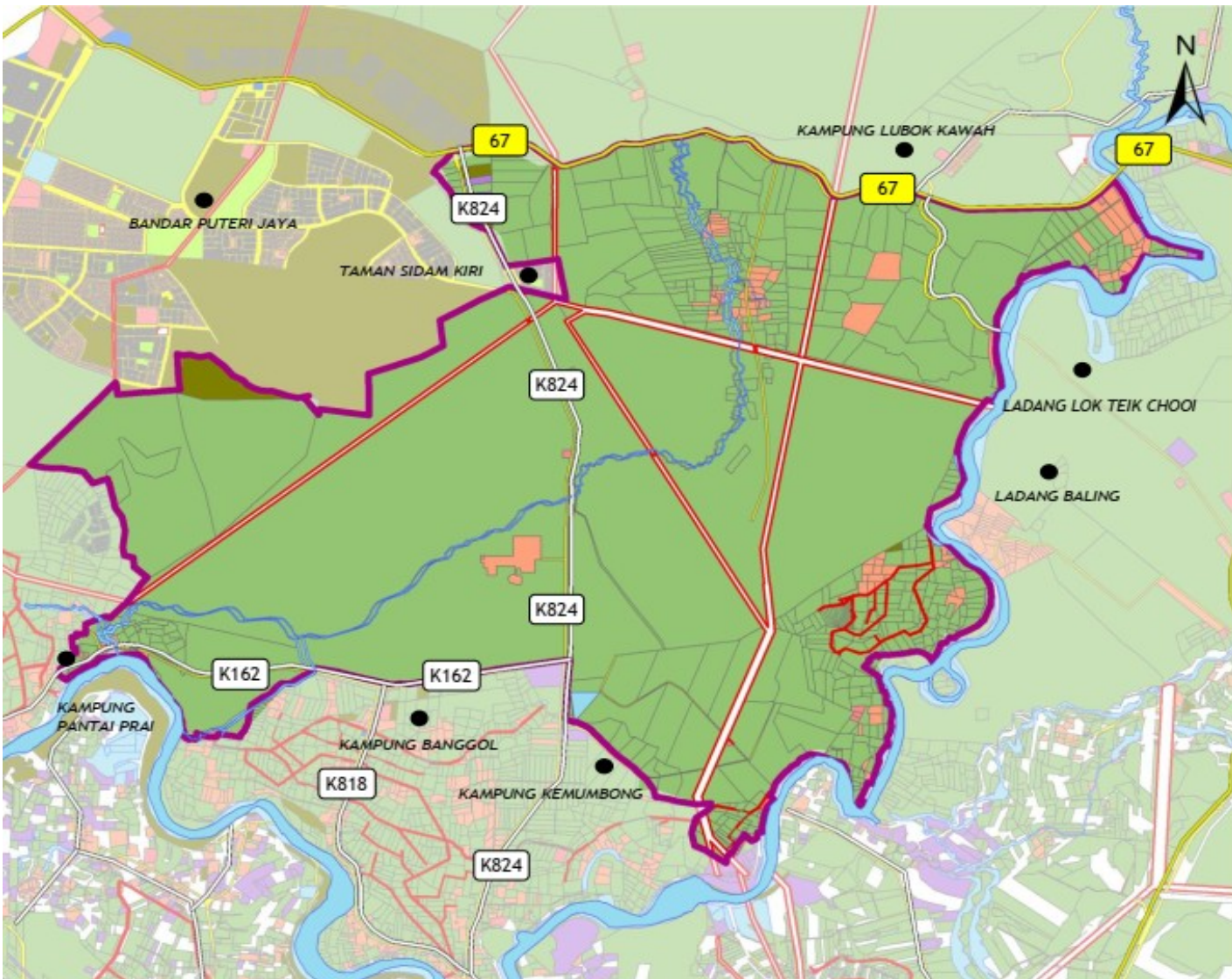
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### Layout Plan



## Existing Land Use Zoning at Project Site



- Jalan Negeri
- Jalan Persekutuan.
- Sempadan Tapak Cadangan
- Sempadan Daerah
- Sungai/Badan Air

| PETUNJUK           |                                   |                   |             |
|--------------------|-----------------------------------|-------------------|-------------|
|                    | Guna Tanah                        | Keluasan (Hektar) | Peratus (%) |
|                    | Perumahan and Kampung Tradisional | 1,035.32          | 26.00       |
|                    | Infrastruktur dan Utiliti         | 128.61            | 3.23        |
|                    | Institusi dan Kemudahan Awam      | 3.98              | 0.10        |
|                    | Pengangkutan                      | 29.86             | 0.75        |
|                    | Pertanian                         | 2,776.65          | 69.92       |
|                    | Badan Air                         | 7.56              | 0.19        |
| <b>Keseluruhan</b> |                                   | <b>3982</b>       | <b>100</b>  |

### Major Development Components

| No.                                | Development Component                      | Area (Hectare)     | Percentage (%) |
|------------------------------------|--|--------------------|----------------|
| 1.                                 | Airport + Airport City                     | 1,927.14           | 48.39          |
| 2.                                 | Aerotropolis                               | 1,280.79           | 32.16          |
| 3.                                 | SLAM Hub                                   | 527.78             | 13.25          |
| 4.                                 | Others (Not Part of Project's Development) | 249.06             | 6.2            |
| TOTAL                              |  | 3,982.51           | 100            |
| Development Component under OTHERS |  |                    |                |
| No.                                | Development Categories                     | Sub-Area (hectare) | Percentage (%) |
| 4a                                 | Settlement - Kg.Pantai Chicar              | 103.06             | 2.58           |
| 4b                                 | Settlement - Kg.Pantai Prai                | 74.38              | 1.86           |
| 4c                                 | Committed Development                      | 35.83              | 0.90           |
| 4d                                 | RTB (Rancangan Tebatan Banjir)             | 17.91              | 0.44           |
| 4e                                 | Roads (K824, K162)                         | 17.88              | 0.44           |
| SUB-TOTAL                          |  | 249.06             | 6.2            |

### Development Components of the Proposed Project

### Description of Main Components

#### Airport and Airport City

The Airport is the core development of the Project where it is supported by various facilities and infrastructure that includes Airfield, Passenger, Cargo, Airport and Airline Support Facilities, Airport Access and Utilities and Non-Aeronautical Development.

#### Aerotropolis

- The Business Park and Commercial are the main development components followed by the Free Trade Zone and Residential components as minor components.

#### SLAM Hub

The types of industries proposed in the SLAM Hub are:

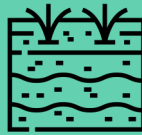
- Aerospace
  - Avionics – electronic systems and equipment specifically designed for use in aviation industry.
  - Aircraft interiors and Maintenance, Repair and Overhaul (MRO) supports the achievement of economic complexity objective.
- Logistics
  - Intermodal rail-road hinterland terminal
  - Logistics services for optimization of logistics cost for industrial park tenants.
- Manufacturing
  - High value manufacturing activities in Electric and Electronics (E&E), Mechanical and Electrical (M&E) and Pharmaceuticals etc.

## Existing Environment



### Topography

The Project site elevation ranges from 2 m mean sea level (MSL) to 74 m (MSL)



### Soil

A mixture of quartz, feldspars, plagioclase and biotite.



### Geology

Shale, siltstone, sandstone and orthoquartzite. .



### Hydrogeology

- The areas upstream of Sungai Muda are located on continental deposits and consist of clay, silt and gravels as parent materials.
- The areas downstream of Sg Muda are located on marine deposits and made up of clay and silt.
- The Project site is located within a high groundwater level area, where aquifer will likely be as deep as 50 – 60 m with starting depth being around 5 m below ground.



### Terrain and Erosion Potential

- 99.7 % of the Project area is within Slope Class I and II, whilst 0.3% is within class III and IV.
- The Project site shows 1.16% no appreciable erosion. 3.05% for minor sheet erosion, 74.91% for moderate sheet erosion and 0.87 % for severe sheet erosion.



### Climate & Meteorology

Butterworth Station (5° 27' 26" N, 100° 23' 18" E ")

### Rainfall and Rain Days

Highest in Oct 2011 (595.6 mm and 25 days)

Lowest in Feb 2014(55.3 mm and 2 days)

### Temperature

Highest temperature is in March 2016( 29.9°C )

Lowest temperature is in November and January 2009 (26.6°C)

### Relative Humidity

Highest in April 2017 (85.0%)

Lowest in March 2016 (71.7%)

### Wind

Fluctuates between 0.3-5.4 m/s

Annual mean speed is 2.2 m/s

Dominant wind blowing from East (30%)



### Hydrology

- The Project site is located within the Sungai Muda river basin located at the south-eastern region of the state of Kedah.
- The nearest hydrograph station is at Jambatan Syed Omar and Ladang Victoria.
- Sg. Muda supplies water for irrigated agriculture such as paddy fields and potable water supply to Kedah and Penang, including the Kulim Hi-Tech Park.
- Constructional material such as riverbed sand is also mined from Sungai Muda.
- The river is also used as a navigation channel for local fishing boats, particularly around the river mouth.
- Sungai Jerong, a tributary of Sungai Muda located in the lowest part of Sungai Muda basin flows through the Project Site, from northern boundary to the south-western of the Project site.
- Many of the flood risk areas are confined to within the low-lying areas closer to Sungai Jerong and not along Sungai Muda.

## Existing Environment



### Land Use

- During the *Mesyuarat Jawatankuasa Perancang Negeri kali ke-155 (Bil. 1/2020)* which was held on 17<sup>th</sup> March 2020, the planning committee approved the conversion of the agriculture and land zoned for residential use to transportation and mixed development for the proposed KXP Project.
- Based on a preliminary site survey carried out, approximately 3,554 hectares (92.38%) of the Project site is currently under oil palm and rubber plantation with multiple villages interspersed in-between.
- Surrounding Land Use includes residential areas, educational and religious institutions.
- The Project area has been gazetted for agricultural development and therefore is not considered to be an ESA.

### Traffic

- The Project site is accessible via Federal Route 67 which connects Sungai Petani to the west and Baling to the east.
- The Project site is also reachable via several state roads (K162- Jalan Pantai Prai and K824 - Jalan Sidam Kiri) and rural roads.
- Overall, it can be said that of the 14 junctions assessed, exactly half or seven (7) were operating at acceptable levels; between LoS A and C, while the remaining seven (7) will require additional effort to increase their operating performance from LoS E and F to at least LoS C.



### Ecology



- The flora species at the Project area are mostly dominated by cultivated and commercial species due to agricultural activities.
- In terms of fauna, a total of 100 bird species and 50 mammal species were expected to be present within the Project site.
- The assessment of phytoplankton at the Project area recorded five (5) different phyla i.e., Bacillariophyta, Euglenophyta, Chlorophyta, Pyrrophyta, and Cyanophyta from 9 sampling locations at Sg. Muda and Sg. Jerong.
- A total of three (3) major phyla of zooplankton, i.e., Amoebozoa, Rotifera, and Arthropoda were recorded at the Project area.
- Three (3) major phyla of macrobenthos i.e., Arthropoda, Annelida and Mollusca were recorded along Sg. Muda and Sg. Jerong.
- With respect to the study area, a total of 87 individuals of fish were caught i.e., 77 individuals at Sg. Muda and ten (10) individuals at Sg. Jerong. A total of 12 fish species from eight (8) families and two (2) prawn species from a family were identified.

### Airspace Feasibility



- The surrounding airports are Penang International Airport and RMAF Air Base Butterworth, Penang.
- The distance of the Project site from Penang International Airport and RMAF Butterworth are 14.2km and 13.6 respectively.
- The approach waypoints of the aforementioned airports will be taken into consideration to evaluate the current airspace and create new air procedures.

### Community Health



- The Kedah state has a lesser ratio of doctor to its total population, compared to the whole of Malaysia, 1:610 and 1:480 respectively.
- There are one (1) hospital, nine (9) Health Clinics, 22 Rural Clinics and six (6) 1Malaysia Clinics in the district.
- In general, the state of Kedah recorded a higher incidence of food-water borne diseases, particularly food poisoning compared to the national rate.
- The state had higher incidence rates for vaccine-preventable diseases like diphtheria and pertussis compared to Malaysia.
- In general, the present sanitation status of the study area is good and the affected communities within the ZOS are generally of good health and live with a clean environment.

## Existing Environment

### Environmental Baseline Monitoring



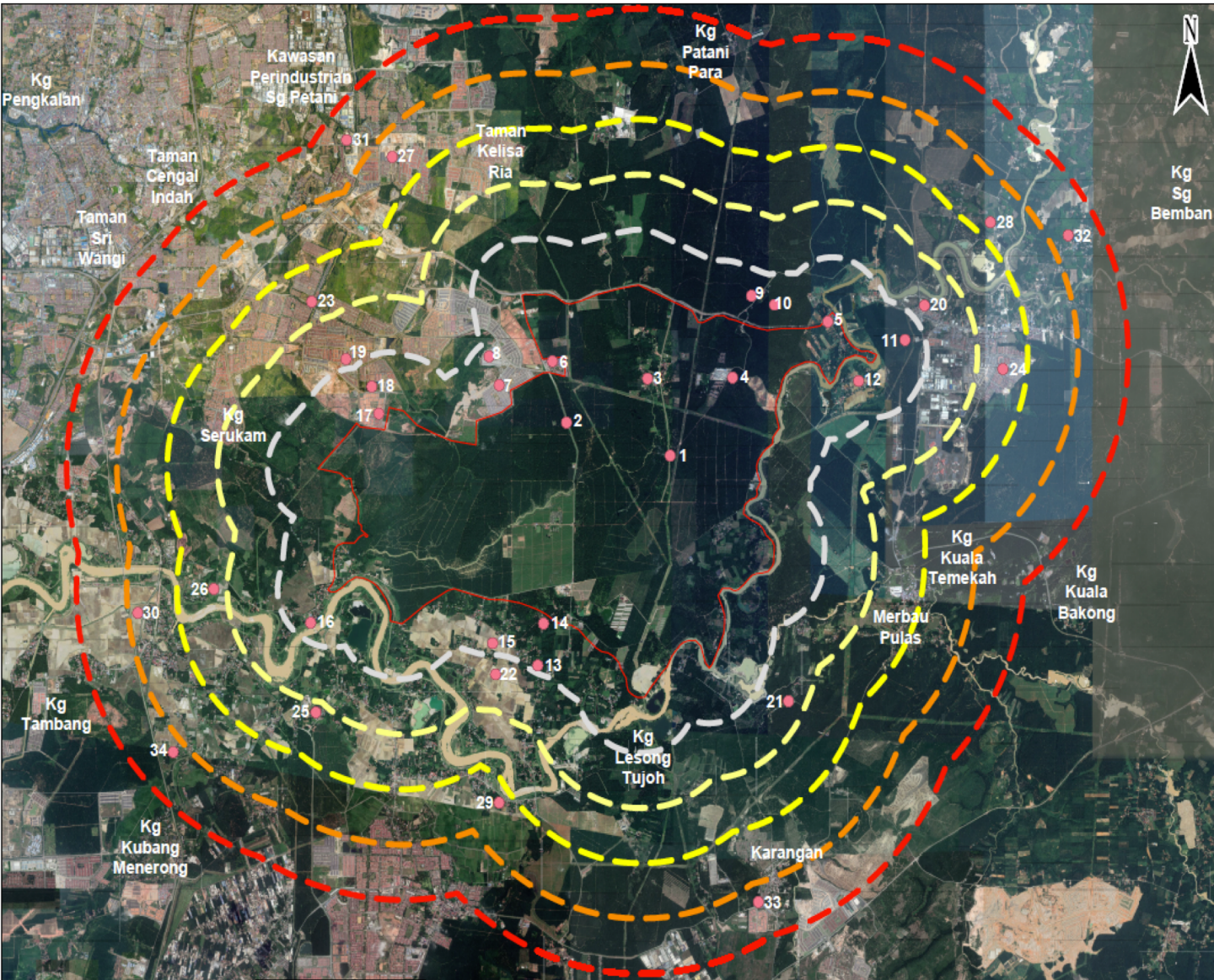
- Water Quality
  - 10 monitoring points along Sg. Muda
  - 5 monitoring points along Sg. Jerong
  - 3 monitoring points at Jalan Kuala Ketil, Taman Sidam Kiri and Bandar Puteri Jaya
  - 1 monitoring point upstream of Kulim Hi-tech WTP
- Air Quality and Wind Direction
  - 7 monitoring points at various locations around the Project Site, at the nearest sensitive areas.
- Noise
  - 7 monitoring points at various locations around the Project Site, at the nearest sensitive areas.
- Vibration
  - 7 monitoring points at various locations around the Project Site, at the nearest sensitive areas.
- Groundwater
  - 4 monitoring points at several locations within the Project site

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### 5-km Land Use



|   |   |   |  |
|---|---|---|--|
| <p><b>5 km Surrounding Landuse:</b></p> <ol style="list-style-type: none"> <li>1. Scarboro Estate Temple</li> <li>2. SJK(T) Ladang Scarboro BHG 2</li> <li>3. Masjid Al-Huda</li> <li>4. Kampung Jerong</li> <li>5. Masjid Al-Muhsini</li> <li>6. Taman Sidam Kin</li> <li>7. PR1MA @ Sungai Petani 1</li> <li>8. PR1MA @ Sungai Petani 2</li> <li>9. SK Dataran Muda</li> <li>10. Kg Lubok Segintah</li> </ol> | <ol style="list-style-type: none"> <li>11. Masjid Pantai Chicar</li> <li>12. Masjid Ar-Rahman</li> <li>13. Kg Banggol</li> <li>14. Kg Padang Buloh</li> <li>15. Kg Padang Meligai</li> <li>16. Masjid Pantai Perai</li> <li>17. Bandar Seri Astana</li> <li>18. SK Seri Pinang</li> <li>19. Bandar Utama</li> <li>20. Taman Tanjung Puteri</li> </ol> | <ol style="list-style-type: none"> <li>21. Kg Bukit Ah Chong</li> <li>22. Kg Lubok Saga</li> <li>23. Bandar Puteri Jaya</li> <li>24. Taman Desa Bidara</li> <li>25. Kg Ekor Kucing</li> <li>26. Kg Seberang Tok Soh</li> <li>27. Bandar Mutiara</li> <li>28. Kg Bukit Belacan</li> <li>29. Kg Bukit Sidam</li> <li>30. Kg Permatang Saga</li> </ol> | <ol style="list-style-type: none"> <li>31. Taman Sutera Idaman</li> <li>32. Kg Lubok Machang</li> <li>33. Taman Desa Cinta Sayang</li> <li>34. Kg Padang Beka</li> </ol> <p><b>Legend:</b></p> <ul style="list-style-type: none"> <li>- Project Site</li> <li>- 1 km Radius</li> <li>- 2 km Radius</li> <li>- 3 km Radius</li> <li>- 4 km Radius</li> <li>- 5 km Radius</li> </ul> |
|---|---|---|--|

- Most of the proposed site is an agricultural area of 3554 hectares (92.8%) consisting of rubber and palm plantations.
- The existing housing area within the proposed site covers an area of 98.39 hectares (2.56% of the proposed site area). This area consists of 258 houses and 2611 residents dispersed over 12 villages.
- There are 5 religious institutions within the proposed site, comprised of 3 temples and 2 mosques.

## Baseline Monitoring Location


### AIR, NOISE AND VIBRATION MONITORING LOCATION



**Legend:**

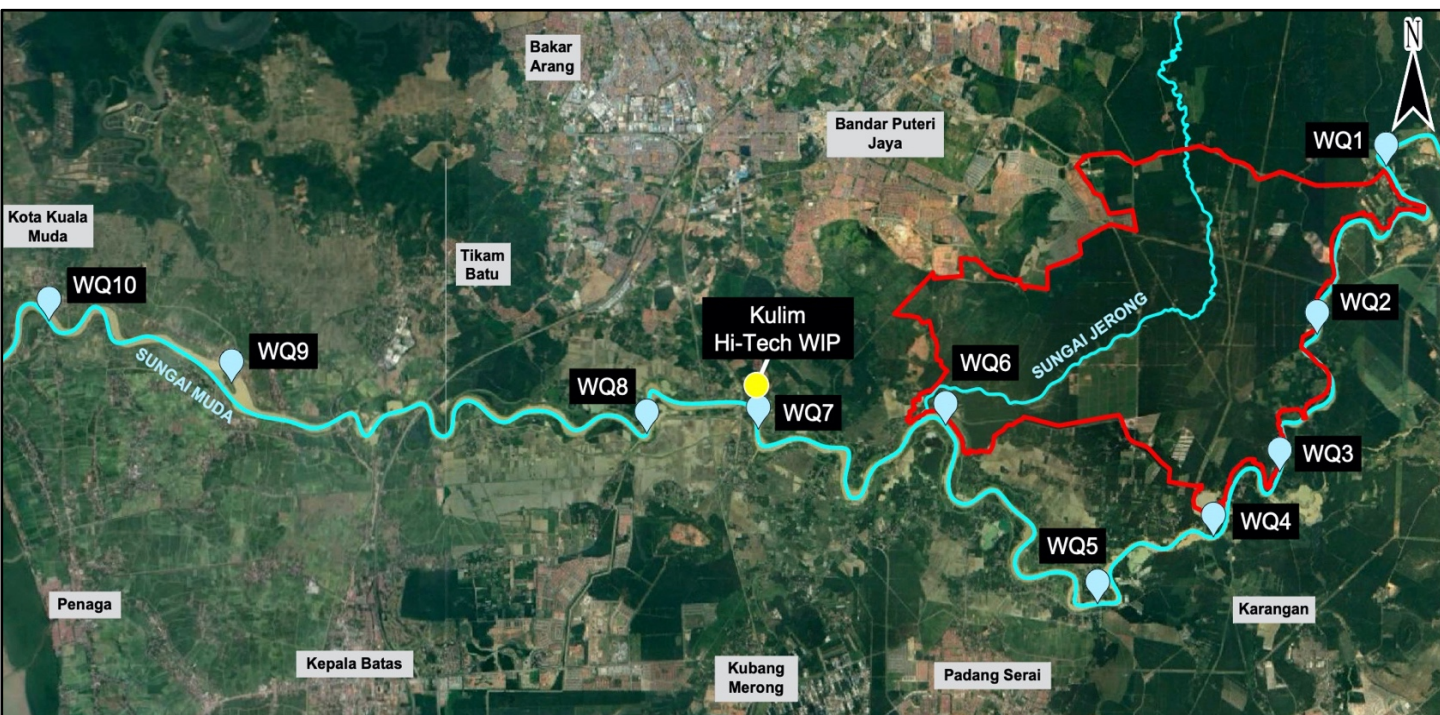
 - Project Site

**Stations:**

 - Air, Noise and Vibration

## Baseline Monitoring Location

### WATER QUALITY MONITORING



**Legend:**

- Project Site
- River

**Stations:**

- Water Quality (River/Marine)

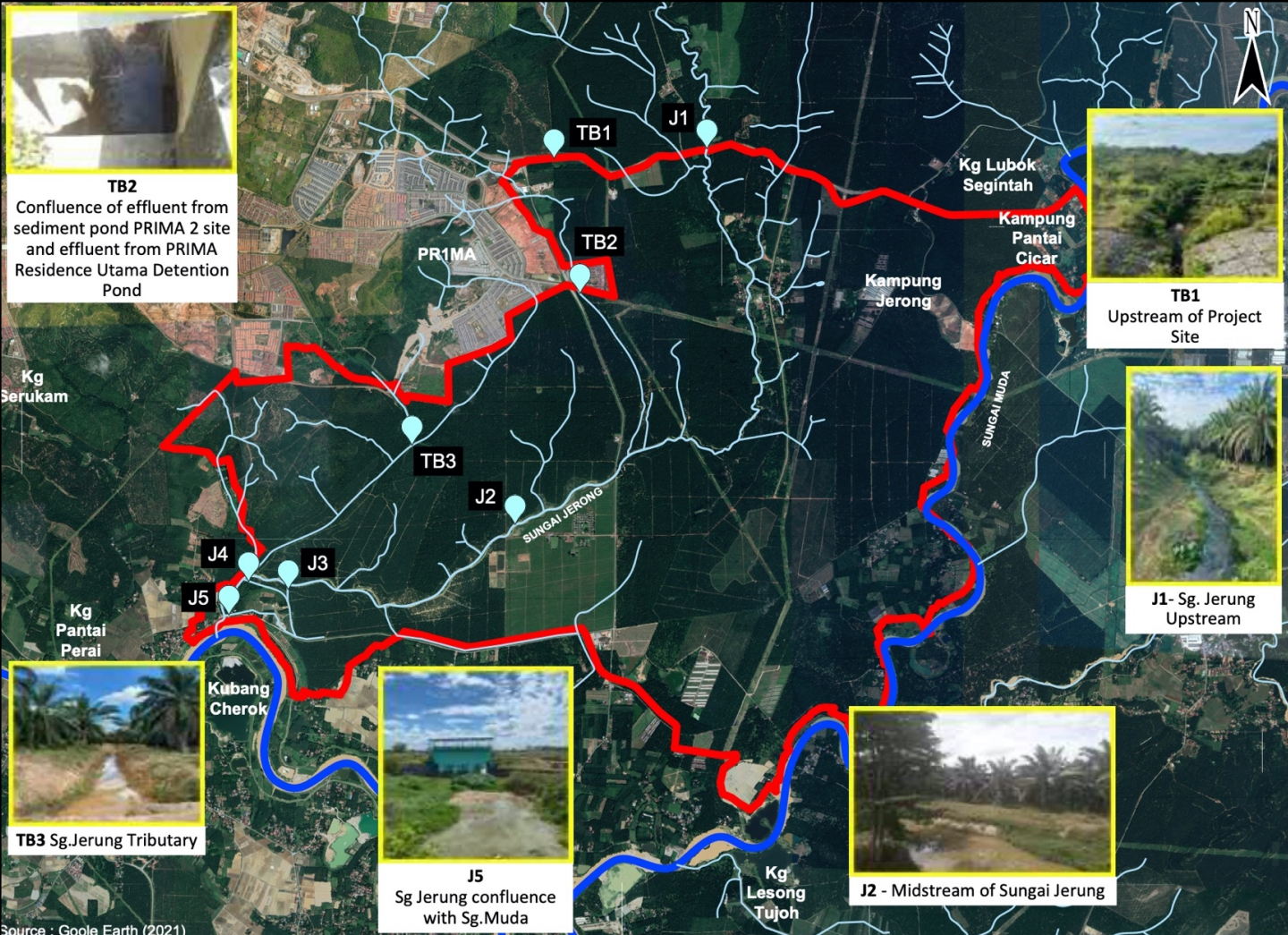
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## Baseline Monitoring Location

### WATER QUALITY MONITORING



Source : Goole Earth (2021)

**Legend:**

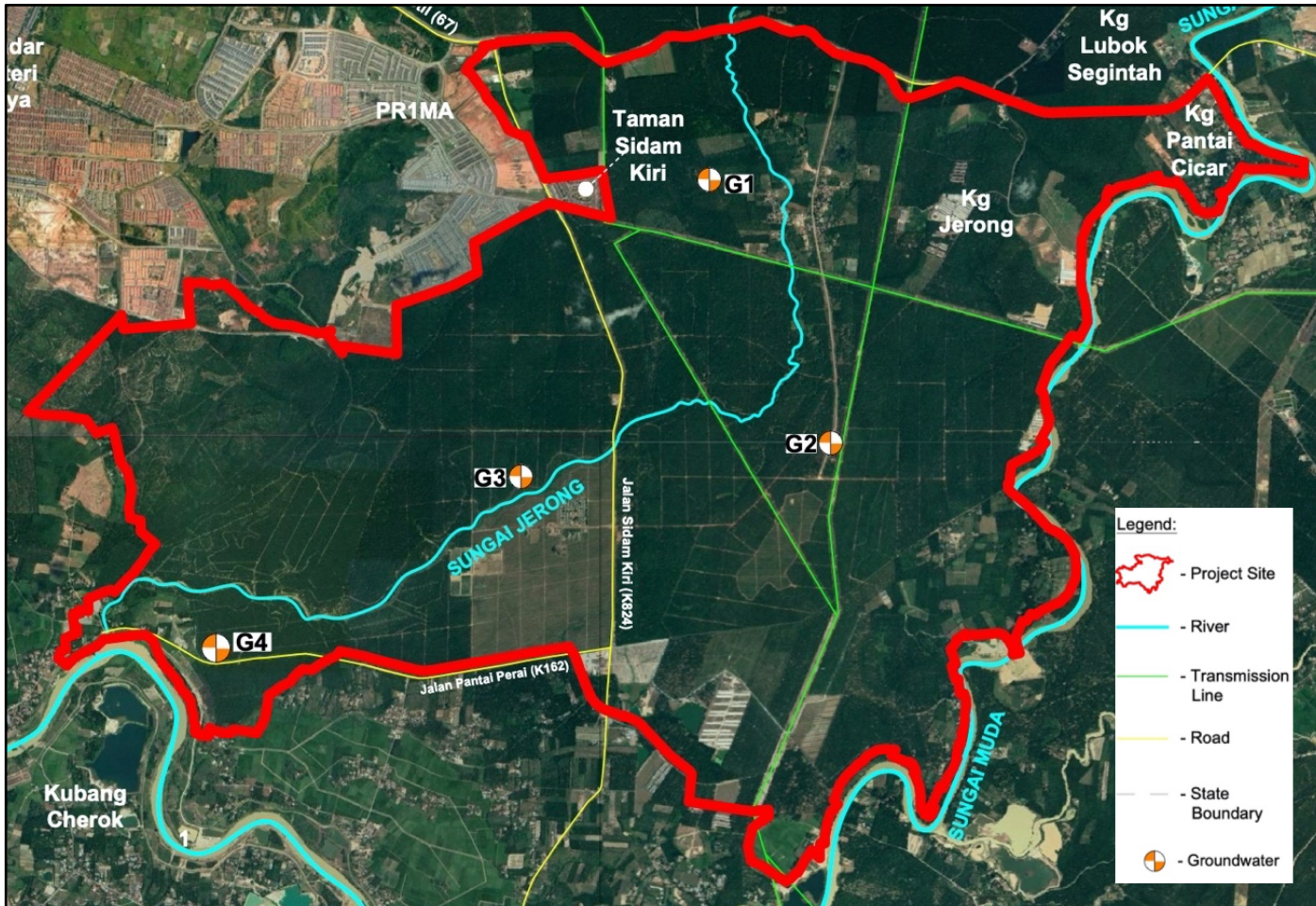
- Project Site

**Stations:**

- Water Quality Sampling Station

## Baseline Monitoring Location

### GROUNDWATER MONITORING



### General Assessment



#### Geohazard Assessment

- 99.7% of the Project area is categorized as Slope Class I and II. 0.3% of the area is categorized as class III and IV.
- Sheet and rill erosion will be likely in the event proper drainage systems are not installed and integrated as part of the Project development.
- At the Project site, occurrences of river bank failure was observed at Sungai Jerong, namely the Aerotropolis development area. An old scar failure with dimension of 10 m length and 3 m width was observed at the confluence of Sungai Jerong and Sungai Muda.
- The soil condition of a majority of the Project area has been classified as having low geotechnical constraint. A significant area on the eastern boundary of the Project site has been classified as having high geotechnical constraint.



#### Soil Erosion

### Construction Phase

- The overall area of the Project site is considered to have a low soil erosion risk due to its relatively flat terrain with majority of the land area falling into low erosion risk category.
- 96.44% of the Project site is under Class I and the remaining 3.56% falls within Class II.

### Operational Phase

- Soil erosion is not of significant concern due to absence of site-clearing and construction activities.

### Construction Phase

- Soil and groundwater impacts arising from accidental spillage and leakage of hazardous chemicals and wastes during the construction phase are assessed to be low. The extent of soil and groundwater contamination is likely to be localized and surficial.
- The need for significant groundwater discharge is unlikely. In the unlikely event that some dewatering is required, the extracted water will be conveyed via the silt trap proposed for the construction works area prior to discharge into the site's drainage system.

### Operational Phase



#### Land Contamination and Hydrogeology

- During the operational phase of the project, groundwater will not be abstracted for use within the site. Potable water supply will be obtained from the Department of Water Supply for use within the site. Thus, there will be no direct impacts on the local groundwater system.
- The accumulation of volatile organic compounds (VOCs) as a result of petroleum hydrocarbon spills into the underlying soil and groundwater may reach explosive levels in subsurface utility systems, or the concentrations of these vapours may cause acute health effects to facility and maintenance workers. '
- Changes in pH from acid and chemical spills have the potential to affect microorganisms in soil and groundwater and affect the natural soil processes such as biodegradation.
- Contaminants present in groundwater on-site have the propensity to migrate to downgradient neighbouring properties and affect underlying aquifers or threaten sensitive habitats in rivers.

### General Assessment



#### Hydrology

- The double mass curves derived from two stations at the Project site show that the rainfall data collected from the two respective hydrological stations are of high consistency and thus, they can be treated as homogeneous rainfall. IDF(Intensity-Duration-Frequency) curves derived from the two stations also show that the intensity of rainfall decreases linearly with the increase in the duration of rainfall.
- The potential for flooding to occur was identified at an area upstream of Sungai Jerong at chainage 10400 to the downstream areas. The flood depth near Kampung Jerong, located within the Project site, is expected to be in the range of 0.1 m to 1.6 m which is about the same depth as recorded in the Flood Report by DID.
- It can be observed that the critical duration for 5 ARI, 10 ARI, 20 ARI and 50 ARI is 12 hours while 6 hours critical duration is achieved for 100 ARI in the Sungai Jerong basin.

### Construction Phase

- Stockpiles of earth spoils, cement and sand are sources of pollution if sited too near to waterways. Similarly, silt and sediments will be swept into rivers which will cause blockage of river flow causing water pollution and reduction in river depths by deposition.
- Accidental leaks and spills of construction oils will occur during refuelling, services and storage, resulting in contamination of soil and rivers.
- Hazardous chemicals, if spilled onto the ground, may enter waterways together with surface runoff and/or groundwater, resulting in toxification of water, which will kill aquatic lifeforms and any animals that drink them.
- Improper management of waste, sewage and sillage can lead to severe impacts on nearby waterways such as degradation of water quality and eutrophication.



#### Water Quality

### Operational Phase

- The water quality of Sungai Muda will potentially be affected by the activities at the Airport such as aircraft refuelling, aircraft maintenance and cleaning which will generate spillages and contaminated surface runoff.
- High biocide and anti-fouling agents will be released in the cooling water blowdown at the cooling tower of the proposed airport thereby resulting in water quality impacts to the receiving waterbodies.
- Any untreated industrial wastewater from activities at the SLAM hub discharged into Sungai Muda or its tributaries will affect the water quality of Sungai Muda adversely thus impact the quality of the water at the intake points downstream of the the Project site.
- High organics and ammonia from untreated STP discharge can threaten aquatic life and therefore needs to be appropriately controlled.

### General Assessment



#### Flood Risk

- Kampong Jerong, located within the Project Site, is a flood-prone area. Flood cases in the area are usually due to heavy rainfall for short durations.
- The closest major dam to the Project Site is the Pedu Dam. A dam break results in significant property damage, lifeline disruption (utilities) business disruption, displacement of families from their homes and environmental damage.

## Impact Assessment

### Construction Phase

- The potential air quality impact during site clearing is mainly due to improper disposal which is the open burning activities of the vegetative wastes. This activity may cause substantial amount of air pollution as it releases significant amounts of pollutants such as dust particulates, soot, smoke and odour .
- Site clearing and earthworks create open, bare and exposed areas that are prone to generate dust especially during dry periods when strong winds blow across these surfaces.
- Due to the weight and size of soil particles, most of the particles are expected to be carried over short distances, unless winds are strong and persistent.
- Dust is expected to be generated due to entrainment of particles when vehicles move over unsealed surfaces. Dust may also be generated from the carriage of dry materials that have potential to cause dust generation such as soil, aggregate, cement and sand.
- Results from the Air Dispersion Modelling indicates that for the Project, mitigating measures to control fugitive dust need to be adopted where possible, to further reduce the uncontrolled emissions of PM<sub>10</sub> and PM<sub>2.5</sub>.



### Air Quality

### Operational Phase

- During the operational phase, incremental air quality impacts are expected due to the increase in aircraft and vehicular emissions from localised air and ground traffic. Examples include:
  - Combustion of aviation fuel
  - Vehicles travelling to and from the airport, and ground service equipment such as tugs for aircraft and baggage, fuel and catering lorries, busses and vans that transport passengers.
  - Aircraft and airfield maintenance such as painting, metal cleaning and emergency and fire training
- According to the findings of the Air Quality Model, airport operations may produce various regulated pollutants, including volatile organic compounds (VOCs), carbon monoxide (CO), particulate matter (PM), lead, sulphur oxides (SO<sub>x</sub>), and nitrogen oxides (NO<sub>x</sub>).
- Based on the large numbers of estimated factories and manufacturing plants which shall be housed in the Aerotropolis, both large and small scale, gaseous emissions will be anticipated. The emissions from different industries contain gaseous contaminants such as sulphur, carbon dioxide (CO<sub>2</sub>), oxides of nitrogen, methane, and so on.
- It is also to be noted that the overall Project development will be carried out in phases for over a span of approximately 30 years. Impacts will not be one-off but a progressive and stable disposition of activities planned for the realisation of the Project.

### Construction Phase

- Based on the simulation results, it is concluded that the predicted cumulative L<sub>max</sub> levels at the identified NSRs are generally within the recommended limits. However, anticipated community response to noise due to the Project was significant during the construction period at N1, North-west of the Project site.



### Noise

### Operational Phase

- Based on the simulation results, it is concluded that the predicted cumulative L<sub>Aeq</sub> levels at some of the identified NSRs are generally within the recommended limits, except for N3 and N6, south and west of the project area respectively, which are above the recommended limits. However, anticipated community response to noise due to the Project is expected to be none during the operational period of the Project.



### Vibration

#### Construction Phase

- Based on the identified sensitive receptors surrounding the Project site, attention will be given at the residential area of Taman Sidam Kiri due to its proximity to the Project Site. At this area, Best Management Practices by adopting low vibration equipment by the Project Proponent and the appointed Contractor during the construction period.

#### Operational Phase

- Vehicular movement such as trucks/lorries rarely create vibration unless there are bumps due to frequent potholes in the road travelled.
- Rattle noise and vibration will be induced by the low-frequency components of ground noise during aircraft landing and take-off. For the Project, due to the adequate distance from the nearest sensitive receptors, ground borne vibration due to the commercial aircrafts is anticipated not to be significant.
- Low flying helicopter passing through the nearby residential areas may produce noise which is characterized by large low frequency components that will impact the building and produce rattle (i.e. sounds of rattling objects or windows within the dwelling) or vibration (the perception of vibrating building elements or furniture), which in turn will lead to increased annoyance by the helicopter noise. It is anticipated that there will be minimal operation of low flying helicopter landing and taking-off from the Project.



### Quantitative Risk Assessment

#### General Assessment

- During the operational phase of the airport, there will be risk associated from proposed fuel tank farm located within the airport area. There will be potential fire and explosion events due to improper handling of flammable liquids onsite during the fuel's storage, aircraft refuelling, fuel and transportation by tanker.
- Consequence modelling of fire and explosion events were carried out to determine the impact of such events via consequence modelling software; ALOHA/CASQADE.
- The credible scenario consequences assessed does not reach involuntary recipients of industrial risk surrounding the Project, which is in compliance with DOE's risk acceptance criteria.
- It is noted that the risks have been assessed on a conservative basis, both in terms of consequences
- The results below are in compliance of the requirements stipulated by the DOE risk criteria:
  - 37.5 kW/m<sup>2</sup> heat radiation hazard zone.
  - The 1 x 10<sup>-5</sup> per year IR contour for the proposed project is within the Project site.
  - The 1 x 10<sup>-6</sup> per year IR contour of the proposed project is within the proposed Project site and does not encompass involuntary recipients of industrial risks such as residential areas, schools, hospitals, and places of continuous occupancy, etc.

## Impact Assessment

### Construction Phase

- Ecological impacts arising from Project development are expected to be from low to medium due to oil palm being a planted species. The ecological impacts arising will also be progressive because the Project will be developed over 30 years.
- The main flora species at the Project site is *Elaeis guineensis* (oil palm) which is a commercially planted species and not deemed as a rare or threatened local species.
- The land clearing activity will impact the fauna within the oil palm areas due to loss of plant cover which previously provided shelter, foraging grounds and roosting sites for animals such as the Eurasian Wild Pig and Common Palm Civet.
- The study concludes that based on the existing species of flora and fauna found on site, there are no significant impacts to the flora and fauna common to the Project site.



### Terrestrial Ecology

### Operational Phase

- Bird strikes are common at airports and it can be a significant threat to aircraft safety.
- An assessment was carried out to determine the occurrence of bird strikes. It was concluded that bird strikes will not be an issue as the Project site is not located within the pathway of migratory birds.
- The Sungai Jerong realignment and construction of the Master Drainage system, which will include the construction of permanent ponds and water bodies, is not expected to cause bird gathering or bird strike.

### Construction Phase

- Sediment discharge into water bodies and surface runoff will lead to an increase in suspended solids within water bodies which can cause reduced dissolved oxygen concentrations, uninhabitable conditions for aquatic life and water quality degradation.
- Decaying biomass, if not properly disposed of and located close to the banks of Sungai Jerong or Sungai Muda, will increase the organic content of the water and thus increase the BOD levels and reduce the DO levels of the rivers. In addition, they can also attract rodents and other vermin.
- Untreated sewage and sanitary waste will lead to pollution of water bodies with *E. Coli* ammoniacal nitrogen which are hazardous to aquatic life.
- Litter, particularly plastics or plastic coated, are persistent in the environment as they take long time to degrade. In the long term, plastics break into microparticles which are ingested by aquatic organisms.
- After thorough investigation, the magnitude of impact on the aquatic biological resource will be considered as moderate and short term, particularly on the plankton and benthic, while fishes are mobile and thus will migrate to either upstream or downstream.
- The magnitude of impact on inland fisheries and recreational fishing is considered as moderate and for short-term only.



### Aquatic Ecology

### Operational Phase

- Contaminated surface runoff from airport operations represent a significant environmental threat on the receiving waterbodies as they contain relatively high concentration of contaminants.
- Degradation of water quality will arise in the event the STP is not operated in an optimal manner resulting in inadequately treated effluent entering Sungai Jerong and impacting Sg. Muda as well.
- The impact on the fisheries, angling and aquaculture activities is considered minor provided the recommended mitigation measures are implemented effectively.



**Waste Management**

### Construction Phase

- Improper disposal of putrescible municipal wastes on-site would attract disease-carrying rodents and insects;
- Improper management of wastes might lead to drainage channel blockage during rainfall events potentially obstructing the drainage flow;
- Improper disposal of construction waste may lead to illegal dumping of the waste at the roadside or into the waterbodies directly;
- Improper management of scheduled wastes may cause spillage or leakage into the ground surfaces which may lead to contamination of surface water and groundwater. The contaminated surface runoff may flow into Sg. Jerong or directly into Sg. Muda, thus causing water quality degradation and eventually leading to reduced quality of the aquatic ecology system of the river;
- Wastes are also potential fire hazards within the site.

### Operational Phase

- Lack of storage, collection and disposal of the wastes will cause illegal dumping. The dispersed solid waste from illegal dump often blocks the drainage system which may lead to flooding and creates unhygienic conditions with KXP Project area. Blocked drains are generally mosquito breeding grounds, which may cause diseases to spread.
- Open solid waste dumps attracts rodents and may become flies breeding place. Flies are vectors that spread diseases among humans.
- Leachate produced from the waste generally contains pollutants. The leachate flows into the nearby water bodies. Possible deterioration of water quality of Sg. Muda and its tributary will impact the water supply scheme downstream of Sg. Muda.
- Improper management of scheduled waste may cause water quality impacts and also impact on human health.
- Aesthetics and odour nuisance.



**Traffic**

### Construction Phase

- During the earthworks activities, the offsite dumping deposits of unsuitable topsoil and alluvium material will be carried out. The unsuitable material will be transported out from the Project site to the designated landfill.
- It is expected that all the construction vehicles and machineries will be utilising these northern and southern route to reach the KXP Project site. During these periods, it is expected that there will be a slight increase in the traffic flow of the affected roads; Road FT67, Road K824, Road K618 and road leading to Kampung Jerong.
- The heavy vehicular movements may also impact the quality of the roads as potholes might be created and this will impact the other vehicles.

### Operational Phase

- It was found that the identified key roads within the Project area could sufficiently cater for the transportation needs for 15 to 20 years. It is also expected that with the operation of the Northern Corridor Highway by 2035, the traffic on the State Road K824 for traffic travelling from Sungai Petani/Kuala Ketil to Kulim Padang Serai and vice-versa will be reduced.
- Level of service (LOS) for all proposed intersections between 2021 to Ultimate vary from A-C.

### General Assessment



#### Airspace

- While the Project's trajectories are sited towards the east side of the Butterworth TMA in order to avoid conflicts with Penang International Airport (PEN) trajectories, there are still some crossing between the Project's trajectories and that of PEN.
- Similar to the PEN Airport, the trajectories into the Project's runway has been placed in such a way it reduces as much as possible the conflicts with the Butterworth Airport's trajectories.
- At this juncture of time, a detailed mitigation measure for the airspace is not available as discussion with Air Traffic Control (ATC) controllers is needed to resolve and reduce potential conflict and workload. Nonetheless, the trajectories can be easily solved by vertical separation and altitude constraints.

### Construction Phase

- The main concern from construction sites is fugitive dust, particulate matter (PM) and Nitrogen Dioxide. These pollutants are produced by diesel engines that power machinery and vehicles.
- The fugitive dust is often tracked out onto the public roads on the wheels of vehicles leaving the site and can then be resuspended back into the air that we breathe and remain there for many days or even weeks.
- The health impacts of these pollutants can include being a contributory factor to the follows:
  - Respiratory illness
  - Cardiovascular disease
  - Reduced lung function, especially in children



#### Community Health

### Operational Phase

- In the operational phase, most of the hazard quotients are not more than one for all air receptors during the operation phase of the Project
- The findings of this study do not pose any added health impacts to the vicinity of communities nearby. Therefore, the activities during the operational phase of the Project is expected to not cause additional health risk to the air receptors.
- As for noise impacts based on health risks, it is expected to be of no excess impact on the nearby communities during the operational phase.



#### Health Risk Assessment

| Health Risk Assessment Matrixz |   |   | Consequence |             |                  |       |              |
|--------------------------------|---|---|-------------|-------------|------------------|-------|--------------|
|                                |   |   | 1           | 2           | 3                | 4     | 5            |
|                                |   |   | Negligible  | Low         | Moderate         | Risky | Highly Risky |
| Likelihood                     | E | Higher than National rate                 | NOISE       | RIVER WATER |                  |       |              |
|                                | D | Higher than state rate                    |             |             |                  |       |              |
|                                | C | Lower than state, but high among district |             |             | DISEASE OUTBREAK |       |              |
|                                | B | Lower among districts                     |             |             |                  |       |              |
|                                | A | Not Possible                              |             |             |                  |       |              |

## Mitigation Measures



### Geohazard Assessment

#### Construction Phase

- Initial stabilization of soil using heavy duty tarpaulin sheets, close turbing or employing slope strengthening works, followed by mechanical and chemical soil stabilization.
- Cleared areas must be turfed, vegetated and consisted of proper drainage systems.
- Fill surfaces must be compacted, covered, turfed and vegetated.

#### Operational Phase

- In the operational phase, all constructed areas will have been stabilised, paved, concrete-line or landscaped with proper slope reinforcement works.



### Hydrogeology and Land Contamination

#### Construction Phase

- A secured area will be provided for storage of any hazardous material
- All temporary fuel tanks and drum storage areas will be provided with drip collection devices and be sited on sealed areas.
- All activities that may result in the potential release of hazardous materials to the ground will be performed only on designated sealed areas or on drip trays.
- Any accidental spills of fuel, oil or other hazardous chemicals will be cleaned up immediately.
- Appropriate and well maintained sanitary facilities.

#### Operational Phase

- The fuel storage tanks in the tank farm and any reagent storage tanks will be located within concrete-bunded enclosures
- Regular maintenance of fuel storage tanks coupled with proper instrumentation to warn of overfilling or leaking, will be implemented.
- Procedures on proper chemical handling will be enforced.



### Soil Erosion

#### Construction Phase and Operational Phase

- Mitigation for erosion and sedimentation arising from the Project site will be in accordance with the ESCP and LDP2M2.
- The perimeter controls are composed of BMP's that are utilized onsite which include the temporary drainage system, silt trap and sediment basin.

#### Construction Phase

- The structural measures which refers to any physical construction applied to the system in reducing or avoiding possible damages, or making a situation of becoming hazard resistance, will be implemented.
- The non-structural measures composed of methodology; excluding physical construction but applying knowledge and practice to reduce the hazard impact, such as policies, laws, public awareness, training and education, will be implemented.



### Hydrology

#### Operational Phase

- The crucial component of operational mitigation measures for hydrology of the Project site is the relocation works of Sg. Jerong. This it to maintain the safety of the runway and passenger terminals, avoid the risk of chemical pollution and reduce the risk of bird strikes.

## Mitigation Measures

### Construction Phase

- Development will be carried out in phases to reduce generation of fugitive dust.
- Water trucks will be used to reduce dust on construction roads whilst wash trough for wheel washing will be used for construction vehicles.
- Construction stockpiles will be covered with tarpaulin sheets.
- Perimeter hoarding will be constructed to reduce wind-blown dust.
- All dusty materials will be sprayed with water/covered as appropriate prior to any loading, unloading or transfer operation so as to maintain the dusty materials wet;
- Fuel-efficient and well-maintained haulage trucks will be used to minimize exhaust emissions



### Ambient Air Quality

- Airport air quality mitigation measures is being guided by the International Civil Aviation Organization (ICAO) issued guidance document entitled "Document 9889: Airport Air Quality Manual". The measures are regulatory, technical, operational and economic.
- At the aerotropolis, regular monitoring must be carried out to ensure that concentrations of pollutions do not exceed regulation.
- It should also be ensured that The Project will not contribute any more than 25% of the applicable ambient air quality standards to allow additional, future sustainable development in the same airshed
- It has to be noted that most of the mitigation measures will be provided by the individual investors for their premises within the SLAM area.

### Construction Phase

- Construction activities involving heavy machineries with high noise will only be carried out during daytime only.
- Erection of temporary jersey barrier with plastic hoarding around the Project site and/or active work areas especially at the identified sensitive areas.
- All the equipment and machineries will be well-maintained to avoid emitting excessive noise;
- Public will be allowed to register noise complaints over the construction period.
- The vibration at point of generation will be reduced with the use of alternative methods, reduction of energy input for impactive activities, containment of vibration generated, and protection of adjacent vibration sensitive buildings by appropriate engineering measures;



### Noise and Vibration

### Operational Phase

- All aircrafts will comply with the acoustic certification standards set by ICAO.
- Define zones around airports associated with different noise levels taking into account population levels and growth as well as forecasts of traffic growth and establish criteria for the appropriate use of such land, taking account of ICAO guidance.
- Identification of work areas with high noise, of 82 dB(A) or more and implementation of noise control in those identified noisy areas
- It is recommended that the roads within and leading to and from the Project site be maintained adequately by their respective agency. The helicopter impacts while present is deemed low due to the minimal operation of low flying helicopter landing and taking off from the Project. Hence, no mitigation measures are needed.

## Proposed Environmental Monitoring Program



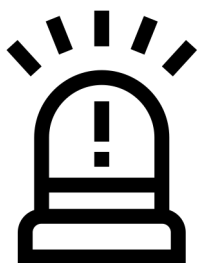
### Compliance Monitoring

- Ensures EIA conditions of approval are complied with by project proponent.
- Carried out by Accredited Laboratory



### Environmental Compliance Audit

- Environmental Audits by a registered environmental auditor.
- Possesses Certified Erosion, Sediment and Storm Water Inspector (CESSWI) Qualification
- Best Management Practices (BMP)s will be adopted



### Impact Monitoring

- Ensures potential impacts stated in EIA preparation stage are correct.
- Ensures mitigation methods are properly implemented.



### Baseline Monitoring

- General indication of the baseline environmental conditions at the time of reporting.

### Environmental Monitoring Program

- Provides Database of environmental impacts.
- Early indicator of environmental impacts.



### Performance Monitoring (PM)

- Ensures effectiveness of pollution control systems and mitigation measures.
- EO to carry out PM on site.

### Self-Regulatory Monitoring

- Ensures effectiveness of mitigating measures and compliance towards environmental regulations.
  - Carried out by EO.



7(seven) Noise/Vibration monitoring locations

19(nineteen) Water Quality monitoring locations



7(seven) Air Quality monitoring locations

4(four) Groundwater monitoring locations



## Emergency Response Plan

### Emergency Response Team

- A team of qualified individuals with specific roles and responsibilities to carry out during an emergency.
  - Responsible for executing the following procedures:



#### Fire Emergency Response Plan

- Coordinating workers movement and communication with fire department



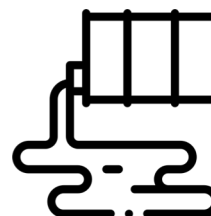
#### Medical Emergency Response Plan

- Procedure to follow and contact process with medical services



#### Erosion and Sediment Control Plan (ESCP) Failure Response Plan

- Control and maintenance methods



#### Oil Spillage Procedures

- Mitigation methods and reporting process.