

## **CHAPTER 9: ENVIRONMENTAL MANAGEMENT PLAN**

### **9.1 OBJECTIVE OF EMP**

The base document for the environmental management of the proposed Project is called the Environmental Management Plan (EMP). EMP defines the organization structures, responsibilities, operational measures and resources required to ensure that the environmental impacts which will be inevitably arise during the site clearing and operation stages are properly managed and any potential adverse impacts are mitigated or minimised as far as possible. The philosophy is to strike a balance between the development of the proposed Project and environmental preservation.

EMP is written to describe how the recommendations of this S2EIA and any further conditions that imposed by DOE to the proposed Project will be implemented. The EMP translates the pollution prevention and mitigation measures (P2M2s) recommended in the EIA report and the approval conditions (COAs) into action. The EMP needs to be prepared in accordance to Guidance Document for Preparation and Submission of EMP by DOE and should be approved by the DOE before implementation of the proposed Project. In this instance, the contractor should prepare separate EMPs for the site preparation stage and by the operator for the operational stage.

An Environmental Management Team (EMT) would need to be established to implement the mitigation measures, carry out monitoring and internal audits besides liaising with other agencies pertaining to all matters related to the environment. The basic manpower requirement of the EMT is an Environmental Officer that will be responsible to coordinate and monitor all the activities of the EMP.

## 9.2 LAND DISTURBING POLLUTION PREVENTION AND MITIGATION MEASURES

The LD-P2M2 gives guidance to the Project Proponent's personnel especially the Environmental Officer (EO), in supervising the implementation of the LD-P2M2 that includes the installation, inspection and maintenance of the Best Management Practices (BMPs) as well as in preparing the required documentation and reports. The focus of the LD-P2M2 is on the prevention, mitigation and control of the discharge from the development area containing the major pollutant (suspended solids) resulting from land disturbing activities.

LD-P2M2 design package is included in Appendix 8-1 which shall be referred for the design and development of this Project as per DID guidelines in the *Manual Saliran Mesra Alam Edisi 2 (MSMA 2<sup>nd</sup> Edition) 2012*.

The pollution prevention and mitigating measures (P2M2s) as shown in **Figure 9-1** shall be adopted, applied and implemented in the process of carrying out land disturbing activities at the development site. The P2M2s outlined in this section are the minimum standard requirements whether physical or non-physical measures to be taken to prevent, reduce and control the discharge of suspended solids and other pollutants from the development site. As work progresses, more mitigation measures may be applied where necessary. Therefore, to minimize the erosion and sedimentation from the Project site, the mitigation measures summarized in **Table 9-1** shall be adopted.

The proposed mitigation measures are based on eight (8) principles of erosion and sediment control as stated in MSMA 2<sup>nd</sup> Edition, 2012:

**Table 9-1: Land Disturbing Pollution Prevention and Mitigation Measures**

Erosion and Sediment Control Principles	Proposed Mitigation Measures
Minimizing Soil Erosion	<ul style="list-style-type: none"> <li>• The Project site will be divided into three (3) phases with 15 sub-phases for plantation. The site clearing and plantation will be conducted plot by plot starting from first plot until the fifth plot. Each plot will take about 6 months for completion. Overall, the plantation project is estimated to take about three (3) years for completion. This will be followed by harvesting period which is estimated to be completed within 26 years.</li> <li>• Existing vegetation shall be maintained to the maximum extent possible to filter runoff and provide erosion protection:               <ul style="list-style-type: none"> <li>- The clearing activities shall be confined within the plot area.</li> <li>- Vegetation cover should not be cleared until planting are ready to begin. In order to reduce soil erosion, existing vegetation along the riverbanks should be retained as riparian buffer to reduce direct surface runoff;</li> <li>- Close supervision is thus necessary, especially during the site clearing activity.</li> </ul> </li> <li>• Stream buffers shall be established, and natural waterway reserves should be delineated as recommended by Department of Irrigation and Drainage (DID) Malaysia.</li> <li>• Minimising erosion from steep terrain.</li> <li>• Ground cover should be established immediately to control erosion.</li> </ul>
Preserving Top Soil and Other Assets	<ul style="list-style-type: none"> <li>• All excavated topsoil shall be stockpiled, protected from erosion, and later used for revegetation.</li> <li>• Vegetation of high ecological or social value should be identified, protected, and if required transplanted.</li> </ul>
Access Route and Site Management	<ul style="list-style-type: none"> <li>• Access roads to the site shall be paved for at least 10 m into the site from any existing paved road;</li> <li>• In steep terrain, roads aligned across slopes can also disrupt downslope soil drainage and be instrumental in causing landslides;</li> <li>• Locating roads along ridgelines, placing rock blankets along roads to limit the formation of rills and gullies, drainage systems should be incorporated but should not drain onto disturbed soils or erodible slopes, avoiding deep cuts into soils in mid-slope roads and maintaining the road surface and drainage system;</li> <li>• In order to maintain operational efficiency as well as preventing erosion it is important that both roads and harvesting pathways are well maintained;</li> <li>• Road drainage and culverts must also be well constructed and maintained; and</li> </ul>

<b>Erosion and Sediment Control Principles</b>	<b>Proposed Mitigation Measures</b>
	<ul style="list-style-type: none"> <li>Road maintenance program shall be in place. This program should include regular inspection, especially during wet weather with any maintenance of roads, drainage ditches or culverts required rapidly carried out. A record should be kept of any maintenance made so that road sections and culverts which regularly fail can be identified and corrective action taken.</li> </ul>
Runoff Control and Management	<ul style="list-style-type: none"> <li>Established temporary drainage system to direct runoff water so that it does not run across disturbed area and unstable area;</li> <li>Runoff from undisturbed areas and natural watercourses shall be diverted away from disturbed land using runoff management best management practices (BMPs) such as earth banks and diversion drains;</li> <li>Runoff from disturbed area shall be collected by a temporary (or permanent) drainage system and treated (using available sediment control BMPs), before being released (complying with DOE standard limit) into natural watercourses;</li> <li>Temporary drainage system should be designated such that the system does not contribute to the sedimentation problems (stable channel design);</li> <li>No watercourse or reserve along a watercourse shall be disturbed until full plan detailing the proposed works have been submitted to and approved by DID;</li> <li>Ineffective drainage controls shall be noted (especially during wet weather) and promptly corrected.</li> </ul>
Earthwork and Erosion Control	<ul style="list-style-type: none"> <li>Inactive working areas (areas not anticipating any site clearance activity in upcoming 30 days) shall be stabilised within 7 days with proper stabilization techniques.</li> </ul>
Sediment Prevention Control	<ul style="list-style-type: none"> <li>A total of seven (7) sediment basins have been proposed for this Project to intercept sediment carrying runoff before discharging into the natural watercourse.</li> <li>Check dam has been proposed to be installed along the earth drain. Check dam is a small, sometimes temporary, dam constructed across a swale, drainage ditch, or waterway to counteract erosion by reducing water flow velocity.</li> </ul>

Erosion and Sediment Control Principles	Proposed Mitigation Measures
Slope Stabilization	<ul style="list-style-type: none"> <li>• There shall be no obstruction or interference with natural waterways. Where a road is to be cut across a river or stream, bridges and culverts as prescribed by the enforcement authority shall be constructed and maintained according to specifications;</li> <li>• Slope steeper than 35° or 70% shall not be worked and should instead be identified, stabilised and maintained.</li> <li>• Slope steeper than 35° has been marked in the LD-P2M2 plan.</li> </ul>
Site Maintenance	<ul style="list-style-type: none"> <li>• A maintenance programme shall be prepared to include plans for the removal and disposal of unwanted sediments, the repair of structural damages, and improvement or modification of BMPs (based on engineer's recommendation);</li> <li>• Regular inspections should also be planned for on a fixed interval as well as before and after each storm event;</li> <li>• All erosion and sediment control measures shall be constructed and maintained by the developer;</li> <li>• Final discharges from the development site shall comply with ambient standards for TSS (100 mg/L and below) and turbidity for the designated beneficial use of the receiving water.</li> </ul>

BMPs are the most suitable measures which could be implemented into the Project site to control or prevent any unwanted event such as landslide, flooding and excessive erosion and sedimentation.

The recommended BMPs to be installed during clearing period are as follows:

- a) Temporary drain
- b) Check dam
- c) Silt fence
- d) Sediment basin
- e) Wash trough
- f) Cover crop

Below is a BMPs selection chart where the contractor or crop planting team can use as a reference for continual improvement on mitigation measures to be implemented for protection of environment against soil erosions and sediments transportation into external water courses.

BMP Category	Practice Good Housekeeping	Contain Waste	Minimise Disturbed Area	Stabilise Disturbed Area	Project Slope & Channels	Site Perimeter	Control Internal Erosion
<b>Site Planning Considerations</b>							
Scheduling	√	√	√	√	√	√	√
Preservation of Existing Vegetation			√	√	√	√	
<b>Physical Stabilisation</b>							
Geotextiles and Mats				√	√		
Temporary Waterway Crossing	√		√	√			
Construction Road Stabilisation	√		√	√			
Construction Access Stabilisation	√		√	√		√	
<b>Diversion of Runoff</b>							
Earth Bank		√			√	√	√
Diversion Channel					√	√	√
Slope Drain					√		
<b>Flow Velocity Reduction</b>							
Drainage Outlet Protection					√		
Check Dam					√		
<b>Sediment Trapping/Filtering</b>							
Sediment Fence						√	√
Sand Bag Barrier					√	√	√
Brush or Rock Filter					√	√	√
Drainage Inlet Protection						√	√
Sediment Traps							√
Sediment Basins							√





Figure 9-1: LD-P2M2 Layout



### **9.3 PROPOSED MANAGEMENT PLAN**

Based on the potential significant environmental impact and evaluation as discussed in previous Chapter 7 and 8, the following specific management plan is required to be prepared by Project Proponent during the EMP stage prior to the execution of this proposed Project in order to complement the mitigation measures. The plan needs to be in collaboration with EIA approval terms and conditions imposed by DOE including other consent by respective agencies or department such as, Local Authority and etc.

#### **9.3.1 Waste Management Plan**

Two (2) types of waste will be generated during the implementation of this Project i.e., solid waste and scheduled waste. The following waste management plans are required to be in place:

- a) Solid Waste Management Plan; and
- b) Scheduled Waste Management Plan.

All the above waste management plans should highlight type of waste to be generated or expected to be generated, volume, storage area, location for final disposal, type of disposal, category of waste (segregation purposes) and etc. Detail procedure and process flow need to be described in this waste management plan including roles and responsibilities on personnel in charge.

#### **9.3.2 Biomass Management Plan**

Biomass Management Plan is required to manage all the uneconomical trees, shrubs and etc. from site preparation and clearing activities. This biomass management plan needs to describe on procedure and roles to manage the biomass such as disposed off by sorting/recovery of re-useable biomass (segregate re-useable timber from vegetative wastes) or will be left onsite at a specific stockpile area where it can compose naturally to be use as an alternative ground cover.

## **9.4 PROPOSED MONITORING PROGRAMME**

Part of content to be highlighted in the EMP is the Environmental Monitoring Programmes. The environmental monitoring programme will comprise three (3) types of monitoring as follows in accordance to DOE guidelines:

- i. Performance Monitoring (PM);
- ii. Compliance Monitoring (CM); and
- iii. Impact Monitoring (IM).

### **9.4.1 Performance Monitoring (PM)**

Performance monitoring in this case referring to management performance indicator (MPI) that provides information about the management efforts to influence an organization's environmental performance. This includes environmental costs or budget, number of audit findings, percentage of environmental targets achieved, number of complaints from public or employees, costs of environmental damage (legal non-compliance).

In this case, monitoring against the effectiveness of LD-P2M2 in order to assess the effectiveness of mitigation measures in place.

#### **9.4.1.1 Total Suspended Solid (TSS)**

Regular inspection and maintenance will be carried out to ensure that the drains and sediment basins are operating efficiently. Monthly TSS monitoring shall be carried out at discharge outlets of the sediment basin during site clearing period. The water discharged from the sediment basins should not contain suspended solid load exceeding 100 mg/L as stipulated by the DOE's standard. It should be noted that the TSS monitoring for the active sediment basins should be carried out on a monthly basis. The following measures and procedures should be adhered to during sediment basin sampling and monitoring:

- a) Sampling of the discharge is done at the discharge outlet. Where a pipe or distinctive discharge point is not accessible, the sample is to be collected from any convenient point immediately;

- b) Collection of the sample, from the direct outlet or pipe, is into the sample bottle while from shallow streams or flow paths, a suitable scoop can be used but care to be taken that bottom sediment or sand is not taken in during sampling;
- c) Sampling is not to be carried out during or immediately after a rain or storm event. When rain had occurred, a minimum time interval of two hours is recommended after the rain or storm event before sampling;
- d) All samples must be collected in the appropriate plastic bottles and after collection or filled to the brim, be firmly capped and if possible, sealed with masking tape;
- e) The quantity of sample must not be less than 1 liter;
- f) All samples must be clearly marked, either on the bottle or on labels, the location or ID of the sampling station, the date and time of sampling and the person taking samples. Where labels are used, care must be taken to ensure that these do not come off during the transportation to the laboratory;
- g) A chain of custody form (with details on number of samples, type of analysis required, date of collection and date of dispatch) to be filled and forwarded with the samples to laboratory; and
- h) Although discharges from sediment basins are tested only for Total Suspended Solids, the samples should be sent as soon as possible to the laboratory for analysis to avoid any possible interference from decomposition of organic material.

#### **9.4.1.2 Sediment and Erosion Control BMPs**

The effectiveness of Sediment and Erosion Control BMPs should be monitored based on the presence of silt behind or within control devices, the presence of silt behind or within control devices, the presences of silt downstream of the site, and sign of erosion in stabilized areas after a storm level. The system may be deemed ineffective if;

- a) Silt is present outside the control area;
- b) Structural controls are breached or fail under storm events of minor intensity.
- c) Rills and gullies are present in stabilized slopes;
- d) Evidence of silt build up in downstream stromwater drains and waterways is apparent;
- e) Controls are not maintained in accordance with design guidelines.

Monitoring should also take into any change in drainage patterns and the extent of the change and addressed accordingly. The areas undergoing active site clearing are stabilized as quickly as possible through the use of vegetation, mulch, erosion control matting, or structural methods within seven (7) calendar days of the last site clearing and plantations activity. If the activity or other site conditions do not allow stabilization within 7 days, alternative control approaches should be taken such as the use water bowser trucks for wetting the access roads and the use plastic sheets near the slopes.

#### **9.4.1.3 Site Inspection**

The key to controlling erosion and sedimentation is the effective implementation and maintenance of LD-P2M2 and this is the best achieved by undertaking a regular site inspection to ensure the LD-P2M2 is always operating in accordance with its design intent.

Hence the inspection will be performed as part of a regular inspection programmed. The personnel in charge of site inspections for the proposed project would be the Environmental Officer who will be in charge of the overall implementation of the LD-P2M2.

The results of the inspection and assessment will be recorded in writing. The report will include the date of inspection, the person (s) who performed the inspection and the observations.

The site inspection will enable the new BMPs and adjustment to be carried out effectively through the tracking of changes.

##### **a) Frequency of Inspections**

Inspections should be undertaken;

- During any storm event that threatens to exceed the available capacity in sediment basins and permanent water quality control status;
- After any storm event with substantial runoff;
- Daily, during hot or dry weather when grass cover is less than 100% on vegetated areas;

- Weekly as a matter of site routine for all site work particles;
- Before site closure or any other time when it might be otherwise left unattended for more than seventy-two hours; and
- From the site access in a fixed direction, which allow others (replacement worker, DOE or consent authority officers) to follow the recorded inspection routine schedule.

#### **b) Overall Program Activities**

The site inspection program will consist of the following activities;

- Inspection of earth drains and slope drains. Initiate cleaning if required;
- Removal of any stockpile material or sediment that has encroached within 2 m of surface drain;
- Restoration of low spots in earth banks and diversion drains to their original height and compact;
- Where necessary, constructions of extra earth drain and/or diversion drains that help separate on-site dirty waters from other waters;
- Install any new erosion and sediment control measures that have become necessary since the previous inspections due to severe storms or progress in the site`s development;
- Checks to ensure that all earth banks, and waterways are operating within the safe limits for the surface conditions by noting any evidence in scour; and
- Ensure that any construction work at site since previous inspection has not diverted sediment and water away from any site work practice.

#### **c) Inspection of Sediment Basins**

All sediment basins must be inspected after every rain or storm event and on a regular basis at least twice per week especially during active site clearing is in progress or work areas cleared and permanent protective measures has yet to be carried out.

The inspection must cover the following;

- Amount of silt/sediment retained - no more than 2/3`s of the depth of the sediment basin or 66% i.e., if a sediment basin is 3 m deep, the amount of silt

must not exceed 2 m and the depth of water remaining must not be less than 1 m;

- Integrity of side walls and bund - there must be no leaks or breaches of the bund walls where water can bypass the bund wall or the pipe outlet;
- The aggregate material surrounding the perforated pipe should be inspected to ensure that these are not compacted with settled silt; and
- Presence of vegetative debris or washed construction waste material into the sediment basin.

#### **9.4.1.4 Maintenance Program**

Maintenance work should be carried out based on the site inspection. Every erosion and sediment control measure on a construction site must be checked periodically and maintained sufficiently to ensure proper performance during every stage of development. In view of that, an Inspection and Maintenance Plan should be prepared by the personnel in charge. Maintaining the erosion and sediment control measures would be by the contractor team managers and sub-contractors appointed at the respective work areas.

##### **i. Sediment Basin Maintenance / Desilting Procedure**

Based on the site inspections, especially after each runoff event, arrangements will be made for the removal of sediments and other pollutants. This will include the removal of sediment from sediment basins and disposal in compliance with local regulations as well as the clearing trash racks of all bulky and floatable material after each heavy storm or as otherwise required averting clogging of drainage system and onsite flooding.

All sediment basins must be maintained at regular intervals depending on the rain conditions to achieve minimal efficiency. In any case, inspection of the sediment basin should be carried out after every storm event. The maintenance work for the sediment basin is as follows:

- When the sediment basin is filled with sediment greater than 2/3`s of the depth, de-silting works to remove the accumulated sediment must be carried out immediately to maintain the functionality of the sediment basin;

- De-silting can be carried out by a backhoe, but care must be taken to not damage and breach the bund wall or the pipe outlet;
- The sediment removed from the sediment basin must not be placed next or near to the sediment basin or within water flow channels where the possibility of the sediment washing back into the sediment basin is likely during the next rain or storm event. The removed sediment should be removed for dumping at the approved dump site;
- All breaches of the bund wall or must be repaired or replaced as soon as possible to maintain the functionality of the sediment basin;
- Vegetative debris or construction waste material washed into the sediment basin must be removed immediately to prevent any blockage and also damage to the bund wall or outlet pipe; and
- A maintenance log to be completed with details of sediment basin in terms of sediment basin ID number, location, date of inspection, type of maintenance or repair work and the date and the person responsible.

## **ii. Repairing of Damaged and Breached Structures**

Inspections should be carried out by the respective construction team managers on all structures for damage especially after any significant rainfall, and where necessary, take the following remedial actions:

- Repair, re-pin, or replace torn, detached or otherwise damaged liners, biodegradable blankets, geo-fabric, etc.;
- Fill and compact any low spots and breaches in earth banks and diversion drains where vehicles or other factors have reduced the design height or stability; and
- Repair (destabilize) any areas of soil erosion to reduce further erosion.

### **9.4.1.5 Record Keeping**

Record keeping of all inspections, compliance certifications, and non-compliance reporting are to be retained for at least 3 years by the Project Implementer. The use of photographs may be useful.

In addition, records of incidents such as spills or other episodic releases should be kept. The availability of such historical data will be useful for analysis and modifying



the BMPs. For instance, the data can be used to identify areas or activities whereby there is a predominance of spills to enable efforts to be focused accordingly.

It is also highly recommended that records be kept for any BMPs that are “action” in nature such as housekeeping as opposed to BMPs that can be gauged by physical changes such as turfing. Such “action” based BMPs can only be gauged and demonstrated through record keeping. For instance, the keeping record on the sediment basin desilting activity will provide insight into how soon it takes for the trap to fill.

Effective record keeping can be done using a logbook. A logbook should always be kept in site for inspection by DOE or Local Authority Officers with entries made weekly on;

- Dates of installation and removal of site work practices;
- Repair of any damage to site work practices;
- Rainfall depths, durations, and times;
- Storage capacity available in pollution control structures;
- Condition of site work practice structures and stabilized surfaces;
- Time, date, volume, and type of additions of flocculation;
- Estimates of water volumes discharges; and
- Estimates of pollutant volumes removed.

#### **9.4.2 Compliance Monitoring (CM)**

The proposed compliance monitoring programmed comprises the following key tasks:

- i. Monitoring of river water quality, ambient air quality and noise level to assess the environmental conditions against work progress and intensity;
- ii. Analysis of the monitoring results including visual survey; and
- iii. Formulation of recommendations on suitable measures for areas of non-compliance.

The summary of the monitoring programmed is tabulated in **Table 9-2** and the proposed location as shown in **Figure 9-2**.

**Table 9-2: Compliance Monitoring Program during Development Stage**

Environmental Component	Parameter	Compliance Requirement	Proposed Monitoring Station	Frequencies	Methodology	Personnel Required																				
Ambient Air Quality	Particulate Matter 10 $\mu$ m (PM <sub>10</sub> ), Particulate Matter 2.5 $\mu$ m (PM <sub>2.5</sub> ),	Malaysian Ambient Air Quality Standards (MAQS), 2020.	<table border="1" style="width: 100%;"> <thead> <tr style="background-color: #d9ead3;"> <th>Station ID</th> <th>Coordinate</th> </tr> </thead> <tbody> <tr> <td>A1</td> <td>N02° 34' 42.32" E 103° 37' 52.58"</td> </tr> <tr> <td>A2</td> <td>N02° 35' 18.10" E 103° 37' 44.33"</td> </tr> <tr> <td>A3</td> <td>N02° 31' 42.72" E 103° 38' 57.97"</td> </tr> </tbody> </table>	Station ID	Coordinate	A1	N02° 34' 42.32" E 103° 37' 52.58"	A2	N02° 35' 18.10" E 103° 37' 44.33"	A3	N02° 31' 42.72" E 103° 38' 57.97"	Monthly	<table border="1" style="width: 100%;"> <thead> <tr style="background-color: #d9ead3;"> <th>Parameters</th> <th>Methodology</th> <th>Equipment</th> <th>Duration</th> </tr> </thead> <tbody> <tr> <td>Particulate Matter 10 <math>\mu</math>m (PM<sub>10</sub>)</td> <td>ASTMD 4036, 1998 In-House Method (ESL/FA-06)</td> <td rowspan="2">MiniVol™ TAS Sampler</td> <td>24 hours</td> </tr> <tr> <td>Particulate Matter 2.5 <math>\mu</math>m (PM<sub>2.5</sub>)</td> <td>based on Manufacture's Measurement Procedures (MiniVol™ TAS)</td> <td>24 hours</td> </tr> </tbody> </table>	Parameters	Methodology	Equipment	Duration	Particulate Matter 10 $\mu$ m (PM <sub>10</sub> )	ASTMD 4036, 1998 In-House Method (ESL/FA-06)	MiniVol™ TAS Sampler	24 hours	Particulate Matter 2.5 $\mu$ m (PM <sub>2.5</sub> )	based on Manufacture's Measurement Procedures (MiniVol™ TAS)	24 hours	<ul style="list-style-type: none"> <li>Environmental Officer</li> <li>Environmental Monitoring Consultant</li> </ul>	
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Noise Level	LAeq, LA <sub>max</sub> , LA <sub>min</sub> , LA <sub>10</sub> , LA <sub>50</sub> and LA <sub>90</sub>	Planning Guidelines for Environmental Noise Limits and Control, Schedule of Permissible Sound Levels First Schedule Recommended Permissible Sound Level (LAeq) by Receiving Land Use for New Development i.e. 60 dBA (Day Time) and 55 dBA (Night Time).	<table border="1" style="width: 100%;"> <thead> <tr style="background-color: #d9ead3;"> <th>Station ID</th> <th>Coordinate</th> </tr> </thead> <tbody> <tr> <td>N1</td> <td>N02° 34' 42.32" E 103° 37' 52.58"</td> </tr> <tr> <td>N2</td> <td>N02° 35' 18.10" E 103° 37' 44.33"</td> </tr> <tr> <td>N3</td> <td>N02° 31' 42.72" E 103° 38' 57.97"</td> </tr> </tbody> </table>	Station ID	Coordinate	N1	N02° 34' 42.32" E 103° 37' 52.58"	N2	N02° 35' 18.10" E 103° 37' 44.33"	N3	N02° 31' 42.72" E 103° 38' 57.97"	Monthly	<table border="1" style="width: 100%;"> <thead> <tr style="background-color: #d9ead3;"> <th>Parameters</th> <th>Methodology</th> <th>Equipment</th> <th>Duration</th> </tr> </thead> <tbody> <tr> <td>LAeq, LA<sub>max</sub>, LA<sub>min</sub>, LA<sub>10</sub>, LA<sub>50</sub> and LA<sub>90</sub></td> <td>ISO 1966</td> <td>Sound Level Meter &amp; Octave Filter</td> <td>24 hours</td> </tr> </tbody> </table>	Parameters	Methodology	Equipment	Duration	LAeq, LA <sub>max</sub> , LA <sub>min</sub> , LA <sub>10</sub> , LA <sub>50</sub> and LA <sub>90</sub>	ISO 1966	Sound Level Meter & Octave Filter	24 hours	<ul style="list-style-type: none"> <li>Environmental Officer</li> <li>Environmental Monitoring Consultant</li> </ul>				
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Parameters	Methodology	Equipment	Duration																							
LAeq, LA <sub>max</sub> , LA <sub>min</sub> , LA <sub>10</sub> , LA <sub>50</sub> and LA <sub>90</sub>	ISO 1966	Sound Level Meter & Octave Filter	24 hours																							
River Water Quality	Temperature, pH, Dissolved Oxygen, Turbidity, Biochemical Oxygen Demand (BOD <sub>5</sub> at 20°C), Chemical Oxygen Demand, Total Dissolved Solids, Total Suspended Solids, Ammoniacal Nitrogen, Oil & Grease, Nitrate, Nitrite, Phosphate, Potassium, Arsenic, Boron, Cadmium, Copper, Lead, Iron, Iron (II), Mercury, Manganese, Tin, Zinc, Silver, Selenium, Fecal Coliform Count, Aldrin/Dieldrin, BHC, Chlordane, t-DDT, Endosulfan, Heptachlor/Epoxide, Lindane, 2,4-d, 2,4,5-T, 2,4,5-TP, Paraquat	National Water Quality Standards (NWQS)	<table border="1" style="width: 100%;"> <thead> <tr style="background-color: #d9ead3;"> <th>Stations ID</th> <th>Coordinate</th> </tr> </thead> <tbody> <tr> <td>W1</td> <td>N2° 31' 9.46" E 103° 39' 54.78"</td> </tr> <tr> <td>W2</td> <td>N02° 31' 42.72" E 103° 38' 57.97"</td> </tr> <tr> <td>W3</td> <td>N02° 31' 42.72" E 103° 38' 57.97"</td> </tr> <tr> <td>W4</td> <td>N02° 34' 21.47" E 103° 35' 54.41"</td> </tr> <tr> <td>W5</td> <td>N02° 35' 5.90" E 103° 38' 26.23"</td> </tr> <tr> <td>W6</td> <td>N02° 34' 41.21" E 103° 38' 22.88"</td> </tr> <tr> <td>W7</td> <td>N02° 35' 19.84" E 103° 37' 29.81"</td> </tr> <tr> <td>W8</td> <td>N02° 39' 3.20" E 103° 36' 58.08"</td> </tr> <tr> <td>W9</td> <td>N02° 35' 16.55" E 103° 40' 0.55"</td> </tr> </tbody> </table>	Stations ID	Coordinate	W1	N2° 31' 9.46" E 103° 39' 54.78"	W2	N02° 31' 42.72" E 103° 38' 57.97"	W3	N02° 31' 42.72" E 103° 38' 57.97"	W4	N02° 34' 21.47" E 103° 35' 54.41"	W5	N02° 35' 5.90" E 103° 38' 26.23"	W6	N02° 34' 41.21" E 103° 38' 22.88"	W7	N02° 35' 19.84" E 103° 37' 29.81"	W8	N02° 39' 3.20" E 103° 36' 58.08"	W9	N02° 35' 16.55" E 103° 40' 0.55"	Monthly	<p>The surface water samples will be collected using grab sampling technique (ASTMD 5358, 1993).</p> <ul style="list-style-type: none"> <li>In-situ measurement for pH, Dissolved Oxygen (DO), Turbidity, Total Dissolve Solids (TDS) and Temperature were also carried out during sampling using HydroLab data sonde MS4DS4.</li> <li>The samples will be preserved and stored in a cooler box before being transported to the SAMM accredited laboratory for analysis.</li> </ul>	<ul style="list-style-type: none"> <li>Environmental Officer</li> <li>Environmental Monitoring Consultant</li> </ul>
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Environmental Component	Parameter	Compliance Requirement	Proposed Monitoring Station	Frequencies	Methodology	Personnel Required																
Groundwater Quality	pH value, Colour, Turbidity, Conductivity, Total Dissolved Solids, Chloride, Ammonia, Nitrate, Iron, Fluoride, Hardness, Manganese, Chemical Oxygen Demand, Surfactants, Biochemical Oxygen Demand, Nitrate, Mercury, Cadmium, Arsenic, Cyanide, Lead, Chromium, Copper, Zinc, Sodium, Sulphate, Selenium, Silver, Magnesium, Mineral oil, Phenol, Nickel, Total Coliform, E. Coli, Organochlorine Pesticides (OCP)	Groundwater Quality Standard for Drinking Water Conventional Treatment (GACS for DACT)	<table border="1"> <thead> <tr> <th>Stations ID</th> <th>Coordinate</th> </tr> </thead> <tbody> <tr> <td>G/1</td> <td>N02°31'9.46" E103°39'54.78"</td> </tr> <tr> <td>G/2</td> <td>N02°31'42.72" E103°38'57.97"</td> </tr> <tr> <td>G/3</td> <td>N02°31'42.72" E103°38'57.97"</td> </tr> <tr> <td>G/4</td> <td>N02°34'21.47" E103°35'54.41"</td> </tr> <tr> <td>G/5</td> <td>N02°35'5.90" E103°38'26.23"</td> </tr> <tr> <td>G/6</td> <td>N02°34'41.21" E103°38'22.88"</td> </tr> <tr> <td>G/7</td> <td>N02°35'19.84" E103°37'29.81"</td> </tr> </tbody> </table>	Stations ID	Coordinate	G/1	N02°31'9.46" E103°39'54.78"	G/2	N02°31'42.72" E103°38'57.97"	G/3	N02°31'42.72" E103°38'57.97"	G/4	N02°34'21.47" E103°35'54.41"	G/5	N02°35'5.90" E103°38'26.23"	G/6	N02°34'41.21" E103°38'22.88"	G/7	N02°35'19.84" E103°37'29.81"	Monthly	Installations of ground water are conducted using manual hand Auger. <ul style="list-style-type: none"> <li>• Three (3) meter PVC pipes with two (2) inch diameter size are installed after drilling completed.</li> <li>• Clean disposal bailers used to collect ground water samples.</li> <li>• The collected ground water samples are kept in container and preserved 4°C before sending to the laboratory for analysis.</li> </ul>	<ul style="list-style-type: none"> <li>• Environmental Officer</li> <li>• Environmental Monitoring Consultant</li> </ul>
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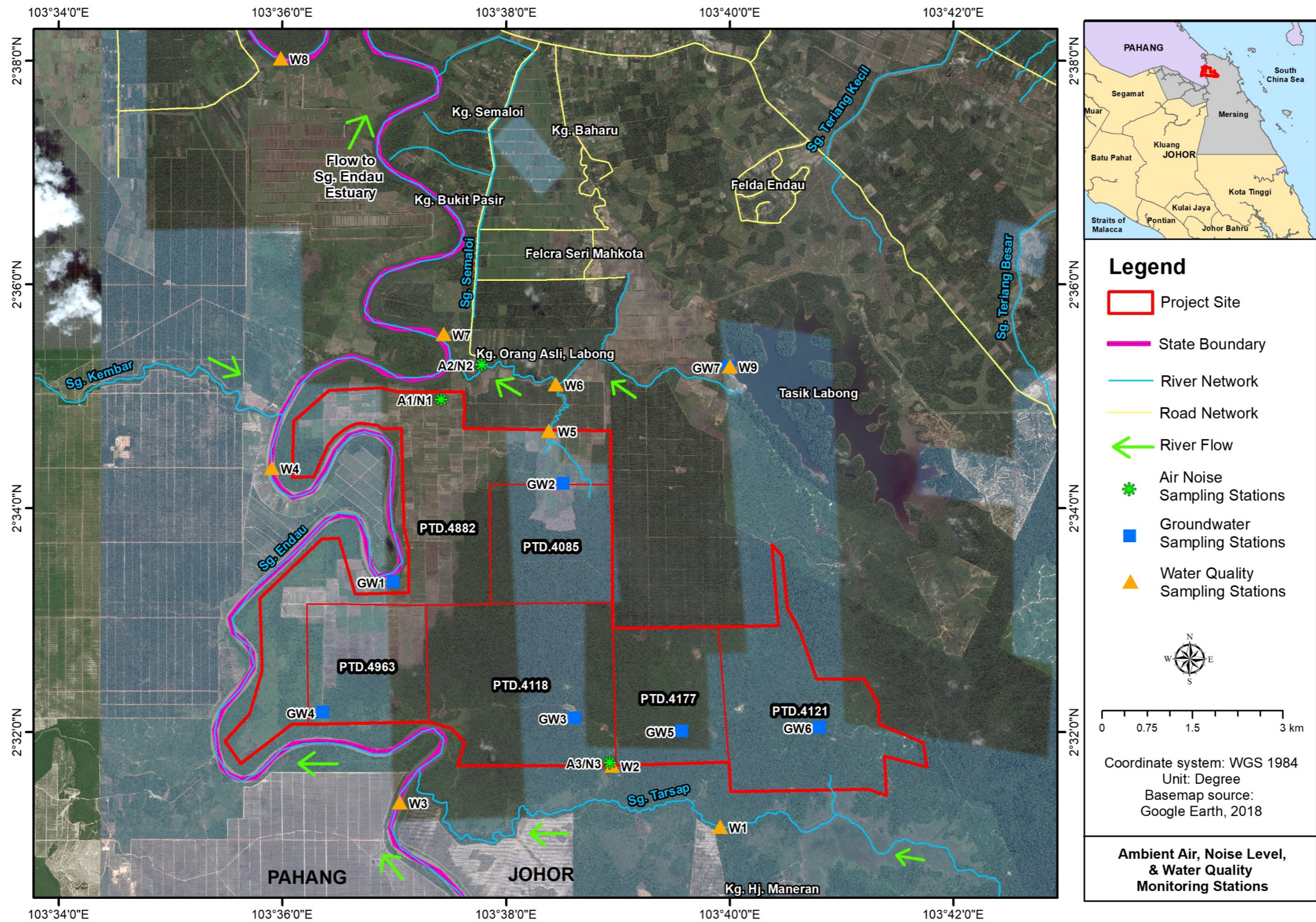


Figure 9-2: Sampling Station for Compliance Monitoring



### 9.4.3 Impact Monitoring (IM)

Impact monitoring is the quality assurance testing carried out over the day-to-day activities of the Project. The conceptual of impact monitoring are summarize in **Table 9-3**.

**Table 9-3: Impact Monitoring Programme**

	<b>Development Stage</b>	<b>Operational Stage</b>
<b>Component</b>	Sediment Basin	Along perimeter drain
<b>Parameter</b>	Erosion & Sedimentation	Phosphate & Nutrient
<b>Compliance Requirement</b>	NA	NA
<b>Proposed Monitoring Station</b>	Discharge outlet of sediment basin	Along perimeter drain
<b>Target and Objective(s)</b>	Erosion & Sedimentation	Algal blooms in ponds should be investigated. Blooms indicate nutrient run-off with surface water.
<b>Frequencies</b>	After rainfall event*	Monthly
<b>Methodology</b>	Visual observation	Visual observation
<b>Personnel Required</b>	Site supervisor	Site supervisor

\* Rainfall intensity recorded 12.5 mm or more

## 9.5 ENVIRONMENTAL AUDIT

Environmental compliance audit will be imposed by DOE in the EIA approval terms and conditions for this Project. It must be carried out by a third-party environmental auditor registered with the DOE subject to the frequency as required by DOE.

The main objectives of the audit are to identify any non-compliance with regards to the EIA/EMP requirements and practices that could be significantly deteriorate the environment and the effectiveness of mitigation measures.

It should also review the environmental condition outside the site area, which is likely to effected, directly or indirectly by site activities.

The audit team shall refer to the following information in conducting the audit but not limited to:

- The EIA approval condition from DOE;
- The EIA recommendations on environmental protection and mitigation measures;
- Best Management Practices as per LD-P2M2; and
- Environmental Monitoring Report.

The audit findings and their associated recommendations on improvements to the environmental protection and mitigation measure shall be submitted to AASSB for taking immediate action. The contractor shall follow the procedures and time frames stipulated in the environmental audit for the implementation of the mitigation proposal. An action reporting system shall be implemented to report on any remedial measures implemented subsequent to the environmental audit within the Project team.

## **9.6 GUIDED SELF REGULATION**

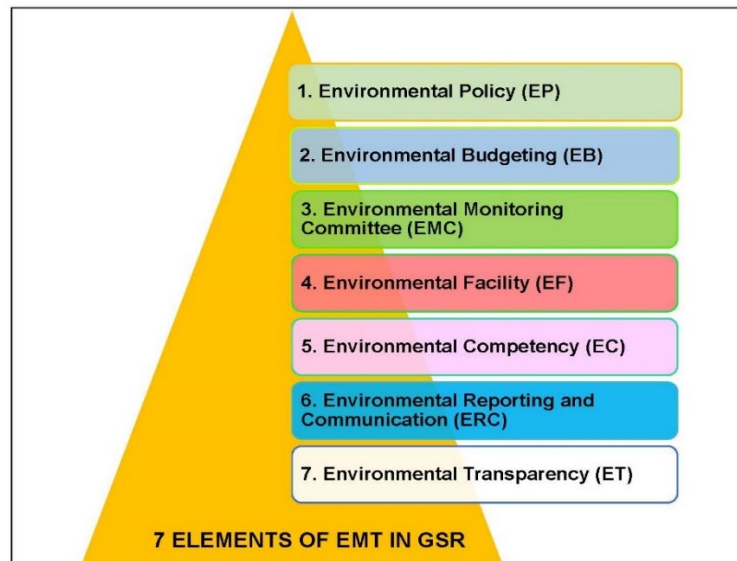
DOE has adopted a regulation approach named 'Guided Self-Regulation (GSR)'. The GSR is a complement to the existing Command and Control approach of enforcement which aimed to achieve environmental compliance to the Environmental Quality Act 1974 more effectively.

These terms will be stated in the EIA Approval Conditions together with the checklist of GSR for better understanding by the Project team, contractors, sub-contractors and those involved in this Project.

The implementation of environmental mainstreaming is to promote and in still self-regulation that will be translated into regulatory requirements on compliance and performance monitoring of pollution control measures, scheduled reporting, record keeping, competent person and involvement of environmental professional playing specific roles.

In order to achieve the state of self-regulation, the DOE has formulated a set of environmental mainstreaming tools (EMT) to be implemented so that the elements were captured and been practices in the organizations.

The seven (7) elements of EMT are shown in **Figure 9-3** below:



**Figure 9-3: Seven (7) Elements of EMT**

Brief description of each element is as below:

**a. EP - Environmental Policy**

An Environmental Policy (EP) of AASSB which shall be communicated to the stakeholders, consultants, contractors, and other parties involved in this Project that demonstrate their strength of message and commitment in managing the environment of their operational activities.

**b. EB - Environmental Budgeting**

Allocate budget for implementing environmental measures to comply with environmental requirements imposed by DOE and other related agencies. This includes sufficient funds for all stage of Project planning and implementation with itemized budget required for water quality monitoring, air quality and noise monitoring, for comprehensive site survey and investigation of the specific existing site conditions, for the implementation of Environmental Management Plan (EMP) including temporary pollution prevention and mitigation measures (P2M2) as discussed earlier. P2M2 shall be those which can be described as Best Available Technologies (BATs), or industry best practices.



**c. EMC - Environmental Monitoring Committee**

Setup two (2) monitoring committee as follows to ensure that roles and responsibilities of top-level management and officers are well structured in managing the environmental issues of the proposed Project site.

It will cover the responsibilities of Project proponent, Contractor(s) and Project consultant involved in this Project. EMC play an important role throughout the construction phase to ensure that all activities were carried out according to the plan without ignoring the environmental impact.

a) EPMC: Environmental Performance Monitoring Committee.

This committee is chaired by a senior officer of the organization and it meets monthly, or at a minimum, once in a quarter.

b) ERCMC: Environmental Regulatory Compliance Monitoring Committee

This committee is chaired by Chief Executive Officer or Chairman of the organization and it meets at a minimum, once a year.

**d. EF - Environmental Facility**

Provide adequate facility in complying with regulatory standard and requirements of effluent treatment system, scheduled waste management facilities, solid waste management infrastructure such as waste bin, wash through, and etc.

**e. EC - Environmental Competency**

Appointing an Environmental Officer (EO) to be charged with responsibilities to execute environmental quality control and performance monitoring functions during the construction and operation phases of the Project implementation. Service of an EO can also be obtained from an Environmental Officer Service Provider (contractor or environmental consultant).

Besides EO, a competent person that Certified Environmental Professional In Scheduled Waste Management (CePSWaM) is value added to monitor the management of scheduled waste at the proposed project site.

**f. ERC - Environmental Reporting and Communication**

Regularly communicate and submit to DOE on progress of Project and compliance status on monitoring programmes and other relevant information once required. This includes other forms but not limited to EIA 1-18, EIA 2-18, ESC On-line and GSR Checklist.

**g. ET - Environmental Transparency**

Be transparent and committed to respond promptly to any complaints if any and to identify any improvements in working practices to avoid breaches of any legal limits.