CHAPTER 8

MITIGATING MEASURES

8.1 INTRODUCTION

The primary objective of proposed mitigating measures is to ensure that the potential impacts, as predicted to be due to the proposed project development, are minimized or reduced to within acceptable limits as set by the Department of Environment and other authorities, and to be of insignificant impacts to the environment.

Recommendations for possible preventive or remedial measures will be made for each of the adverse impacts evaluated as significant in **Chapter 7**. Particular attention will be given to issues mentioned in **Chapter 6**. The recommendations will be made based on discussions with the project proponent and professional judgement for the control of pollutants into the environment. Mitigation will consist of a number of related actions, many of which may consist of ensuring effective management and control of site operations. Mitigating measures for the phases of Construction, Operation and Abandonment including End of Life are discussed below. Monitoring programmes are given in **Chapter 9**.

8.2 MITIGATING MEASURES DURING CONSTRUCTION PHASE

8.2.1 Disturbance Pollution Prevention and Mitigation Measures (LDP2M2)

Erosion control facilities should be ready and operational prior to land clearing and earth works, to ensure that no turbid runoffs are discharged to the drain that flow to Sg. Baluk. Water quality modelling (**Section 6.7**) has shown that if the suspended solids concentration in the discharge from the sediment basin is maintained at below 50 mg/l, the Sg. Baluk water quality would not be significantly impacted during construction. To ensure this is achieved, a Land Disturbance Pollution Prevention and Mitigation Measures (LDP2M2) assessment was carried out (see **Section 7.2**) and the mitigating measures proposed for construction phase are given below:

8.2.2 Adherence to DOE Guidelines

Project proponent must conform and adhere to DOE guidelines for applying the appropriate LD-P2M2 approach in implementing the best available technologies (BAT) or any practical practices. It should be implemented during both construction and operational phases. The requirements and specifications stipulated in the following documents issued by the DOE and DID shall be adhered to:

- Environmental Impact Assessment Guideline in Malaysia (EGIM) – Appendix 3 & 4 (DOE, 2016).
- Guidelines on Land Disturbing Pollution Prevention and Mitigation Measures (LD-P2M2) (DOE, 2017).
- Urban Stormwater Management Manual (MSMA) 2nd Edition (DID, 2012).
- Guideline for Erosion & Sediment Control in Malaysia (DID, 2010).
- Other relevant guidelines and guidance documents issued by the DOE pertaining to environmental-related system and management.

8.2.3 Principles of LD-P2M2

The selected LD-P2M2 shall be installed and correctly maintained. The surface runoff shall be channelled into sediment basin(s) and silt traps to reduce the sedimentation in the receiving stream/river. During the project period i.e., earthwork and construction phase, the project proponent is required to carry out environmental monitoring and audit programs as part of the implementation of LD-P2M2 to ensure environmental compliance in term of water quality due to erosion and sedimentation. To review the performance of the implementation of Best Management Practices (BMPs) and its maintenance records, as well as to verify the results of the water quality assessment, the audit shall be carried out by experienced and qualified person who is registered with the DOE. When the selection of the Best Management Practices is carried out in such a manner, the stated objectives can be achieved and be workable on site. Any changes or modifications need to be carried out in a systematic manner where revision plans shall be issued to all relevant parties, clearly indicating the changes. The control measures are designed based on the following principles (EGIM DOE, 2016):

a) Integrate project design with site constraints.
b) Preserve and stabilize drainageways.
c) Minimize the extent and duration of disturbance.
d) Control runoff flows onto, through, and from the site in stable drainage structures.
e) Stabilize disturbed areas promptly in a timely manner.

f) Protect steep slopes.
g) Use sediment controls to prevent off-site damage.
h) Protect inlets, storm drain outfalls, and culverts.
i) Provide access and general construction controls.
j) Inspect and maintain control measures.
k) Employ experienced and competent personnel.
l) Conduct training on environmental requirements to relevant parties.

8.2.4 LD-P2M2 Layout

The LD-P2M2 shall be constructed at the project site before any of the land-disturbing activities started. The overall LD-P2M2 layout plan designed for the project is shown in **Figure 8.2(1)**.

Figure 8.2(1) LD-P2M2 (Post-Bulk Stage)

8.2.5 Post-Bulk Stage

No LD-P2M2 is designed for the pre-bulk stage as the site was already graded to platform level. The LD-P2M2 layout for the post-bulk stage is shown in **Figure 8.2(1)**. The LD-P2M2 shall be installed prior to the commencement of land clearing at site. Temporary earth drain (TED) is designed to collect the surface run-off and channel it into the proposed sediment basin prior to final discharge into the outside water body, i.e., existing earth drain within the Gebeng Industrial Estate (GIE).

8.2.6 Soil Erosion Control

The preventive measures shall be planned through the preparation of an LD-P2M2 to minimize the erosion before development begins. The contractor shall conduct the land clearing and earthwork in phases. By maintaining the existing vegetation to the maximum extent, it is possible to help filter runoff and provide erosion protection. Inactive working areas (areas not anticipating any activity in upcoming 30 days) shall be stabilized within 7 days with proper stabilization techniques (MSMA, DID, 2012). The following soil erosion control shall be provided at the project site:

1) **Preservation of Vegetation Strips**

Preservation of existing vegetation such as trees, shrubs and plants can minimize the soil disturbance at the project site, stabilize soil, trap suspended particles from sheet flow runoff and promote infiltration of storm water; in particular trees in river reserve should be left in place to filter runoff etc. before it enters the stream or river. **Figure 8.2(2)** shows an example of vegetations strip along a river. Whenever practicable, 10m width of the vegetation strip at the area perimeter shall be preserved for water quality protection and reduction of pond bank erosion (MSMA, DID, 2012). River reserve widths as specified by JPS (DID) is given in **Table 8.3 (1).**

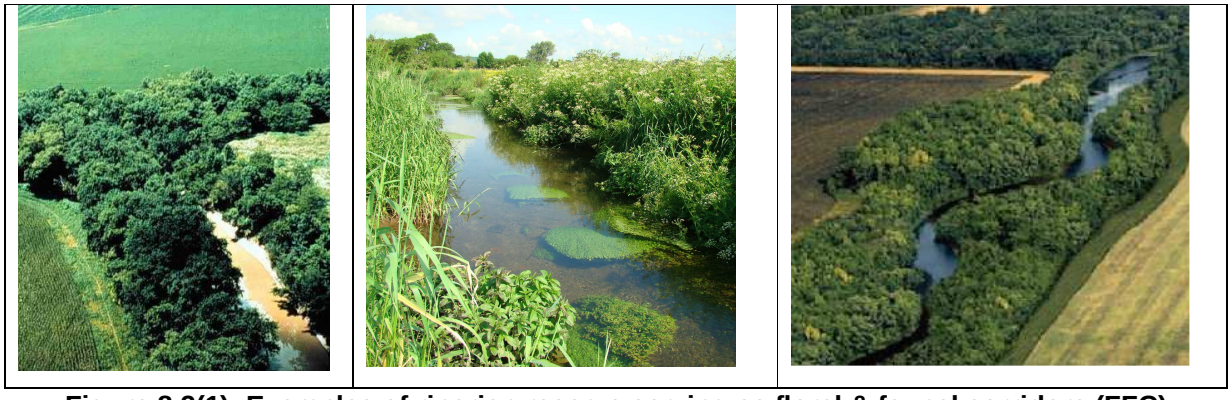


Figure 8.2(1): Examples of riparian reserve serving as floral & faunal corridors (FFC)

2) **Mulching and Earth Cover**

Biomass can be left to mulch on site and applied over the bared and exposed area. Mulching used as soil cover has the potential to reduce erosion by as much as 90%. Whenever practicable, mulching shall be used either to stabilize temporarily or permanently cleared or barren areas. Mulching increases soil infiltration capacity, thus reducing runoff volume. Where there is insufficient mulch for cover, biodegradable earth cover which may function as seed germination blanket may be applied.

Mulching to reduce erosion

Biodegradable earth cover

Slope cover and seed germination blanket

Figure 8.2(2): Earth Covers by mulching or biodegradable covers

8.2.7 Runoff Control & Management

a) Runoff management is a process to control the direction, volume and velocity of the transport medium and safely convey storm water so that its potential for erosion is reduced. It also able to direct storm water away from exposed soils. Transport control should direct the flow to areas where the sediment can be trapped and removed. This will decrease the amount of runoff, detain runoff to reduce its velocity and divert runoff from erodible areas. During the earthwork activity, temporary earth drain (TED) shall be constructed along the phase area perimeter to collect the surface runoff and channel it into the proposed silt traps and sediment basin(s). TED shall take into consideration a flood return period of a minimum of 10 years to ensure that there is no overflow into the nearby existing area. It should be altered as and when necessary.

The TED also shall be constructed at the existing ponds perimeter to control the sedimentation into the pond. Check dams shall be installed in the proposed TED to reduce surface runoff velocity and assist in sediment trapping. A rain gauge station shall be installed within the project site and inspection and maintenance, if necessary, of the proposed ESCP measures shall be carried out once the rainfall reading is ≥12.5 mm. Examples of runoff control and management are shown in **Table 8.2(1).**

Table 8.2(1): Example of Runoff Control and Management

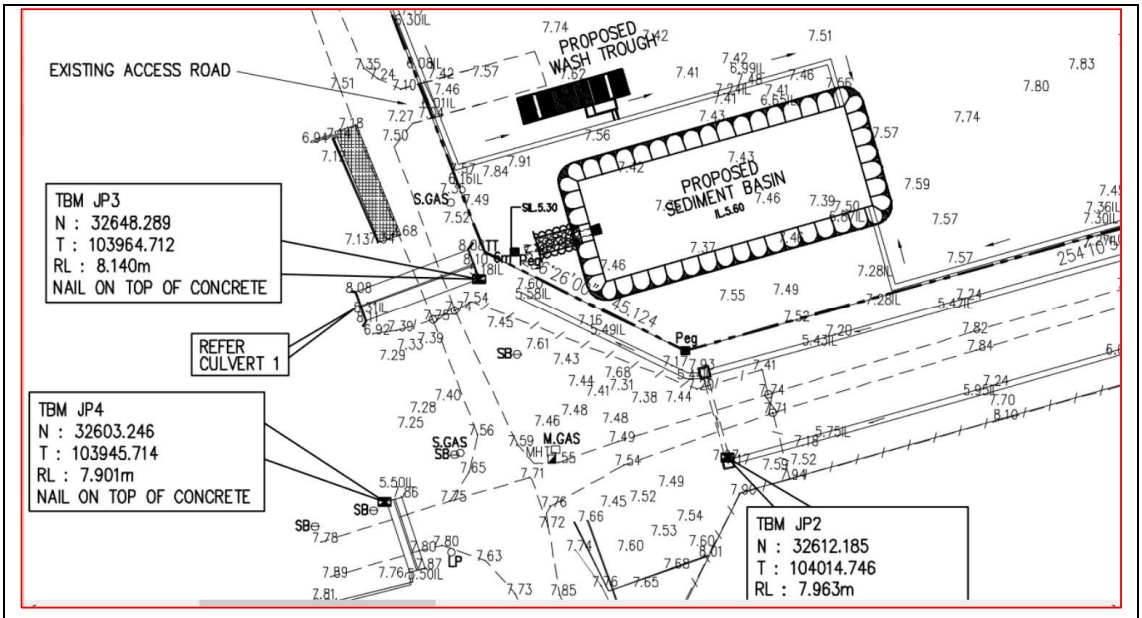
RUNOFF MANAGEMENT	Example Photo
Temporary Earth Drain (TED) Temporary earth drain diverts runoff from stabilised areas around disturbed areas, and direct runoff into sediment traps or basins. Provision of earth drain increases the potential for infiltration and diverts sediment-laden runoff into trapping devices. The channel requires regular inspection and after each rainfall, sediments built-up in the channel that could restrict its flow capacity need to be removed.	 **Earth drain**
Temporary Waterway Crossing Temporary waterway crossing, e.g., a culvert shall be provided for access purposes. It provides erosion free access point. The outlet may be composed of rock, grouted riprap, or concrete rubble which is placed at the outlet of a culvert, conduit, or channel to prevent scour of the soil caused by high flow velocities, and to absorb flow energy to minimise erosive velocities. Outlet protection and velocity dissipation prevents the flow from eroding the receiving downstream reach.	 **Culvert**
Arrangement of Check Structure Check structure is located at strategic locations to reduce the velocity of the storm water flows, thereby reducing erosion of the diversion channel and promoting sedimentation. Check structure shall be installed with intervals of 20 meter, based on site condition.	 **Check dam**

8.2.8 Sediment Control

It is well known that storm water runoff is the principal cause of soil erosion. Proper storm water handling for erosion control can be accomplished by one or combination of the following ways, which are reduction and detention of the runoff, interception, and diversion of runoff. Under the development, the following measures are proposed to minimize and mitigate sedimentation as well as other environmental issues.

1) Silt Trap and Sediment Basin

The details of sediment basin (**Figure 8.2(4)**) proposed for the post-bulk stage are shown in **Figure 8.2(**. Before land-disturbing activities are executed, sediment basin shall be first constructed and made operational. Any constructed sediment basin shall be equipped with vertical silt marker for the purpose of measuring the depth of accumulated sediment to facilitate maintenance program. Performance monitoring (PM) shall be carried out regularly and the maintenance work shall be conducted at least once a month or as required.



Sediment Basin SB-1: Area = 8.0937 ha
Dimensions: 61.4m x 26.2m x 1.9m (depth)
SB1 design calculation sheet is shown in **Appendix 3**.

Figure 8.2(4): Proposed Sediment Basin and location of Wash Trough

2) Wheel Wash Trough

A wheel wash through shall be installed at the egress point of the project site to prevent carryover of earth materials and other pollutants onto public roads **(Figure 8.2(4))**. All vehicle tyres shall be cleaned before entering public road and the vehicle body shall be briefly hosed down as shown in **Figure 8.2(5)**. A typical wheel wash trough design is shown in **Figure 8.2(5)**. Vehicles shall enter and leave the development site only via the permitted exit. Overflows and storm water from the wash are to go through to a silt trap. Removed materials and collected sediment must be disposed in a suitable manner that will not cause erosion or pollution hazard to river water quality.

Vehicle hosing to remove dirts from vehicle body

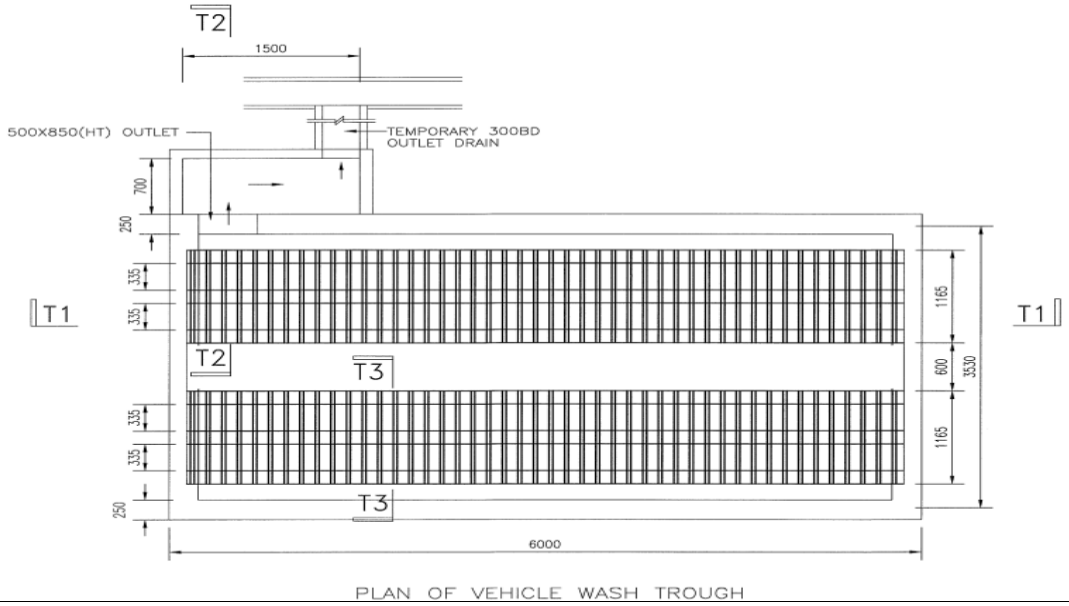


Figure 8.2(5) Wheel wash trough with vehicle hosing and a typical trough design

8.2.9 Inspection and Maintenance

The site operation and LD-P2M2 shall be inspected regularly as part of the Performance Monitoring (PM) program. Performance Monitoring (PM) shall be carried out to ensure that the LD-P2M2 at site are in optimal condition and effectively control the impacts from the project activities to within acceptable levels. An Environmental Officer (EO) shall carry out the performance monitoring at site. The compliance and performance Monitoring (PM) program, is summarized as follows:

Table 8.2(2): Compliance and Performance Monitoring for LD-P2M2 Measures

Location	Frequency	Parameters	Compliance Level	Reporting
a) Compliance Monitoring				
Final discharge point from the project site	Monthly and after heavy rainfall (>12.5mm)	TSS and Turbidity	TSS (≤50mg/l) Turbidity (250NTU)	Monthly and within 24 hours after the heavy rainfall (>12.5mm)
b) **Performance Monitoring (PM)**				
All P2M2 on site: • Silt traps • Temporary earth drains • Check dams • Silt fences • All P2M2	• Daily • After heavy rainfall (>12.5mm)	Structural integrity, functionality, practicality, and frequency of maintenance for all P2M2	• Approved LD-P2M2 and ESCP. • Design of P2M2 to comply with MSMA 2nd Ed. specifications.	Weekly reporting to Project Manager

8.2.10 Competent Person

An experienced environmental officer (EO) shall be appointed to manage and supervise the implementation and maintenance of the LD-P2M2 at site. The EO must be a competent person i.e., Certified Erosion, Sediment and Stormwater Inspector (CESSWI) or equivalent as recognized by the DOE.

8.2.11 Air Quality due to earthworks and transportation

Mitigation measures for air quality control are important so that adverse impacts to the environment and humans will be reduced. The mitigation measures recommended for air pollution are as follows (examples are shown in **Figure 8.2(6)**);

1) Fenced construction area to reduce wind-blown dust dispersion and dust clouds;
2) The heights from which materials are dropped should be reduced to a practical minimum height to control fugitive dust emissions arising during material handling;
3) Ensure construction access or haulage route are kept damp by water browser or equivalent measures on regular basis during the whole construction period. As a rule of thumb, water spraying should be conducted at least every 2 hours during hot and dry conditions when evaporation of water is greatest (*Hong Kong Construction Association, 2013*). More frequent water spraying should be conducted as when necessary;
4) All dusty materials should be sprayed with water prior to any loading, unloading or transfer operation so as to maintain the dusty materials wet;
5) The load carried by the vehicle off-site should be covered by clean impervious sheeting to ensure that the dusty materials do not leak from the vehicle;
6) All construction vehicles shall have their wheels washed in a wheel wash trough before leaving the site onto a public road;
7) Areas cleared for open spaces shall be turfed as soon as possible;
8) All vehicle within the Project Site to adhere to the speed limit of 25 km/hr;
9) All stockpile construction material that could generate fugitive dust during high wind speed such as fine sand and aggregate to be covered when not in used or during high wind speed;
10) Fuel-efficient and well-maintained haulage trucks will be used to minimize exhaust emissions. Smoke belching vehicles and equipment shall not be allowed and shall be removed from the Project Site;
11) Undertake immediate repairs of any malfunctioning construction vehicles and equipment;
12) Idling of engines shall be discouraged;
13) To maintain good housekeeping at the Project area, a good housekeeping checklist for managing construction dust can be developed by the Project Proponent as part of its periodic internal environmental auditing for the Project;
14) The supervisor for the project site must keep a log book to compile all complaints from the surrounding dwellers and address the issues immediately.

15) Installation and operation of portable generator set or other fuel burning equipment should comply with the requirements of the Environmental Quality (Clean Air) Regulations 2014 or CAR 2014; usage of a generator set in the site has to comply with CAR2014, Third Schedule, Regulation 13. A Written notification must be forwarded to the DOE.

Where applicable, Project Proponent to adopt Best Management Practices (BMPs) for control of fugitive dusts during construction activity as examples illustrated in **Table 8.2(3).**

Table 8.2(3): BMP Examples for Control of Fugitive Dust during Construction Activities

Best Management Practice	BMP Description
	Minimize disturbance of exposed ground surfaces: Avoiding unnecessary disturbance of exposed surfaces will decrease generation of fugitive dust and reduce clean up works.
	Pave haul roads and storage areas: Heavy vehicles pulverize surface materiasl and create a constant source of dust. If too costly, pave just the entrance and gravel the remainder to reduce the amount of surface silt.
	Apply dust suppression measures when needed: The schedule of application may need adjusting to more frequent application intervals.
	Clean up dusty spills immediately: Regular scheduled and unscheduled housekeeping is required to ensure Project site cleanliness.
	Grow vegetative ground cover: Growing of grasses or legumes is the most effective and feasible control as these plants may provide dense cover. Even when the plants dry up, the roots help to hold the soil in place.

Table 8.2(3): BMP Examples for Control of Fugitive Dust during Construction Activities

Best Management Practice	BMP Description
	Use wind erosion controls: Bushes or trees, wood or rock walls or earthen banks may function as permanent wind-breaks. Porous wind fences (about 50% porosity is ideal) may be employed as temporary measures; reduced wind velocity allows larger particles to settle to the ground.
	Enclose dusty materials storage and handling areas: Where dusty materials are frequently loaded and unloaded, employ storage silos, 3-sided bunkers or open-ended building. If handling is less frequent, wind fencing may be used. Conveyor loading may require enclosure or water spray bars above and below the belt to reduce emissions.
	Water using water bowser and/or sweep often: Fewer treatments are necessary in cool, wet weather. Ensure adequate water supply and dust control equipment is in good working order.
	Reduce speed: Limit speed on unpaved surfaces to 15 or 25 km per hour for well-travelled areas and heavy vehicles, never exceed 40 kmph for any vehicle on any unpaved surface.
	Minimise transport of dusty material offsite: Rinse vehicles before they leave the property and tightly cover loaded trucks.

In addition to the above BMPs, the Project Proponent shall also refer to the Department of Environment (DOE) Malaysia issued guidance document for mitigation of fugitive emission under the **CAR 2014**. The guidance document is entitled "***Guidance Document on Fugitive Emission Control"***.

8.2.12 Noise Level Due To Construction Works

During construction, the increased noise level is mostly due to machineries and heavy vehicles. The mitigation measures recommended for noise nuisance are as follows;

- Vehicles and machineries shall be regularly serviced and maintained.
- Hoardings shall be erected around the project site in order to mitigate noise nuisance towards the surrounding areas.
- Proper mitigation measures for the personnel likely to be exposed to high noise level like provision of Ear Protective Safety Equipment (ear plug or ear muff)
- The supervisor for the Project site must keep a log book to compile all complaints from the surrounding dwellers, if any, and address the issues immediately.

8.2.13 Water Quality due Workers' Discharge of Sewage and Sullage

As the project is relatively small in size, during construction, the workers are expected to be housed in the surrounding Gebeng and Balok areas and no workers camp would be set up. Sufficient number of temporary toilets are to be installed, serviced by the supply company, with sewage disposed into a proper sewage treatment plant. Once the permanent sewage facilities are installed, these may be used by the workers.

8.2.14 Wastes Management of Construction and Sanitary Solid Wastes

a) During site clearing, wastes are to be managed as follows:

- Vegetative wastes and illegally dumped industrial scraps are to be sent to the nearest sanitary landfill (Jabor sanitary landfill) using proper waste trucks, with wastes covered to ensure no overfilling and spillage.
- The site supervisor is to make sure of the number of trucks, and that their loads are disposed at the sanitary landfill, and not dumped elsewhere, such as via consignment note.
- No burning of wastes is allowed and a board warning against burning should be prominently displayed near the workers' entrance, as shown below:

b) During construction

The contractor has to be made responsible for proper management of wastes at site and the daily SOP has to include site management to ensure all wastes are properly taken care of. The SOP becomes part of the EMP for the Site Environmental Officer (EO). As far as possible wastes should be sold to recyclers, eg, metal scraps, cardboards, plastics, etc. The disposable unrecyclable wastes shall be accumulated in designated waste bins, and collected by licensed waste collectors. Disposal will be at the nearest approved landfill.

With respect to garbage management sufficient number of covered garbage bins at required locations should be provided and garbage should be regularly collected and disposed by a licenced commercial garbage collector. The biodegradables have to be regularly and promptly collected to avoid leachate, odour and pests, while the non-putrescibles may be collected about once a fortnight (dry collection). Otherwise, putrescibles and canteen wastes may be composted in in-situ composters **(Figure 8.2(7))**, such that only paper, plastics and bottles may be segregated and disposed as dry wastes about once a fortnight.

Figure 8.2(7): Composters to compost putrecibles (food wastes, etc.)
(www.envirosourcesb.com)

8.2.15 Management of Scheduled Wastes

All scheduled wastes shall be stored in secure storage areas, constructed in accordance to requirements of the Environmental Quality (Scheduled Wastes) Regulations 2005, EQ(SW)R 2005. All aspects of management of scheduled wastes have to be in compliance with the EQ(SW)R

2005, such as, scheduled wastes can only be collected and transported by licensed collectors and transporters, and their labelling, handling and storage have to be as stipulated by the EQ(SW)R 2005. Clearly labelled and secure storage facilities have to be erected to ensure that people and premise are safe from possible fire, waste spillage, reactions, etc. Fuel and waste oil storage bases have to be bunded, with bunded volume at 110% of maximum tank volume. Any spillage shall be promptly collected and managed as scheduled waste(s). All wastes have to be accounted for and audited against the raw materials (lubricants, etc) brought in.

8.2.16 Traffic due to Transportation of materials and movement of vehicles

All the guidelines and procedures recommended by the Road and Transport Department, JKR, and other authorities must be followed. Install temporary pavement on top of the existing road network at the exit/ entry points. Schedule the movement of heavy vehicles to enter and exit the existing road to off-peak hours. Ensure parked trucks along the roadside do not to cause traffic congestion. Install adequate temporary signage and markings as recommended by JKR Guidelines, i.e., Arahan Teknik (Jalan) 2A- 85 and 2C-85, Standard Traffic Sign and Temporary Signs and Work Zone Control, such as the signages shown in **Figure 8.2(8).**

Ensure all loads are securely covered. Any spillage, should it occur shall be promptly cleared off the road. Ensure all vehicles are well maintained and do not emit thick smokes or loud noises.

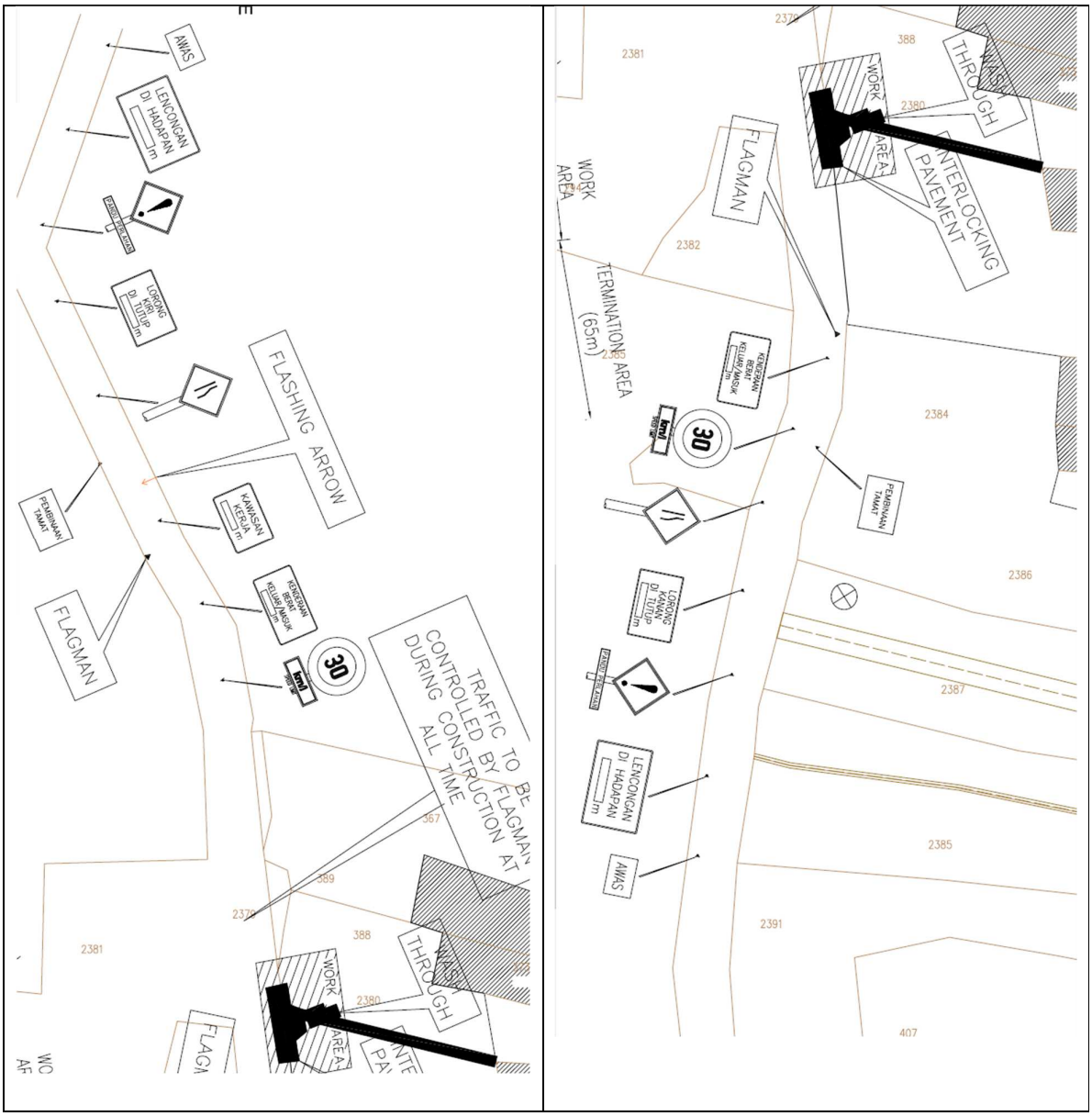


Figure 8.2(8) Proposed traffic control features during construction

8.2.17 Socioeconomic Mitigating Measures

During construction, the professional staff, such as engineers, will be Malaysians with several Japanese professionals. The construction workers will be Malaysians, with priority to locals; as the number of workers is expected to be about 50 heads at most times, no workers quarters will be provided. As the staff and workers settle in nearby areas, there will be demands for housing and services, thus positively contributing to commercial growth around Gebeng, Baluk

and Kuantan. As seen in landuse assessment in **Chapter 6** the adjacent townships are rapidly growing with housings under construction, thus should be able to absorb the requirements due to this proposed project.

For non-specialised jobs during construction, priorities will be given to local businesses.

The project proponent is to implement a Traffic Management Plan to ensure minimum congestion and maximum safety for workers, pedestrians, and road users in general.

8.3 MITIGATING MEASURES DURING OPERATIONAL PHASE

8.3.1 Preliminary

As discussed in Chapter 7, and shown by **Table 7.1(1) Project Activities and Potential Environmental Impacts,** during operational phase the activities which might significantly affect the environment are the discharges of gaseous and liquid effluents. Air quality modelling (AQM) was carried out to predict potential impacts of the discharges from the SCaRF (see **Section 7.5**); the findings may be summarised as:

a) During normal plant operation, the contribution of identified criteria air pollutants from the project to the surrounding environment is assessed to be minimal or insignificant at all identified off-site sensitive receptors.
b) All identified pollutants are not anticipated to create any significant impact to the existing airshed.

Water Quality Modelling (WQM) was also carried out (See **Section 7.6**) to predict potential impacts of the discharge of industrial effluents, treated or otherwise (raw or without treatment) at the river's normal and low flows and found the potential impacts to be insignificant, with discharge from SCaRF making no difference to water quality of Sg. Baluk, primarily because the discharge from SCaRF is relatively small, at only 385 m^3/d at full capacity. Nevertheless, the Industrial Effluent Treatment System (IETS) has to be in good operating conditions at all times, with treated effluent complying to the Standard B of the Environmental Quality (industrial Effluent) Regulation 2009 or the EQ(IE)R2009; for this the mitigating measures are given below, together with other relevant mitigating measures.

8.3.2 Air Quality due to Gaseous Effluent Discharge

The main emission is from the slow roasting process; the use of soda roasting process where Sodium Carbonate, Na_2CO_3, is added (**Figure 5.3(3)**) is crucial to this process, as it traps the acidic gases and compounds from being in gaseous form and going out into the air pollution control system (APCS). Thus, ensuring sufficient addition of Na_2CO_3 is necessary to ensure the wellbeing of the roasting process and the reduction of acidic gases, before the exhaust gas moves to the APCS stages.

Performance of each stage or unit operation of the APCS has to be carefully monitored and tracked in terms of performance trend so that the performance of the next unit is predictable. In the same way the load to the final unit, the electrostatic precipitator (EP), should be maintained at all times, at levels calculated to comply to the emission limit as per EQ(CA)R 2014.

Each stage of the APCS should be operating and releasing gaseous effluent within a set envelop. With these boundaries defined, any exceedance beyond the envelope, at any stage in the APCS, not just at the stack, can be connected to trigger an alarm at the control room and at the mobile handphone of the person in charge (PIC).

Continuous emission monitoring system (CEMS) are to be installed at both stacks to ensure emission comply to CAR 2014; the DOE guidelines on CEMS as shown below should be referred to, as the system has to interphase with the DOE infrastructures.

For the proposed Project, the Air Pollution Control System for Scrubber System shall be monitored in accordance with Department of Environment (DOE)'s *Technical Guidance on Performance Monitoring of Air Pollution Control System (APCS).* As required by the DOE, the APCS will be operated and maintained by **competent personnel**, who is trained and certified under the *Certified Environmental Professional in Bag Filter Operation (CePBO)* and/or *Certified Environmental*

Professional in Scrubber Operation (CePSO). The relevant schedules of the **CAR 2014** for the proposed stacks emission concentration limits are as follows:

1. Proposed Scrubber System - ***Fifth Schedule [Regulation 15]: Emission Standards for Hazardous Substances: Category (4) Gaseous and volatile inorganic substances: (a) Volatile inorganic substances other than Oxides of Sulfur and Oxides of Nitrogen:*** *Class (3): In case of an untreated mass flow of 300 grams/hour or more for each substance an emission standard of 30 mg/m^3 applies for NH_3 and Category (4) Gaseous and Volatile Inorganic Substances: (b) Oxides of Sulphur and Oxides of Nitrogen: general limit values for oxides of sulphur (sum of SO_2 and SO_3 expressed as SO_2) and oxides of nitrogen (sum of NO and NO_2 expressed as NO_2): In the case of an untreated mass flow of 5.0 kilograms/hour or more for each substance an emission standard of 400 mg/m^3 shall apply if not stated otherwise bin the Third Schedule* and *Second Schedule [Regulation 13]: Limit Values and Technical Standards (General): (II) Control of NMVOC Emissions: 1 (b).*

As prescribed in **Regulation 6: Measure to reduce emission**, the regulation is as read below:

> An owner or occupier of a premises involved in any activity or industry listed in First Schedule shall incorporate measures to reduce the emission of air pollutants to the atmosphere in accordance with the Best Available Techniques Economically Achievable determined by the Director General.

For the Project, the relevant Best Available Technique (BAT) Guidance Documents and Guidance Document issued by DOE Malaysia under the **CAR 2014** are as follows:

- ***Guidance Document on Fuel Burning Equipment and Air Pollution Control Systems*** for the design of the Fuel Burning Equipment, Bio-scrubber System and Chimney.

As prescribed under CAR 2014, **transmissometer** for **opacity measurement** (Regulation 12(3)) (*for premise that emits 2.5 kilograms per hour of dust or more or has potential to emit smoke darker than shade No.2 on the Ringlemann Chart*) and/or Continuous Emission Monitoring System (CEMS) [Regulation 17(1)] will be installed at the relevant stack and links directly to DOE for its monitoring purposes. For the CEMS for its air emission monitoring, the Project Proponent is to be guided by the following DOE issued guidelines

- Volume I: Guideline for the Installation & Maintenance of CEMS for Industrial Premises/Facilities;
- Volume II: Guideline for the Continuous Emission Monitoring Systems – Data Interface System (CEMS-DIS) for Industrial Premises/Facilities.

- Prior to any installation of fuel burning equipment and air pollution control system, **Written Notifications** as required under Regulation 5 the above said regulations shall be carried out by submission to the state DOE office as per the following:
  - AS/PUB/N-APB: Air Emission Sources (Fuel Burning Equipment);
  - AS/PUB/N-Bagfilter: Air Emission Sources (Air Pollution Control System [Bag Filter]);
  - AS/PUB/N-Scrubber: Air Emission Sources (Air Pollution Control System [Scrubber]);
  - AS/PUB/N-Chimney: Installation of Exhaust/Vent, and
  - Other relevant forms issued by DOE Malaysia.

Upon completion of the installation of these equipment, a written declaration shall be submitted to state DOE under Regulation 7(5).

As prescribed in CAR2014, the mechanism of monitoring stack emission from declared sources such as CEMS and periodic monitoring exercise during the Project operation will assist the Project Proponent in documenting its air pollutants contribution to the receiving environment and from time to time to evaluate the economically achievable best available techniques as practiced by internationally and/or prescribed by Director General of Environmental Quality under the Best Available Technique Guidance Documents as provided under the CAR 2014 to reduce its future emission to the receiving environment.

It is to be noted that in the DOE issued guidelines under CAR 2014 entitled ***"Guidance Document for Fuel Burning Equipment and Air Pollution Control Systems"***, it was prescribed that *as a general guideline, a minimum requirement of the stack height should be at least 3 meters above the highest structure within vicinity of the stack*. While any weather protection cowls shall be designed so that they do not obstruct the vertical free flow of gases, fumes or dust. The recommended rain cap as prescribed in the above guidelines is shown as **Figure 8.3(1)** below.

Annex 9

Recommended Rain Cap

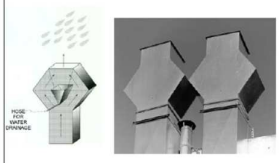
No.	Rain Cap	Name
1.	**Hexagonal –** This design diverts air around an internal wedge used to catch rain. A hose is connected to the bottom of the wedge which drains the collected rain water	
2.	**Stack-in-a-Stack –** This design is based on the principle that rain falls at an angle. The inner stack is surrounded by an outer stack with space between the two. Rain runs down the inside wall of the outer stack, instead of down the inside wall of the inner stack	
3.	**Hinged Stacks –** A hinged flapper damper opens when paint booth is on, and closes when fan is turned off. A booster fan may need to be installed to help push open the flaps.	
	Another version the flapper damper opens and closes with the aid of a counter weight that slides back and forth on a rod for manual adjustment	
4.	**Inverted Cone Stack –** Grating or brackets support the cone which is suspended above the stack opening.	

Figure 8.3(1): DOE Recommended Rain Cap

The sampling ports for the proposed stacks shall be designed in accordance to the Malaysian Standard **MS 1596: 2003: Determination of Concentration and Mass Flow of Particulate**

Matter in Flue Gas for Stationary Source Emissions. The extract is shown in **Figure 8.3(2)** below:

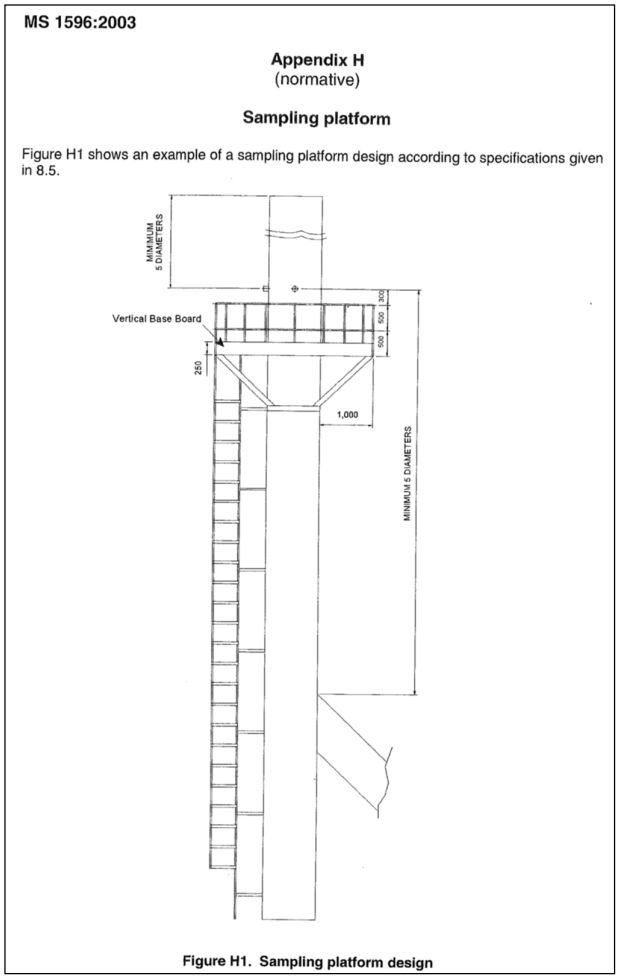


Figure 8.3(2): Sampling Platform Design

8.3.3 Water Quality DueTo Effluent Discharge

Treated effluent complying to at least Standard B of EQ(IE)R2009, is to be ensured at all times. Water quality modelling carried out for various scenarios (**Section 7.6**) has shown that due to relatively small flowrate from the proposed project, as compared to the flowrate of Sg. Baluk, the loading from SCaRF would not make any noticeable change to the concentrations in Sg, Baluk, in all the scenarios. Nevertheless, the legal emission limit for SCaRF is the Standard B of EQ(IE)R2009, and this shall be complied to at all times, for all parameters.

To ensure that the treated effluent quality always meets the Standard B of the EQ(IE)R2009; among essential measures are:

- The IETS is designed to release maximum of half the Standard B limit for each

parameter;

- The plant does not release more than the load designed for the IETS feed load.
- Should there be unusual loads from maintenance or process failure, the load should be contained in an emergency tank for slow dosing without upsetting the IETS conditions. If this is performed, the IETS conditions should be carefully monitored during dosing.
- The treated effluent tank (also as Backwash water tank) may be used as a Check Pond, where at its inlet may be place online pH and ammonia meters; non-complying treated effluent may then be recycled for further treatment.

Good performance of the IETS is to be ensured at all times, throughout its lifetime. Symptoms of plant lack of performance are to be detected during regular monitoring of the IETS. Among the symptoms and their mitigating measures are:

a) Insufficient removal of nutrients

   Ensure sufficient aeration, and residence time for nitrification to occur.

b) Insufficient removal of organics

   Ensure sufficient aeration and residence time for oxidation to occur.

c) Insufficient removal of suspended solids

   Ensure sufficient settling time and that flocs are stable with good settling characteristics at all times. At all times look out for potential bulking, due to surges or accidental loadings, e.g. due to washings of containers, spillages, etc.

d) Equipment upset leading to incomplete treatment

   Any upset should be immediately attended to via spare equipment, with insufficiently treated effluent returned for treatment. This return line should be provided in the design.

8.3.4 River Reserve Allocation and Protection

Riparian vegetation on the river reserve (at least 5m wide) serves to filter runoffs and maintain bank integrity; without the river reserve runoffs from sites and roads would directly enter the river, polluting its water with sediments from vehicle tracks, wastes from road surfaces, etc. The road reserve has another important ecological function, where being contiguous along the rivers, it acts as floral and faunal corridors (FFC) that protect and provide ecosystems for riparian vegetation and insects and small faunas (lizards, frogs, birds, fireflies, butterflies, bees, beetles, etc.) as well as larger animals, such as otters, river terrapins, monitor lizards, etc. FFCs such as those shown in **Table 8.3(1)** eventually merge with those wider FFCs along Sg. Baluk, and may become ecosystems for enriching the local wildlife. Without such FFCs, developments in GIE would diminish the local flora and fauna, while the banks would be more prone to bank attrition and eventual collapse, notably during heavy rains or floods.

The project proponent needs to ensure the project boundary does not encroach into river reserves (also known as riparian reserves). There should be sufficient buffer between the boundaries of the proposed development to the riverbank. The Malaysian Department of Irrigation and Drainage (DID) have guidelines on this, as depicted in **Table 8.3(1)** below. For the proposed project site, the drain in front of the lot becomes a tributary of Sg. Baluk and should be allocated a reserve of 5m to the fence to be maintained as river reserve. As far as possible the river reserve should be planted with riparian vegetation, so that it would become FFCs as well as bank protector.

Table 8.3(1). River Reserves for Development based on River Width (DID, 2008)

River Width (m)	River Reserve (m)
>40	50
20 - 40	40
10 - 20	20
5 - 10	10
<5	5
Ref.: Department of Irrigation and Drainage (DID) (2008). Online : Pembangunan Melibatkan Sungai dan Rizab Sungai, retrieved on 12th January 2017. http://www.water.gov.my/images/pdf/information_for/garis panduan pembangunan melibatkan sungai rezab sungai.pdf.	

8.3.5 Scheduled Waste Management During Operation

Generation of any scheduled waste (SW) has to be notified to the DOE, with the inventory regularly updated, using provisions in the eSWIS system, as according to the Environmental Quality (Scheduled Wastes) Regulation 2005, EQ(SW)R2005. The inventory matches the generation rate as given in the Mass Balance (MB) and any transfer out of the plant is accounted in the eSWIS system. In this way all the SW is accounted for.

All scheduled wastes shall be stored in secure storage areas, constructed in accordance to requirements of the EQ(SW)R2005. Storage of hazardous material, such as oil and chemicals, has to be in separately bunded areas, with bunded capacity at 110% of the biggest tank volume. Any spillage shall be promptly collected and managed as scheduled waste(s). All aspects of management of scheduled wastes have to be in compliance with the EQ(SW)R 2005, such as, scheduled wastes can only be collected and transported by licensed collectors and transporters, and their labelling, handling and storage have to be as stipulated by the EQ(SW)R 2005. Clearly labelled and secure storage facilities have to be erected to ensure that people and premise are safe from possible fire, waste spillage, reactions, etc. All wastes have to be accounted for and audited against the raw materials (lubricants, etc) brought in.

8.3.6 Solid Waste Management During Operation

Solid wastes comprise (1) garbage from workers, and (2) industrial solid wastes, such as waste papers, cardboards, containers, etc. Garbage is to be managed as per municipal solid wastes. Industrial solid wastes from industrial areas are usually contracted out to a licensed waste contractor. All wastes have to be properly stacked, with regular collection by disposal contractor and recyclers. To reduce collection frequency, biodegradables may be composted in in-situ composters as recommended during construction period; these will also prevent odours, leachate and pests such as rats and flies, while generating compost.

8.3.2 Socioeconomic Mitigating Measures during Operation

To respond to the concerns of Respondents, the project proponent will be taking or recommended to take the following mitigating measures:

1) The professional staff, such as engineers and chemists, and workers will be mostly Malaysians with several Japanese professionals, with priorities given to locals;
2) Priorities will be given to locals for internships, such as for fresh graduates, which may result in them being absorbed as staff, once they prove themselves;
3) Employed locals will be given training and opportunities to upscale their careers;
4) The plant management will ensure regular maintenance and audit of:
    a. process equipment in the whole process train;
    b. equipment for the train in the IETS;
    c. equipment for the APCS train
    d. transportation fleet
    e. waste management compliance for scheduled wastes and general wastes.
5) Use of local roads for heavy loads on the way to the plant be limited to daylight hours, which may mean the trucks carrying spent catalyst leaving the plant in Pengerang, Johor, before 11am, as it takes 6 to 7 hours to reach Gebeng (see **Appendix 5**)
6) The plant should be aware of infrastructures and amenities in the area, thus the well-being of its employees and their families, and contribute via its CSR fund to improvement of the area; one of the ways is via the setting up of network of river reserve along Sg. Baluk as proposed in **Section 8.3.2**.

8.4 MITIGATING MEASURES DURING ABANDONMENT OR END OF LIFE

Restoration after abandonment should be carried out as soon as project is abandoned or ended. This restoration involves:

- Removal of structures, including buildings, fences and transmission lines;
- Removal of wastes from operation, such as stored scheduled wastes, according to proper procedures;
- All scheduled wastes (SW) will be transferred to licenced prescribed premises for SW recovery or disposal, with all operations carried out complying to the EQ(SW)R2005.
- Removal of debris resulting from demolition according to proper procedures; as far as possible wastes should be reused or recycled by licensed recyclers.
- Restoration of land to original or environmentally stable state, i.e., covering of trenches and holes, restoring land cover vegetation and ensuring there is no erosion risk;
- Satisfying the landowner and the DOE that proper restoration has been completed and obtaining release of responsibility for the site.