

## 5.2.2 *Monitoring for Biogas during Construction*

5.2.2.1 Biogas may accumulate in excavated areas, confined areas and areas below ground. When methane concentration reaches a dangerous level, it would pose a risk of explosion and asphyxiation. Suitable portable gas detectors should be used to detect the biogas in these areas. The equipment used for borehole monitoring can also be applied in this case. Other gases such as carbon monoxide and hydrogen sulphide may also be generated and accumulated in confined areas. The gas detectors should have the functions to detect these dangerous gases during monitoring.

5.2.2.2 The portable gas detectors should be equipped with suitable alarm device to alert the operator who is carrying out the monitoring when the following conditions are detected:

- 1) The flammable range of methane is 5 – 15% v/v. When the concentration of methane rise to 20% LEL or 1.0% v/v, no works and no entry to the construction site should be allowed and the personnel on-site should be evacuated.
- 2) Carbon monoxide is toxic and any personnel should not stay in an area with high concentrations of carbon monoxide. The concentration of carbon monoxide should not exceed 300ppm for short-term exposure (1 hour) and should not exceed 50ppm for long-term exposure (8 hours).
- 3) When oxygen level drops to 18% v/v or below, there would be a risk to the personnel on-site. Ventilation should be increased to restore the oxygen level to above 18% v/v.
- 4) Hydrogen sulphide is toxic even at low concentrations. A threshold limit of hydrogen sulphide concentration is 10 ppm for 8-hour Time Weighted Average and 15ppm for 10-minute period.

## 5.3 *Monitoring Locations*

5.3.1 Monitoring borehole locations are related to the likely risks posed by the potential emission of methane gas. The proposed monitoring borehole locations are shown in **Drawing No. 22936/EN/145**. The total number of monitoring boreholes at Kai Tak Approach Channel (KTAC), Kwun Tong Typhoon Shelter (KTTS) and Hoi Sham are listed below:

<u>Location</u>	<u>No. of Borehole</u>
KTAC	10
KTTS	10
Hoi Sham	20

**5.3.2** The proposed monitoring boreholes at KTAC are evenly allocated in the KTAC. These boreholes are distributed in two rows with 5 monitoring boreholes in each row. In the event that the measured methane emission rate is higher than the maximum safe rate of gas emission, additional monitoring boreholes in between the adjacent boreholes may be required.

**5.3.3** The biogas assessment of the EIA concluded that the methane potential in KTTS and Hoi Sham areas was lower than that in KTAC. It is proposed to install approximately 20 monitoring boreholes for the Hoi Sham reclamation and 10 monitoring boreholes for the KTTS reclamation. The boreholes should be evenly distributed across the areas.

## **5.4 Monitoring for Biogas after Reclamation**

**5.4.1** Monitoring of the methane, carbon dioxide and oxygen levels at the monitoring boreholes as shown in **Drawing No. 22936/EN/145** should be carried out on a monthly basis. The purposes of the monitoring are:

- to detect the actual methane emission rate after reclamation and to confirm the biogas assessment results;
- to confirm if there is any constraint to the future development due to methane hazards; and
- to identify the suitable protection measures or any additional protection measures to be incorporated into the design stage so as to safeguard the future development.

**5.4.2** The monitoring should be implemented prior to commencement of the construction works and may be extended throughout the construction period. The duration for borehole monitoring would depend on the actual methane emission rate. The monitoring data should cover the flow rate of methane measured during the low atmospheric conditions to confirm whether there is any exceedance of the maximum safe rate of gas emission (10 l/m<sup>2</sup>/d) under unusual conditions. The trend of the monitoring results should be analysed. Continuous monitoring would be required if an increasing trend of the flow rate in a particular area were found. Monitoring should continue until the measured methane emission rate is consistently lower than the maximum safe rate of gas emission. The exact monitoring duration should be agreed and confirmed with EPD.

## **5.5 Monitoring for Biogas during Construction**

**5.5.1** With reference to the *Landfill Gas Hazard Assessment Guidance Note*, methane gas should be monitored periodically in all excavations, manholes, chambers and confined areas during construction. In order to safeguard the personnel on-site during the construction phase of the development, excavations of 1m depth or more and all poorly ventilated areas should be monitored for methane, carbon dioxide and oxygen. Other toxic gases such as hydrogen sulphide and carbon monoxide should also be monitored.

## **5.6 Monitoring for Biogas in Buildings**

**5.6.1** Routine monitoring should be carried out in void space of those buildings with protection measures implemented. Rooms with poor ventilations, unventilated areas, basements, basement carparks, etc. should be monitored in order to check the effectiveness of the implemented protection measures. The parameters to be monitored should include methane, carbon dioxide and oxygen.

**5.6.2** Methane gas may penetrate into buildings through conduits, pipes, sewer drains and storm drains of the underground services. Utility voids of the underground services should be monitored periodically. Monitoring frequency should be reviewed quarterly and be agreed with EPD.