

12 Environmental Monitoring and Audit Requirements

12.1 Introduction

This section provides descriptions of the environmental and operational variables and parameters to be monitored, and the purpose for which each should be monitored, e.g. as an indication of general background conditions or as an indicator of unacceptable environmental impact.

In accordance with the requirements as stipulated in Annex 21 of the TM-EIAO, it is considered necessary to conduct the Environmental Monitoring and Audit (EM&A) programme during the construction, operation, restoration and aftercare phases of the Project and to define the relevant scope of EM&A requirements, including:

- Provision of a database against which to determine any short- or long-term environmental impacts of the landfill extension;
- Confirmation of the validity of any assumptions made in the design of landfill extension;
- Provision of an early indication that any of the environmental control measures or other operational practices are failing to achieve the required standards;
- Provision of data to determine the effectiveness of any mitigation or control measures implemented through amendments in procedures during the life of landfill;
- Provision of data to enable an environmental audit of the construction, operation, restoration and aftercare works to be undertaken; and
- Assessment of compliance with the environmental and pollution control and operational requirements.

12.2 Project Organisation

A project organisation consisting of the Independent Consultant (IC), Independent Environmental Checker (IEC), Environmental Team (ET), Project Proponent (EPD) and DBO Contractor should be established to take on the responsibilities for environmental protection for the NENT Landfill Extension Project. The IEC will be appointed by the Project Proponent to conduct independent auditing on the overall EM&A programme including environmental and operation monitoring, implementation of mitigation measures, EM&A submissions, and any other submission required under the Environmental Permit (EP). The organisation, responsibilities of respective parties and lines of communication with respect to environmental protection works are given in the EM&A Manual.

12.3 EM&A Manual and Implementation Schedule

EM&A is an important aspect in the EIA process which specifies the timeframe and responsibilities for the implementation of environmental mitigation measures. The requirements on environmental monitoring (including baseline and impact monitoring) are given in the EM&A Manual.

A project specific EM&A Manual to the NENT Landfill Extension was prepared with reference to the latest design information available and EPD's generic EM&A Manual. The project specific EM&A Manual highlights the following issues:

- Organisation, hierarchy and responsibilities of the DBO Contractor, Project Proponent, ET, IEC and IC with respect to the EM&A requirements during construction, operation, restoration and aftercare phases of the landfill extension;
- Information on project organisation and programming of construction activities;

- Requirements with respect to the construction schedule and necessary EM&A programme to track the varying environmental impacts;
- Full details of methodologies to be adopted, including all field, laboratory and analytical procedures, and details on quality assurance;
- Procedure for undertaking on-site environmental audits;
- Definition of Action and Limit Levels;
- Establishment of Event and Action Plans;
- Requirements of reviewing pollution sources and working procedures required in the event of non-compliance of environmental criteria and complaints;
- Requirements for reviewing the EIA predictions, implementation of mitigation measures, and effectiveness of environmental protection and pollution control measures adopted; and
- Presentation of requirements for EM&A data and appropriate reporting procedures.

An Environmental Mitigation Implementation Schedule (EMIS) has been prepared and included in the EM&A manual to summarise all the required mitigation measures need to be implemented during the construction, operation, restoration and aftercare phases of the landfill extension. The implementation responsibilities are also identified in the EMIS which is also included in the EM&A Manual for submission to EPD.

The DBO Contractor should review the mitigation measures and EMIS with respect to the design developments and construction methodology. In case the DBO Contractor needs to update the mitigation measures and EMIS, the EM&A Manual should be updated accordingly. The DBO Contractor should seek EPD's prior approval on these amendments before construction commences.

12.4 EM&A Programme

Detailed requirements of the EM&A programme are described in the EM&A Manual. Measurements and activities are summarised as follows:

- Baseline monitoring on groundwater, surface water, dust, ambient emissions of odour, VOC and ammonia, and ecology (flora and fauna);
- Impact monitoring on leachate, LFG, groundwater, surface water, dust, ambient emissions of odour, VOC and ammonia, meteorological data, volume and density of waste, settlement, waste type, and ecology (flora and fauna);
- Remedial actions in accordance with the Event and Action Plan within the timeframe in cases the specified criteria in the EM&A Manual were exceeded;
- Logging and keeping records of monitoring results; and
- Preparation and submission of Monthly, Quarterly and Annual EM&A Reports.

12.5 Method Statements

The environmental aspects of working methods should be controlled through checking of the DBO Contractor's method statements which should be submitted and approved by the IEC prior to the works commence. The Project Proponent should specify an arrangement whereby the method statements would be scrutinised and signed off by the IEC before approval.