

## ANNEX III

CONTROL AND MONITORING PROCEDURES  
IN OPERATION AND AFTER-CARE PHASES

## 1. Introduction

The purpose of this Annex is to provide the minimum procedures for monitoring to be carried out to check:

- that waste has been accepted to disposal in accordance with the criteria set for the category of landfill in question,
- that the processes within the landfill proceed as desired,
- that the environmental protection systems are functioning fully as intended,
- that the permit conditions for the landfill are fulfilled.

## 2. Meteorological data

[<sup>F1</sup>.....]

**Textual Amendments**

- F1** Deleted by [Directive \(EU\) 2018/850 of the European Parliament and of the Council of 30 May 2018 amending Directive 1999/31/EC on the landfill of waste \(Text with EEA relevance\)](#).

Should Member States decide that water balances are an effective tool for evaluating whether leachate is building up in the landfill body or whether the site is leaking, it is recommended that the following data are collected from monitoring at the landfill or from the nearest meteorological station, as long as required by the competent authority in accordance with Article 13(c) of this Directive:

	<b>Operation phase</b>	<b>After-care phase</b>
<b>1.1. Volume of precipitation</b>	daily	daily, added to monthly values
<b>1.2. Temperature (min., max., 14.00 h CET)</b>	daily	monthly average
<b>1.3. Direction and force of prevailing wind</b>	daily	not required
<b>1.4. Evaporation (lysimeter)<sup>a</sup></b>	daily	daily, added to monthly values
<b>1.5. Atmospheric humidity (14.00 h CET)</b>	daily	monthly average

**a** Or through other suitable methods.

## 3. Emission data: water, leachate and gas control

Sampling of leachate and surface water if present must be collected at representative points. Sampling and measuring (volume and composition) of leachate must be performed separately at each point at which leachate is discharged from the site. Reference: general guidelines on sampling technology, ISO 5667-2 (1991).

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Monitoring of surface water is present shall be carried out at not less than two points, one upstream from the landfill and one downstream.

Gas monitoring must be representative for each section of the landfill. The frequency of sampling and analysis is listed in the following table. For leachate and water, a sample, representative of the average composition, shall be taken for monitoring.

The frequency of sampling could be adapted on the basis of the morphology of the landfill waste (in tumulus, buried, etc). This has to be specified in the permit.

	<b>Operating phase</b>	<b>After-care phase<sup>c</sup></b>
<b>2.1. Leachate volume</b>	monthly <sup>ac</sup>	every six months
<b>2.2. Leachate composition<sup>b</sup></b>	quarterly <sup>c</sup>	every six months
<b>2.3. Volume and composition of surface water<sup>g</sup></b>	quarterly <sup>c</sup>	every six months
<b>2.4. Potential gas emissions and atmospheric pressure<sup>d</sup>(CH<sub>4</sub>, CO<sub>2</sub>, O<sub>2</sub>, H<sub>2</sub>S, H<sub>2</sub> etc.)</b>	monthly <sup>ee</sup>	every six months <sup>f</sup>

**a** The frequency of sampling could be adapted on the basis of the morphology of the landfill waste (in tumulus, buried, etc.). This has to be specified in the permit.

**b** The parameters to be measured and the substances to be analysed vary according to the composition of the waste deposited; they must be laid down in the permit document and reflect the leaching characteristics of the wastes.

**c** If the evaluation of data indicates that longer intervals are equally effective, they may be adapted. For leachates, conductivity must always be measured at least once a year.

**d** These measurements are related mainly to the content of organic material in the waste.

**e** CH<sub>4</sub>, CO<sub>2</sub>, O<sub>2</sub>, regularly, other gases as required, according to the composition of the waste deposited, with a view to reflecting its leaching properties.

**f** Efficiency of the gas extraction system must be checked regularly.

**g** On the basis of the characteristics of the landfill site, the competent authority may determine that these measurements are not required, and will report accordingly in the way laid down in Article 15 of the Directive.

2.1 and 2.2 apply only where leachate collection takes place (see Annex I(2)).

#### 4. Protection of groundwater

##### A. Sampling

The measurements must be such as to provide information on groundwater likely to be affected by the discharging of waste, with at least one measuring point in the groundwater inflow region and two in the outflow region. This number can be increased on the basis of a specific hydrogeological survey and the need for an early identification of accidental leachate release in the groundwater.

Sampling must be carried out in at least three locations before the filling operations in order to establish reference values for future sampling. Reference: Sampling Groundwaters, ISO 5667, Part 11, 1993.

##### B. Monitoring

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The parameters to be analysed in the samples taken must be derived from the expected composition of the leachate and the groundwater quality in the area. In selecting the parameters for analysis account should be taken of mobility in the groundwater zone. Parameters could include indicator parameters in order to ensure an early recognition of change in water quality<sup>(1)</sup>.

	<b>Operation phase</b>	<b>After-care phase</b>
<b>Level of groundwater</b>	every six months <sup>a</sup>	every six months <sup>a</sup>
<b>Groundwater composition</b>	site-specific frequency <sup>bc</sup>	site-specific frequency <sup>bc</sup>
<b>a</b>	If there are fluctuating groundwater levels, the frequency must be increased.	
<b>b</b>	The frequency must be based on possibility for remedial actions between two samplings if a trigger level is reached, i.e. the frequency must be determined on the basis of knowledge and the evaluation of the velocity of groundwater flow.	
<b>c</b>	When a trigger level is reached (see C), verification is necessary by repeating the sampling. When the level has been confirmed, a contingency plan (laid down in the permit) must be followed.	

### C. Trigger levels

Significant adverse environmental effects, as referred to in Articles 12 and 13 of this Directive, should be considered to have occurred in the case of groundwater, when an analysis of a groundwater sample shows a significant change in water quality. A trigger level must be determined taking account of the specific hydrogeological formations in the location of the landfill and groundwater quality. The trigger level must be laid down in the permit whenever possible.

The observations must be evaluated by means of control charts with established control rules and levels for each downgradient well. The control levels must be determined from local variations in groundwater quality.

### 5. Topography of the site: data on the landfill body

	<b>Operating phase</b>	<b>After-care phase</b>
<b>5.1. Structure and composition of landfill body<sup>a</sup></b>	yearly	
<b>5.2. Settling behaviour of the level of the landfill body</b>	yearly	yearly reading
<b>a</b>	Data for the status plan of the concerned landfill: surface occupied by waste, volume and composition of waste, methods of depositing, time and duration of depositing, calculation of the remaining capacity still available at the landfill.	

### [F<sup>2</sup>6. Specific requirements for metallic mercury

For the purposes of temporary storage for more than 1 year of metallic mercury, the following requirements shall apply:

#### A. Monitoring, inspection and emergency requirements

A continuous mercury vapour monitoring system with a sensitivity of at least 0,02 mg mercury/m<sup>3</sup> shall be installed in the storage site. Sensors shall be positioned at ground level and head level. This shall include a visual and acoustic alert system. The system shall be maintained annually.

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The storage site and containers shall be visually inspected by an authorised person at least once a month. Where leaks are detected, the operator shall immediately take all necessary action to avoid any emission of mercury to the environment and restore the safety of the storage of the mercury. Any leaks shall be considered to have significant adverse environmental effects as referred to in Article 12(b).

Emergency plans and adequate protective equipment suitable for handling metallic mercury shall be available on site.

B. Record keeping

All documents containing the information referred to in Section 6 of Annex II and in point A of this Section, including the certificate accompanying the container, as well as records concerning the destocking and dispatch of the metallic mercury after its temporary storage and the destination and intended treatment shall be kept for at least 3 years after the termination of the storage.]

**Textual Amendments**

- F2** Inserted by [Council Directive 2011/97/EU of 5 December 2011 amending Directive 1999/31/EC as regards specific criteria for the storage of metallic mercury considered as waste.](#)

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- (1) Recommended parameters: ph, TOC, phenols, heavy metals, fluoride, AS, oil/hydrocarbons.