

CONSULTATION DOCUMENT ON A SIMPLIFICATION OF THE TITANIUM DIOXIDE DIRECTIVES

Detailed explanation of the working document

Article 1 sets out the objective, in line with Article 1 of Directive 78/176/EEC.

Article 2 lists definitions for the purpose, by simplifying and rationalising the definitions set out in Article 1 of Directive 78/176/EEC, Article 2 of Directive 82/883/EEC and Article 2 of Directive 92/112/EEC.

Article 3 states that Member States should take appropriate measures to encourage prevention, reuse and recycling of waste from the titanium dioxide industry, in line with Article 3 of Directive 78/176/EEC and Article 11 of Directive 92/112/EEC.

Article 4 establishes measures to protect the aquatic environment against pollution caused by waste from the titanium dioxide industry, by simplifying and rationalising Articles 3, 4, 6 and 10 of Directive 92/112/EEC and Articles 4, 5 and 7 of Directive 78/176/EEC as well as the relevant Annexes of Directive 82/883/EEC.

Article 5 establishes measures to protect land against pollution caused by waste from the titanium dioxide industry, by simplifying and rationalising Articles 4, 6 and 7 of Directive 78/176/EEC and the relevant Annexes of Directive 82/883/EEC.

Article 6 establishes measures to protect the air against pollution caused by waste from the titanium dioxide industry, by simplifying and rationalising Articles 9 and 10 of Directive 92/112/EEC and Articles 4, 6 and 7 of Directive 78/176/EEC as well as the relevant Annex of Directive 82/883/EEC.

Article 7 establishes rules related to the national competent authority, in line with Article 7 (2) of Directive 78/176/EEC.

Article 8 simplifies and rationalises the reporting obligations of the Member States, laid down in Article 9 and 10 of Directive 78/176/EEC and Article 7 of Directive 82/883/EEC.

Articles 9 and 10 provide for technical adaptations to the Annexes of the basis of a comitology procedure, in line with Articles 9 and 10 of Directive 82/883/EEC.

Article 11 contains reporting obligations in line with Article 14 of Directive 78/176/EEC.

Articles 12-15 are administrative provisions.

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Questionnaire

1. Do you think the specifications of certain wastes from the titanium dioxide industry (Article 2 (2)), which are relevant for Article 4 and 6, could be further simplified? If so, which consequences would this have for Articles 4 and 6?
2. Do you think the prohibition of disposal of certain wastes from the titanium dioxide industry into water as well as the emission limit values (Article 4 (1) and (2)) could be further simplified in light of other pieces of Community legislation, such as Article 4 of Directive 75/442/EEC, emission limit values of the Water Directives, such as Directive 86/280/EEC? If so, please specify in what way.
3. Do you think the system of prior authorisations and monitoring of the releases to the environment (Article 4 (5) and (6), Article 5 (2) Article 6 (3) and Annex I-V) could be further simplified in light of other pieces of Community legislation, such as Directive 96/61/EC on IPPC? If so, please specify in what way.
4. Do you think the prohibition of disposal (Article 5 (1)) could be further simplified in light of other pieces of Community legislation, such as Directive 1999/31/EC and its waste acceptance criteria? If so, please specify in what way.
5. Do you think the emission limit values to air (Article 6 (1) and (2)) could be further simplified in light of other pieces of Community legislation, such as Directive 96/61/EC on IPPC? If so, please specify in what way.
6. Do you think the Annexes could be further simplified? If so, please specify in what way.
7. Do you think any measures should be added? If so, please specify which ones and give reasons.
8. Do you think any measures should be deleted? If so, please specify which ones and give reasons.

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Article 1

Objectives

This Directive lays down measures which aim, as a first priority, at the prevention of waste from the titanium dioxide industry and, in addition, at the progressive reduction and eventual elimination of negative environmental impacts caused by waste from the titanium dioxide industry.

Article 2

Definitions

For the purpose of this Directive:

1. 'waste from the titanium dioxide industry' shall mean any substance or object falling under the definition of Article 1 (a) of Directive 75/442/EEC on waste resulting from either the sulphate process or the chlorine process used in the titanium dioxide industry;
2. 'solid waste' shall mean
 - (a) in case of the sulphate process:
 - insoluble ore residues not broken down by sulphuric acid during the manufacturing process,
 - copperas, i.e. crystalline ferrous sulphate ($\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$);
 - (b) in case of the chlorine process:
 - insoluble ore residues not broken down by the chlorine during the manufacturing process,
 - metal chlorides and metal hydroxides (filtration substances), arising in solid form from the manufacture of titanium tetrachloride,
 - coke residues arising from the manufacture of titanium tetrachloride;
3. 'strong acid waste' shall mean:
 - (a) in case of the sulphate process: the mother liquors arising from the filtration phase following hydrolysis of the titanil sulphate solution. If these mother liquors are associated with weak acid wastes which overall contain more than

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0,5 % free sulphuric acid and various heavy metals, including strong acid waste which has been diluted until it contains 0.5% of less free sulphuric acid. The liquors and waste taken together shall be considered strong acid waste;

- (b) in case of the chlorine process: waste containing more than 0,5 % free hydrochloric acid and various heavy metals, including strong acid waste which has been diluted until it contains 0.5% of less free sulphuric acid;
4. 'treatment waste' shall mean: filtration salts, sludges and liquid waste arising from the treatment (concentration or neutralization) of strong acid waste and containing various heavy metals, but not including neutralized and filtered or decanted waste containing only traces of heavy metals and which, before any dilution, has a pH value above 5,5;
 5. 'weak acid waste' shall mean: wash waters, cooling waters, condensates and other sludges and liquid wastes, other than those included in the above definitions, containing 0,5 % or less free sulphuric acid;
 6. 'neutralised waste' shall mean: any liquid which has a pH value over 5,5, contains only traces of heavy metals, and is obtained directly by filtration or decantation from strong or weak acid waste after its treatment to reduce its acidity and its heavy metal content;
 7. 'dust' shall mean: kinds of dust from production plants and in particular ore and pigment dust;
 8. 'SO_x' shall mean: gaseous sulphur dioxide and trioxide released in the various stages of the manufacturing and internal waste treatment processes of the sulphate process, including acid droplets;
 9. 'chlorine' shall mean: gaseous chlorine released in the various stages of the chlorine manufacturing process;
 10. 'disposal' shall mean any of the operations provided for in Annex II A of Directive 75/442/EEC on waste;
 11. 'industrial establishment' shall mean installations producing titanium dioxide irrespective of the production process used.

Article 3

Prevention, reuse and recycling

Member States shall take the appropriate measures to encourage the prevention, reuse and recycling of waste from the titanium dioxide industry.

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Article 4

Reduction of environmental impacts to water

1. Member States shall prohibit the deliberate dumping of any solid waste, strong acid waste, treatment waste, weak acid waste or neutralised waste into a water body, sea or ocean by any waterborne vessel or airborne craft.
2. Member States shall prohibit the disposal of solid waste, strong acid waste from the titanium dioxide industry as well as treatment waste from the sulphate process into a water body, sea or ocean.
3. Member States shall ensure that industrial establishments meet following emission limit values when the following types of waste are discharged into a water body, sea or ocean:
 - (a) for weak acid waste and neutralised waste from the sulphate process: not more than 800 kg of sulphate per tonne of titanium dioxide produced;
 - (b) for weak acid waste, treatment waste and neutralised waste from the chlorine process not more than the following values of total chloride per tonne of titanium dioxide produced:
 - 130 kg using neutral rutile;
 - 228 kg using synthetic rutile;
 - 450 kg using slag.
4. In the case of an industrial establishment using more than one type of ore, the emission limit values of paragraph 3 shall apply in proportion to the quantity of these ores used.
5. Member States shall monitor compliance with the limit values of paragraph 3 in relation to the actual production of each industrial establishment.
6. Member States shall prohibit any other releases of waste from the titanium dioxide industry to a water body, sea or ocean, unless prior authorisation is issued by the competent authority of the Member State concerned.
7. The competent authority of a Member State may grant such authorisation, provided that the conditions set out in Article 4 of Directive 75/442/EEC are met. To this end, Member States shall monitor discharges from the titanium dioxide industry into water, as specified in Annexes II-III of this Directive. Authorisation may be granted for a limited period only. It may be renewed.

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Article 5

Reduction of environmental impacts to land

1. Member States shall prohibit the disposal of any type of waste from the titanium dioxide industry on land unless prior authorisation is issued by the competent authority of the Member State concerned.
2. The component authority of a Member State may grant such authorisation, provided that the conditions set out in Article 4 of Directive 75/442/EEC are met. To this end, Member States shall monitor the environmental impacts of waste disposal on land, as specified in Annexes IV-V of this Directive. Authorisation may be granted for a limited period only. It may be renewed.

Article 6

Reduction of environmental impacts to air

1. Member States shall ensure that emissions of acid droplets resulting from the sulphate process to air are prohibited.
2. Member States shall ensure that each industrial establishment meets the following emission limit values to air:
 - not more than 50 mg/nm³ of dusts from major sources at a temperature of 273 K per cubic metre and a pressure of 101,3 kPa; and not more than 150 mg/nm³ of dust from any other source;
 - not more than 10 kg of SO₂ equivalent per tonne of titanium dioxide produced of gaseous sulphur dioxide and trioxide emissions, taking into account (i) the volume of gas released over the duration of the specific operation in question and (ii) the average sulphur dioxide and trioxide content measured over the same period, while determining the SO₂ and SO₃ flow rate under the same temperature and humidity conditions;
 - not more than 500 mg/mn³ SO_x calculated as SO₂ equivalent of liquid wastes emissions, taking into account (i) the volume of gas released over the duration of the specific operation in question and (ii) the average sulphur dioxide and trioxide content measured over the same period, while determining the SO₂ and SO₃ flow rate under the same temperature and humidity conditions;
 - not more than 5 mg/mn³ of chorine emissions as a daily average concentration or not more than 6 grammes per tonne of titanium dioxide

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produced; and not more than 40 mg/ng³ of chlorine emissions at any time.

3. Member States shall monitor compliance with the limit values of paragraph 2 in relation to the actual production of each industrial establishment. .
4. Member States shall prohibit any other releases of waste from the titanium dioxide industry to air, unless prior authorisation is issued by the competent authority of the Member State concerned.
5. The competent authority of a Member State may grant such authorisation, provided that the conditions set out in Article 4 of Directive 75/442/EEC are met. To this end, Member States shall monitor releases from the titanium dioxide industry into air on the basis of Annex I of this Directive. Authorisation may be granted for a limited period only. It may be renewed.

Article 7

Competent authority

Member States shall appoint a competent body to carry out the monitoring operations required by the Annexes to this Directive. In the case of cross-frontier pollution between Member States, the body the question shall be appointed jointly by the parties concerned.

Article 8

Record keeping

Member States keep record of the monitoring results related to the emission limit values of Article 4 (2) and 6 (2) as well as to Annex I-IV of this Directive. These records shall, in respect of each environment affected, as a minimum include the following information:

- a description of the sampling point;
- a description of the sampling method used;
- the measurements results; and
- the measurement methods.

Member States shall make these records available at request of other Member States or Community institutions.

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Article 9

Adaptations to the Annexes

The Annexes to this Directive shall be adapted to scientific and technical progress, taking into account other pieces of Community legislation, in accordance with the procedure laid down in Article 10.

Article 10

Committee procedure

1. The Commission shall be assisted by the committee established by Article 18 of Directive 75/442/EEC, hereinafter referred to as ‘the Committee’.
2. Where reference is made to this Article, Articles 5 and 6 of Decision 1999/468/EC shall apply, having regard to the provision of Article 8 thereof.

The period laid down in Article 5 (6) of Decision 1999/468/EC shall be set at three months.

3. The Committee shall adopt its rules of procedure.

Article 11

Reporting and information

1. At three-yearly intervals Member States shall send a report to the Commission on the implementation of this Directive. The report shall be drawn up on the basis of a questionnaire or outline drafted by the Commission in accordance with the procedure laid down in Article 6 of this Directive. The questionnaire or outline shall be sent to the Member States six months before the start of the period covered by the report. The report shall be sent to the Commission within nine months of the end of the three-year period covered by it.

In line with the reporting periods of Directive 91/692/EEC, the first report shall cover the period from [...] to [...] inclusive.

2. The Commission shall publish a Community report on the implementation of the Directive within nine months of receiving the reports from the Member States.

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Article 12

Repeal

Council Directive 78/176/EEC, as amended, Council Directive 82/883/EEC, as amended, and Council Directive 92/112/EEC are repealed.

Article 13

Implementation

Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with this Directive by [...] at the latest. They shall forthwith inform the Commission thereof.

When Member States adopt those provisions, they shall contain a reference to this Directive or be accompanied by such a reference on the occasion of their official publication. Member States shall determine how such reference is to be made.

Article 14

Entry into force

This Directive shall enter into force on the [...] day following that of its publication in the *Official Journal of the European Union*.

Article 15

Addressees

This Directive is addressed to the Member States.

ANNEX

ANNEX I

METHOD OF WASTE DISPOSAL: DISCHARGE INTO AIR

(¹) If the production process used process.
 (²) To be used once measuring measurements to be carried out used.
 (³) The figures must be sufficiently

Components	Parameters to be determined		Minimum annual sampling and analysis	Comments
	mandatorily	Optionally		
Air	Sulphur dioxide (SO ₂) (¹)	Dust	Continuously	1. Region with surveillance by an existing air pollution surveillance network with at least one station near the production site giving representative readings for pollution emanating from the site
	Chlorine (²)		12 (³)	2. Region with no surveillance network. Measurement of total amounts of gaseous discharges emitted by the production site Where a site has a number of discharge sources, sequential measurements may be made. The reference method of measurement for sulphur dioxide is that given in Annex III

is the sulphate
 technology allows continuous
 and where the chlorine process is
 representative and significant.

ANNEX II

METHOD OF WASTE DISPOSAL: DISCHARGE INTO OR IMMERSION IN SALT WATER
(estuarine, coastal, open sea)

Components	Parameters to be determined		Minimum annual sampling and analysis frequency	Reference method of measurement
	mandatorily	Optionally		
Water column sea Non-filtered water (l)	Temperature (°C)		3	Thermometry. Measurement is to be carried out on the spot at the time of sampling
	Salinity (‰)		3	Conductimetry
	pH (pH unit)		3	Electrometry. Measurement is to be carried out on the spot at the time of sampling
	Dissolved O ₂ (mg/O ₂ dissolved/l)		3	- Winkler method - Electrochemical method
	Turbidity (mg solids/l) or suspended matter (mg/l)		3	For turbidity: turbidimetry For suspended matter: gravimetry - Weighing after filtration through 0.45 µm pore size membrane filter and drying at 105 °C - Weighing after centrifugation (minimum
	Fe (dissolved and in suspension) (mg/l)		3	After the sample has been appropriately prepared, determination by atomic absorption spectrophotometry or by molecular absorption spectrophotometry
		Cr, total Cd, total Hg (mg/l)	3	- Atomic absorption spectrophotometry - Molecular absorption spectrophotometry
	Ti	V, Mn, Ni, Zn	3	Atomic absorption spectrophotometry

Components	Parameters to be determined		Minimum annual sampling and analysis frequency	Reference method of measurement
	mandatorily	optionally		
	(mg/l)	(mg/l)		
		Cu, Pb (mg/l)	3	- Atomic absorption spectrophotometry - Polarography
Sea water filtered through 0.45 µm pore size membrane filter ⁽¹⁾	Dissolved (mg/l)	Fe	3	Determination by atomic absorption spectrophotometry or by molecular absorption spectrophotometry
		Cr, Cd, Hg (mg/l)	3	- Atomic absorption spectrophotometry - Molecular absorption spectrophotometry
		Ti, V, Mn, Ni, Zn (mg/l)	3	Atomic absorption spectrophotometry
		Cu, Pb (mg/l)	3	- Atomic absorption spectrophotometry - Polarography
Suspended solids remaining in 0.45 µm pore size membrane filter	Total (mg/l)	Fe	3	- Atomic absorption spectrophotometry - Molecular absorption spectrophotometry
		Cr, Cd, Hg (mg/l)	3	Atomic absorption spectrophotometry
		Ti, V, Mn, Ni, Zn (mg/l)	3	- Atomic absorption spectrophotometry - Polarography
	Hydrated oxides and hydroxides of iron (mg Fe/l)		3	Extraction of the sample under appropriate acid conditions; measurement by atomic absorption spectrophotometry or by molecular absorption spectrophotometry. The same method of acid extraction must be used for all samples coming from the same site

Components	Parameters to be determined		Minimum annual sampling and analysis frequency	Reference method of measurement
	mandatorily	optionally		
Sediments In the top layer of sediment as near the surface as possible	Total Ti, Fe (mg/kg dry matter)	V, Cr, Mn, Ni, Cu, Zn, Cd, Hg, Pb (mg/kg dry matter)	1	Identical methods to those for measurements in the water column. After appropriate preparation of the sample (wet or dry mineralization and purification). The
	Hydrated oxides and hydroxides of iron		I	Identical methods to those for measurements in the water column
Living organisms Species representative of the site: benthic fish and invertebrates or other appropriate	Ti, Cr, Fe, Ni, Zn, Pb (mg/kg wet and dry weight)	V, Mn, Cu, Cd, Hg (mg/kg wet and dry weight)	1	Atomic absorption spectrophotometry after appropriate preparation of the composite sample of ground flesh (wet or dry mineralization and purification) - For fish, the metals must be measured in muscle or other appropriate tissue; the sample must consist of at least 10 specimens
	Benthic fauna Diversity and relative abundance		1	Qualitative and quantitative classification of representative species, indicating the specimen count per species, density, dominance
Planktonic fauna		Diversity and relative abundance	1	Qualitative and quantitative classification of representative species, indicating the specimen count per species, density, dominance
Flora		Diversity and relative abundance	I	Qualitative and quantitative classification of representative species, indicating the specimen count per species, density, dominance

Fish in particular	Presence of morbid anatomical lesions in fish		1	Visual inspection of samples of the representative species taken for chemical analysis
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(¹) Member States may choose whether to analyse non-filtered or filtered water for substances under 'Parameters'.

(²) Species representative of the site of discharge in particular in terms of their sensitivity to bioaccumulation, e.g. *Mytilus edulis*, crangon crangon, flounder, plaice, cod, mackerel, red mullet, herring, sole (or other appropriate benthic species).

ANNEX III

METHOD OF WASTE DISPOSAL: DISCHARGE INTO FRESH SURFACE WATER

Components	Parameters to be determined		Minimum annual sampling and analysis frequency	Reference method of measurement
	mandatorily	optionally		
Water column (1) Non-filtered fresh water	Temperature (°C)		3	Thermometry. Measurement is to be carried out on the spot at the time of sampling
	Conductivity at 20°C ($\mu\text{S cm}^{-1}$)		3	Electrometric measurement
	pH (pH unit)		3	Electrometry. Measurement is to be carried out on the spot at the time of sampling
	Dissolved O ₂ (dissolved mg O ₂ /l)		3	- Winkler method - Electrochemical method
	Turbidity (mg solids/l or suspended matter) (mg/l)		3	For turbidity: turbidimetry For suspended matter: gravimetry - Weighing after filtration through 0-45 μm membrane filter and drying at 105 °C

			<ul style="list-style-type: none">- Weighing after centrifugation (minimum time five minutes, and average acceleration 2 800 to 3 200 g) and drying at 105 °C
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Components	Parameters to be determined		Minimum annual sampling and analysis frequency	Reference method of measurement
	mandatorily	optionally		
Non-filtered fresh water (2)	Fe (dissolved and in suspension) (mg/l)		3	After the sample has been appropriately prepared, determination by atomic absorption spectrophotometry or by molecular absorption spectrophotometry
		Cr, total Cd, total Hg (mg/l)	3	- Atomic absorption spectrophotometry - Molecular absorption spectrophotometry
	Ti	V, Mn, Ni, Zn	3	Atomic absorption spectrophotometry
		Cu, Pb (mg/l)	3	- Atomic absorption spectrophotometry - Polarography
Fresh water filtered through 0-45 µm pore size membrane filter (2)	dissolved Fe (mg/l)		3	Measurement by atomic absorption spectrophotometry or by molecular absorption spectrophotometry
		Cr, Cd, Hg (mg/l)	3	- Atomic absorption - Molecular absorption spectrophotometry

	Ti, V, Mn, Ni, Sn	3	Atomic absorption spectrophotometry
	Cu, Pb (mg/l)	3	- Atomic absorption spectrophotometry - Polarography

Components	Parameters to be determined		Minimum annual sampling and analysis frequency	Reference method of measurement
	mandatorily	optionally		
Suspended solids remaining in 0.45 µm pore size membrane filter	Fe	Cr, Cd, Hg	3	- Atomic absorption spectrophotometry
		Ti, V, Mn, Ni, Zn	3	Atomic absorption spectrophotometry
		Cu, Pb	3	- Atomic absorption spectrophotometry
	Hydrated oxides and hydroxides of iron (mg Fe/l)		3	Extraction of the sample under appropriate acid conditions, measurement by atomic absorption spectrophotometry or by molecular absorption spectrophotometry.
Sediments In the top layer of sediment, as near the surface as possible	Ti, Fe (mg/kg dry matter)	V, Cr, Mn, Ni, Cu, Zn, Cd, Hg, Pb (mg/kg dry matter)	1	Identical methods to those for measurements in the water column.
	Hydrated oxides and hydroxides of iron		1	Identical methods to those for measurements in the water column.
Living organisms Species representative of the site	Ti, Cr, Fe, Ni, Zn, Pb (mg/kg wet and dry weight)	V, Mn, Cu, Cd, Hg (mg/kg wet and dry weight)	1	Atomic absorption spectrophotometry after appropriate preparation of the composite sample of ground flesh (wet or dry mineralization and purification) - For fish, the metals must be measured in muscle or other appropriate tissue; the sample must consist of at least 10 specimens

Components	Parameters to be determined		Minimum annual sampling and analysis frequency	Reference method of measurement
	mandatorily	optionally		
Benthic fauna	Diversity and relative abundance		1	Qualitative and quantitative classification of representative species, indicating the specimen count per species, density, dominance
Planktonic fauna		Diversity and relative abundance	1	Qualitative and quantitative classification of representative species, indicating the specimen count per species, density, dominance
Flora		Diversity and relative abundance	1	Qualitative and quantitative classification of representative species, indicating the specimen count per species, density, dominance
Fish in particular		Presence of morbid anatomical lesions in fish	1	Visual inspection of samples of the representative species taken for chemical analysis

⁽¹⁾ Samples must be taken at the same time of the year and if possible at a depth of 50 cm below the surface.

⁽²⁾ Member States may choose whether to analyse non-filtered or filtered water for substances under 'Parameters'.

ANNEX IV

METHOD OF WASTE DISPOSAL: STORAGE AND DEPOSIT ON LAND

Components	Parameters to be determined		Minimum annual sampling and analysis frequency	Reference method of measurement
	mandatorily	optionally		
1. Unfiltered surface water around the site in the area affected by the storage and at a point outside this area ⁽¹⁾ ⁽²⁾ ⁽³⁾	pH (pH unit)		1	Electrometry. Measurement is to be carried out at the time of sampling
	SO ₄ ⁽⁴⁾ (mg/l)		1	- Gravimetry - Complexometric titration with EDTA - Molecular absorption spectrophotometry
2. Unfiltered ground-water around the site including, where necessary, outflow points ⁽¹⁾ ⁽²⁾	Ti () (mg/l)	V, Mn, Ni, Zn (mg/l)	1	Atomic absorption spectrophotometry
	Fe ⁽⁶⁾	Cr	1	- Atomic absorption spectrophotometry - Molecular absorption spectrophotometry
	Ca (mg/l)		1	- Atomic absorption spectrophotometry - Complexometric titration
		Cu, Pb	1	- Atomic absorption spectrophotometry - Polarography
	Cl ⁽⁵⁾ (mg/l)		1	Titrimetry (Mohr method)
Environment of the storage and dumping site	Visual inspection of: - topography and site management - effect on subsoil - ecology of the site		1	Methods to be chosen by Member States

- (1) Sampling must be carried out at the same time of year.
- (2) When monitoring surface water and groundwater, particular attention is to be paid to any matter carried by running water from the waste storage area.
- (3) Sampling must be carried out 50 cm beneath the surface of the water, if possible.
- (4) Mandatory determination where storage or dumping contains waste from the sulphate process.
- (5) Mandatory determination where storage or dumping contains waste from the chlorine process.
- (6) Also includes the measurement of Fe in the filtrate (suspended solids)

ANNEX V
METHOD OF WASTE DISPOSAL: INJECTION INTO SOIL

Components	Parameters to be determined		Minimum annual sampling and analysis frequency	Reference method of measurement
	mandatorily	optionally		
1. Unfiltered surface water around the site in the zone affected by the injection	pH (pH unit)		1	Electrometry. Measurement is to be carried out at the time of sampling
	SO ₄ ⁽¹⁾		1	- Gravimetry - Complexometric titration with EDTA
2. Unfiltered ground-water around the site including out flow points	Ti ⁽²⁾ (mg/l)	V, Mn, Ni, Zn (mg/l)	1	Atomic absorption spectrophotometry
	Fe ⁽³⁾ (mg/l)	Cr (mg/l)	1	- Atomic absorption spectrophotometry - Molecular absorption spectrophotometry
	Ca (mg/l)		1	- Atomic absorption spectrophotometry - Complexometric titration
		Cu, Pb (mg/l)	1	- Atomic absorption spectrophotometry - Polarography

Environment Topography	Cl ⁶ (mg/l)		1	Titrimetry (Mohr method)
	Ground stability		1	Photographic and topographic survey
	Permeability Porosity		1	Pumping tests Well-logging

⁽¹⁾ Mandatory determination where waste from the sulphate process is injected into soil.

⁽²⁾ Mandatory determination where waste from the chlorine process is injected into soil.

⁽³⁾ Also includes the measurement of Fe in the filtrate (suspended solids).