

Northern Ireland Environment Agency

POLLUTION INVENTORY REPORTING

The Pollution Prevention and Control Regulations (NI) 2003 – Guidance Notes Q33/11 V4

Pollution Inventory Reporting

The Pollution Prevention and Control Regulations (NI) 2003

Guidance notes

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1. Objectives of the Pollution Inventory (PI)

The main objectives of the PI are to help:

- provide the public with easy access to information about substances and wastes released and/or transferred from industry in their locality;
- us protect the environment by providing information to assist in policy development;
- Government meet its national and international environmental reporting commitments, such as the Kyoto protocol on climate change.

2. Purpose of this guidance

This guidance document will help you make your PI return.

A separate PI reporting codes document contains a comprehensive list of all codes used in PI reporting.

3. How to report

To make your PI return you should use:

- the Pollution Inventory Reporting Form, Q33/10, (latest version) available from our website at:

<http://www.ni-environment.gov.uk/pollution/ippc/pol-emission-reg.htm>

Sector specific reporting guidance is available on the EA website.

The website address is:

<http://www.environment-agency.gov.uk/pi>

4. Changes to reporting requirements for 2007 onwards

The list of PI substances and reporting thresholds has changed.

- Releases to land must be reported, but only relating to the disposal of waste by application to land or underground injection.
- Detailed methods for determining releases and transfers must be reported when either M (measurement) or C (calculation) techniques are used. Look-up tables are provided in the associated PI reporting codes document.
- 'Sewer emissions' have been re-labelled as 'Off-site transfers in wastewater' to reflect the fact that such 'emissions' do not enter the external environment. This includes

wastewater transferred off-site in, for example, tankers.

- When reporting releases to waters and transfers in wastewater, each route is compared separately with the relevant reporting threshold. Previously the sum of the two figures was compared to the threshold.
- Details of trans-frontier shipments taking place during 2007 and thereafter must be reported.

5. Format of the PI form

The form consists of six parts:

- Part 1 About the operator and site
Includes confidentiality and declaration sections
- Part 2 Releases to air
- Part 3 Releases to land
- Part 4 Releases to waters
- Part 5 Off-site transfers in wastewater
- Part 6 Off-site waste transfers.

6. Guidance for specific industrial sectors

A range of sector-specific guidance and tools have been produced to assist you in making your PI return. These can be obtained from the EA PI website and cover the following activities:

- Combustion
- Petroleum
- Iron & Steel
- Cement & Lime
- Incineration
- Paper & pulp
- Landfills – leachate releases tool and GasSimLite
- Hazardous waste transfer stations
- Waste treatment operations
- Used oil treatment
- Food & Drink

The sector-specific guidance and tools are not statutory, but are designed to help you quantify releases where you do not have site-specific data available. In general, you should use the best data and techniques available to you, although we do not require additional monitoring to be undertaken. A number of references to reporting guidance developed by other organisations are provided in section 11 to assist you.

7. Completing Part 1 - About you and your site

Everyone must complete and return the form with Part 1 completed as a minimum. Questions 1.6 to 1.10 are optional.

7.1 Question 1.1

Authorisation, licence or permit number

The response to this question depends on your current regulatory regime as follows:

- PPC permitted installation – give the original permit number.
- IPC authorised process – give the original authorisation number.

'Reporting unit' will be used to describe any of the above activities throughout these guidance notes.

7.2 Question 1.4

7.2.1 NACE code

We need to know the 4-figure NACE code defining the main economic activity of the 'reporting unit'.

To select the correct 4-figure NACE code:

1. Identify all PPC Schedule 1 Part A activities associated with the 'reporting unit'.
2. Read off the corresponding possible 2-figure NACE codes from Table 1 in the associated PI reporting codes document.
3. Using those 2-figure codes, select the 4-figure NACE code that best represents the main economic activity of the 'reporting unit' from the 'Class' column of Table 2 in the associated PI reporting codes document.
4. Enter the 4-figure NACE code on the reporting form.

7.2.2 NOSE-P codes

We need to know all the relevant NOSE-P codes for the polluting processes of the 'reporting unit'.

To select the correct 5-figure NOSE-P codes:

1. Identify all PPC Schedule 1 Part A activities associated with the 'reporting unit'.
2. Read off the corresponding NOSE-P codes from Table 1 in the associated PI reporting codes document.

In some cases there is more than one possible NOSE-P code for a given PPC activity code.

3. To help you choose the code relevant to the 'reporting unit' study the text in the final column of Table 1 in the associated PI reporting codes document, which gives a

description of the NOSE-P process in the context of the PPC activity.

4. Having identified all the NOSE-P codes relevant to the 'reporting unit', choose the main one and enter this in the appropriate answer box. *Where there is a choice, the main polluting process will normally be the one most closely related to the main economic activity of the 'reporting unit'.*
5. Any additional NOSE-P codes should be reported in the 'Other' answer boxes. See worked example below:

Worked Example

A PPC-permitted chemical plant producing vinyl chloride (VC) and PVC and with a 100 MW fuel combustion plant on site.

- The relevant Schedule 1 Part A PPC activity codes are 4.1 and 1.1a, which correspond to a 2-figure NACE code of 24 for the plant's main economic activity (chemical industry).
- Looking at the PI reporting codes document, the most appropriate 4-figure NACE code is 24.16 (manufacture of plastics in primary forms).
- From Table 1 of the PI reporting codes document the relevant NOSE-P codes are 105.09 (for the VC and PVC processes) and 101.02 (for the combustion plant).
- The main NOSE-P code is 105.09, as this is most representative of the plant's main economic activity.

If the plant operates under separate IPC authorisations for three prescribed processes, the releases from each should be reported separately with one NOSE-P code on each reporting form (i.e. 105.09 for the VC process, 105.09 for the PVC process and 101.02 for the combustion plant). The NACE code on all three reporting forms would be 24.16.

Questions 1.6–1.10

Information given in these questions is voluntary.

7.3 Question 1.8

Annual output from your main economic activity

Describe the main product of the main economic activity carried out at the 'reporting unit' and the quantity produced in the relevant units of measurement.

For operators of waste plants who are unable to identify an obvious product, reference to the main process on site will suffice, for example landfilling. In these cases the quantity of waste processed could be inserted in the 'quantity' box.

7.4 Question 1.9

Annual consumption

Give the annual consumption of electricity, gas, oil and coal in megawatt hours (MWh) for the 'reporting unit'. You will need to convert fuel masses and volumes into energy equivalents using appropriate calorific values (CV, usually given as kJ or MJ per tonne or m³). Multiply the CV by the mass or volume of annual fuel use then convert from Joules to MWh, using 1MWh = 3.6GJ.

Give the annual water use of the 'reporting unit' in cubic metres.

7.5 Question 1.10

Email and web address

You can give us a website and/or email address for any external enquiries relating to your data.

7.6 Commercial confidentiality

The reporting form enables you to say whether you consider any (or all) of the information you are giving is commercially confidential.

Any claim for confidentiality is deemed to be a claim under regulation 32 of the Pollution Prevention and Control Regulations (Northern Ireland) 2003 and you should submit a reasoned justification in writing.

If you do not enclose a written justification for each item included in the confidentiality claim, we are likely to reject it straight away.

If you consider *some* of the submitted information is confidential:

- tick the 'Commercial in confidence' box next to the appropriate items on the form;
- tick the appropriate box under the 'Confidentiality' section of the 'Checklist' in Part 1 of the form;
- list any supporting documents submitted in the appropriate box under the 'Confidentiality' section of the 'Checklist' in Part 1 of the paper or web form.

If you consider *all* of the submitted information is confidential:

- you do not need to tick the 'Commercial in confidence' box for each item;

- tick the appropriate box under the 'Confidentiality' section of the 'Checklist' in Part 1 of the form;
- ensure your written justification covers all the information provided;
- list any supporting documents submitted in the appropriate box under the 'Confidentiality' section of the 'Checklist' in Part 1 of the paper or web form.

We will determine your claim for commercial confidentiality within a period of 28 days from the date of the application or within an agreed longer period.

8. Completing Parts 2-5 – Releases and transfers

Parts 2-5 of the PI return require you to report annual mass releases of specified substances to air, land and waters, and off-site transfers in wastewater from the 'reporting unit' specified in question 1.1.

In reporting you should use one or more of the approaches listed in the section entitled 'How to quantify PI releases' and follow the reporting conventions below.

8.1 Definition of media

8.1.1 Releases to air

For the purposes of quantifying the total amount of substance released to air, 'air' is taken to mean both the inside and outside of a building. However, when quantifying the amounts released from a given point as part of the overall mass contribution, care must be taken not to double count.

8.1.2 Releases to waters

The release medium should be specified as groundwater (G), river (R), estuary (E) or sea (S). Definitions are given below.

- **Groundwater (G)** - The definition used is from the EC Groundwater Directive (80/68/EEC) and Water Framework Directive (2000/60/EC): 'all water which is below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil.'
- **Rivers and inland waters (R)** - This includes surface fresh waters which are defined, by default, as those inland surface waters which are not part of an estuary.
- **Estuary (E)** - Estuary is defined in line with the Urban Waste Water Treatment

Directive (91/271/EEC): 'estuary means the transitional area at the mouth of a river between fresh water and coastal waters. Member states shall establish the outer (seaward) limits of estuaries for the purpose of this Directive.

- **Sea (S)** - For the purposes of PI reporting, the sea designation corresponds to coastal waters up to three miles from the coast.

8.1.3 Releases to land

For the purposes of PI reporting 'releases to land' only applies waste that is subject to the disposal operations 'land treatment' or 'deep injection'. If waste is treated in this way, substance specific releases are reported by the operator of the installation producing the waste, regardless of the disposal location. Accidental releases of substances onto the soil of the installation, e.g. as spillages, do not have to be reported.

8.1.4 Off-site transfers in wastewater

Reporting of off-site transfers in wastewater comprises all relevant substances transferred to wastewater treatment plant via sewer or other means, eg by tanker. Transfers within the defined 'reporting unit' should not be reported.

8.2 Reporting Conventions

8.2.1 Total releases (including notifiable releases)

You are required to report your total annual mass releases or transfers for each specified substance and each media in the 'Total releases' column. This figure should include point source, fugitive and any notifiable releases.

A release value, n/a or brt should be entered in the 'Total releases' column as appropriate.

These are explained below:

- *Release* - When the annual release exceeds the reporting threshold enter the total annual mass released or transferred.
- n/a (not applicable) - where no release or transfer of the substance occurred in the reporting year to that medium, enter 'n/a'.
- brt (below reporting threshold) - Where the annual releases or transfers have been determined and found to be below the reporting threshold, enter 'brt'.

8.2.2 Mass units and significant figures

All releases should be quoted in kilotonnes 'kt', tonnes 't', kilogrammes 'kg', grammes 'g' or

milligrammes 'mg' per year with three significant figures. Rounding to three significant figures does not refer to the statistical or scientific uncertainty, but provides a common standard for all reported data. Examples of rounding raw data to 3 significant figures are shown below.

Original release (kg/year)	Release reported to 3 significant figures (kg/year)
0.0000123456	0.0000123
0.0512495	0.0512
1.23456	1.23
12.3456	12.3
12	12.0
123.456	123
1234.567	1230
12345.678	12300
1234567890.0000	1230000000

8.2.3 Notifiable releases

'Notifiable releases' are unplanned and unauthorised releases of a particular substance or substances to the environment. They may result from an emergency, mis-operation, accident or plant failure.

In these cases the permit or authorisation requires you to provide us with a specific notification, followed by specific information on the releases. If notifiable releases of a substance were made during the reporting year, the amounts released during such events should be quantified and detailed in the 'Notifiable releases' column and included with any other releases in the 'Total releases' column. In such cases you should estimate the mass lost to each release medium. There is no reporting threshold for notifiable releases, so if no such releases have taken place this should be designated by 'n/a'.

Reporting of notifiable releases is not required for sites currently operating solely under waste management licences and in such cases enter 'n/a' in the 'Notifiable releases' column.

Case studies**Spillage**

Thirty tonnes of cleaning solvent is split. You need to consider the fate of the spilled substance.

- Ten tonnes of solvent is recovered for reuse so this does not reported in the 'Notifiable releases' column.
- You estimate that 2 tonnes is lost to air and 18 tonnes has gone into waters – these figures need to be reported in the 'Notifiable releases' column.

Fire

An accidental fire in skip of waste for landfill results in the combustion of 60 tonnes of wood.

- This loss to air need to be reported in the 'Notifiable releases' column. Use emission factors to estimate pollutant releases to the atmosphere during the incident.

8.2.4 Codes for methods used to determine releases

All release data reported should be accompanied by a code that indicates how figures have been determined. These codes do not necessarily refer to the accuracy of the data, because there is no uniform relationship between the methods used (code) and the accuracy of the resulting figure. There are three possible codes to indicate the release determination method for the reported data.

These are detailed in the table on the following page

Enter code:	M = measurement	C = calculation	E = estimation
Release data based on:	Measurements using standardised or accepted methods. Often, additional calculations are needed to convert the results of measurements into annual releases.	Calculations using nationally or internationally agreed estimation methods and emission factors, which are representative for the industrial sectors.	Non-standardised estimations derived from best assumptions or expert guesses.
Used when releases are based on or calculated:	from direct monitoring results for specific processes at the plant, based on actual measurements of pollutant concentrations for a given release route. It refers to results of standardised or accepted (continuous) measurement methods; on the results of short term and spot measurements.	on activity data (fuel used, production rate, etc) and emission factors. In some cases more complicated calculation methods can be applied, using variables like temperature, global radiance etc; on a mass balance approach; from published references, including our sector-specific guidance and tools.	by expert judgement, not based on publicly available references; using guesses of the releases in case of absence of recognised release estimation methodologies or good practice guidelines.
Considerations	continuous release monitoring will yield the most accurate figure for annual releases. some monitoring is only performed on an intermittent basis. In these instances, the duration of the release must be noted to enable accurate quantification of the annual releases to be made. the frequency of the direct measurements should also be taken into account when determining if monitoring data alone are sufficient for making a reasonable annual estimate. Spot measurements of any release parameter may not be fully representative of the annual releases value of that substance. This may be due to variations in the release profile due to production and process changes or variability in sampling and analysis techniques. although direct measurement should yield the most accurate results, only rarely will sufficient data be available for all release points to enable the total annual releases of a substance to be quantified without resorting to other techniques (for example calculations and estimations).	when undertaking a mass balance calculation, the period over which the calculation is performed needs to be defined to take into account non-continuous processing or variation in processes. The mass balance calculation may be performed over a year, or over a defined period from which the results are adjusted to provide the annual quantities released; simple mass balance calculations can be used for a specific substance on an individual process; mass balance must estimate annual releases, and so it is best to estimate based on total annual data. If data collected over a period of less than one year are used to calculate mass balances, the operator must ensure that the interpolated annual figures reflect the operation of the plant over that period; use the most appropriate emission factors from monitoring of similar sites, plant or releases.	the quality of emission factor data can vary widely. In some instances, emission factors have been calculated from measurements under test conditions on a large variety of equipment whilst others have been derived from detailed monitoring data. Some have simply been based on average releases from similar types of processes; some emission factors will be plant or process-specific, while others may be national averages. The quality of emission factors varies depending on the applicability and the reliability of the calculations and original measurements used to derive them; the highest quality data available should be used in any calculations; once the appropriate emission factors for the process have been identified, they will need to be tailored to the specific site process.

Enter the code that corresponds to the method used to determine the largest proportion of the annual releases.

Worked Examples – how to decide method codes

Example 1. The annual release of a substance to air from a plant was determined purely from monitoring data of stack releases, and there were no other sources of this substance to air from the plant – enter M.

Example 2. The annual release of a substance to air was determined from three processes by different approaches

- 30% of the total from measurement (releases from a stack)
- 15% of the total by estimation (fugitive releases)
- 55% of the total by calculation (releases from vents)

The greatest proportion of the total annual releases to air was determined by calculation – enter C.

8.2.5 Detailed release determination methods

After selection of 'M' or 'C' as the reporting method for a given substance, a specific method code must be entered.

A comprehensive listing of all generic and substance specific detailed determination methods can be found in tables 3 and 4 in the associated PI reporting Codes document.

A detailed method description is not required if 'E' is selected as the reporting method for a given substance.

8.3 Releases to air – substance-specific guidance

For 'Inorganics' and 'Organics' the total mass of the specified substance should be reported.

For 'Metals and compounds' the mass of each relevant compound should be converted to the mass of metal it contains.

For the 'Other substance groups' total mass should be reported unless otherwise specified. Specific guidance is provided below for these substance groups

8.3.1 Carbon dioxide

Carbon dioxide from thermal and chemical sources should be reported separately. Thermal sources are those arising from combustion of fuel. Chemical sources are those arising from other processes, eg from degradation of waste in landfills. The sum of these two sources should be compared to the reporting threshold to determine whether releases are above or below the combined reporting threshold.

8.3.2 Brominated diphenylethers

The total mass of penta-, octa-, and deca-compounds of this type should be reported.

8.3.3 Chlorine and inorganic compounds and fluorine and inorganic compounds

The mass of each inorganic chlorine compound and chlorine should be converted to the equivalent mass of HCl (by dividing by relative molecular mass and multiplying by 36.5) then these figures summed to give the total mass to be reported. The same approach should be taken for fluorine and inorganic fluorine compounds, with the mass reported as the total HF equivalent (divide by relative molecular masses, multiply by 20 and sum).

8.3.4 Halogenated fluorocarbons

There are six groups of halogenated fluorocarbons we need to know about. In each case the total mass should be reported. These are described below:

Chlorofluorocarbons (CFCs)

A general class of halogenated organic compounds based on methane and ethane, in which all of the hydrogen atoms have been fully substituted with chlorine and fluorine atoms.

Halons

For the purposes of PI reporting halons are a general class of halogenated organic compounds based on methane and ethane, in which all of the hydrogen atoms have been substituted with chlorine and/or fluorine and at least one other halogen species. In practice this definition means that a halon will contain bromine atoms in addition to chlorine and/or fluorine atoms.

Hydrobromofluorocarbons (HBFCs)

A general class of halogenated organic compounds based on methane and ethane in which some of the hydrogen atoms have been substituted with fluorine and bromine atoms.

Hydrochlorofluorocarbons (HCFCs)

A general class of halogenated organic compounds based on methane and ethane in which some of the hydrogen atoms have been substituted with chlorine and fluorine atoms.

Hydrofluorocarbons (HFCs)

A general class of halogenated organic compounds based on methane and ethane in which some of the hydrogen atoms have been substituted with fluorine atoms.

Perfluorocarbons (PFCs)

A general class of halogenated organic carbons based on methane and ethane in which all of the hydrogen atoms have been substituted with fluorine atoms.

Types of halogenated fluorocarbons

Acronym	Name	Composition
CFC	Chlorofluorocarbons	chlorine + fluorine + carbon only
-	Halons	fluorine +/- or chlorine + carbon + one other halogen
HBFC	Hydrobromofluorocarbons	hydrogen + bromine + fluorine + carbon only
HCFC	Hydrochlorofluorocarbons	hydrogen + chlorine + fluorine + carbon only
HFC	Hydrofluorocarbons	hydrogen + fluorine + carbon only
PFC	Perfluorocarbons	fluorine + carbon only

8.3.5 Dioxins and furans

Dioxins and furans are a family of compounds known chemically as polychlorinated dibenzodioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs). Each compound is

made up of two benzene rings interconnected by oxygen atoms. Each individual PCDD or PCDF is termed a congener (there are 210 congeners in total). In reporting dioxin and furan releases to the PI, only the mass of PCDD and PCDF with chlorine atoms in the 2, 3, 7 and 8 positions (which are of particular environmental concern) should be included. The 17 relevant PCDD and PCDF congeners are listed below.

Relevant dioxin congeners

Congener	WHO-TEF	I-TEF
PCDDs		
2,3,7,8-TCDD	1	1
1,2,3,7,8-PeCDD	1	0.5
1,2,3,4,7,8-HxCDD	0.1	0.1
1,2,3,7,8,9-HxCDD	0.1	0.1
1,2,3,6,7,8-HxCDD	0.1	0.1
1,2,3,4,6,7,8-HpCDD	0.01	0.1
OCDD	0.0003	0.001
PCDFs		
2,3,7,8-TCDF	0.1	0.1
2,3,4,7,8-PeCDF	0.3	0.5
1,2,3,7,8-PeCDF	0.03	0.05
1,2,3,4,7,8-HxCDF	0.1	0.1
1,2,3,7,8,9-HxCDF	0.1	0.1
1,2,3,6,7,8-HxCDF	0.1	0.1
2,3,4,6,7,8-HxCDF	0.1	0.1
1,2,3,4,6,7,8-HpCDF	0.01	0.01
1,2,3,4,7,8,9-HpCDF	0.01	0.01
OCDF	0.0003	0.001

There are various ways of reporting dioxin releases in terms of their toxicity. The two schemes to be used in reporting to the PI are those of International toxicity equivalents (I-TEQs) and World Health Organisation toxicity equivalents (WHO-TEQ).

Under these schemes each dioxin congener is assigned a toxic equivalency factor (I-TEF for the International scheme and WHO-TEF for the WHO scheme). The 2,3,7,8-TCDD isomer is the most toxic, and by convention is assigned a TEF of 1.0. The remaining 2,3,7,8-positional congeners are then assigned lower TEFs, relative to that of 2,3,7,8-TCDD.

The toxicity mass of a particular substance relative to 2,3,7,8-TCDD, can then be expressed by multiplying the mass of those 2,3,7,8-positional congeners present in the mixture by

their respective TEFs. The resulting toxic equivalents (TEQs) are expressed in terms identical to those in which the individual congeners are expressed, which for PI purposes is mass.

You must give the total quantity of dioxins and furans in terms of their International toxicity equivalents (I-TEQs) and WHO toxicity equivalents (WHO-TEQs).

TEFs for each of the 17 relevant 2,3,7,8-positional congeners of PCDDs and PCDFs are presented in the Table to the left. All other congeners that may be present in a sample are assigned a TEF value of 0.0 and so are not reportable to the PI.

Worked Example - calculating Dioxin and Furan releases

If monitoring data representative of annual releases are available, the TEQ of the mixture is obtained by summing the individual TEQs using the following approach:

STEP 1: Calculate the TEQ for each congener released. Multiply the concentration (per m^3) of each released congener by its TEF and then by the total volume released in that year (in m^3) to provide the TEQ.

STEP 2: Calculate the total TEQ released. Add together the TEQs of all the congeners released.

Carry out Steps 1 and 2 for both sets of TEFs.

8.3.6 Non-methane volatile organic compounds (NMVOCs)

The figure reported should be the total mass of all NMVOCs. It should include the masses of all NMVOCs specified in the schedule and detailed on the form and any others named by the operator, where individually they exceed the 5 tonnes reporting threshold.

The term volatile organic compound (VOC) covers a wide range of substances with different environmental impacts. They are principal components in atmospheric reactions that form ozone and other photochemical oxidants. For the purpose of this guidance, and when completing the PI reporting form, volatile organic compounds are defined as:

'Any organic compound released to the atmosphere from the operator's installation or process, but excluding releases of naturally produced volatile organic compounds from within

the plant boundary and methane (which is a non-reactive compound and is therefore not classified as a VOC)'.

Organic compounds with negligible photochemical reactivity may also be excluded from this classification. If you believe your process releases a volatile organic compound that is not photochemically reactive, you should discuss and reach agreement on this with your inspector prior to excluding it from the PI return. Where no other detailed species data are available for process releases for a particular industry the most recent National Atmospheric Emission Inventory (NAEI) speciation spreadsheet can be used. It contains species profiles for a number of industrial processes likely to release VOCs.

Using the NAEI spreadsheet

STEP 1: Download the spreadsheet from the EA PI website.

STEP 2: Under the 'Use of profiles' tab choose the sector that most closely matches your operation from column A and then read off the corresponding species profile in column B. Under the 'Profiles' tab select the chosen species profile number. This provides a proportionate breakdown of the likely VOC speciation from the defined operation.

STEP 3: Apply VOC proportion to your total VOC release figure for each species.

For example benzene: $\text{t/year} = \text{total VOC release (t/year)} \times \text{NAEI benzene proportion}$.

8.3.7 Nitrogen oxides

Nitrogen oxide releases are defined as the sum of nitrogen dioxide and nitric oxide releases. The nitric oxide releases should be converted to their nitrogen dioxide mass equivalent (by multiplying by 1.5) before being added to the mass of nitrogen dioxide released.

8.3.8 Particulate matter

Report separately the total mass of particulate matter released (in the row 'Particulate matter – total') and the masses of PM_{10} and $\text{PM}_{2.5}$ released (in the rows 'Particulate matter – PM_{10} ' and 'Particulate matter – $\text{PM}_{2.5}$ ' respectively). PM_{10} is particulate matter with an aerodynamic diameter of 10 microns or less and $\text{PM}_{2.5}$ with an aerodynamic diameter of 2.5 microns or less.

8.3.9 Polychlorinated biphenyls (PCBs)

Polychlorinated biphenyls (PCBs) are a group of 209 chlorinated organic compounds. The UK Committee on Toxicity has recommended 13 PCB congeners as a priority, which may have a dioxin-like effect and these are listed below.

PCBs and their toxic equivalency factors

PCB	IUPAC number	WHO-TEF
non-ortho		
3,3',4,4'-TCB	77	0.0001
3,4,4',5-TCB	81	0.0003
3,3,4,4',5-PeCB	126	0.1
3,3',4,4',5,5'-HxCB	169	0.03
mono-ortho		
2,3,3',4,4'-PeCB	105	0.00003
2,3,4,4',5-PeCB	114	0.00003
2,3',4,4',5-PeCB	118	0.00003
2',3,4,4',5-PeCB	123	0.00003
2',3,3',4,4',5-HxCB	156	0.00003
2,3,3',4,4',5'-HxCB	157	0.00003
2,3',4,4',5,5'-HxCB	167	0.00003
2,3,3',4,4',5,5'-HpCB	189	0.00003

For releases of PCBs to air (the requirement is different for water) two figures should be reported: the total annual mass released and the total annual release based on WHO-TEQ values for the sum of the 12 substances listed above. Where monitoring has been carried out, calculating TEQ values requires the same approach as for dioxins and is outlined in the following steps:

Worked example – calculating PCB releases

STEP 1: Calculate the WHO-TEQ for each PCB released
 Multiply the concentration (per m³) of each PCB releases by its WHO-TEF and then by the total volume releases in that year (in m³) to provide the WHO-TEQ.
 STEP 2: Calculate the total WHO-TEQ released
 Add together the WHO-TEQs of all the congeners released.

8.3.10 Sulphur oxides

The releases of sulphur oxides, expressed as the mass equivalent of sulphur dioxide, should be reported. In practice this means converting any sulphur trioxide releases to the equivalent mass of sulphur dioxide (by multiplying by 0.8) and adding to the mass of sulphur dioxide released.

8.3.11 Other individual organic compounds

Comprises any organic compound not reported elsewhere. Give details of releases of such compounds which exceed 5 tonnes in the reporting year.

8.3.12 Other individual halogens

Comprises four halogens: fluorine, chlorine, bromine, and iodine.

Give details of releases of any of the above compounds, which exceeds 1 tonne per year.

Other individual acid-forming gases

Includes any substance that may form an acid when added to water, for example hydrogen bromide.

Give details of any releases, which exceed 1 tonne a year and are not already recorded elsewhere.

8.4 Large combustion plant directive

Some installations may fall under the reporting requirements of the EU Large Combustion Plant Directive (LCPD). These installations must report separate figures for nitrogen oxides, sulphur dioxide and particulate matter releases to air. Releases for LCPD reporting are not necessarily the same as for the whole 'reporting unit'. If you are affected you should report releases to air in the main section of Part 2 (the sulphur oxides, nitrogen oxides and particulate matter rows) and in the 'Large combustion plant directive' table at the end of Part 2 (releases to air). Note that the LCPD releases figure has no minimum reporting value – you must report your total releases whatever their values.

8.5 Releases to water – substance-specific reporting

For 'Inorganics' and 'Organics' the total mass of the specified substance should be reported. For 'Metals and compounds' the mass of each relevant compound should be converted to the mass of metal it contains. For the 'Other

substance groups' total mass should be reported unless otherwise specified. Specific guidance is provided below for these substance groups.

8.5.1 Brominated diphenylethers

The total mass of penta-, octa-, and deca-compounds of this type should be reported.

8.5.2 Chlorides, fluorides and cyanides

For each of these classes of compounds, convert the mass of individual inorganic species to the equivalent mass of chloride, fluoride or cyanide respectively and report the sum in each class.

8.5.3 Dioxins and furans

Same requirements as for releases to air.

8.5.4 Halogenated organic compounds

The mass of the fraction of adsorbable organohalogenated compounds (AOX) should be reported as mass of chloride.

8.5.5 Nitrogen

Convert the mass of individual inorganic nitrogen-containing species (nitrate, nitrite etc) to the equivalent mass of nitrogen (N) and report the sum.

8.5.6 Phenols

Report the total mass of phenol and simple substituted phenols expressed as total carbon.

8.5.7 Phosphorus

Convert the mass of individual inorganic phosphorus-containing species (phosphate, etc) to the equivalent mass of phosphorus (P) and report the sum.

8.5.8 Polychlorinated biphenyls (PCBs)

Report the total mass of all PCBs released.

8.5.9 Polycyclic aromatic hydrocarbons (PAHs)

Report the sum of releases of benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene and indeno(1,2,3-cd)pyrene.

8.5.10 Total organic carbon (TOC)

A TOC annual load should be generated from representative measurement and flow data. In the absence of such data the value can be taken as one third of the annual COD load.

8.6 Transfers in wastewater – substance specific reporting

Please use the same reporting conventions as detailed in section 8.5.

8.7 Releases to land – substance specific reporting

Please use the same reporting conventions as detailed in section 8.5 apart from:

8.7.1 Benzene, Toluene, Ethyl benzene, Xylene (BTEX)

The sum of the four substances should be compared to the reporting threshold to determine whether releases are above or below the combined reporting threshold.

9. Completing Part 6 of the PI return – waste transfers

In this section you should report the annual tonnages of wastes arising from process-related activities and transferred off-site for disposal or recovery. Exclude liquid wastes transferred via sewer or other means to wastewater treatment plant (these should be reported as substance-specific off-site transfers in wastewater).

9.1 Reporting thresholds

For hazardous wastes (those indicated by an asterisk in the EWC code) no reporting threshold applies. For all other EWC/D&R code combinations a reporting threshold of 5 tonnes applies. Quantities below this should be reported as 'brt'.

9.2 Completing the reporting table

You should report the quantity of waste transferred off site according to its 6-figure European Waste Catalogue (EWC) codes (see EC Commission Decision 2000/532/EC) and according to the Waste Framework Directive (WFD) disposal and recovery codes (EC Council Directive 75/442/EEC, as amended). See the associated PI reporting codes document for a Comprehensive listing of EWC codes and D&R codes.

Completing section 6 – waste transfer

STEP 1: Complete the relevant 6-figure EWC codes in the first column in the format xx yy zz

STEP 2: Complete the relevant WFD D&R codes in the first row.

STEP 3: Enter waste tonnages or 'brt' (below reporting threshold) as appropriate.

There is no need to insert 'n/a' (not applicable) in the boxes where no waste is transferred off-site.

9.3 Mass determination methods

You should select a method used to determine the greatest proportion of waste transferred under each of the four categories below:

- Hazardous waste disposed
- Other waste disposed
- Hazardous waste recovered
- Other waste recovered

(hazardous wastes are indicated by an asterisk against the EWC code)

The mass determination method options are:

- Weighing
- Calculation (includes a free text field allowing further details to be entered)
- Estimation

9.4 Transboundary waste shipments

The following details of transboundary shipments of hazardous waste taking place during 2007 and thereafter must be reported on an annual basis:

- Tonnes transferred
- Name of recoverer
- Address of recoverer
- Address of actual recovery site receiving the transfer
- Method used to determine mass (weighing, calculation or estimation)

Please submit this information on a separate sheet if applicable.

10. Worked example – estimating site releases

The reporting requirements for the PI encompass releases from the whole of the 'reporting unit'.

This includes the releases from defined points (point sources), non-point sources and fugitive releases occurring from processing, transfer, storage, maintenance and cleaning operations.

In order to complete Parts 2 and 3 of the PI reporting form accurately you should assess the releases and activities on your site in a logical manner. To do this you will probably need to establish:

- the boundary of the 'reporting unit'
- the sources of releases
- the medium to which releases occur, and
- the substances released.

Step 1: identify the 'reporting unit' boundary

A process diagram will help you identify all possible points from which releases are likely to occur. Take care to ensure that all relevant areas including materials receipt, loading, storage, on-site transportation and waste handling are included. For dedicated waste management industries include all relevant processes such as waste pre-treatment plant, landfill leachate treatment plant and landfill gas combustion plant.

Step 2: identify sources of releases

Once the 'reporting unit' boundary and all associated elements have been defined, it should then be possible to identify potential sources of releases. The primary sources of releases are likely to be from the process or waste management activities, but all sources including storage, handling and discharge/disposal must be taken into account.

Step 3: link sources to media

Link each of the identified sources of release to a specific medium – air, land or waters – or off-site transfers in wastewater. These media form the basis of the PI reporting form. The quantified releases of a substance should be documented in relation to the receiving media, subject to reporting thresholds.

Step 4: substances released.

All substances which are included on the PI reporting form (for air and water) which come into or leave the relevant boundary, need to be identified. Only substances involved in the process operations and maintenance activities should be included.

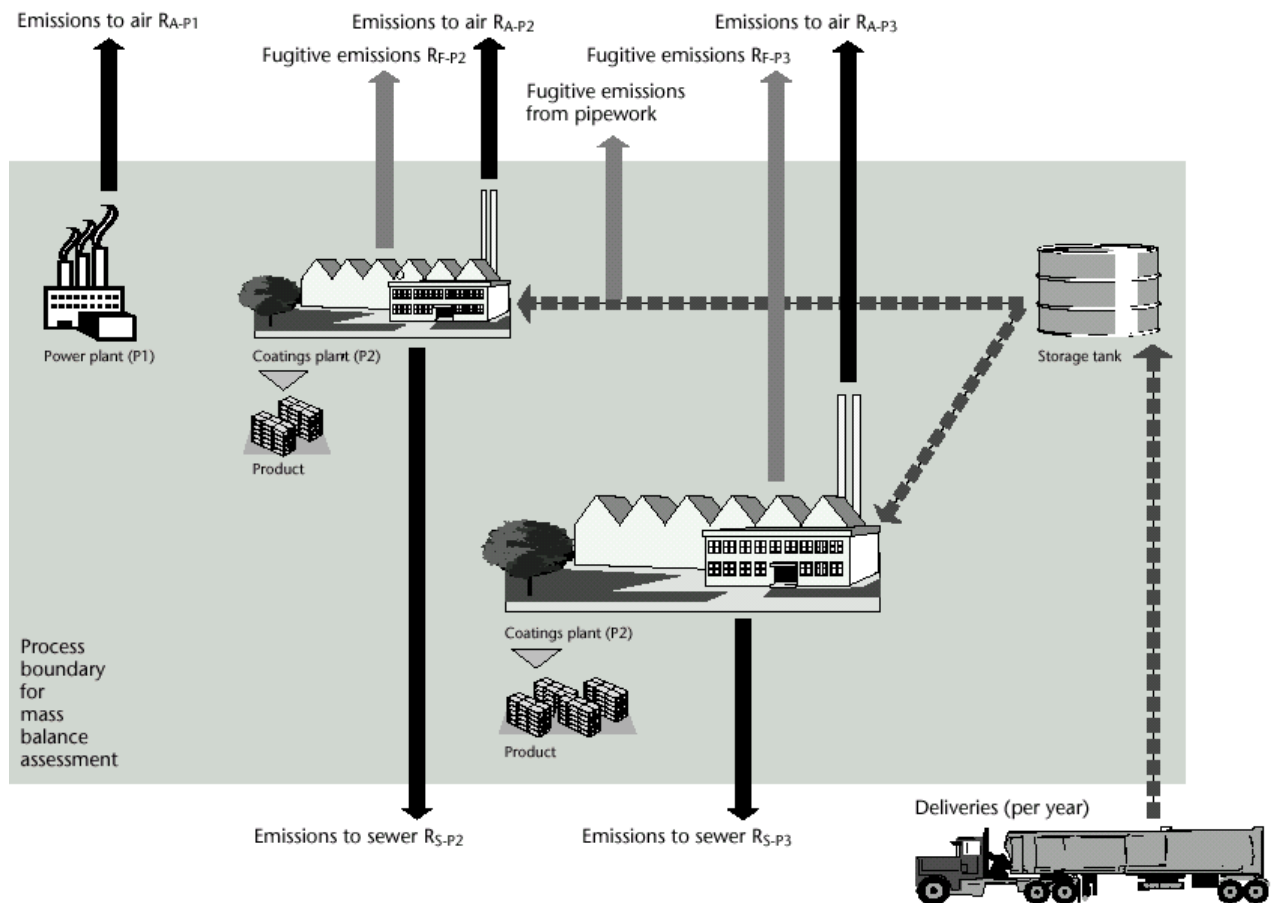
Step 5: determine release quantities

If a substance is or has the potential to be released from the relevant boundary, the amount released should be established. The total quantity of a given substance released per annum is required by the PI reporting form or reporting as n/a or brt (See "Reporting conventions" on page 5). Information on the rate and timing of release is important when calculating the annual mass releases. Therefore, for each of the planned release points, such information should be obtained wherever possible.

The worked example that follows shows some of the points made here.

Example

The example considers a plant that has three processes on-site but operates under one authorisation or permit. For plants with multiple authorisations a separate PI reporting form will need to be completed for each authorisation number (i.e. each 'reporting unit'). The diagram below shows a simplified version of the plant.



One process (P1) generates power for the plant, and has releases to air (R_{A-P1}).
 One process (P2) coats materials, and has releases to air and off-site transfers in wastewater via sewer (R_{A-P2} & R_{W-P2}) and fugitive releases from flanges, valves, etc (R_{F-P2}).

One process (P3) is similar but not identical to P2 with smaller throughput and has releases to air and off site transfers in wastewater via sewer (R_{A-P3} & R_{W-P3}) and fugitive releases from flanges, valves etc (R_{F-P3}).

A liquid effluent stream from P2 and P3 is treated via a wastewater treatment works, and then discharged to a local sewer. Other fugitive releases occur from the pipework leading from the raw material storage tank to the plants. For simplicity only a limited number of possible PI

substances that could be released from each process have been considered. The type of releases and the type and frequency of monitoring from all the processes on the site are summarised in the Table below.

Type of release and monitoring regime

Process	Type of release or transfer	Source of releases or transfers	Code for release or transfer source	Example of pollutants released or transferred	Monitoring regime
P1 (power generation plant)	air	stack	R _{A-P1}	SO ₂ , NO _x	Continuous for some pollutants, but calibration problems meant data unreliable and has been rejected
	wastewater	(none)			
	fugitive	(none)			
P2 (coating process)	air	vent	R _{A-P2}	NM VOC	Continuous
	wastewater	treatment plant	R _{w-P2}		Spot reading every month (lasting 1 hr.); reading taken in effluent before it enters local sewer
	fugitive	storage/flange s/ pipes etc.	R _{F-P2}		(None)
P3 (coating process)	air	vent	R _{A-P3}	NM VOC	2 spot readings (3 hrs each) over the year
	wastewater	treatment plant	R _{w-P3}		Spot reading every month (1 hr); reading taken in effluent before it enters local sewer
	fugitive	storage/flange s/ pipes etc.	R _{F-P3}		(None)

The table below summarises which approach (from monitoring, estimation or calculation) could be used in this example to enable reporting of annual mass releases from each route from each process. It is deliberately not prescriptive, as the operator will always have to

use some judgement about which is the best approach to reporting releases. The most important point is to use the approach that is likely to give the best estimate of the annual mass release from the process being considered.

One approach for determining annual mass releases

Source of releases	Pollutants considered	Calculation approach for releases (M,C or E)	Method to complete the calculations	Notes
R _{A-P1} (to air)	SO ₂	C or E	Releases of for example SO ₂ could be assessed by calculating (C) the product of the annual fuel burnt by sulphur content of the fuel. Releases of SO ₂ and other combustion gases could also be assessed by calculation (C, possibly E) from the products of suitable emission factors and the quantity of fuel burnt.	Ideally, releases would have been assessed from the monitoring data. It might be necessary to take into account variations in the sulphur content of the fuel if approach (C) is used.
R _{A-P2} (to air)	NMVOC	M	Releases of total NMVOC could be assessed from the results of the continuous monitoring (M) and the volumetric flow rates.	The VOC releases could be speciated by using the NAEI approach.
R _{A-P3} (to air)	NMVOC	M or C	Releases of total NMVOC could be assessed from the results of the spot measurement data (M) assuming it is representative of releases over the whole year or could be assessed by applying the monitoring data from P2 to this process (C).	The operator will have to consider how applicable the continuous monitoring for process P2 is to process P3 before approach (C) is used. The VOC releases could be speciated using the NAEI approach.
R _{w-P2} (via sewer)	(none)			
R _{w-P3} (via sewer)	(none)			
R _{F-P2} (to air)	NMVOC	C	Releases of total NMVOC could be assessed by a mass balance approach (C). This would be determined from: <ul style="list-style-type: none"> ▪ (quantity in the storage tank at the beginning of the year - quantity in the storage tank at the end of the year) + quantity delivered during the year = overall use by P2 and P3 and then <ul style="list-style-type: none"> ▪ fugitive VOC releases from P2 = quantity used by P2 – (releases to air through vents + quantity converted/contained in the product) 	Here, it is assumed that no VOC is sent to the sewer, but this may need to be considered.
R _{F-P3} (to air)	NMVOC	C	See method above	

The next step is to summarise all releases of the compounds from all the on-site processes according to the discharge route, and then enter the total annual releases on the PI reporting form.

Here, just the total NMVOC releases to air are considered:

Summary of NMVOC releases to air

VOC releases to ...	Code	% of total annual releases	Calculation approach
Air from vents and stacks	R _{A-P1}	(none)	
	R _{A-P2}	42	M
	R _{A-P3}	30	C
from fugitive releases	R _{F-P2}	17	C
	R _{F-P3}	11	C
Waste via the water treatment works	R _{W-P2} & R _{W-P3}	(none sent to the sewer)	

Here, the operator would record the total annual NMVOC release to air on the PI reporting form and enter C as the method of assessment since the majority (58%) of releases are calculated. Transfers of VOCs via sewer are assumed to be 0 and therefore 'n/a' would be entered against appropriate substances in Part 5 of the reporting form.

11. Further Guidance

11.1 Guidance on monitoring techniques

If source monitoring data are to be used to generate annual mass releases for PI reporting it is important that such monitoring is carried out correctly. EA has published guidance documents on good source monitoring practice, which can be downloaded from our MCERTS 'Monitoring technical guidance notes' web page. A link to this page is provided from <http://www.environment-agency.gov.uk/pi>.

Report number	Report title
M1	Sampling requirements for stack-emissions monitoring
M2	Monitoring of stack emissions to air
M16	The measurement and monitoring of volatile organic compounds to air from industrial installations
M17	Monitoring ambient particulate matter in ambient air around waste facilities
M18	Monitoring discharges to water and sewer
M20	Quality assurance of continuous emissions monitoring systems

Additionally, a number of documents on good monitoring practice have been published by the International Standards Organisation (ISO), the European Committee for Standardisation (CEN), the British Standards Institute (BSI) and a number of other organisations including the German and American standards organisations (DIN & ASTM respectively). Details can be obtained from the following web sites.

ISO

<http://www.iso.ch/iso/en/ISOOnline.openerpage>

CEN <http://www.cenorm.be/>

BSI <http://www.bsi-global.com/index.xalter>

DIN <http://www2.din.de/index.php?lang=en>

ASTM <http://www.astm.org>

11.2 Sources of information for emission factors and release determination

Releases to air (in priority order for UK use)

11.2.1 The National Atmospheric Emissions Inventory (NAEI)

Includes estimates of releases of 19 atmospheric pollutants. It is useful for estimating releases from industrial combustion processes and for VOC speciation.

<http://www.naei.org.uk>

11.2.2 Atmospheric Emission Inventory Guidebook

Within the UNECE's EMEP programme a task force on emission inventories maintains the Atmospheric Emission Inventory Guidebook. The Guidebook is a joint activity of UNECE/EMEP and the European Environment

Agency. It contains chapters for specific source sectors, where all available emission factors and calculation methods are collected. The Task Force maintains a working web site, where drafts for new chapters and modifications of existing ones are available. This is a useful source of emission factors when not available from the NAEI. Unlike the NAEI there is a breakdown of emission factors by boiler size.
<http://www.aeat.co.uk/netcen/airqual/TFEI/unece.htm>

11.2.3 UK emission factors database

A UK emission factors database was produced during the compilation of urban emission inventories associated with local air quality management. Factors have been derived for specific IPC industrial processes based in urban areas but not all PPC sectors are included. These factors should therefore only be used where better sources are unavailable. The following web link provides access to a range of publications associated with local air quality management where such emission factors can be located.
<http://www.defra.gov.uk/environment/airquality/local/index.htm>

11.2.4 The European Topic Centre on Air Emissions

Supports member states in making tools available for determining, collecting and reporting air release data. These tools are still under development but currently include release estimation methods and default emission factors.
<http://air-climate.eionet.europa.eu/>

11.2.5 The Intergovernmental Panel on Climate Change (IPCC)

The IPCC has produced guidelines for the establishment of emission inventories of greenhouse gases within its National Greenhouse Gas Inventory Programme (NGGIP). The revised IPCC guidelines (1996) for national greenhouse gas inventories contain emission factors and release estimation methods for all sectors as defined in the United Nations Framework convention on Climate Change. Furthermore, the IPCC developed a report on 'Good practice guidance and uncertainty management in national greenhouse gas inventories'. These can be downloaded from the website.
<http://www.ipcc-nggip.iges.or.jp/>

11.2.6 The USEPA Office of Air Quality Planning and Standards

THE USEPA maintains a comprehensive website where all material on emission factors and release estimation methods in the United States can be viewed and, in many cases, downloaded. In general, emission factors from these sources should only be used in the absence of appropriate UK or European values.
<http://www.epa.gov/ttn/chief/>

11.2.7 Environment Australia

Australian Emission Estimation Technique industry manuals.
<http://www.npi.gov.au/handbooks/>

11.2.8 OECD

Database on Use and Release of Industrial Chemicals:
<http://appli1.oecd.org/NIEA/urchem.nsf/>

Releases to water

11.2.9 OSPAR Commission

Information on the releases and pollutants to water covered by this agreement
<http://www.ospar.org/>

11.2.10 Norwegian Pollution Control Authority

The Norwegian Pollution Control Authority's project 'Harmonised quantification and reporting procedures for hazardous substances (HARP)' contains information on the releases and pollutants to water.
http://www.sft.no/artikkel_33492.aspx?cid=30041

Other sources of information

11.2.11 European IPPC bureau and BREF documents

The IPPC Directive states the conditions of permits Member States issue on Annex I activities must be based on Best Available Techniques (BAT) to achieve a high level of protection of the environment as a whole. The European IPPC Bureau in Seville collects information from a number of sources and drafts reference documents for the Commission to inform the permitting authorities, industry and other interested people. The Bureau is developing in co-operation with Members States and industry a series of reference documents over a period of at least 5

years so as to cover, as far as practicable, the Annex I activities. These documents are called BAT Reference Documents – BREFs.

They contain information on:

- production processes and techniques
- current release levels
- release reduction measures and techniques in the determination of BAT.

The BREF documents are posted on the European IPPC Bureau website:

<http://eippcb.jrc.es/pages/FAbout.htm>

11.2.12 UNEP

United Nations Environment Programme, *Inventory on information sources on chemicals*:

<http://www.chem.unep.ch/irptc/invent/igo.html>

11.3 Additional PI Guidance

Sector specific guidance can be downloaded from the EA PI webpage:

www.environment-agency.gov.uk/pi

12. Glossary

Terms used in this document for the purposes of reporting to the Pollution Inventory their meaning in this guidance is as follows:

Installation

An industrial complex with one or more PPC Schedule 1 Part A activities carried out.

IPC authorisation

The licence issued by the NIEA regulating the operation of IPC prescribed processes.

IPPC directive

The EU directive on Integrated Pollution Prevention and Control implemented in each member state.

Main economic activity

The main revenue-generating activity at the installation as defined under the NACE categorisation scheme.

NACE

The EC statistical office (Eurostat) classification scheme of economic activities.

NOSE-P

The EC statistical office (Eurostat) classification scheme of sources of industrial process releases.

PI

Pollution Inventory.

PPC permit

The licence issued by the NIEA regulating the operation of PPC industrial activities.

PPC activity.

A PPC Schedule 1 Part A activity is an industrial process regulated by the NIEA and defined in the PPC regulations.

PPC regulations

The Pollution Prevention and Control Regulations (Northern Ireland) 2003 [SI 1973](#).

Reporting unit

The industrial operation from which releases and transfers must be reported to the PI.

Site

The location of the Installation.

*Our aim is to protect, conserve and
promote the natural and built environment
for present and future generations.*

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