044 – Offshore Norge Recommended guidelines for discharge and emission reporting

PREFACE

This guideline is supported by Offshore Norge forum/fora professional network for emissions reporting and by the Offshore Norge panel for Environment. It has also been approved by the director general.

The responsible manager in Offshore Norge is the Manager, Environment, who can be contacted via the switchboard at +47 51 84 65 00.

This guideline is developed with broad petroleum industry participation by interested parties in the Norwegian petroleum industry and is owned by Offshore Norge.

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INTRODUCTION

Purpose

Since 1997, all Operators on the Norwegian Continental Shelf have submitted emissions reports to Norwegian Environment Agency and Offshore Norge. This has been in a pre-defined format and has previously been done on spreadsheets and paper reports. The 2003 report was the first time that emissions and discharge data were reported electronically to Environment Web (EW). The reporting from 2014 for emissions in 2013 was in a new system, EPIM Environmental Hub (EEH). In 2021 this system changed its name from EEH to Footprint.

These guidelines have been prepared to aid in reporting and as a reference for the individual data to be reported. The guidelines go through requirements of the emissions and discharge report and the data tables that shall be reported to Footprint.

Footprint can be accessed from this url: footprint.collabor8.no.

Guidance for use of Footprint is given in Footprint' user manual and tutorial videos.

These guidelines will serve as an extension of information provided in M107-2016 Guidelines for reporting from offshore petroleum activities from the Norwegian Environment Agency , as well as Guideline from Norwegian Radiation and Nuclear Safety Authority (in Norwegian only).

These guidelines will help ensure consistent emission and discharge reporting from all licenses with clear definitions in accordance with an unambiguous format.

Definitions and abbreviations

BOP	Blow Out Preventer
CCS	Carbon Capture ans Storage
CHARM	Chemical Hazard Assessment and Risk Management; A tool for mutual comparison of offshore chemicals and expected damage potential
CH_4	Methane
CO	Carbon monoxide
CO_2	Carbon dioxide
DSA	Norwegian Radiation and Nuclear Safety Authority
EEH	EPIM Environmental Hub
EPIM	EPIM E&P Information Management Association
HOCNF	Harmonised Offshore Chemical Notification Format. Format for chemical documentation defined by OSPAR.
NMVOC	Non-Methane Volatile Organic Compounds
NORM	Naturally occuring radioactive material.

NORSAS	Norwegian Resource Centre for Waste and Recycling
N_2O	Dinitrogen oxide
NO_x	Nitrogen oxide
NOD	Norwegian Offshore Directorate.
NS	Norwegian Standard
OGP	International Association of Oil & Gas Producers
OSPAR	Oslo-Paris Convention for the protection of the Marine Environment of the North-East Atlantic and Oslo-Paris Commission for the protection of the Marine Environment of the North East Atlantic
PAH	Polycyclic aromatic hydrocarbons
PCB	Polychlorinated biphenyls
PDO	Plan for development and operation
PEMS	Predictive Emission Monitoring System
PLONOR	Pose Little Or No Risk to the Marine Environment. A list of OSPAR chemicals assumed to have little or no effect on the marine environment by discharges
SCR	Selective catalytic reduction
Sm^3	Standard cubic meters. Standard conditions at 15^{O}C at 1 atmosphere
SO_x	Sulfur oxides
TAD	Norwegian Customs and Excise

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GENERAL INFORMATION ABOUT THE REPORTING

Which facilities and activities that should be reported

The emissions report shall meet the reporting requirements of both Norwegian Environment Agency, Norwegian Radiation and Nuclear Safety Auhority and NOD.

The reporting shall be performed according to the Petroleum Act's definition of petroleum activity. This includes:

- Permanent installations (fixed installations). The reporting shall also include the installation phase.
- Mobile facilities when they are on location, such as drilling rigs, well intervention facility (subsea) and more. Mobile facilities are defined as not included as part of the permanent development plan and that they have no physical connection to the permanent device with a bridge connection etc. Clarification is given in the text box below.
- Licenses for CO_2 storage is to be reported from 2022. In Footprint a new field is created for this activity. Naming as follows: 'CCS aktiviteter + Operator'.
- Combined facilities flotel/crane if the main function is flotel.
- Well stimulation-/processing facilities when these are connected to the well.
- Transportation systems
- Onshore terminals that are defined as part of the petroleum activities in the Petroleum Act, including processing, compression of gas for onward transport and loading of crude oil/condensate and naphtha. The distinction between petroleum activities on one hand and processing/refining on the other side shall follow the Company Petroleum Tax boundaries. **The requirement for reporting is mandated in the Petroleum Tax Act. This does not mean that the emissions are reported twice in national statistics, but the emissions in Footprint are used by NOD in its RNB reporting.**

Requirements for annual reporting in Section 34, first paragraph, letter c of the Management Regulations are addressed to the operator, and it applies to reporting pollution etc. from the offshore petroleum activities, cf. guidelines for reporting from offshore petroleum activities. This requirement is granted in accordance with the Pollution Control Act, and applies, within the scope of the Pollution Control Act, to petroleum activities, cf. Section 2 of the Framework Regulations. The requirement for reporting includes pollution from activities that are the operator's responsibility in accordance with section 7, first and second paragraphs of the Framework Regulations.

Petroleum activities are all activities related to subsea natural resources, including exploration, exploration drilling, extraction, transport (excluding transport of petroleum in bulk by ship), utilization, planning and completion of such activities, cf. the Framework Regulations section 6 letter g, cf. Petroleum Act § 1 -6 letter c. The definition of petroleum activities coincides with Section 4, first paragraph, of the Pollution Control Act regarding the application of the Act to activities on the continental shelf (the Act applies to exploration for and extraction and exploitation of subsea natural deposits on the continental shelf).

For mobile facilities, a boundary must be drawn between pollution from activities carried out by the mobile facilities on behalf of an operator as part of the petroleum activities (eg drilling and well operations) and pollution from the maritime operation of the facilities (shipowner's responsibility).

Mobile facilities are part of the petroleum activities when they carry out assignments related to exploration, exploration drilling, extraction, transport, utilization and completion of subsea petroleum deposits, and planning such activities. Pollution, eg emissions to sea and air and waste management, from mobile facilities as a result of such activities shall be reported in accordance with the Management regulations § 34, first paragraph, c.

In the case of pollution from the maritime operation of mobile facilities, the Ship Safety Act and regulations apply, cf. Pollution Act § 5. Such pollution shall not be reported in accordance with § 34, first paragraph, letter c of the Management Regulations. That means that emissions from a mobile facility that is on hold should not be reported.

According to the above, the term "on location" is not precise in relation to what is to be reported from mobile facilities in accordance with the Management Regulations § 34, first paragraph, letter c, as pollution from mobile facilities on location can come from activities related to both the petroleum activities and maritime operations of the facilities.

Emissions from refineries and other onshore facilities should be reported according to "corporate self-reporting" in Altinn, as required for land-based industries. According to NOD, specific information to Footprint for emissions to air shall be given for some plant/activities as listed below:

The processing plant at Kollsnes (Gassled E)	Emissions to air for the entire facility
Mongstad	Loading of non-processed products (NMVOC and CH_4)

Sture (Oseberg Transport System)	Loading of non-processed products (NMVOC and CH_4), and the oil heater (CO_2 and NO_x)
Gassled D (Kårstø)	Emissions related to gas compression for further transport (all emissions) and emissions associated with loading condensate and naphtha (only NMVOC andCH_4)
The processing plant at Ormen Lange	Loading of non-value-added products (NMVOC and CH_4), and boilers and diesel engines (CO_2 and NO_x)
Hammerfest LNG processing plant	Emissions to air for the entire facility

All fields shall, according to NOD's definition, deliver a separate annual report, even if there have been no emissions or discharges. For satellite fields that produce through another field (such as Statfjord North that produces through Statfjord), emissions and discharges will be reported for the field where the discharges occur. Mobile facilities that conduct drilling or well operations will report under the field where the well(s) is/are connected.

A separate report must be submitted for the Operator's exploration activity. The “Field" where emissions have occurred (The Operator Exploration Activity), shall be summed up in one overall emissions report for exploration,
Example: "Exploration Operator AS". For drilling, all data refer to the wellbore and/or the facility that performs drilling (drilling rig, whether it is a mobile or (in rare cases) a fixed installation).

For wells drilled over year-end the companies may choose to report for the year in which the discharges occur, or report for the year the well is completed. Reporting method, calculation methods and which data that is moved shall be described in the emissions report.

There shall be provided a contact person for the report.

Quality assurance of data

To make sure that the Government and the industry can establish and maintain a sufficient overview of the industry's total emissions, the quality of the reported data needs to be satisfactory. This means that:

- All reportable emissions and discharges from the activities must be included and emission reports must be complete.
- Emissions data and other information reported must be accurate. This means that emissions must be calculated using well-known methods, with the appropriate emission factors and the calculations must be free of errors.
- Emissions figures must be presented using adopted standard for units, naming and terminology.

The Operator is responsible for quality control of all data in the emissions report. In cases where contractors report directly to the Operator (e.g. chemical suppliers and waste contractors), the Operator is responsible for ensuring that the evaluation and control procedures the subcontractors use are adequate, and that data collection is complete.

Analysis of the discharge streams as a basis for the establishment of discharge data can be carried out by the Operator or by an independent laboratory. The Norwegian Environment Agency requires an approved accreditation to accept discharge analysis from an independent laboratory.

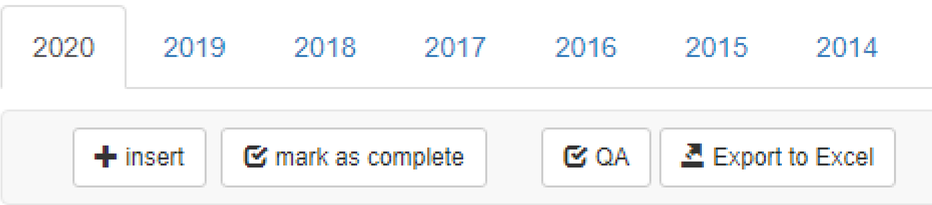
Significant changes from the previous year must be explained and the uncertainty of the individual emissions must also be briefly explained. Information about third-party control and ring tests that have been carried out during the reporting year must also be given. Deviations from the measurement- and calculation program must be commented on.

The emissions and discharge report shall give a picture of the activity, emissions and discharges for the field for the reporting year as well as trends over time.

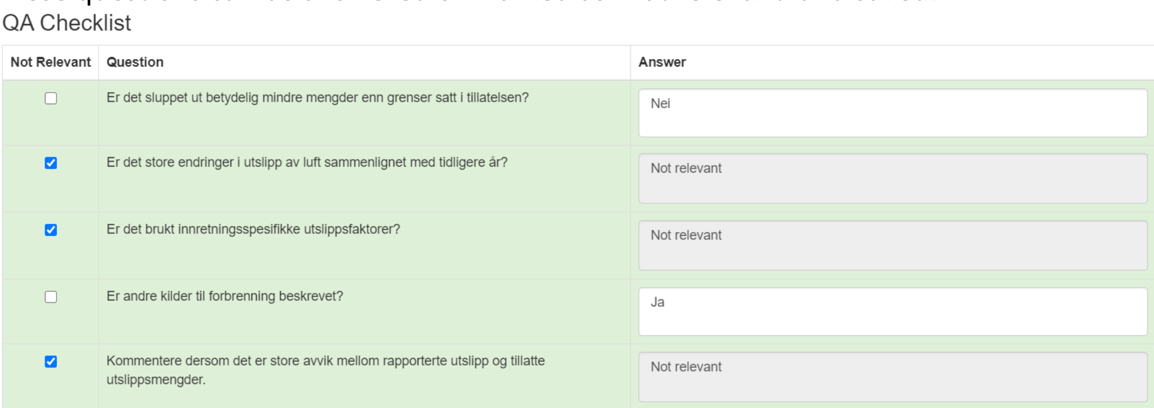
Conversion factors and calculations must be documented by the individual Operator.

Quality assurance of data in Footprint

<u>QA questions in Footprint</u>
From the 2020 reporting, QA questions have been made in Footprint for all tables. Select the QA button at the top to see the QA questions of the table you have selected:



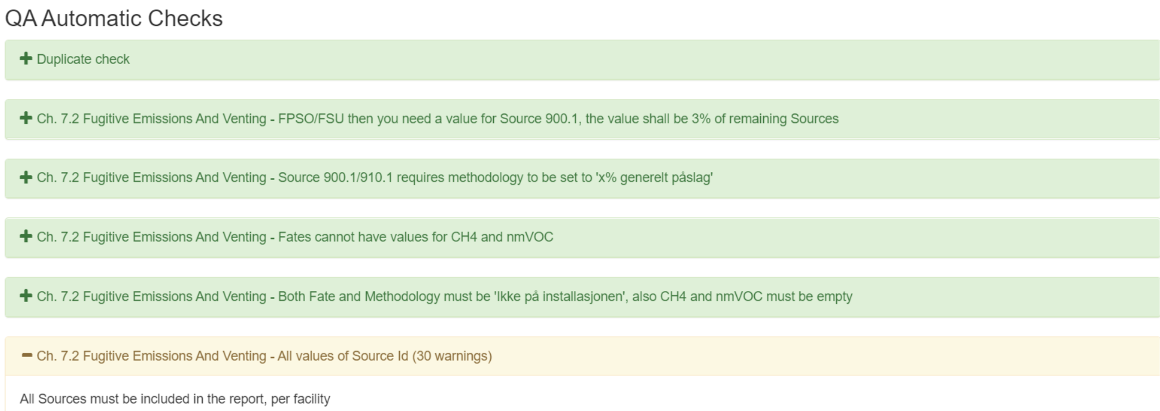
These questions can be answered or marked as 'Not relevant' and saved:


QA Checklist

Not Relevant	Question	Answer
☐	Er det sluppet ut betydelig mindre mengder enn grenser satt i tillatelsen?	Nei
☑	Er det store endringer i utslipp av luft sammenlignet med tidligere år?	Not relevant
☑	Er det brukt innretningsspesifikke utslippsfaktorer?	Not relevant
☐	Er andre kilder til forbrenning beskrevet?	Ja
☑	Kommentere dersom det er store avvik mellom rapporterte utslipp og tillatte utslippsmengder.	Not relevant

The save button is located in the top left corner:

<u>Automatic QA checks in Footprint</u>
Automatic checks have also been made in Footprint which checks whether all necessary numbers and information have been reported into the system, that there are no double counting of any numbers and that the connection between reported numbers is correct. If something is not right, this will come up as warnings:



Reporting Process

The reporting process has changed compared to earlier years:

- Data is uploaded to Footprint
- QA questions can be answered in Footprint
- The user has to mark a table as complete when the data are complete
- The user can then upload the report and publish the data
- The data can be re-published as often as required until 15th of March
- When the emissions and discharge report for the field is completed, deadline the 15th of March, the report and data must be published in Footprint, and the Environment Agency and Norwegian Radiation and Nuclear Safety Authority will start reviewing the reported data.
- From this date the emission and discharge report can be assumed as public, but the pdf reports will not be published on the Offshore Norge webpage until 1st of May.
- The data can be updated as long as required, but any updates will not be available for any other parties until Offshore Norge have been informed about the changes and the need for publishing new data and report.
- The data can be sent back to the operator for updating if any errors or questions about confirmation. The operator can also change the report after 15th of March, but

- Unless the Environment Agency demands it, it is not necessary to update the pdf report with changes after 15th of March. If this is needed it must appear clearly from the report what the changes are.

- Procedure for updates in Footprint after 15th of March:
    1) NEA/DSA requests correction:
        - Contact Offshore Norge, ask them to open for re-publication
    2) Operator finds errors that needs to be updated in Footprint
        - Inform NEA/DSA that numbers will be updated
        - Contact Offshore Norge, ask them to open for re-publication

  Correct the relevant numbers in Footprint and in the pdf-report if necessary and upload the pdf-report. When the numbers are corrected, they must be republished.

- From the 2021 reporting there is no longer a requirement to upload a document in Footprint if nothing is to be reported, a comment can be entered in Footprint instead.

Click on the ‘Publish’ button:

Enter comment and press the ‘Complete publishing’ button:

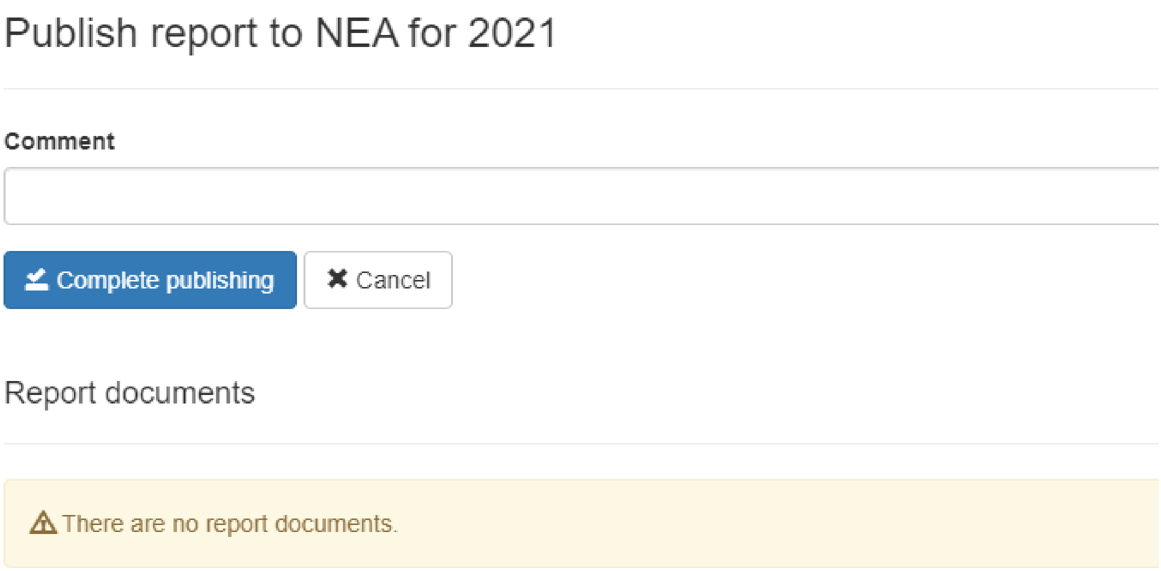


TABLE 1 DEADLINES FOR THE VARIOUS STEPS IN THE REPORTING PROCESS.

Step	Action	Deadline
1	Update of information about operator, field, facility, wellbore etc. by NOD	Synchronized continuously
2	Reporting by the operator	15th of March
3	Review by Environment Agency and NRPA	15th of March
4	Update of erroneous data	ASAP

The following table lists the relevant contacts.

TABLE 2 CONTACTS FOR QUESTIONS

Agency	Contact person	e-mail address	Telephone
Offshore Norge	Kirsten Løland Anne-Lise Søyland	kirsten.loland@offshorenorge.no anne-lise.soyland@offshorenorge.no	934 88 077 916 94 887
Norwegian Environment Agency	Switchboard Mathilde Juel Lind	 mathilde.juel.lind@miljodir.no	03400 997 96 093
NOD	Rune Hult	rune.Hult@sodir.no	51 87 60 77
Norwegian Radiation and Nuclear Safety Authority	Hilde Knapstad Tanya Helena Hevrøy	hilde.knapstad@dsa.no tanya.hevroy@dsa.no	924 50 822 950 21 189

System errors in Footprint are automatically reported directly from Footprint. The user can also get help by choosing ‘Get help’ and describe the problem in the dialogue window that appears.

PART I REPORTING TO THE NORWEGIAN ENVIRONMENTAL AGENCY

1 THE FIELD'S STATUS

This chapter shall give a general overview of the field, and background information on the emissions and discharges. The chapter should be concise and informative.

1.1 Definitions and explanations

The Operator shall provide a brief and general description of the field. Among other things:

- What installations, wells and subsea installation covered in the report, including interfaces to offshore fields and onshore plants (for example as hub for processing and/or transport/export)
- Activities during the year, including drilling- and well activities
- Expected major changes upcoming year
- Production breaks during the year (revision stops, incidents etc.)
- Improvements and changes that have an environmental effect
- Overview of discharge permits for the field

The Operator shall describe any changes to the plans and measures for the zero-discharge work.

The historical and forecasted production shall be illustrated. This information is available from the annual reports to the Revised National Budget (RNB) to the NOD.

The table below shows the conversion of produced quantities of oil equivalents (Sm^3 o.e.) according to NOD's current norm:

TABLE 3 NOD CONVERSION FACTORS OF OIL EQUIVALENT

Petroleum Product	Converted from	Converted to oil equivalent (o.e.)
Oil	1 Sm^3	1 Sm^3 o.e.
Condensate	1 ton	1.3 Sm^3 o.e.
Condensate	1 Sm^3	1 Sm^3 o.e.
NGL	1 ton	1.9 Sm^3 o.e.
Gas	1000 Sm^3	1 Sm^3 o.e.

1.2 Reporting tables in Footprint

Footprint table updates in chapter 1

No updates

All tables with production numbers that should be reported to Footprint are synchronized with NOD's database DISKOS. From 2023 DISKOS is maintained by Halliburton: https://www.diskos.com/.

2 DRILLING

This chapter will provide information on drilling with water-based, oil-based and synthetic drilling fluids. Acute pollution from drilling shall not be reported here, but under section 8.2.

In this chapter, drilling fluids (mud) and cuttings shall be reported. It shall be reported per wellbore/mud system, not per sections. All cuttings/mud shall be reported, including cuttings/mud from drilling with open mud system (with no risers). This shall be reported for both exploration and development wells. So-called "shallow wells" are not reportable. These are wells that are drilled to test equipment or to obtain information on the rock characteristics, and normally not deeper than 200 meters. More information about well classification is given in the NOD's topic pages (https://www.sodir.no/en/facts/wells/well-classification/).

Wells drilled over a year-end should be reported as a whole and can either be reported in the year the discharge occurs (if completed before reporting deadline), or the year in which the well is completed. Which reporting method selected should be described in the emission and discharge report.

Data must be allocated to the current reporting year to be able to report this data to Footprint.

2.1 Definitions and explanations

2.1.1 General

Cuttings/drilling fluid from drilling that is discharged offshore or treated onshore/offshore shall be reported in this chapter. The amount of cuttings/mud that is sent to shore for disposal must also be reported as hazardous waste in chapter 9. Amount of drilling fluid returned to the drilling fluid supplier for reuse shall not be included in the reporting.

Note regarding the amount of waste generated and the amount of waste handled:

There is not necessarily a correlation between the quantity of drilling waste in chapters 2 and 9, although the waste originates from identical drilling operations. There are three reasons for this:
Lags in recording and reporting. Waste generated in one year could eventually be treated in a waste treatment plant the following year.
The data in chapter 2 are estimated values from offshore drilling operations while in chapter 9 the values are based on actual weight
In table 2.2 and 2.4 in the annual report total amount of cuttings is calculated from theoretical hole volume and hole factor. Drilling fluid is not included here.
Imported and exported cuttings in chapter 2 contains cuttings with appendages of drilling fluid
Drilling waste given in chapter 9 is weighted amount of cuttings with appendages of drilling fluid
The waste is transported to shore. There may be minor adjustments to the amount of waste due to changes in the moisture content of the waste.

The Operator should have procedures to ensure that reporting of waste is consistent and complete, and that there is no double reporting.

The extent of reuse of drilling mud shall be briefly explained, for example reuse on the rig, reuse in other projects or return to drilling fluid supplier. This should be quantified if possible.

A new table is included in the written report, ‘Drilling activities’. Data for this table are taken from the Footprint-input table ‘Drilling’.

2.1.2 *Drilling with water-based drilling fluids*

Water-based drilling fluids are used where technically feasible. It is generally permissible to release cuttings with water-based drilling fluids.

2.1.3 Drilling with oil-based drilling fluids

Oil-based drilling fluid is normally used for sections in the well demanding particularly high technical characteristics of the drilling fluid. It is normally not allowed to discharge cuttings generated by the use of oil-based drilling fluids, but a permission to discharge cuttings may be granted for non-sensitive areas, if the cuttings have an attachment of oil no higher than 1 weight percent based on the cuttings dry weight.

When drilling with oil-based drilling fluids, the cuttings act as a water repelling putty mass that will settle on the seabed when discharged. Cuttings are analyzed by a retort analysis which determines the amount of oil, water and solids. Total amount of dry substances is the sum of clean cuttings (i.e. drilled-out rock from the formation) plus the dry substances from the drilling fluid (which includes weighting materials, clay and salts).

Results from the retort analyses shall be weighted average values for the current section. There is no need to specify this in more detail in the report, but the information and calculations shall be available for internal/external audits.

2.1.4 Drilling with synthetic fluids

Synthetic fluids are normally ester or olefin based. Different types of synthetic drilling fluids are reported in the same table.

Norwegian Environment Agency may give permission to discharge cuttings with appendages of synthetic drilling fluids. Permission is not given to discharge pure synthetic drilling fluids or untreated cuttings.

Synthetic drilling fluids are mostly no longer in use. Synthetic fluids are reported and documented similarly to oil-based drilling fluids.

2.1.5 Plugging operations

According to M-107, any completed plugging operations must be described briefly. Information on how old well fluids have been handled and how health and environmental considerations have been taken care of shall be provided. The use and discharge of chemicals in connection with plugging operations, including old drilling fluids, shall be reported in Chapter 4. Old drilling fluids sent to land as waste shall be reported in Chapter 9.

2.2 Reporting tables in Footprint

Footprint-table updates in chapter 2

New table for handling of old well fluids in connection with plugging operations added (Table 5).

TABLE 4 FOOTPRINT INPUT TABLE: DRILLING

Column Title	Normal Value/ Content
Operator	Name of the operating company
StructureType	Drilling
ReportYear	Year (current reporting year)
ActualYear	Year (actual year for exploration drilling)
Field	Field name as provided by NOD
Facility	Facility name as provided by NOD
Location	Name of drilling location
Wellbore	Well bore name given by NOD
MudSystem	Water, oil- or synthetic based system
Length (m)	The well's length (depth)
TheoreticalHoleVolume (m3)	Theoretical hole volume
HoleFactor (tonnes/m3)	Hole factor
MudDischarged (tonnes)	Discharge of drilling fluid as appendage to cuttings

Column Title	Normal Value/ Content
MudInjected (tonnes)	Drilling fluid as appendages of cuttings injected
MudSentOnshore (tonnes)	Drilling fluid sent onshore as waste
MudLeftOrLost (tonnes)	Drilling fluid left in the formation or lost to the formation
CuttingsWithMudExportedToOtherFields (tonnes)	Cuttings with appendages sent to other fields
CuttingsWithMudImportedFromOtherFields (tonnes)	Cuttings with appendages imported from other fields
CuttingsWithoutMudDischarged (tonnes)	Discharge of cuttings
CuttingsWithoutMudInjected (tonnes)	Injection of cuttings
CuttingsWithoutMudSentOnshore (tonnes)	Cuttings sent onshore
AverageOilOnCuttingsDischarged (g/kg)	Average concentration of oil on cuttings discharged to sea [g/kg]*

*NB! The requirement in the Activities Regulations §68 states that there should be maximum 10 g oil/kg dry substance. Amount of dry substance are not reported, and concentration given here is therefore not per kg of dry matter, but per total amount of cuttings.

TABLE 5 FOOTPRINT INPUTTABELL: OLDWELLFLUIDSPLUGGINGOPERATIONS

Column Title	Normal Value/ Content
Operator	Name of the operating company
StructureType	OldWellFluidsPluggingOperations
ReportYear	Year (current reporting year)
ActualYear	Year (actual year for exploration drilling)
Field	Field name as provided by NOD
Facility	Facility name as provided by NOD
Location	Name of drilling location
Wellbore	Well bore name given by NOD
Discharged (tonnes)	Discharge of well fluid
Injected (tonnes)	Well fluid injected
SentToOnshoreDisposal (tonnes)	Well fluid sent onshore as waste
TypeOfActivity	Allowed values: • Permanent plugging operations • Temporarily plugging operations • Other

2.3 Calculation methodology

2.3.1 General

The Drilling Operator normally has a mass balance accounting for drilling fluids and cuttings. The Operator should calculate each section of the well, and then add them together to obtain the required data for each well.

One needs the density of the drilling fluid for each section to calculate the mass.

2.3.2 Calculation of theoretical hole volume

Theoretical hole volume is calculated from the diameter of the individual sections and the length of each section:

$$THV = \left(\frac{D}{2} * \frac{2{,}54}{100}\right)^2 * \pi * Length$$

TABLE 6 EXPLANATION OF THE COMPONENTS IN THE EQUATION FOR CALCULATING THE THEORETICAL HOLE VOLUME. EQUATION (1).

Component	Unit	Description
THV	m^3	Theoretical hole volume
D	“	Section diameter in inches
Length	m	Length of section

3 OIL AND OILY WATER

3.1 Definitions and explanations

3.1.1 General

This chapter shall give an explanation of the discharge streams for the field and how each discharge stream is treated.

Discharge sources will normally be:

- Produced water (formation water and condensed water)
- Displacement water (ballast water) from storage facilities for oil
- Drainage water, which can also include water used for flushing of tanks and other oily waste water if it is treated in the same system as the drainage water.
- Oil-contaminated water associated with sand cleaning (jetting).
- Other oily water

If a large proportion of hazardous substances are discharged together with some of the discharge streams this shall be reported. The quantification limit for each substance shall be specified.

When calculating the quantity of substances discharged, field-specific factors based on measured concentrations in the produced water shall be used.

For fields with one single discharge permit, but several installations, the total discharges from the field shall be reported in this chapter.

Accidental discharges of oil are not reported in this chapter, but in chapter 8.

In the tables, both the amount of oil and the oil concentration in the water shall be reported. Oil in water analyses shall be performed according to ISO method (ISO EN 9377-2) or equivalent methods that can be calibrated against the ISO method.

The amount of water discharged shall be reported. It is specified that the injected water volumes shall be injected produced water only, or other oil contaminated water. Injected sea water or source water (for example, water from the Utsira formation) shall not be reported to Footprint.

Footprint facilitates for reporting one data set per installation and water type. Where there are several discharge streams for the same water type and installation, the proportional amount to total emissions must be reported so the total discharges from the facility and the field is correct.

The operator shall describe any changes with regards to plans and measures for the zero-emission work.

In accordance with M-107, there are requirements to report internal objectives for the content of oil and chemicals in water and explanations if objectives have not been achieved.

3.1.2 Risk assessment of produced water

The status of the zero-discharge work must be described. If environmental risk assessments have been carried out, for example new EIF calculations, for produced water or technology assessments for handling produced water (cf. Activity Regulations § 60 with guidance), the results and any implemented measures in the reporting year shall be summarized in Table 3.1.1. If there are major changes from previous years, this must be described. It must be stated which emission year is the basis for the EIF calculations, if this is another year than the reporting year, then this can be given as 'Acutal year' in Footprint.

3.1.3 Produced water

Produced water is formation water which is separated out in the separation process and/or water that is condensed in the production process. This water follows the oil and must be separated from the oil and then treated in an acceptable manner.

Produced water contains the following groups of substances:

- Dispersed oil
- Organic compounds from the formation
- Inorganic compounds from the formation, both dissolved salts and precipitates
- Chemicals
- Naturally occurring radioactive material (NORM)

The composition and content of produced water vary considerably from field to field, and partly also from well to well. Information about the composition can only be established through analyses.

There is always oil in dispersed form in produced water. A number of other organic compounds from the formation are dissolved in the produced water, including PAH compounds, BTEX (benzene, toluene, ethyl benzene and xylene), phenols, alkyl phenols and carboxylic acids. Dissolved inorganic compounds from the formation also occur. This is mainly salts and heavy metals. Formation residues (limestone, sandstone), occur together with corrosion products and deposits.

Discharges of dispersed oil, organic compounds and heavy metals shall be reported to the Norwegian Environment Agency.

Produced water contains chemical additives. The chemicals can come from three sources:

- Chemicals may be injected into the well, the oil/gas process or other processes that are associated with the produced water system.

- Chemicals can be added to the injected water that circulates through the reservoir and return along with the well stream through production wells.
- Chemicals can be added to the production stream from upstream installations.

Discharges of chemicals in produced waters shall be reported to Norwegian Environment Agency in chapter 4.
The report shall include a brief description of treatment methods and analytical methods.

Treatment:
Produced water shall contain a maximum of 30 mg of dispersed oil per liter of water discharged as a weighted monthly average. It must be purified to remove excess dispersed oil. Treatment equipment varies and shall be described in the report. This includes water treatment technology for cleaning the water condensed from the gas production.

Analysis:
Discharges of oil in produced water is determined by analysis using current standards[1]. The concentration of dispersed oil in water is measured in mg/litre. Norwegian Environment Agency encourage operators to use instruments that provide a continuous analysis of oil in water, especially the effluent from produced water. Norwegian Environment Agency will normally not require manual sampling if continuous measurement is used.

Total discharged produced water volume is measured by flow meter and is expressed as m^3. Concentration of heavy metals and PAH compounds, BTEX, phenols, alkyl phenols and carboxylic acids in discharges are also determined by analysis of produced water. The discharged quantities are determined by the discharge concentrations and measured flow discharged. Offshore Norge recommends that at least 2 samples with three replications each year are taken for the determination of dissolved components in produced water[3].

The components to be included in a produced water analysis are given in Table 11. In addition, from the 2019 reporting, it is possible to report on individual components of the alkyl phenols and xylene as given in Table 12.

Provide a brief overview of:

- Number of samples analyzed
- Whether the samples are considered to be representative for the actual discharges
- Significant changes compared to the results from previous years

Major changes from the previous year must be explained in the report. Discharges of heavy metals, aromatics and alkyl phenols shall be calculated on the basis of the amount of water discharged. Water exported or injected shall not be included for these discharges and produced water analysis is not required for exported or injected water volumes. It is still recommended to analyze the injected water, as part of the survey of various measures in the

[1] For details, see – Offshore Norge. 085 Recommended Guidelines for sampling and analyses of produced water.

'zero discharge to sea' work, and because it is an advantage for the operators to know what the discharge savings from such measures has been.

Naphthalene Acids is a group of compounds that occur in some fields. It would therefore be appropriate to point this out in a comment under the table, so that this analysis is reported only for those fields where discharge of Naphthalene Acids is applicable.

3.1.4 Displacement Water

Displacement water is sea water used to balance the oil in storage tanks. When oil is loaded into the tanks the water is displaced and led to the sea. Seawater is drawn into the tanks when the oil is offloaded to shuttle tankers, to replace the oil.

Discharge of displacement water is determined using the same principles as produced water.

Displacement water from storage tanks will normally include:

- Dissolved organic compounds from the oil (mainly dispersed oil)
- Chemicals added to the oil. Some of these are water soluble and dissolve in the displacement water.

The displacement water will normally contain the same level of inorganic compounds as seawater. One should be aware of the formation of H_2S in the presence of sulphate-reducing bacteria.

Treatment:
There is a requirement for treatment of dispersed oil down to a maximum content of 30mg/liter of water. Most storage tanks currently meet this requirement without special treatment. There are no discharge standards for other substances.

3.1.5 Drainage water

Drainage water is rainwater, wash water and more, which is directed to open or closed drains. Drainage water shall be treated before discharge. Injection is also an option for some installations.

3.1.6 Other oily water

If an Operator has discharges of oily water which is not produced water, drained water, displacement water or oil spills in connection with jetting this should be reported as "other oily water" in the table to be included in the written report.

All types of water that are reported ***into*** Footprint must have a category, new categories can be added in Footprint at the request of the Operator. The table that comes out from Footprint, for use in the written report, collects all categories other than produced water, drained water, displacement water and water from jetting as 'Other oily water'. The written report shall describe what is included in 'Other oily water'.

3.1.7 Jetting

Sand will be deposited in the separator tanks during the separation process. The sand settles in the bottom of the separator tanks. Special jet nozzles wash the inside of the tanks to get the sand out. In many cases the production is stopped during a jet operation.

There are requirements for treatment of water and sand before discharge. For jetting, the total oil discharge and oil appendages on sand shall be reported in addition to the total amount of water for jetting released to sea. This might come from different sources. Oil in produced water is one source, if produced water is used for jetting. There might also be an oil film inside the separator tank that is flushed out with the water. Discharges exceeding the limit during jetting shall be mentioned in the report. The limit is 1 weight percent oil appendages on the sand per job, based on dry mass.

According to M-107 the Operator must inform about jetting operations performed at the field in the reporting year and how the discharges of oil as oil pendants on sand and water from jetting are calculated and reported, for example whether oil in the water from jetting is included in the reported quantities of oil to sea from produced water.

3.1.8 Oil on cuttings, sand or solid particles

There is a new table in the written report called 'Oil on cuttings, sand or solid particles'. In this table the following must be reported:

- Discharge of base fluid in organic drilling fluid (oil-based and synthetic) on cuttings, sand and other solid particles
- Oil concentration as a pendant on sand in connection with jetting

Data for this table is retrieved from the existing Footprint tables ‘Drilling’ and ‘Jetting’.

According to M-107 formation oil on cuttings, sand and/or solid particles with an oil content of less than 10 grams per kilogram of dry mass shall not be reported. Any discharge of cuttings with a content of formation oil over ten grams per kilogram is a deviation from the Activity Regulations §68 and shall be reported as a deviation and explained in chapter 8.

3.2 Reporting Tables to Footprint

Footprint table updates in chapter 3 *No updates.*

TABLE 7 FOOTPRINT INPUT TABLE: PRODUCEDWATERRISKASSESSMENT

Column Title	Normal Value / Content
Operator	The name of the Operator
StructureType	ProducedWaterRiskAssessment
ReportYear	Year (current reporting year)
ActualYear	Year when EIF-calculation was performed
Field	The field name as given by NOD
Facility	Device name as provided by NOD
Location	Name of drilling location
ChemicalAnalysis	Select 'Yes' if it is done in accordance with regulatory requirements, it may have been done in previous years, but it must be less than 5 years since the last time and no significant changes.
WetTesting	Select 'Yes' if it is done in accordance with regulatory requirements, it may have been done in previous years, but it must be less than 5 years since the last time and no significant changes.
WetAssesment	Select 'Yes' if it is done in accordance with regulatory requirements, it may have been done in previous years, but it must be less than 5 years since the last time and no significant changes.
SubstanceBased	
LargestContributor	Only the largest contributor should be given.
TechAssessment	
EIF	Enter value if it is done in accordance with regulatory requirements. It may have been done in previous years, but it must be less than 5 years since the last time and no significant changes.
BatAssessment	
BatAssessmentConclusion	The operator shall provide a brief summary of the assessment and status of any decided measures. No predefined list - free text.
MeasuresImplemented	Measures that are implemented
Comment	

Note that produced water reported in the OilyWater-table and analysis reported in the ProducedWaterAnalysis-table must be associated with the same 'DischargePoint'.

3.2.1 Oily water

TABLE 8 FOOTPRINT INPUT TABLE: OILYWATER

Column Title	**Normal Value / Content**
Operator	Name of the operating company
StructureType	OilyWater
ReportYear	Year (current reporting year)
ActualYear	Year (actual year for exploration drilling)
Field	Field name as provided by NOD
Facility	Facility name as provided by NOD
Location	Name of drilling location
WaterType	Produced/Drainage/Displacement/Bilge water/Leftover water/Plug water/Wash water/Sea water/Riser water/ Purified slop water/Water from well cleaning/Water from pipelines/Water from start-up/Formation water
ReportMonth	Month reported
DischargePoint	Can be used to separate the emissions of installations with multiple emission points
WaterImported (m3)	Water volumes imported
WaterInjected (m3)	Water volumes injected
WaterExported (m3)	Water volumes exported
WaterToSea (m3)	Water volumes discharged to sea
OilConcentrationISOmethod (mg/l)	Mean monthly oil concentration calibrated against ISO method
MethodologyForOIWAnalysis	Description of the methodology used for the 'Oil in water' analysis

In the table data for all oily water, except water for jetting is reported.

3.2.2 Jetting

TABLE 9 FOOTPRINT INPUT TABLE: JETTING

Column Title	**Normal Value / Content**
Operator	Name of the operating company
StructureType	Jetting
ReportYear	Year (current reporting year)
ActualYear	Year (actual year for exploration drilling)
Field	Field name as provided by NOD
Facility	Facility name as provided by NOD
Location	Name of drilling location
ReportMonth	Month reported
OilOnSolidParticles (g/kg)	Mean monthly oil concentration as appendage on sand
OilToSea (tonnes)	Amount of oil discharged during jetting, calibrated against IS method

3.2.3 Analysis of dissolved components in produced water

TABLE 10 FOOTPRINT INPUT TABLE: PRODUCEDWATERANALYSIS

Column Title	Normal Value / Content
Operator	The name of the Operator
StructureType	ProducedWaterAnalysis
ReportYear	Year (current reporting year)
ActualYear	Year (actual year for exploration drilling)

Column Title	Normal Value / Content
Field	The field name as given by NOD
Facility	Device name as provided by NOD
Location	Name of drilling location
DischargePoint	Can be used to separate the emissions of installations with multiple emission points
Component	The component in the produced water which was tested. See Table 11 and Table 12.
SampleConcentration (g/m3)	The concentration of the component in the sample
DetectionLimit (g/m3)	The detection limit of the respective component in the sample
Laboratory	Laboratory where the test is performed
Technique	The technique used in the analysis (for example GC)
Methodology	The method used in the analysis (such as an ISO method)
SampleDate	Date the sample was collected

TABLE 11 DISSOLVED COMPONENTS IN PRODUCED WATER TO BE ANALYZED

Component			
Oil in water (Installation)	C2-dibenzothiophene	***PHENOLS:***	***HEAVY METALS:***
NPD / BTEX:	C3-dibenzothiophene	Phenol	Arsenic
Benzene	***16-EPA-PAH:***	C1-Alkylphenols	Lead
Toluene	Acenaphthylene*	C2-Alkylphenols	Cadmium
Ethyl benzene	Acenaphtene*	C3-Alkylphenols	Copper
Xylene	Anthracene*	C4-Alkylphenols	Chromium
NPD / PAH:	Fluorene*	C5-Alkylphenols	Mercury
Naphtalene	Fluoranthene*	C6-Alkylphenols	Nickel
C1-naphtalene	Pyrene*	C7-Alkylphenols	Zink
C2-naphtalene	Chrysene*	C8-Alkylphenols	Iron
C3-naphtalene	Benzo(a)anthracene*	C9-Alkylphenols	Barium
Phenantrene	Benzo(a)pyrene*	***ORGANIC ACIDS:***	
C1- Phenantrene	Benzo(g,h,i)perylene*	Formic acid	
C2- Phenantrene	Benzo(b)fluoranthene*	Acetic acid	
C3- Phenantrene	Benzo(k)fluoranthene*	Propionic acid	
Dibenzothiophene	Indeno(1,2,3-c,d)pyrene*	Butyric acid	
C1-dibenzothiophene	Dibenz(a,h)anthracene*	Valeric acid	
		naphtenic acids	

*The total sum of the group 16-EPA-PAH shall be stated in the report. The total sum of each of the groups BTEX, PAH, NPD, phenols, organic acids and heavy metals shall be stated in the report.

Naphtalene and phenantrene is not part of the 16-EPA-PAH. Anthracene is moved from the NPD-PAH group to the EPA-PAH-group.

Radioactivity (226Ra, 228Ra, 210Pb and 228th) is removed from Table 11, this is now included in chapter 11.

From the 2019 reporting, it will be possible to report on individual components of the alkylphenols and Xylene, but this is not a requirement. The individual components on which it will be possible to report are given in Table 12.

TABLE 12 EXTENDED WATER ANALYSIS FOR ALKYLPHENOLS AND XYLENE- SINGLE COMPONENTS THAT CAN BE REPORTED TO FOOTPRINT

Phenols and Xylene
C1 Alkylphenols:
2-methylphenol
3+4-methylphenol
C2 Alkylphenols:
4-ethylphenol
2,4-dimethylphenol
3,5-dimethylphenol
C3 Alkylphenols:
4-n-propylphenol
2,4,6-trimethylphenol
2,3,5-trimethylphenol
C4 Alkylphenols:
4-n-butylphenol
4-*tert*-butylphenol
4-isopropyl-3-methylphenol
C5 Alkylphenols:
4-n-pentylphenol
2-*tert*-butyl-4-methylphenol
4-*tert*-butyl-2-methylphenol
C6 Alkylphenols:
4-n-hexylphenol
2,5-diisopropylphenol
2,6-diisopropylphenol
2-*tert*-butyl-4-ethylphenol
6-*tert*-butyl-2,4-dimethylphenol
C7 Alkylphenols:
4-n-heptylphenol
2,6-dimethyl-4-(1,1-dimethylpropyl) phenol
4-(1-ethyl-1-methylpropyl)-2-methylphenol
2,6-diisopropyl-4-methylphenol
C8 Alkylphenols:
4-n-octylphenol
4-*tert*-octylphenol
2,4-di-*tert*-butylphenol
2,6-di-*tert*-butylphenol
C9 Alkylphenols:
4-n-nonylphenol
2-methyl-4-*tert*-octylphenol
2,6-di-*tert*-butyl-4-methylphenol
4,6-di-*tert*-butyl-2-methylphenol
Xylene
p-Xylene

Phenols and Xylene
m-Xylene
o-Xylene

3.3 Calculation methodology

3.3.1 Water balance

Make sure there is a water balance for all water types:

Generated water + Imported water = Water discharged + Injected water + Exported water

3.3.2 Oil concentration

Oil concentration shall be reported, calibrated against the ISO method.

3.3.3 Oil to sea from jetting

Dispersed oil and oil appendages on sand shall be analysed according to OSPARs reference method (OSPAR, 2005). Oil appendages on sand shall be reported as g oil/kg dry sand.

Based on the discharge volumes and oil concentration the total oil discharge from jetting operations can be calculated, reference is made to chapter 4 in Guidelines 085.

4 USE AND DISCHARGE OF CHEMICALS

4.1 Definitions and explanations

4.1.1 General

All chemicals used offshore, and which require permission for use, shall be reported. This includes hypochlorite produced on the facility, chemicals for cleaning freshwater production facilities and chemicals released in connection with permanent plugging operations. The reported chemicals require eco-toxicological documentation in the form of an HOCNF, and the operator shall ensure that chemicals used, re-injected or discharged, are tested for eco-toxicological properties. Ref “Aktivitetsforskriften” § 62 to § 67.

With regards to freshwater production, NEA has come with a clarification: *"Chemicals used upstream freshwater making (evaporator or reverse osmosis filter), including filter cleaning, shall be reported and requires HOCNF. If the chemical is used for cleaning freshwater tanks, piping or other parts of the freshwater process plant, HOCNF or permit is not required".*

Use and discharge of chemicals that are legal in accordance with the Activities Regulations § 66 must also be reported (according to M-107):

- Chemicals in fire water systems (fire foam)
- Chemicals to avoid well control incidents or recover well control
- Chemicals that have been field tested
- Chemicals in closed systems with a consumption of more than 3000 kg per facility per year (normally this applies to hydraulic oils).

Chemicals that have been used or discharged must be reported in categories in accordance with section 63 of the activity regulations. Except (according to M-107):

- Substances that are exempt from the requirements for ecotoxicological testing of chemicals, either in accordance with section 62 of the activity regulations, or in the field permit. These must be reported in Footprint in the category "substances without test data and categorization requirements exemption" These substances has no colourcoding.
- Hypochlorite produced on a facility is exempt from testing requirements and must be reported under category 7 in the red category. Hypochlorite must be reported under separate function group 40
- Gas trace elements are reported in a separate table in Footprint.
- Additive packages are exempt from testing requirements and must be reported under category 0.1. The use or release of substances that lack test data and that are not exempt from ecotoxicological testing must be reported as category 0 in the black category.

From the reporting year 2020, information on substitution of chemicals has been moved to Chapter 4. Here, Operators must provide an overview of the substitution plans for all chemicals in black category, red category, yellow sub-category 2 and 3, in accordance with the

Activity Regulations §65. Year for out-phasing of chemical must be given. Year for change of supplier can be used if nothing else is available.

Reporting of Hypochlorite produced at the facility

The self-produced hypochlorite is used as a biocide. In general, it is added to all seawater used on board. Hypochlorite injected into seawater, both as an additive and as in-situ produced, will in a few seconds be mainly converted into various bromine compounds, mainly HBrO and BrO-. It is HBrO and BrO- that act as biocides in seawater.

Analysis methodology
It is recommended to use systems to measure free oxidant (here largely HBrO and BrO-). Free oxidant reacts with N, N-diethyl-pphenylenediamine (DPD) to form a red color, which is a measure of the concentration of oxidant. The accuracy is stated by the supplier of instruments to be about 5 percent. However, one must be aware that the decomposition of free oxidant in seawater with some organic content, happens very quickly. It is therefore important that the time from the sample is taken until the chemicals are added is as short as possible.

Reporting
The recommended basis for reporting self-produced hypochlorite will be:

- Consumption: The concentration of self-produced hypochlorite will vary with, among other things, voltage. In general, it is around 1000 mg / l free chlorine. Consumption is added quantity multiplied by the amount of water.
- Discharges: In general, we would recommend weekly sampling in the event of discharges. On remotely operated installations, the frequency will be lower. The average concentration of the concentration in the samples multiplied by the amount discharged during the month is the amount discharged.

Where frequent sampling is not possible, an emission factor where emissions are equal to 50% of the amount added is recommended.

The consumption of chemicals, injection and emissions should be given in tonnes per area of use and function group. Specific changes compared to last year, for example new areas of application, major changes in consumption and/or discharges, shall be commented on in the text.

Accidental spills of chemicals must be reported in chapter 8.

The reporting requirement applies to all chemicals used for drilling, well operations, process, utility systems, and related operations of the facilities. The chemicals are divided into areas of application.

- Chemical is the common term for chemical substances and/or preparations.

- Substances are the chemical ingredients the product contains. A substance can in many cases be a pure chemical compound, but it can also be a distillate or another complex compound (physical mixture). The substance must be indicated with a unique chemical composition.
- Product is the name of the chemical product used. The product is often composed of substances consisting of one or more active substances, with an organic or aqueous solvent added to it.
- Trade name is the name that the product is sold as. A product can have several trade names depending on the supplier.
- Areas of application tell what areas the material is used; as for example drilling, production, gas processing, etc.
- Functional groups are divided according to the function the chemical has; as for example corrosion inhibition, defoaming, etc. The function groups are common to all areas of application.
- The Plonor list is a list from OSPAR of chemicals that is assumed to have little or no effect on the marine environment.
- Nems Chemicals is a database with HOCNF information.

Discharge of chemicals is quantified by mass balance principle. For production chemicals and chemicals from other production sites, the discharge amount will be determined by mass balance based on added amounts, injection point, solubility properties in water and the distribution of produced water between discharge, export and injection.

Products added to the production stream will follow the oil or water. Water-soluble products/substances will mainly follow the produced water which is discharged or injected.

For chemicals in application area G and H the interfaces with other fields and cooperation with other Operators shall be described, where applicable. It shall be indicated whether the product stream received from other fields contain chemicals (this applies for chemicals in application H), and if information on this is received from the Operator of the upstream field. Similarly, it shall be informed if an export stream contains chemicals and if the Operators of the downstream facilities have been informed about this.

The total amount of product shall be reported, and also the amount of water in the chemical product. Amount of water is indicated as a separate substance on par with other substances. The chemicals should be placed in functional groups based on the function they have. This means that:

- Function Group 26, *completion chemicals,* shall only be used for those chemicals that are specifically used for completion. Other chemicals used during the completion operation, such as barite, shall be placed under the functional groups they naturally belong to (barite in group 16, etc.)
- Function Group 10, *hydraulic fluid,* shall only be used for clean hydraulic fluid. Any additives are placed under their respective functional groups (e.g. Corrosion Inhibitor in

group 2). Function Group 10 also includes hydraulic fluids that traditionally have had a separate function group, e.g. BOP fluid.

Within each application area information about all products (trade name) used shall be reported.

Drilling and well chemicals are to be reported at wellbore level for each installation in which they are used. Other chemicals are reported at facility level. For the reporting of chemicals other than drilling and well chemicals to Footprint, it should be reported blank in the column "Wellbore". For chemicals in function group K (trace elements) wellbore can be reported in the column ‘Wellbore’.

Use, discharge and injection of chemicals shall include water.

Chemicals in closed systems

Guidelines from Norwegian Environment Agency states that "All consumption and discharges of chemicals shall be reported, including consumption of chemicals in closed system with a consumption of more than 3000 kg per facility per year ". Chemicals in closed systems shall be reported under category F. Normally this applies to hydraulic oils.

NB! The Norwegian Environment Agency does not consider underwater hydraulic systems as closed and chemical consumption and emissions must therefore be subject to the permit.

If several Operators use the same rig in a year, the Operators must agree on how this should be reported to avoid double reporting.

Use and emissions of dispersants and beach-cleaning agents to combat acute pollution, chemicals that are tested on field and contingency chemicals, should also be reported.

4.1.2 Exceptions

The following chemicals are omitted from the reporting requirement:

- Chemicals that are released from the sacrificial anodes, ship-bottom paint (bunnstoff) etc.
- "Water makers", i.e., chemicals used in the production of drinking water/fresh water and therefore have approval from health authorities

4.1.3 Application area A – Drilling and well chemicals

Definition:

- Drilling and well chemicals are chemicals that are used for well activities and are either injected, discharged to sea, lost to the formation or sent to shore. These include chemicals used for:
    - Drilling Operations
    - Well Completion
    - Well work over (wire line), well clean-up and well maintenance
    - Cementing
    - Well Stimulation
- All chemicals used in the drilling module (such as hydraulic fluids, lubricants and dope) shall be reported here.
- Chemicals added to wells to maintain/improve production characteristics (such as acid-stimulating chemicals, scale inhibitors and scale dissolvers) are perceived as well-treatment chemicals and shall be reported here.
- Diesel used for well treatment shall also be reported here.

Drilling and well chemicals shall be reported at wellbore level.

4.1.4 Application area B - Production Chemicals

Definition:

- Chemicals added to the production stream with an intent to influence/help the production process at the facility.
- Chemicals added to satellite fields and transported by pipeline to the main field with the same purpose.
- Chemicals that are injected to increase the production

Exception:

- Chemicals used for dehydration or CO_2 and H_2S removal from natural gas (Application area E - Gas Treatment Chemicals).
- Chemicals from other production sites (Application area H - Chemicals from other production sites)

4.1.5 Application area C - Injection Chemicals

Chemicals added to liquid or gas and injected into the formation to increase production of oil and/or gas that can be back-produced in production wells:

- Injected seawater/source water: All chemicals added to sea water/source water before injection.
- Produced water to be injected: Chemicals added only for injection purposes, i.e., after the outlet of oil/gas /water separator.

- Other chemicals which are injected into the reservoir for production of oil and gas, for example by secondary and tertiary recovery, gels to stop the water rise, etc.
- Water Injection Chemicals used in satellite field, and which are coming back with the well stream and pipeline to the main field.

4.1.6 Application area D - Pipeline Chemicals

Definition:

- Chemicals used when laying, preparing, and draining, startup, and shutdown of pipelines
- Colour substances

4.1.7 Application area E – Gas Treatment Chemicals

Definition:

- Chemicals used for dehydration of natural gas or the removal of CO_2 and / or H_2S from natural gas.

Exception:

- Chemicals injected into the pipeline for control of hydrate (included in the Application area G - Chemicals added export flow)

4.1.8 Application area F - Utility Chemicals

Definition:

- Chemicals used in utility processes on the platform
  - Cooling systems
  - Detergents
  - BOP fluids
  - Corrosion Inhibitors
  - Firefighting chemicals, also when used in tests and during verification
  - Etc.
- Chemicals used for washing and cleaning operations of the facilities and discharged through the facility drainage systems.
- The use and discharge of grease for jack-up operations shall be reported.
- Chemicals in closed system with consumption of more than 3000 kg per reporting entity per year.

- As per M107-2014, the Environment Agency would like fire-fighting chemicals, including those used during exercises and testing, to be reported in Footprint. Previously, this was only specified in the text.

4.1.9 Application area G – Chemicals added to the export stream

Definition:
These are chemicals that are added in pipeline systems to perform functions in the transport system, such as:

- Inhibitors to avoid hydrates
- Friction-reducing additives ("Drag reducers")
- Corrosion inhibitors and biocides
- Chemicals in other water volumes that are added to the export flow

Exception:

- Production chemicals that follow the export stream.
- Chemicals added to flowlines at satellite fields and transported by the well stream to the main field (reported in Application area B - Production Chemicals).

If chemicals in Application area G is used, the downstream operator must be informed. Export streams will also contain the flow of residual water produced since onshore processing plants allows up to 0.5% water content in the oil. It may therefore be necessary to inform the onshore receiving facilities about the chemical content in the export stream.

Normally there will be no discharge of chemicals within this range of use. Discharge will however be possible at the downstream facility. These discharges shall be reported under Application H by the downstream fields. (Consumption, however, shall be reported under Application G by the upstream facility).

Note! It is important that this information is reported and that all reports are forwarded to the downstream operator. The downstream operators can then include this information in their report (in Application area H).

4.1.10 Application area H – Chemicals from other production sites

Definition:

- These are chemicals that are reported as consumption in Application area G at the upstream installation.
- It is not normally reported consumption under this range of use. Consumption shall be reported by the upstream operator under Application G; discharge may however occur.

Exception:

- Chemicals coming from the wellhead platform and subsea facilities via flowlines shall be reported as production chemicals.

Information about the chemicals in application area H must be obtained from the operator of the upstream facilities. The report shall describe the interface with the upstream facilities and how coordination with the upstream operator has taken place.

4.1.11 Application area K – Trace elements

Definition:

- Here trace elements or tracers means oil- and water-soluble substances which are injected into the wells to improve reservoir control

Exception:

- Gas tracers are to be reported in section 7.4

Consumption, discharges and any injection of tracers shall be given in kg.

4.2 Reporting tables In Footprint

Footprint table updates in chapter 4

*New column for reporting discharge reduction measures added to Chemical substitution table (*Table 13*).*

TABLE 13 FOOTPRINT INPUTTABLE: CHEMICALSUBSTITUTION

Column	Normal Value / Comments
Operator	The name of the Operator
StructureType	ChemicalSubstitution
ReportYear	Year (current reporting year)
ActualYear	Year (actual year for exploration drilling)
Field	The field name as given by NOD
Facility	Facility name as provided by NOD
Location	Name of drilling location
TradeName	Tillatelses ID 1
ColorCategory	Rød/Svart/Gul underkategori 2/Gul underkategori 3

Column	Normal Value / Comments
SubstitutionDeadline	Year for out-phasing of chemical. Year for change of supplier can be used if nothing else is available.
Evaluation	Possible alternatives, status, any reasons why one can not substitute the chemical. Assessment means a description of alternatives, priorities and other factors that affect the substitution work.
OtherDischargeReductionMeasures	**Description of measures implemented to reduce discharges**

TABLE 14 FOOTPRINT INPUT TABLE: CHEMICAL PRODUCT

Column	Normal Value / Comments
Operator	The name of the Operator
StructureType	ChemicalProduct
ReportYear	Year (current reporting year)
ActualYear	Year (actual year for exploration drilling)
Field	The field name as given by NOD
Facility	Facility name as provided by NOD
Location	Name of drilling location
Wellbore	If the use of chemicals can be allocated to a particular well this should be stated. If not, the facility name as given in the column "Facility" shall be used.
RangeOfUse	Write the character code of the range of use where the chemical is used. See Table 16 for a summary.
FunctionGroup	Write the number code for the function the chemical has. See Table 17 for a summary.
TradeName	Trade name of the substance
Supplier	Chemical Supplier
ColourClassification	The product color code. The same as the product's most hazardous substance. Given as Black, Red, Yellow or Green.
Used (tonnes)	The consumption of the product in the reporting year
Discharged (tonnes)	The discharge of the product in the reporting year
Injected (tonnes)	Injected amounts of product in the reporting year
UsedInWellControlEvent	Indicates whether the substance is used as a chemical to avoid well control incidents or regain well control or not. Yes/No.*
UsedInClosedSystem	Yes/No
UsedForFieldTest	Yes/No

*Note that function group 28 (Firefighting chemicals (AFFF)) are contingency chemicals regardless of use.

TABLE 15 FOOTPRINT INPUT TABLE: GASTRACER

Column	Normal Value / Comments
Operator	The name of the Operator
StructureType	GasTracer
ReportYear	Year (current reporting year)
ActualYear	Year (actual year for exploration drilling)
Field	The field name as given by NOD
Facility	Facility name as provided by NOD
Location	Name of drilling location
TradeName	Trade name of tracer
Used (kg)	Consumption of tracer
Emission (kg)	Emission of tracer

Table 16 Range of use for chemical reporting

Application	Operations
A	Drilling and well treatment chemicals
B	Production chemicals
C	Injection chemicals
D	Pipeline chemicals
E	Gas treatment chemicals
F	Utility chemicals
G	Chemicals added to the export stream
H	Chemicals from other production sites
K	Chemicals for reservoir management

Table 17 Functional groups for chemical reporting

No.	Function
1	Biocides
2	Corrosion Inhibitor
3	Scale Inhibitor
4	Antifoam
5	Oxygen Remover
6	Flocculent
7	Hydrate inhibitor
8	Gas Drying Chemicals
9	Antifreeze
10	Hydraulic fluid (including BOP fluid)
11	PH-regulating chemicals
12	Friction-reducing chemicals
13	Wax inhibitor
14	Dye/colorant
15	Emulsion breaker
16	Weighting materials and inorganic chemicals
17	Chemicals to prevent lost circulation
18	Viscosity-changing chemicals (including lignosulfate, lignite)
19	Dispersants
20	Surfactants
21	Shale Stabilizer
22	Emulsifier
23	Dope
24	Lubricants
25	Cementing Chemicals
26	Completion Chemicals
27	Washing and cleaning products
28	Firefighting chemicals
29	Oil-based base fluid
30	Ester-based base fluid
31	Polyalphaolefin-based base fluid
32	Water Treatment Chemicals
33	H_2S scavenger
34	Diversion agent
35	Chlorine remover
36	CO_2 remover

No.	Function
37	Other
38	Scale remover
39	Beach-cleaning agents
40	Hypochlorite (produced on the installation)

4.3 Calculation methodology

4.3.1 Calculation of discharges and re-injection of chemicals in Application A

The fate of chemicals used in drilling and well treatment is often difficult to determine. Drilling Operator will in each case assess how much of the chemicals are left / lost in the well, discharged or returned for reinjection.

During well treatment operations where chemicals are added to the well, but where these are expected to be recovered/back-produced over time, should chemicals discharged be reported based on the solubility in and density of the water flow, based on the principles in chapter 4.3.2.

4.3.2 Calculation of emissions and re-injection of chemicals from application area B and H

These chemicals are added to the production stream and will follow the production stream. Each chemical must be evaluated for solubility in water. Some operators consider each substance in each chemical for their specific solubility in water.

The proportion of the chemical dissolved in oil will follow the production stream and not be discharged.

The proportion of the chemical that dissolves in water will follow the water stream. One can thus formulate the following balance:

$$
\begin{aligned}
F_k &= I_k + U_k + E_k + O_k \\
I_k &= F_k * \left(a_{kV} * \frac{PV_{injected}}{PV_{total}} \right) \\
U_k &= F_k * \left(a_{kV} * \frac{PV_{emission}}{PV_{total}} \right) \\
E_k &= F_k * \left(a_{kV} * \frac{PV_{exported}}{PV_{total}} \right) \\
O_k &= F_k * a_{kO}
\end{aligned}
\tag{2}
$$

TABLE 18 EXPLANATION OF THE COMPONENTS IN EQUATION (2)

Component	Explanation
F_k	Consumption of chemical k
I_k	Injected amount of chemical k
U_k	Discharged amount of chemical k
E_k	Exported amount of chemical k
O_k	Amount of chemicals k dissolved in the oil phase
a_{kO}	The proportion of chemical k which is dissolved in the oil phase
a_{kV}	The proportion of chemical k which is dissolved in the water phase
PV_{Total}	Total produced water volume (including produced water from upstream facilities)
$PV_{Injected}$	Produced water injected
$PV_{Emissions}$	Produced water discharged to sea
$PV_{Exporterd}$	Produced water exported to downstream field
$a_{kV} * \frac{PV_{injected}}{PV_{Total}}$	This part of the equation gives the proportion of chemical k injected
$a_{kV} * \frac{PV_{emission}}{PV_{Total}}$	This part of the equation gives the proportion of chemical k discharged
$a_{kV} * \frac{PV_{exsported}}{PV_{total}}$	This part of the equation gives the proportion of chemical k exported with the produced water. Downstream fields shall be informed, and the chemicals shall be reported as chemicals from other production sites (preparation H) by the downstream fields.

5 EVALUATION OF CHEMICALS

5.1 Definitions and explanations

This chapter shall provide an overview of the chemicals according to the chemicals' environmental properties. The current criteria are given by the appendix to the Norwegian Environment Agency in M107- *Retningslinjer for rapportering fra petroleumsvirksomhet til havs,* Chapter 4 (in Norwegian only).

The evaluation is to be done on substance level. Substance is in this context defined as the individual components of each chemical product.

TABLE 19 EVALUATION CRITERIA AND CATEGORIES FOR EVALUATION OF THE ENVIRONMENTAL PROPERTIES OF SUBSTANCES IN CHEMICALS

<table>
<tr><th colspan="2">Emissions</th><th>Category[1]</th><th>Norwegian Environment Agency's color-category</th></tr>
<tr><td colspan="2">WATER</td><td>200</td><td>Green</td></tr>
<tr><td colspan="2">Substance without test data that is exempt from categorization requirements</td><td>999</td><td>No color category</td></tr>
<tr><td colspan="2">Substances on the PLONOR list</td><td>201</td><td>Green</td></tr>
<tr><td colspan="2">Substance covered by REACH Annex IV[2]</td><td>204</td><td>Green</td></tr>
<tr><td colspan="2">Substance covered by REACH Annex V[3]</td><td>205</td><td>Green</td></tr>
<tr><td colspan="2">Substances missing test data</td><td>0</td><td>Black</td></tr>
<tr><td colspan="2">Additive packages that are exempted from test requirement and not tested</td><td>0.1</td><td>Black</td></tr>
<tr><td colspan="2">Substances that are believed to be or are harmful in a mutagenic or reproductive manner[4]</td><td>1.1</td><td>Black</td></tr>
<tr><td colspan="2">Substance on the list of priority chemicals or on OSPARS priority list[7]</td><td>2</td><td>Black</td></tr>
<tr><td colspan="2">Substance on REACH candidate list[8]</td><td>2.1</td><td>Black</td></tr>
<tr><td colspan="2">Biodegradability <20% and log Pow ≥ 4.5[5]</td><td>3</td><td>Black</td></tr>
<tr><td colspan="2">Biodegradability <20% and toxicity EC50 or LC50 ≤ 10 mg/l</td><td>4</td><td>Black</td></tr>
<tr><td colspan="2">Two of three categories: Biodegradability <60%, log Pow ≥ 3, EC50 or LC50 ≤ 10 mg/l[5]</td><td>6</td><td>Red</td></tr>
<tr><td colspan="2">Inorganic and EC50 or LC50 ≤ 1 mg/l</td><td>7</td><td>Red</td></tr>
<tr><td colspan="2">Biodegradability <20% [4]</td><td>8</td><td>Red</td></tr>
<tr><td colspan="2">Polymers that are exempted from test requirement and not tested[9]</td><td>9</td><td>Red</td></tr>
<tr><td colspan="2">Potassium hydroxide, sodium hydroxide, hydrochloric acid, sulfuric acid, nitric acid and phosphoric acid</td><td>104</td><td>Yellow</td></tr>
<tr><td colspan="2">Substance with biodegradation> 60%</td><td>100</td><td>Yellow</td></tr>
<tr><td rowspan="2">Substance with biodegradability 20% - 60%</td><td>Subcategory 1 - if the substance is expected to fully biodegrade or will biodegrade to substances that would fall into the yellow or green category, if they were subject to categorization requirements.</td><td>101</td><td>Yellow</td></tr>
<tr><td>Subcategory 2 - if the substance is expected to biodegrade into substances that would be in red</td><td>102</td><td>Yellow</td></tr>
</table>

Emissions		Category[1]	Norwegian Environment Agency's color-category
	category, if they were subject to categorization		
	Subcategory 3 - if the substance is expected to biodegrade into substances that would be in black category, if they were subject to categorization	103	Yellow

[1]Description of the category is given in the flowchart in Figure 1. Category in Footprint Table 5.1 relates to the category in Footprint Table 6.1 to ensure compliance with the figures reported in the two tables.
[2] "Kommisjonsforordning nr. 987/2008".
[3]Norwegian Environment Agency must consider whether the substance is covered by Annex V.
[4] With mutagenic and reproductive harmful substances means mutagenic (Mut) 1A and 1B and toxic for reproduction (Rep) 1A and 1B, cf. appendix 1 in forskrift om klassifisering, merking mv. av farlige kjemikalier eller selvklassifisering».
[5] Data for degradability and bioaccumulation shall be in accordance with approved tests for offshore chemicals.
[6] The prioritylist can be found at miljostatus.no/prioritetslisten
[7] OSPAR List of Chemicals for Priority Action (Revised 2013) (Reference number 2004-12). The list can be found here: https://www.ospar.org/work-areas/hasec/hazardous-substances/priority-action.
[8]Substances on the candidate list can be found here: https://www.echa.europa.eu/candidate-list-table
[9]Aktivitetsforskriften §§ 62-63.

Reported consumption and discharge amounts in Chapter 5 should match the amounts reported as consumption and discharge in chapter 4.

The use of red, black, Yellow Y2 and Y3 chemicals shall be accompanied by a binding substitution plan, ref. Table 12.

Amount of substance discharged can be calculated based on the amount of product discharged and the weight percentage substance in the product (average of upper and lower limits used if only approximate concentration specified by supplier). The percentage of substances in the product must be normalised so that the sum of the substances in a product is 100%.

The categories overlap for some substances. The chemicals shall only be reported in one category and the strictest category shall be used. For substances not categorized as green or yellow the following flowchart in Figure 1 is used (highest priority first category).

For chemicals in category 1.1 it shall briefly be stated whether the substance is Category mut 1A and 1B or rep 1A and 1B.
From the 2020 reporting, several new tables will be added in this chapter, for all the tables the following applies:

- The chemicals must be grouped based on whether they are legal in accordance with section 66 of the activity regulations. The default value is No, it changes to yes if one of the following criteria is met:
  - ChemicalComponentFunctionGroup = 28 (fire protection)

- ChemicalComponentUsedInWellControlEvent = Yes
- Chemical ComponentUsedForFieldTest = Yes
- ChemicalComponentUsedInClosedSystem = Yes

Table 5.1 (in the written report): Consumption and discharge of substances distributed according to their environmental properties have from the 2020 reporting been replaced with the following tables in the written report:

- Table 5.1.1 Use and emissions of substances in the black category
- Table 5.1.2 Use and emissions of substances in the red category
- Table 5.1 3 Use and emissions of substances in yellow and green category

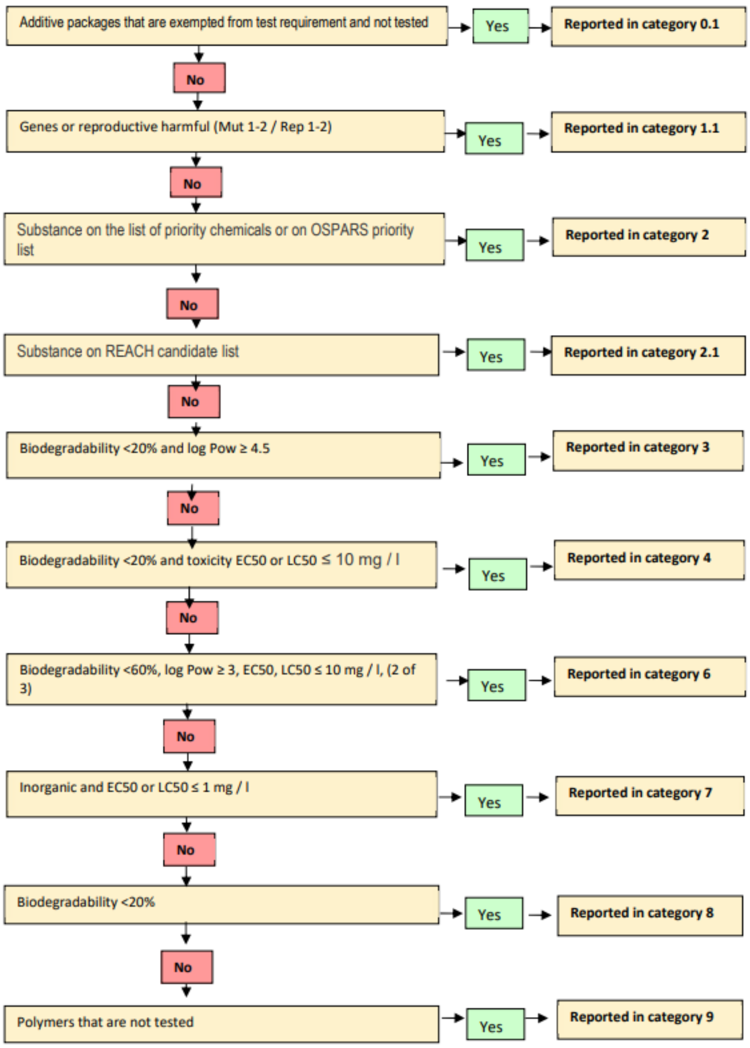


FIGURE 1 FLOWCHART FOR CLASSIFICATION OF CHEMICALS IN THE GROUP OF 0.1 TO 9

5.2 Reporting Tables to Footprint

Footprint table updates in chapter 5

No updates.

TABLE 20 FOOTPRINT INPUT TABLE: CHEMICAL COMPONENT

Column	Normal Value / Content
Operator	Name of the operating company
StructureType	ChemicalComponent
ReportYear	Year (current reporting year)
ActualYear	Year (actual year for exploration drilling)
Field	Field name as provided by NOD
Facility	Facility name as provided by NOD
Location	Name of drilling location
Wellbore	If the use of chemicals can be allocated to a particular well this shall be stated. If not, the facility name as given in the column "Facility" shall be used.
RangeOfUse	Write the character code of the range of use where the chemical is used. See Table 16 for a summary.
FunctionGroup	Write the number code for the function the chemical has. See Table 17 Functional groups for chemical reporting for a summary
TradeName	Trade name of the product
Used (tonnes)	The consumption of the product in the reporting year
Discharged (tonnes)	The discharge of the product during the reporting year
EnvironmentalCategory	The product colour code, ref. Table 16.
Component	The name of the substance in the chemical
Casno	CAS number of the substance to ensure unambiguous identification
Toxicity	The substance toxicity as given in HOCNF datasheets
LogPow	Enter the substance bioaccumulation potential as given in HOCNF datasheets
BOD	Enter the substance biodegradability as given in HOCNF datasheets
Inorganic	
OnListOfPrioritySubstances	List of priority substances
UsedInWellControlEvent	Yes/No
UsedForFieldTest	Yes/No
UsedInClosedSystem	Yes/No
Plastic	Yes/No
MicroPlastic	Yes/No
Nanomaterial	Yes/No
Biosid	Yes/No

5.3 Calculation Methodology

TABLE 21 INFORMATION ON CALCULATION OF SUBSTANCES' ENVIRONMENTAL CHARACTERISTICS FOR REPORTING

Column	Normal Value / Content
Used (tonnes)	Substance consumption in the reporting year multiplied by the substance normalized average concentration. Normalized average concentration can be found in NEMS Chemicals, or may be calculated from HOCNF data sheet
Discharge (tonnes)	Substance discharge in the reporting year multiplied by the substance normalized average concentration. Normalized average concentration can be found in NEMS Chemicals, or may be calculated from HOCNF data sheet
Component	Substance name. Can be found in HOCNF data sheet and in NEMS Chemicals
Toxicity	The substance's toxicity. Can be found in HOCNF data sheet and in NEMS Chemicals. Used to decide Norwegian Environment Agency category.
LogPow	The substance's bioaccumulation potential. Can be found in HOCNF data sheet and in NEMS Chemicals. Used to decide Norwegian Environment Agency category.
BOD	The substance's biodegradation potential. Can be found in HOCNF data sheet and in NEMS Chemicals. Used to decide Norwegian Environment Agency category.
EnvironmentalCategory	All substance shall be allocated to a Norwegian Environment Agency class. Ref. Table 19. They shall be allocated based on the substance's environmental toxicity. Each substance's toxicity, bioaccumulation and biodegradation potential shall be evaluated. The substance shall be allocated to the strictest applicable category in Table 19. No substance shall be double reported. In class 201 – PLONOR, only data that is on OSPARS PLONOR list should be reported.

6 CHEMICAL CONTAMINANT

6.1 Chemicals that contain hazardous substances

The reporting in section 6.1 will contain confidential information and shall not be included in the annual written report but be reported to the Norwegian Environment Agency only as data uploaded to Footprint. Operators must report emissions of compounds that are on the priority list that are present as contaminants in chemical.

Note! Numbers shall be reported into Footprint, but no table will return from Footprint.

Chemicals that are on the PLONOR list shall not be reported, although they fulfill the requirements for BOD <20% (e.g. cellulose).

Some substances can occur in several products. If these are supplied by different manufacturers/suppliers, the test data might vary. It is recommended to report strict and according to the format. This means that the same substance can be entered multiple times with different data for bioaccumulation potential and degradability.

6.1.1 Compounds on the Priority List, as additives and contaminants in products

A combined overview of the discharges of compounds that are on the list of priority substances[2] , shall be given. Compounds present as additives and contaminants in chemical products shall be reported. The information shall appear in the HOCNF data sheet.

Use normalized cut for calculating discharges if the content of the additive is reported as a concentration range, e.g. 0.1-0.3 weight percent of the product.

Earlier this was reported in 9 main groups, now the pollutants on the list of priority substances are to be reported separately.

TABLE 22 THE POLLUTANTS ON THE LIST OF PRIORITY SUBSTANCES

Pollutants on the list of priority substances
Arsenic
Bisphenol A
Lead
Brominated flame retardants
Decamethylcyclopentasiloxane
Diethylhexylphthalate
1,2 dichloroethane (EDC)
Dioxins (PCDD/PCDF)
Dodecylphenol
Hexachlorobenzene (HCB)

[2] *http://www.miljostatus.no/Tema/Kjemikalier/Kjemikalielister/Prioritetslisten/*

Pollutants on the list of priority substances
Cadmium (Cd)
Chlorinated alkylbenzenes (KAB)
Chlorinated paraffin short chained (SCCP)
Chlorinated paraffin medium chained (MCCP)
Chromium (Cr)
Mercury (Hg)
Muskxylene
Nonyl- og octylphenol
Octamethylcyclotetrasiloxane (D4)
Pentachlorophenol
PAH
PCB
PFOA
PFOS
C9-C14 PFCA'er
Surfactants
Tetrachlorethylene (PER)
TBT og TFT
Trichlorobenzene (TCB)
Trichloroethene (TRI)
Triclosan
Tris (2-chloroethyl) phosphate (TCEP)
2,4,6 tri-tert-butylphenol (TTB-phenol)

Two tables shall be prepared, one for additives in products and one for pollution in products.

Calculation of discharges in Footprint table 6.1 shall be based on concentrations given in the HOCNF data sheet. If the products are specified to contain trace (<100 ppm) of the component, 50 ppm is used for calculating the amount.

6.2 Reporting Tables in Footprint

Footprint table updates in chapter 6

No updates.

TABLE 23 FOOTPRINT INPUT TABLE: CHEMICAL CONTAMINANT

Column Title	Normal Value / Content
Operator	Name of the operating company
StructureType	ChemicalContaminant
ReportYear	Year (current reporting year)
ActualYear	Year (actual year for exploration drilling)
Field	Field name as provided by NOD
Facility	Facility name as provided by NOD
Location	Name of drilling location

Column Title	Normal Value / Content
Wellbore	If the use of chemicals can be allocated to a specific well, it shall be mentioned. If not, it should be reported blank in Wellbore.
RangeOfUse	Write the character code of the range of use where the chemical is used. See Table 16 for a summary.
FunctionGroup	Write the number code for the function the chemical has. See Table 17 Functional groups for chemical reporting for a summary
TradeName	The trade name for the chemical
Component	The name on the compound
ContaminantType	Indicate whether the compound is: Additive or Contamination
ComponentContaminantGroup	Specify the component on the priority list, ref. table 19.
Discharged (tonnes)	The amount of the discharge for the specific compound

6.3 Calculation Methodology

Discharges are calculated by obtaining the compound concentration from HOCNF data sheet and multiply the compound concentration in the product with the amount of product discharged.

Use normalized cut for calculating discharges if the content of the additive is reported as a concentration range, e.g. 0.1-0.3 weight percent of the product.

7 EMISSIONS TO AIR AND ENERGY

7.1 Definitions and explanations

For field located at the border to other countries continental shelf, the emissions shall be reported as the actual emissions from facilities located on the Norwegian continental shelf (geographical split).

Emissions from intermediate compressor stations and Norwegian receiver terminals of the pipeline system should also be reported.

Emissions from all fixed installations and mobile units shall be reported. This includes mobile units, connected to a permanent facility with a bridge. Emissions from exploration activity should be reported using the same template, but in a separate report.

Factors used to calculate emissions must be given per source according to M-107. These factors will be back calculated per source in Footprint and are available there. This occurs without the operators having to do anything.

Emissions that are subject to quotas should match the numbers reported in quota context. Any deviations must be explained.

7.1.1 Combustion sources

Combustion gases are gases from the combustion processes that take place in connection with the petroleum activity. Hydrocarbon liquids or gases are used as fuel. Emissions vary with fuel type and combustion process. Combustion of hydrocarbons is carried out due to the following purposes:

- Energy conversion
- Flaring
- Burning of oil and gas in connection with well testing and well clean-up.

If any reporting in the category ‘Other sources of combustion’ this must be described in the written report. Note that in cases of direct emissions of CO_2, this should be reported under ‘other sources’.

7.1.2 Combustion of gas

Fuel gas is used for gas turbines, direct-fired boilers and gas engines.

Offshore Norge has not given recommendation on emission factors for direct-fired boilers and gas engines. The operator must obtain the appropriate/representative emission factors from measurements, calculation or estimation, and obtain an approval of the emission factors by NOD/Norwegian Environment Agency. Quantification of the emissions is made on the equipment level. “Forskrift om særavgifter” lists sjablon values for NO_x emission factors.
Due to the differences in emission factors for different equipment the operator must

determine the amount of fuel gas that goes to the individual subsystems (turbines, boilers, engines) and on equipment that have different emission factors. This can be done by installing separate gauges on each subsystem, or by calculating the distribution of fuel gas in the subsystems based on energy demand.

Measured fuel gas might be used for other purposes, and eventually part of the gas might be sent to flare or vented to cold vent, instead of combustion as fuel in energy converting equipment. If that is the case it should be assured that these gas quantities are not reported twice (e.g., the fuel gas is measured in the combustion gas meter as well as flare gas, when the gas also runs through the flare gas meter).

7.1.3 Combustion of diesel

Diesel is also used for purposes other than fuel. Diesel for such purposes must be deducted from the total amount of diesel used on the facility before emission calculations, unless the quota permit states otherwise.

Mobile facilities use normally diesel as fuel for diesel engines, and in some cases in diesel-fired boilers. At fixed installations diesel are also used in "dual fuel" gas turbines, e.g., when gas production stops or irregularities in the gas compression occur. It is important that the consumption of fuel type for each of these subsystems is determined, since emissions factors for NO_x, NMVOC and CH_4 are different for different equipment. The emission factors will also vary depending on the density of diesel burned. This must be considered when calculating emissions.

7.1.4 Flare

All production and processing platforms are equipped with flare tower and shall report flaring of gas. Flare is used to evacuate or release pressure from the process equipment, to prevent critical situations. Unless the installation has installed equipment for closed flare a pilot flame must always be burning. Flaring accounts for about 7 % of CO_2 emissions from the Norwegian petroleum industry.

The flare gas composition may differ from the fuel gas composition and shall be reported separately from fuel gas used for power generation.

If field-specific emission factors are not available, and permission is given, the recommended emission factors for calculation can be used. See Section 7.1.9 Emission Factors.

The emission factors for NO_x, CH_4 and NMVOC may vary with the amount of gas flared. Since 2007 a standard NO_x factor of 1.4 g NOx / Sm3 gas flared has been used for flaring.

7.1.5 Well test

The Operator must inform if a well test has been carried out over the burner boom. Burned oil, gas and diesel shall be stated. This includes diesel used to balance the well at the start of a well test. Typical emission factor used to calculate spilled oil into the sea when flaring by using boom from well testing and well clean-up is 0.05%. Burning oil and diesel during well test will results in emissions of PCB, Dioxins, Black carbon and PAH. These shall be reported in accordance with emissions factors given in Table 26 and Table 27.

Well testing is divided into the following sources:

- Well test
- Well clean up
- Bleed over burner boom

From the reporting year 2020, a new table will be included in the written report, which will provide information on oil downfall to sea and emissions of soot from the combustion of oil using a burner boom. Figures for this table are taken from the Footprint tables *Combustion* and *WellTest*.

7.1.6 Emissions from storage and loading of oil

This chapter applies to emissions of hydrocarbons to air from fields which use offshore loading of crude oil. Emissions occur:

- from shuttle tankers in connection with loading of crude oil to cargo tanks that use inert gas as a tank atmosphere.
- from floating and free-standing storage tanks/installations (FSO) that use inert gas as a tank atmosphere. This applies to emissions from FSO in connection with the transfer of crude oil to FSO from nearby production facilities

The emissions consist of CH_4 and NMVOC mixed with inert gas. Only CH_4 and NMVOC are to be reported. The Operator must inform whether oil is loaded on the field, and whether the field is covered by the VOC industrial cooperation (VOCIC). Loaded volumes and emissions of CH_4 and NMVOC must be reported through VOCIC. The reporting shall be coordinated with the report of the VOC industrial cooperation.

Emissions of CH_4 and NMVOC from floating combined production and storage units (FPSOs), where the tank atmosphere is natural gas, shall be reported under chapter 7.1.7 (under source codes 130.1 and 130.2).

7.1.7 Direct emissions of methane and NMVOC

This is direct emissions of natural gas from process equipment at the oil and gas facilities. Emissions can come from all systems handling hydrocarbons. Emissions are hydrocarbon gases which are divided into methane (CH_4) and NMVOC. Emission sources can come from:

- Cold Vent. These are emissions that are taken into account during the construction of the facility. Emissions can in many cases be quantified by calculations based on the design and manufacturing data. Cold ventilation can take place through common emission chimneys or emission points in the production equipment.
- Small leakages in the process. These are emissions that are referred to as 'diffuse emissions' and come from pumps, flanges and valves. These emissions can be difficult to quantify.

In addition, direct emissions of CO_2 from CO_2-capture and storage are included as a separate source.

Possible sources of direct emissions are given in the table below. All sources must be reported, including sources that are not on the installation. These are labeled 'Not on installation' in the column 'Fate'.

For the other sources the fate shall be given:

- Measured common vent
- Direct emissions
- Sent to flare
- Recycled

The fate 'Direct emissions' includes emissions from local vents, fugitive emissions and emissions from common vents that are not measured.

If the waste gas is sent to discharge, the amount discharged shall be reported. This shall be calculated and reported as specified in Appendix B (only available in Norwegian).

Recommended quantification methods are available for most emission sources. For some sources, it is recommended that the operators establish their own facility-specific methods. Operators shall, in their emissions reporting, indicate the method used for quantification for each emission source. The operators may use facility-specific quantification method for sources where general method is recommended. It must then be probable that the facility-specific method gives as precise or better emission figures than the general method.

Note that for those sources that have been reported under the following fates:

- Not on installation
- Sent to flare
- Recycled

must be reported accordingly under method in Footprint. This is because method is a compulsory parameter. Table 24 provides an overview of the pre-defined calculation methods that can be selected.

Table 24 Pre-defined calculation methods

Calculation methods
Direct measurements
Indirect measurements
Mass balance
Not on installation

Calculation methods
GRI-GLYCalc (only for 10 and 20 series)
MultiProScale (only for 10 and 20 series)
Emission factor
1% general addition (only for 910.1)
3% general addition (only for 900.1)
Data from supplier
Henrys law (only for 40 series)*
Sent to Flare
Recycling
Included in measured common vent
Other ISM
Flowrate of stripping gas
Calculated from upstream pressure and amount of water
Registration of time with unignited flare
OGI leak/no leak
Calculation of flowrate
Annual vented storage tank volume
Volume of vented process plant

*Not relevant method

A general addition is added to the calculated emissions to include emissions from various sources with small contributions. The operator must add 1% of the sum of the calculated emissions (mandatory). If the facility is an FPSO with oil storage and inert gas (neutral gas) as blanket gas (after the last oil loading before tank inspection) the general addition is increased to 3%.

TABLE 25 SOURCES OF DIRECT EMISSIONS

Source ID	Main Source	Sub source	Fate	Methodology	CH_4 tonnes	NMVOC tonnes
1.1	Measured emissions	Measured common vent				
10.1	Triethyleneglycol (TEG) regeneration	TEG degassing tank				
10.2	Triethyleneglycol (TEG) regeneration	TEG regenerator				
10.3	Triethyleneglycol (TEG) regeneration	Stripping gas				
20.1	Monoethyleneglycol (MEG) regeneration	MEG degassing tank				

Source ID	Main Source	Sub source	Fate	Methodology	CH_4	NMVOC
20.2	Monoethyleneglycol (MEG) regeneration	MEG regenerator				
20.3	Monoethyleneglycol (MEG) regeneration	Stripping gas				
30.1	Amine regeneration	Amine degassing tank				
30.2	Amine regeneration	Amine regenerator				
40.1	Produced water handling	Produced water degassing tank				
40.2	Produced water handling	Flotation tank / CFU				
40.3	Produced water handling	Flotation gas				
40.4	Produced water handling	Discharge caisson				
50.1	Centrifugal compressor sealant oil	Degassing pots				
50.2	Centrifugal compressor sealant oil	Sealing oil retention tank				
50.3	Centrifugal compressor sealant oil	Sealing oil storage tank				
60.1	Piston compressor	Separator chamber				
60.2	Piston compressor	Crank shaft housing				
70.1	Dry compressor seals	Primary seal gas				
70.2	Dry compressor seals	Secondary seal gas				
70.3	Dry compressor seals	Leakage of primary seal gas to secondary vent				
80.1	Flare gas that does not burn	Extinguished flare and ignition of flare				
80.2	Flare gas that does not burn	Non-flammable flare gas				
80.3	Flare gas that does not burn	Inert gas flushed open flare				
90.1	Leaks in the process	Larger gas leaks				
90.2	Leaks in the process	Small gas leaks				
100.1	Purge and blanket gas	Purge and blanket gas				
110.1	Gas analysers and test stations	Gas analysers and test stations				

Source ID	Main Source	Sub source	Fate	Methodology	CH_4	NMVOC
120.1	Drilling	Drilling				
130.1	Storage tanks for crude oil at FPSOs	Gas freeing in connection with tank inspection				
130.2	Storage tanks for crude oil at FPSOs	Abnormal operating situation				
140.1	Gas freeing of process systems	Gas freeing of process systems				
150.1	Ventilation of CO_2 from CCS	Ventilation of CO_2 from CCS				
160.1	Cold vent from turbines	Cold vent from turbines				
900.1	General addition	FPSO				
910.1	General addition	Fixed facilities				

Larger gas leaks shall also be reported under accidental discharges in Chapter 8.

All sources of natural gas emissions referred to in Table 25 above shall generally be included in the basis for the CO_2 tax. Facility-specific factors may affect the basis for tax liability for each individual installation. (Ref. section 7.1.7, all sources shall be reported, including sources not on the installation. These are labeled ‘Not on installation’ in the column ‘Fate’.)

The measurement regulations allow for indirect measurements of the amount of natural gas released to air from systems other than the common cold vent system (ref. §§10 and 12 with guidance). The Norwegian Offshore Directorate can consider the methods described in this guideline and annexes as acceptable for determining taxable emissions of natural gas (ref. the measurement regulations’ guide § 1, second paragraph, § 15 and Annex 2). Fractions in the source streams that are not taxable, such as water vapor or Nitrogen, can be corrected for in the measurement model/measurement. The requirement for uncertainty within 7,5 % applies to the combined measurement uncertainty for the total amount of natural gas in the period (Sm^3/month) at a facility.

The deadlines for reporting CO_2-tax to the Norwegian Offshore Directorate (February 1st and August 1st) apply, until otherwise determined. The Norwegian Offshore Directorate has allowed, through established practice, that the reporting for the second term can be corrected until mid-March. This means that the reporting to Footprint can be used to correct reported cold vent subject to tax. In such situations, companies can inform the Norwegian Offshore Directorate when reporting for the first time, that the final numbers for emissions of unburned hydrocarbons will be available on March 15.

7.1.8 Emission components

CO_2

CO_2 emissions occur from all combustion processes. CO_2 emissions are a function of carbon number of the fuel used. It shall be used field-specific emission factors in accordance with the requirements of the Greenhouse Gas Emission Regulations and approved monitoring program for the relevant facility/unit.

For diesel, the emission factor is usually 3.17 kg CO_2 per kg diesel. For marine diesel oil, jet fuel and crude oil, the same factor is assumed, if there does not exist an equipment-specific emission factor.

NO_x

Emissions of NO_x occurs from all combustion processes. Nitrogen oxides are formed through several mechanisms:

- by oxidation of nitrogen bound in the fuel
- oxidation of nitrogen in the combustion air

The amount of NO_x formed depends on the combustion process. The specific emissions (emissions per kWh output) are significantly higher for diesel than for gas turbines, boiler, gas flaring and well testing.

NO_x emissions from gas turbines increase with increased load.

New combustion technology for gas turbines, which gives 80-90% lower NO_x emissions when running at close to full load, has been introduced in many fields in the North Sea during the past years (Low- NO_x, also called DLE technology). Low- NO_x technology for diesel engines is also under development. These can reduce emissions by up to 50% compared to conventional diesel technology. Even lower emissions can be achieved by using low- NO_x technology of gas engines. NO_x emissions from low- NO_x diesel engines are still far higher than from conventional gas turbines.

There exist also catalysts that can reduce emissions from diesel and gas engines with up to 90% (Selective Catalytic Reduction, or SCR).

SO_x

All gas, diesel and oil contains some sulfur, e.g., in the form of H_2S. Emission quantities are directly related to the sulfur content of the fuel. The sulfur content in gas on the Norwegian Continental Shelf is, with few exceptions, very low.

Emissions of SO_x from gas is calculated based on the H_2S content of the gas as indicated in ppm and the sulfur content of diesel / fuel oil indicated in %. See Section 7.3.4 for calculation of SO_x emissions.

CH_4

CH_4 emissions occur in all combustion processes as non-combusted hydrocarbon. The emissions decrease with increasing load of the internal combustion machine. Emissions of CH_4 from burning diesel and other oils are negligible.

Emissions of NMVOC
NMVOC is an umbrella term for all hydrocarbon gases except methane. Emissions occur in all combustion processes as non-combusted hydrocarbon. Emission mechanisms are otherwise as for methane.

Emissions of PAHs, PCBs and Dioxin
These compounds are complex aromatics and chlorinated organic compounds, which are detected in emissions from well testing.

Emissions of Black Carbon
Black carbon is a type of soot that has been detected in flare exhaust related to well testing and well cleaning.

Use and emissions of gas trace substances
With gas tracers means gaseous chemical substances that are injected into wells to improve reservoir control.

Emissions that are not reported to the Norwegian Environment Agency
Emissions of CO occur from all combustion processes. Emissions of CO from petroleum activities are small and are not reported in the emissions report to the Norwegian Environment Agency.

Emissions of N_2O occur from all combustion processes. The emissions from petroleum activities are small in a national context. N_2O are currently not reported in the annual report.

7.1.9 Emission factors

TABLE 26 OFFSHORE NORGE'S RECOMMENDED EMISSIONS FACTORS FROM COMBUSTION PROCESSES USING NATURAL GAS AS FUEL. SHALL ONLY BE USED IF FIELD-/EQUIPMENT SPECIFIC FACTORS ARE NOT AVAILABLE

Type	Unit	Turbine	Engines	Boilers	Flaring	Well testing
CO_2	Ton/1000 Sm^3	Field-specific	Field-specific	Field-specific	3,72	3,72
NO_x	Ton/1000 Sm^3	Field-specific*	Field-specific*	Field-specific	0,0014	0,0014
CO	Ton/1000 Sm^3	0,0017	Field-specific	Field-specific	0,0015	0,0015
N_2O	Ton/1000 Sm^3	0,000019	Field specific	Field-specific	0,000020	0,000020
CH_4	Ton/1000 Sm^3	0,00091*	Field-specific	Field-specific	0,0033	0,00024
NMVOC	Ton/1000 Sm^3	0,00024*	Field-specific	Field-specific	0,0029	0,00006
SOx	Ton/1000 Sm^3	Field-specific	Field-specific	Field-specific	Field-specific	Field-specific

*Only to be used if equipment specific factors are not available. To determine equipment specific factors, please see NEMS report made on behalf of Offshore Norge: Technical note. Impacts of zero methane emissions from gas turbines, 2021.

TABLE 27 OFFSHORE NORGE'S RECOMMENDED EMISSION FACTORS FROM COMBUSTION PROCESSES WITH DIESEL OR OTHER OIL AS FUEL. SHALL ONLY BE USED IF THE FIELD-/RIG-/EQUIPMENT SPECIFIC FACTORS ARE NOT AVAILABLE

Emissions	Unit	Turbine	Engines	Boilers	Well testing
CO_2	ton/ton	3,17	3,17	3,17	3,17
NOx*	ton/ton	Field-specific*	0,053***	Field-specific*	0,0037
CO	ton/ton	0,0007	0,007	Field-specific	0,018
N_2O	ton/ton	Field-specific	0,0002	Field-specific	Field-specific
CH_4	ton/ton	Field-specific	Field-specific	Field-specific	Field-specific
NMVOC	ton/ton	0,00003	0,005	Field-specific	0,0033
SOx	ton/ton	0,001****	0,001****	0,001****	Field-specific
PAH**	gram/ton	N/A	N/A	N/A	12
PCB**	gram/ton	N/A	N/A	N/A	0,22
Dioxins**	gram/ton	N/A	N/A	N/A	0,00001
Black carbon	kg/ton	N/A	N/A	N/A	1

* If neither measured nor field-specific emission factors for NO_x are available, standard values are listed in "forskrift for særavgifter".
** Not reportable for other than well testing. Source for the factors: Offshore Norge Environmental Programme Phase II, Project C 01. Emissions and Discharges from Well testing, av Kjelforeningen Norsk Energi. 31.05.1994. Tabell 1.1
***Applicable for engines with rpm between 200 and 1000. For other values reference is made to "forskrift for særavgifter".
****According to new requirements only 0,05 weight % sulfur in diesel is allowed, this gives a new factor of 0,001.

7.1.10 Emissions to air of components for which limit values have been set in the permit

From the 2020 reporting, a new table is included in the written report that indicates emissions to air of the components for which limit values have been set in the permit. Figures for this table are taken from the new Footprint table: *PermitLimitEmissions*. In addition, figures are taken from the Footprint tables *Combustion*, *FugitiveEmissionsAndVenting* and *LoadingAndStorageOfCrudeOil*.

If the report covers several facilities, the emissions should be reported in accordance with the permit. This means that if limit values of components per facility have been set, emissions should also be reported per facility. From Footprint, tables both per facility and as sum of facilities are created, use the table/tables that is in compliance with the permit (s).

Note that for low-NO_x-turbines and boilers, emission concentration shall only be reported if a limit value for emission concentration is given in the permit.
The operator must comment if DLE turbines have not been run in low-NO_x mode.

7.1.11 Production and utilization of mechanical/electrical energy

From the reporting year 2020, two new tables have been prepared which are included in the written report which indicates the production and utilization of mechanical/electrical energy at the field.

7.1.12 Energy and emission reduction measures

Both implemented and decided measures that reduce energy consumption and greenhouse gas emissions must be reported. Estimated energy and emission reductions (CO_2, Methane, NMVOC and CO_2-equivalents) shall be reported in Tables 7.4.1 and 7.4.2 in the written report. Measures that reduce NO_x and SO_x must also be reported in Footprint. Decided measures are measures for which an investment decision has been made. If previously decided measures have not been implemented as planned, this must be justified.

'Type of Measure' have pre-defined choices. A pre-defined list of type of measures is given in the table below.

TABLE 28 LIST OF TYPE OF MEASURES

1. Drainage strategy
2. Well design
3. Machine (Power generation)
4. Waste Heat Recovery
5. Pumps
6. Compressors
7. Flaring
8. Venting methane
9. CO_2 capture and storage
10. Electrification
11. Power from renewable sources
12. Energy storage: Batteries
13. Subsea compression
14. Subsea separation
15. Downhole separation
16. LED lights
17. Diesel for electrical operation
18. MEG/TEG optimization
19. Friction inhibitors
97. Structural changes
98. Liquidation
99. Other

This list comes from previous reporting of measures to Offshore Norge, as well as categories in NORSOK S-003 "Environmental Care", but the list is not complete. If the measure does not fit any of these categories, the measure can be reported under 'other'. It is also possible to contact NEMS if there is a need to add new types of measures to this list. This can also be done by using the 'Get Help' button in Footprint and entering the new type of measure that you want. It usually takes a few hours to update the production system. Offshore Norge can also be contacted if you have any comments or questions.

7.2 Reporting Tables to Footprint

Footprint table updates in chapter 7

*CO emission added to Combustion table (*Table 29*)*
*CO concentration added to Exhaust gas concentration table (*Table 30*)*
*Generic indicator for NOx concentration replaces specific indicators for turbine and boiler (*Table 30*)*

7.2.1 Combustion Operations

TABLE 29 FOOTPRINT INPUT TABLE: COMBUSTION

Column	Normal Value / Comments
Operator	The name of the Operator
StructureType	Combustion
ReportYear	Year (current reporting year)
ActualYear	Year (actual year for exploration drilling)
Field	The field name as given by NOD
Facility	Facility name as provided by NOD
Location	Name of drilling location

Source	State if the burning takes place in:
	• Flare
	• Turbine
	• Engine
	• Boiler
	• Oven
	• Well test
	• Well cleaning
	• Bleed over burner boom
	• Other
	    o Other sources include, inter alia, direct emissions of CO_2
	    o In addition: 'Generated energy'*
	• Urea scrubbing

Fuel	Fuel gas, liquid fuel, oil burning or direct emissions. In addition: 'Generated energy'* and 'Urea'
TypeOfTurbine	This specifies turbine type: DLE, SAC, WLE, SAC compressor, SAC generator, SAC injection pump, DLE compressor, DLE generator and DLE injection pump
DieselBurnt (tonnes)	Amount of diesel combusted
GasBurnt (m3)	Amount of gas combusted
OilBurnt (tonnes)	Amount of oil combusted
CO2Emission (tonnes)	Amount discharged CO_2 from combustion operation – CO_2 emission from urea scrubbing shall also be included

Column	Normal Value / Comments
NOxEmission (tonnes)	Amount discharged NOx from combustion operation
NMVOCEmission (tonnes)	Amount NMVOC discharged from the combustion operation
CH4Emission (tonnes)	Amount discharged CH_4 from combustion operation
SOxEmission (tonnes)	Amount discharged SOx from combustion operation
PCBEmission (kg)	Amount discharged PCB from combustion operation (oil burned during well test.)
PAHEmission (kg)	Amount discharged PAH from combustion operation (oil burned during well test.)
DioxinesEmission (mg)	Amount discharged Dioxin from combustion operation (oil burned during well test.)
N_2O (kg)	Amount discharged N_2O from combustion operation
OilDownfall (tonnes)	Fallout of oil from the combustion of oil during well testing
BlackCarbon(kg)	Amount of soot from oil combustion during well testing
COEmissions (tonnes)	**Amount of CO emitted from combustion operations**
GeneratedMechanicalEnergy (GWh)	Generated Mechanical Energy
GeneratedElectricalEnergy (GWh)	Generated Electrical Energy
GeneratedCombinedEnergy (GWh)	Generated Mechanical + Electrical Energy

7.2.2 Exhaust gas concentration

TABLE 30 FOOTPRINT INPUT TABLE: EXHAUSTGASCONCENTRATION

Column	Normal Value / Comments
Operator	The name of the Operator
StructureType	ExhaustGasConcentration
ReportYear	Year (current reporting year)
ActualYear	Year (actual year for exploration drilling)
Field	The field name as given by NOD
Facility	Facility name as provided by NOD
Location	Name of drilling location

Source	State if the burning takes place in:
	• Flare
	• Turbine
	• Engine
	• Boiler
	• Oven
	• Well test
	• Well cleaning
	• Bleed over burner boom
	• Other
	  ○ Other sources include, inter alia, direct emissions of CO2
	  ○ In addition: 'Generated energy'*
	• Urea scrubbing

Fuel	Fuel gas, liquid fuel, oil burning or direct emissions. In addition: 'Generated energy'* and 'Urea'
TypeOfTurbine	This specifies turbine type: DLE, SAC, WLE, SAC compressor, SAC generator, SAC injection pump, DLE compressor, DLE generator and DLE injection pump
ExhaustGasNOxConcentration(mg/Nm3)	**NO_x concentration in exhaust gas (replaces specific indicators for turbine and boiler)**
ExhaustGasCOConcentration (mg/Nm3)	**CO concentration in exhaust gas**

*Applies ONLY if specific information about source and fuel related to generated energy is not available

7.2.3 Loading and unloading of crude oil

TABLE 31 FOOTPRINT INPUT TABLE: LOADINGANDSTORAGEOFCRUDEOIL

Column	Normal Value / Comments
Operator	The name of the Operator
StructureType	LoadingAndStorageOfCrudeOil
ReportYear	Year (current reporting year)
ActualYear	Year (actual year for exploration drilling)
Field	The field name as given by NOD
Facility	Facility name as provided by NOD
Location	Name of drilling location
Type	Storage or loading of crude oil
TotalVolume (Sm3)	Total quantity of oil loaded or saved on installation
EmissionFaktorCH4 (kg/Sm3)	The emission factor for CH_4
EmissionFaktorNMVOC (kg/Sm3)	The emission factor for NMVOC

Column	Normal Value / Comments
TeoreticalEmissionBaselineNMVOC (kg/Sm3)	Theoretical emission factor for NMVOC without emission reduction equipment.

Required data received from Industrial Cooperation (Industrisamarbeidet).

7.2.4 Direct emissions of methane and NMVOC

TABLE 32 FOOTPRINT INPUT TABLE: FUGITIVEEMISSIONSANDVENTING

Column	Normal Value / Comments
Operator	The name of the Operator
StructureType	FugitiveEmissionsAndVenting
ReportYear	Year (current reporting year)
ActualYear	Year (actual year for exploration drilling)
Field	The field name as given by NOD
Facility	Facility name as provided by NOD
Location	Name of drilling location
SourceId	Source of emissions as given in Table 25
Methodology	Method used to calculate emissions for the relevant source, alternatives are given in Table 24.
Fate	The fate of the emission. Alternatives: • Measured common vent • Direct emissions • Sent to flare • Recycled • Not on installation
VOCEmission (tonnes)	Direct emissons of NMVOC
CH4Emission (tonnes)	Direct emissions of CH_4
CO2Emission (tonnes)	Ventilation of CO_2 from CO_2 capture and storage – new source with ID 150.1

7.2.5 Well test

TABLE 33 FOOTPRINT INPUT TABLE: WELLTEST

Column	Normal Value / Comments
Operator	The name of the Operator
StructureType	WellTest
ReportYear	Year (current reporting year)
ActualYear	Year (actual year for exploration drilling)
Field	The field name as given by NOD
Facility	Facility name as provided by NOD
Location	Name of drilling location
Wellbore	Well name as given by NOD.
WellTestType	Indicates whether it is well test, well cleanup and bleed over burner boom.
TotalOil (tonnes)	Total amount of oil generated during well testing.
OilRecovered (tonnes)	The amount of oil recovered.

Column	Normal Value / Comments
DieselBurnt (tonnes)	The amount of diesel being burned. Diesel is usually used to under-balance the well during startup of the well test.
GasFlared (m3)	Amount of gas flared during well testing.
Reference	

7.2.6 Energy Imported/Exported

TABLE 34 FOOTPRINT INPUT TABLE: ENERGYIMPORTEDEXPORTED

Column	Normal Value / Comments
Operator	The Name of the Operator
StructureType	EnergyImportedExported
ReportYear	Year (current reporting year)
ActualYear	Year (actual year for exploration drilling)
Field	The field name as given by NOD
Facility	Facility name as provided by NOD
Location	Name of drilling location
ElectricityImportedFromShore(GWh)	Amount of electrical energy that the field imports from land. The quantity is measured at the export point, and includes electrical energy used on the facility plus losses in the transmission cable.
ElectricityFromOffshoreWind(GWh)	Amount of electrical energy that the field imports from offshore wind. The quantity is measured at the export point, and includes electrical energy used on the facility plus losses in the transmission cable.
ElectricityFromAnotherField(GWh)	Amount of electrical energy that the field receives from another field. The quantity is measured at the export point, and includes electrical energy used on the facility plus losses in the transmission cable.
ExportedEnergy(GWh)	The quantity is measured at the export point, and includes electrical energy used on the facility plus losses in the transmission cable.

7.2.7 Implemented Emission reduction measures

TABLE 35 FOOTPRINT INPUT TABLE: IMPLEMENTEDEMISSIONREDUCTIONMEASURES

Column	Normal Value / Comments
Operator	The Name of the Operator
StructureType	ImplementedEmissionReductionMeasures
ReportYear	Year (current reporting year)
ActualYear	Year (actual year for exploration drilling)
Field	The field name as given by NOD
Facility	Facility name as provided by NOD
Location	Name of drilling location
TypeOfMeasure	Specify what type of measure it is
MeasureDescription	Describe the measure
EstimatedTonnesReducedCO2 (tonnes)	Estimated yearly CO_2 emission reduction
EstimatedTonnesReducedNOx (tonnes)	Estimated yearly NO_x emission reduction
EstimatedTonnesReducedSOx (tonnes)	Estimated yearly SO_x emission reduction

Column	Normal Value / Comments
EstimatedTonnesReducedCH4 (tonnes)	Estimated yearly CH4 emission reduction
EstimatedTonnesReducedNMVOC (tonnes)	Estimated yearly NMVOC emission reduction
EstimatedReducedEnergy(MWh)	
Comments	Here it is possible to enter free text

7.2.8 Confirmed future mitigation measures

TABLE 36 FOOTPRINT INPUT TABLE: CONFIRMEDFUTUREMITIGATIONMEASURES

Column	Normal Value / Comments
Operator	The Name of the Operator
StructureType	ConfirmedFurureMitigationMeasures
ReportYear	Year (current reporting year)
ActualYear	Year (actual year for exploration drilling)
Field	The field name as given by NOD
Facility	Facility name as provided by NOD
Location	Name of drilling location
TypeOfMeasure	Specify what type of measure it is
MeasureDescription	Describe the measure
ConfirmedStartYear	Indicate the year in which the measure is expected to be implemented
EstimatedTonnesReducedCO2 (tonnes)	Estimated yearly CO_2 emission reduction
EstimatedTonnesReducedNOx (tonnes)	Estimated yearly NO_x emission reduction
EstimatedTonnesReducedSOx (tonnes)	Estimated yearly SO_x emission reduction
EstimatedTonnesReducedCH4 (tonnes)	Estimated yearly CH4 emission reduction
EstimatedTonnesReducedNMVOC (tonnes)	Estimated yearly NMVOC emission reduction
EstimatedReducedEnergy(MWh)	

7.3 Calculation methodology

7.3.1 Emissions from combustion

Emissions are normally calculated by mass balance principle from fuel consumption by emission factors. The fuel can be burnt gas, flare gas, natural gas, diesel, fuel oil or crude oil. Emissions are the individual combustion residues (excess air, nitrogen and water vapor are not included in the emission registration).

Combustion emissions should be reported so that the emission factor can be easily calculated afterwards. Specify the amount of fuel burned in each turbine if the turbines have different NO_x emission factors.

<u>Calculating emissions during combustion of gas:</u>

(3)

$$U_i[ton] = Gas\ quantity\left[1000\ Sm^3\right] * f_i\left[ton/1000\ Sm^3\right] \tag{4}$$

Calculation of emissions from the combustion of diesel and oils:

$$U_i[ton] = Fuel\ quantity[ton] * f_i[ton/ton]$$

TABLE 37 EXPLANATION OF THE COMPONENTS IN THE EQUATIONS FOR CALCULATING CO_2 EMISSIONS, USING EMISSION FACTORS. EQUATION (3) AND (4).

Component	Unit	Description
U_i	Ton	Amount released of Gas *i*
i		Gas type; CO_2, NO_x, CH_4, etc.
f_i	ton/1000 Sm^3 ton/ton	Emission factor to calculate the amount of spilled gas by combustion of gas, diesel or oils

Field-specific and / or equipment-specific emission factors are to be used as much as possible. Only when specific factors are not available, emission factors specified in section 7.1.9 Emission Factors can be used.

7.3.2 Determination of CO2 emission factor of combustion

For the calculation of the CO2 emission factor the fuel gas carbon number is used. The carbon number is a direct function of the fuel gas composition. If this is not available, the CO2 emission factor can be calculated from the gas calorific value. It is though assumed that the fuel gas analysis is available as documentation for the calculated emission factor.

Calculation of CO_2 emission factor from net calorific value:

$$f_{CO_2} \approx 0{,}0724 * NCV - 0{,}5771 \tag{5}$$

Calculation of CO_2 emission factor from gross calorific value:

$$f_{CO_2} \approx 0{,}0658 * GCV - 0{,}5771 \tag{6}$$

TABLE 38 EXPLANATIONS OF THE COMPONENTS OF THE EQUATIONS FOR CALCULATING CO_2 EMISSION FACTOR ACCORDING TO THE CALORIFIC VALUE. EQUATION (5) AND (6).

Component	Unit	Description
f_{CO_2}	ton/1000 Sm^3	The emission factor for CO_2. Multiply with the burned gas volume to find emitted quantities of CO_2.
NCV	MJ/Sm^3	Net Calorific Value; Net calorific value of the gas combusted
GCV	MJ/Sm^3	Gross Calorific Value; Gross calorific value of the gas combusted

Emissions of CO_2 from CO_2 treatment plant (for example, when the gas injection system is down) should be reported under “Other Sources" in Footprint, but without quantities of burned gas or diesel.

7.3.3 Determination of NOx emission factor

Engines

If NO_x emissions can be determined by measuring the actual NO_x in the exhaust gas, this shall be used for reporting. Measurement of NO_x emissions shall be conducted under normal and representative operating conditions. Sampling and analysis performed by Norwegian Standard (NS), or other international standard where NS is not available.

If such measurements are not available, source-specific emission factor can be used. Source-specific emission factor are determined by NOD for fixed installations on the continental shelf, the Norwegian Maritime Directorate for mobile devices and Norwegian Environment Agency for land based facilities, upon application by the taxable (emission owner).

If neither the exact discharge nor emission factor is available for the consumed fuel, calculation of emissions can be done according to ‘Forskrift om særavgifter, FOR-2001-12-11-1451’.

An example of the calculation of the emission factor is to use manufacturer-NO_x factor. This is often described as g NO_x per. kWh used energy. Conversion to discharge quantity per. 1000 Sm3 fuel gas or diesel tons determined using the following formula:

$$f_{NO_x} \approx \frac{f_{kWh} * H}{1000000} * \eta_M * (1 - \eta_K) \quad (3)$$

TABLE 39 EXPLANATION OF THE COMPONENTS OF THE EQUATIONS FOR CALCULATING NOX EMISSION FACTOR ACCORDING TO THE GIVEN EMISSION FACTOR IN G NOX PER. KWH. EQUATION (7).

Component	Unit	Description
f_{NO_x}	ton/1000 Sm^3 ton/ton	The emission factor for NO_x is multiplied by the burned gas volume / fuel to determine the quantity of NO_x discharged.
f_{kWh}	g NO_x / kWh	Emission factor per amount of energy
H	kWh/1000 Sm^3 kWh/ton	Calorific value of the fuel. If the calorific value of own diesel is not known, 11900 kWh / ton are used.
η_M		Efficiency of the motor. Specified by manufacturer.
η_K		Efficiency of any catalyst. Specified by manufacturer.

Turbines

An example of the calculation of the emission factor is to use the turbine vendor entered NO_x emissions based on the load on the turbine. This is often depicted as a graph indicating the NO_x concentration as a function of the performance of the turbine. Figure 2 is intended as a descriptive example and should not be used in reporting.

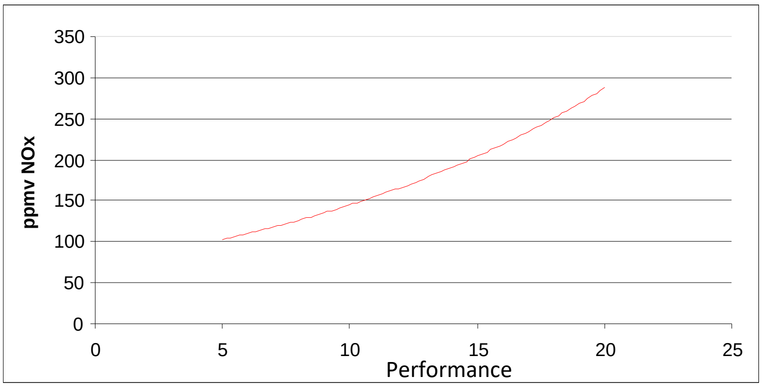


FIGURE 2 EXAMPLE OF NO_x EMISSIONS FROM THE TURBINE LOAD FACTOR.

Estimate the average load on the turbine over the reporting period and read the NO_x emissions in ppmv, which is then converted to tons NO_x/1000 Sm3 fuel gas.

7.3.4 Determination of SOx emissions factor from combustion of gas

SO_x emissions factor from combustion can be determined by measuring the SO_x in the exhaust gas. If such measurements are not available, the emission factor is calculated as shown below.

The gas contains small amounts of H_2S. During combustion is converted into water and SO_x, mainly in the form of SO_2.

Gas analysis indicates the proportion of H_2S in the fuel gas.

<u>The emission factor can be calculated using the following formula:</u>

$$f_{SO_X} \approx k_{H_2S} * 2{,}7 * 10^{-9} \; ton / Sm^3 \tag{3}$$

TABLE 40 EXPLANATION OF THE COMPONENTS OF THE EQUATION FOR CALCULATING THE SO_x EMISSION FACTOR ACCORDING TO THE GIVEN AMOUNT OF H_2S IN THE GAS, MEASURED IN PPM, (EQUATION (8).

Component	Unit	Description
f_{SO_X}	ton/1000 Sm^3	The emission factor for SO_x. Multiply factor with the burned gas volume to find quantities of SO_x discharged.
k_{H_2S}	ppm	The amount of H_2S in the combustion gas
$2{,}7*10^{-9}$	Ton/Sm^3	Conversion factor to calculate the emission factor for SO_x from H_2S amount of fuel gas. See below for the derivation of this factor.

Normally the concentration is in the order of 2.5 ppm, which gives an emission factor of 6.77 * 10-9 tons SOx/Sm3.

SOx consist mainly of SO2. It is therefore based in SO2 emissions to calculate SOx emission factor.

Calculation of SO_x factor from combustion of gas

The temperature is set at 15° C.

TABLE 41 MOLAR MASS WHEN CALCULATING THE SO_x FACTOR BY COMBUSTION OF GAS

Component	Mol mass	Unit
H_2S	34,08	Gram/mol
SO_2	64,06	Gram/mol

TABLE 42 CALCULATION OF NUMBER OF MOLES OF S IN 1 SM³ GAS

Number of moles S in 1 Sm³ gas			
Equation:		$PV = nRT$ $n = \frac{PV}{RT}$	
Pressure	P=	1	Atm.
Volume	V=	1000	Liter
Gasconstant	R=	0,0820575	Liter Atm / mol K
Temperature	T=	288,15	K
Moles	n=	42,2925	Mol

A factor for SO_x mass in tons can be calculated based on 1 ppm (parts per million) of H_2S is combusted with fuel gas:

Table 43 Calculation of mass SO_x

Mass SO_2 from 1 Sm^3 med 1 ppm combusted H_2S		
Amount H_2S i 1 Sm^3 gas	$4{,}22925*10^{-5}$	mol
Amount H_2S i 1 Sm^3 gas	0,0014413275	gram
Mol amount SO_2/mol amount H_2S	1,87969	ton
Mas SO_2 pr. 1 Sm^3 burned	0,002709	Gram
Mas SO_2 pr. 1 Sm^3 burned	$2{,}7*10^{-9}$	Ton

<u>SO_x emissions can be calculated using the amount of H_2S, expressed as ppm, from a fuel gas analysis:</u>

SOx [ton] = 2.7 * 10-9 [tonnes/Sm^3] * amount of H_2S in the fuel gas [ppm] * amount of fuel gas [Sm^3]

<u>The specific SO_x factor is given by:</u>

SO_x factor [ton SO_x/Sm^3 fuel gas] = 2.7 * 10-9 [ton/Sm^3] * amount of H_2S in the fuel gas [ppm]

<u>Example:</u>

- Amount of H_2S equal to 2.5 ppm
- Amount of fuel gas is 110 000 Sm^3.

SO_x = 2.7 * 10-9 [ton/Sm^3] * 2.5 * 110 000 Sm^3 = 0,743 kg

The specific SO_x factor is then in this case <u>6.75 * 10^{-9} ton SO_x/Sm^3 fuel gas</u>

7.3.5 Determination of SOx emission factor from combustion of diesel and fuel oil

SO_x emissions from combustion factor can be determined by measuring the SO_x in the exhaust gas. If such measurements are not available, the emission factor is calculated as shown below.

For diesel and fuel oil the sulfur content is given in percent. The emission factor is then:

$$f_{SO_x} \approx \frac{k_S}{100} * 2\, ton/ton \qquad (9)$$

Table 44 Explanation of the components in the equation for calculating the SOX emission factor according to the given H_2S amount in the diesel, measured in %. (Equation 9).

Component	**Unit**	**Explanation**
f_{SO_x}	ton/ton	The emission factor for SO_x. Multiply factor with the burned oil/diesel volume to find emitted quantities SO_x.
k_S	Percent	Amount of sulfur in diesel fuel or heating oil.

Component	Unit	Explanation
2	Ton/ton	Conversion factor to calculate the emission factor for SO_x from sulfur amount in diesel: $\frac{Molar\ mass\ SO_x}{Molar\ mass\ S} = \frac{64{,}06}{32{,}06} \approx 2$

Calculation of the SO_x factor from combustion of diesel and oil

To calculate a SO_x emission factor for the combustion of diesel or other liquid fuels such as for example well testing, one has to know the sulfur content in the fuel; this is normally given as weight percent.

TABLE 45 MOLAR MASS WHEN CALCULATING THE FACTOR SO_x DURING COMBUSTION OF DIESEL

Component	Molar mass	Explanation
SO_2	64,06	Gram/mol
S	32,065	Gram/mol

Molar mass SO_2 per molar mass S in the fuel is then 64.06 / 32.065 = 1.99782

<u>Emissions of SO_x can be calculated using the quantity S, defined as the weight percent as given by the supplier of the fuel:</u>

SO_x [tons] = 1.99782 [ton / ton] * amount S in fuel [%] * amount of fuel [tons]

<u>The specific SO_x factor is given by:</u>

SO_x factor [tons SO_x / ton fuel] = 1.99782 [ton/ton] * amount S in fuel [%]

> Example:
>
> The amount of diesel is 1,000 tons, and sulfur content is 0.04%.
>
> Then SO_x emissions:
> SO_x = 1.99782 * 0.04 / 100 * 1000 tons = 0.8 tons
>
> Then the emission factor will be:
> SO_x emission factor = 1.99782 * 0.04 / 100 = 0.0008 tons SO_x / ton fuel

7.3.6 Determination of CH_4 emission factors from combustion

CH_4 emissions are reported only for combustion of gas. CH_4 emissions from the combustion of diesel fuel and oil are negligible.

CH_4 emissions factor from combustion exhaust gas is determined by measurements / analysis.

If such measurements / analyses are not available one may use Offshore Norge's recommended emission factors specified in chapter 7.1.9.

7.3.7 Determination of NMVOC emission factors from combustion

NMVOC emission factor of combustion is determined by emission measurements / analysis.

If such measurements / analysis is not available, one may use the Offshore Norge's recommended emission factors as specified in chapter 7.1.9.

7.3.8 Determination of the fallout of oil from the well test

During combustion of oil at the well test, some unburned oil will fall down into the sea. Unless more specific data is known it shall be calculated fallout of 0.05% of the total amount of burned oil. Recommended emission factors for such PAH's, PCB's and Dioxins are given in Table 27.

7.3.9 Determination of emissions from loading and storage of oil

Emissions during loading and storage of crude oil are estimated by the industry cooperation. Required data will be received from here.

First, the amount of evaporated CH_4/NMVOC is calculated. This indicates how much CH_4/NMVOC that is emitted from the storage and loading of crude oil for installations where it is not implemented emission reduction technology.

$$AM_{CH_4/nmVOC} = VO * ADF_{CH_4/nmVOC} \tag{10}$$

TABLE 46 EXPLANATION OF EQUATION (10)

Component	Unit	Explanation
$AM_{CH_4/nmVOC}$	Ton	Total amount of evaporated CH_4/NMVOC during storage or loading of crude oil.
VO	Sm^3	Volume of crude oil stored or loaded.
ADF	Ton/Sm^3	Evaporation factor. Specifies the amount of CH_4 or NMVOC that evaporates per Sm^3 of crude oil stored or loaded.

For installations with installed emission reduction technology, it can be calculated how much CH_4/NMVOC that is recycled and not emitted.

$$GM_{CH_4/nmVOC} = AM_{CH_4/nmVOC} * AMT * DF_{CH_4/nmVOC} * GR \tag{11}$$

TABLE 47 EXPLANATION OF EQUATION (11)

Component	Unit	Explanation
$GM_{CH_4/nmVOC}$	Ton	Recovered amount of CH_4 / NMVOC, i.e. vaporized quantities which are captured by recovery equipment.

Component	Unit	Explanation
$AM_{CH_4/nmVOC}$	Ton	Total amount of evaporated CH_4 / NMVOC during storage or loading of crude oil. Calculated in equation (10)
AMT	%	Part with technology. The part of crude oil stored or loaded with emission recovery technology activated.
$DF_{CH_4/nmVOC}$	%	Design factor. Specifies how much of the evaporated quantities being recovered.
GR	%	Recovery Regularity. Specifies the regularity of recovery plant, when this should be used.

The emissions from the storage and loading of crude oil can then be calculated:

$$UM_{CH_4/nmVOC} = AM_{CH_4/nmVOC} - GM_{CH_4/nmVOC} \tag{12}$$

TABLE 48 EXPLANATION OF EQUATION (12)

Component	Unit	Explanation
$UM_{CH_4/nmVOC}$	Ton	Emitted amount. The amount of CH_4 / NMVOC emitted.
$AM_{CH_4/nmVOC}$	Ton	Total amount of evaporated CH_4 / NMVOC during storage or loading of crude oil. Calculated in equation (10)
$GM_{CH_4/nmVOC}$	Ton	Recovered amount of CH_4 / NMVOC. That is vaporized quantities which are detected by reclamation equipment. Calculated in equation (11)

7.3.10 Well Test

Chapter 7.2.5 summarizes all diesel, gas and oil processed during the well test. Gas, oil and diesel volumes are to match burned quantities given in the chapter on combustion operations in chapter 7.2.1.
Emissions of PAHs, PCBs and dioxins should be reported for well test. See Table 25 for emission factors.

During combustion operations (Section 7.2.1) it should also be stated amount of burnt oil. This amount should match the amount given in the well test table (Table 33) and calculated according to equation 15 below:

$$\text{Amount of burnt oil} = \text{Total amount of oil - reclaimed amount of oil.} \tag{13}$$

8 ACCIDENTAL DISCHARGES AND OTHER MEASURES

For companies that use Synergy or equivalent in event reporting, acute spills are recorded in the system together with the amount and type of the various emissions.

8.1 Definitions and explanations

8.1.1 General

According to M-107, deviations include illegal pollution, which can be unintentional discharges that occur suddenly and other deviations from permits and regulations.

Reporting on an annual basis does not replace reporting of spills that are notifiable under notification regulations.

“Pollution Control Act § 38” definitions of spills: "With acute pollution means pollution of importance, which occurs suddenly"

The report shall state how the Operator maintains follow-up of spills:

- Learning from experience.
- Measures to reduce the number of emissions and the magnitude of the emissions.

In this chapter all unintentional discharges, spills, etc., also of water-based drilling fluids should be reported.

It should be noted that the planned emissions reported in chapter 2 and 4 should not be reported here.

An accidental discharge can be considered as acute pollution although limits set in permits issued pursuant to the Pollution Control Act § 11, is not exceeded. An example of this is an abnormal discharge situation with high concentrations of oil in water for a short time, although this does not result in exceeding the permit in terms of average per month[3].

8.1.2 Accidental oil discharges

All accidental spills of oil from the installations should be reported here.

TABLE 49 OVERVIEW OF GROUPING FOR REPORTING OIL SPILLS.

Type of spill	Definition
Diesel	All accidental spills of diesel. Diesel used and released in conjunction with the well treatment and reported the chemicals, should not be included.

[3] Ref. Guidance for Management Regulations § 29

Type of spill	Definition
fuel oil 1-3	Accidental spills of fuel oil.
Crude oil	All accidental spills of crude oil.
Waste oil	All accidental oil spills of waste oil
Other oils	All accidental spills of other oils*

*Hydraulic oils shall be reported as accidental chemical spill

It should be noted that spills of oil-based drilling fluids should be reported in Section 8.1.3.

8.1.3 Accidental spills of chemicals

All accidental spills of chemicals should be reported here.

TABLE 50 OVERVIEW OF GROUPING FOR REPORTING ACCIDENTAL SPILLS OF CHEMICALS.

Type of chemical	Definition
Oil-based drilling fluid	All accidental spills of oil-based drilling fluid.
Synthetic drilling fluid	All accidental spills of synthetic based drilling fluid.
Water-based drilling fluid	All accidental spills of water-based drilling fluid.
Chemicals	All accidental spills of chemicals

TABLE 51 EVALUATION CRITERIA AND CATEGORIES FOR EVALUATION OF THE ENVIRONMENTAL PROPERTIES OF SUBSTANCES IN CHEMICALS

Emissions	Category[1]	Norwegian Environment Agency's color-category
WATER	200	Green
Substance without test data that is exempt from categorization requirements	**999**	No color category
Substances on the PLONOR list	201	Green
Substance covered by REACH Annex IV[2]	204	Green
Substance covered by REACH Annex V[3]	205	Green
Substances missing test data	0	Black
Additive packages that are exempted from test requirement and not tested	0.1	Black
Substances that are believed to be or are harmful in a mutagenic or reproductive manner[4]	1.1	Black
Substance on the list of priority chemicals or on OSPARS priority list[7]	2	Black
Substance on REACH candidate list[8]	2.1	Black
Biodegradability <20% and log Pow ≥ 4.5[5]	3	Black
Biodegradability <20% and toxicity EC50 or LC50 ≤ 10 mg/l	4	Black
Two of three categories: Biodegradability <60%, log Pow ≥ 3, EC50 or LC50 ≤ 10 mg/l[5]	6	Red
Inorganic and EC50 or LC50 ≤ 1 mg/l	7	Red
Biodegradability <20% [4]	8	Red
Polymers that are exempted from test requirement and not tested[9]	9	Red
Potassium hydroxide, sodium hydroxide, hydrochloric acid, sulfuric acid, nitric acid and phosphoric acid	104	Yellow

<table>
<tr><th colspan="2">Emissions</th><th>Category[1]</th><th>Norwegian Environment Agency's color-category</th></tr>
<tr><td colspan="2">Substance with biodegradation> 60%</td><td>100</td><td>Yellow</td></tr>
<tr><td rowspan="3">Substance with biodegradability 20% - 60%</td><td>Subcategory 1 - if the substance is expected to fully biodegrade or will biodegrade to substances that would fall into the yellow or green category, if they were subject to categorization requirements.</td><td>101</td><td>Yellow</td></tr>
<tr><td>Subcategory 2 - if the substance is expected to biodegrade into substances that would be in red category, if they were subject to categorization</td><td>102</td><td>Yellow</td></tr>
<tr><td>Subcategory 3 - if the substance is expected to biodegrade into substances that would be in black category, if they were subject to categorization</td><td>103</td><td>Yellow</td></tr>
</table>

[1] Categories in Table 49 shall be consistent with categories given in Table 19
[2] "Kommisjonsforordning nr. 987/2008".
[3] Norwegian Environment Agency must consider whether the substance is covered by Annex V.
[4] With mutagenic and reproductive harmful substances means mutagenic (Mut) 1A and 1B and toxic for reproduction (Rep) 1A and 1B, cf. appendix 1 in forskrift om klassifisering, merking mv. av farlige kjemikalier eller selvklassifisering».
[5] Data for degradability and bioaccumulation shall be in accordance with approved tests for offshore chemicals.
[6] The prioritylist can be found at miljostatus.no/prioritetslisten
[7] OSPAR List of Chemicals for Priority Action (Revised 2013) (Reference number 2004-12). The list can be found here:http://www.ospar.org/work-areas/hasec/chemicals/priority-action.
[8] Substances on the candidate list can be found here: https://www.echa.europa.eu/candidate-list-table
[9] Jf. Aktivitetsforskriften §§ 62-63.

An environmental assessment of chemicals discharged to the sea should be carried out. Chemicals that are released into the sea shall be evaluated similar to chemicals released during scheduled activities. Details are given in chapter 5.

8.1.4 Accidental gas emissions

All accidental emissions of harmful gases to air and sea should be reported here.
Example of gas to be reported here is halon gas and other CFCs (chlorofluorocarbons), HFCs, FK-gases, spills of hydrocarbon gas to air and sea, and possibly other acute emissions.

TABLE 52 OVERVIEW OF GROUPING FOR REPORTING ACCIDENTAL EMISSIONS TO AIR.

Type og gas
Hydrokarbongass
HFK
PFK

Type og gas
SF6
KFK, HKFK
HFO-gasser
Annet

In accordance with M-107, the operator must also in the annual report account for any unintentional discharges to sea, including quantity, time, cause, and measures. **From the 2023 reporting this shall be reported to Footprint.**

All of hydrocarbons, at a rate of over 0.1 kg / second, shall be reported (this applies to emissions of gas to air – not emissions of gas to sea).

Note that accidental emissions of methane and NMVOC should also be reported as direct emissions in chapter 7.1.7 under the source 'Larger gas leaks' (Sub-source 90.1). See Appendix B, Chapter 3.11.1.

8.1.5 Emergency preparedness exercise with topic acute pollution

A brief summary of completed emergency preparedness exercises with topic acute pollution should be given in the written report. The summary should include:

- date and goal of the exercise
- which part of the organization has participated?
- experiences from the exercise
- follow-up and measures

If the operator has participated in joint exercises (NOFO exercises) between the operators, they must briefly describe their role in the exercises.

8.2 Reporting Tables for Footprint

Footprint table updates in chapter 8

No updates

8.2.1 Unintentional discharges to sea

Table 53 Footprint input table: UnintentionalDischargesToSea

Column	Normal Value / Comments
Operator	Name of the operating company
StructureType	UnintentionalDischargesToSea
ReportYear	Year (current reporting year)
ActualYear	Year (actual year for exploration drilling)
Field	Facility name as provided by NOD
Facility	Field name as provided by NOD
Location	Name of drilling location
Type	Here the type of spill is selected: Oil, Chemical or **Gas**
Category	Here the category is entered. Obtained from Table 49, Table 50. Type Gas to be reported as Category Gas
VolumeSpilled (m3)	Cumulative volume of acute discharges (m^3)
SpillReference	Internal reference to the spill
EventDate	Event date
EventCause	Event cause
ImplementedMeasures	Implemented measures
AuthoritiesNotified	Yes/No

8.2.2 Evaluation of unintentional discharges to sea

Table 54 Footprint input table: UnintentionalDischargesToSeaChemicalComponent

Column	Normal Value / Comments
Operator	Name of the operating company
StructureType	UnintentionalDischargesToSeaChemicalComponent
ReportYear	Year (current reporting year)
ActualYear	Year (actual year for exploration drilling)
Field	Field name as provided by NOD
Facility	Facility name as provided by NOD
Location	Name of drilling location
RangeOfUse	Write the character code of the range of use where the chemical is used. See Table 16 for a summary.
FunctionGroup	Write Yes/No the number code for the function the chemical has. See Table 17 Functional groups for chemical reporting for a summary
SpillReference	Internal reference to the spill
EventDate	Event date
TradeName	Trade name of the product
Component	The name of the substance in the chemical
Category	
EnvironmentalCategory	Figures referring to the MDir-class to which the substance belongs. Ref. Table 51
Discharged (tonnes)	The discharge of the substance in the reporting year
Plastic	Yes/No
MicroPlastic	Yes/No
NanoMaterial	Yes/No

The sum of emissions given in Table 54 should match the sum of accidental chemical discharges in Table 53.

8.2.3 Unintentional emissions to air

TABLE 55 FOOTPRINT INPUT TABLE: UNINTENTIONALEMISSIONSTOAIR

Column	Normal Value / Content
Operator	Name of the operating company
StructureType	UnintentionalEmissionsToAir
ReportYear	Year (current reporting year)
ActualYear	Year (actual year for exploration drilling)
Field	Field name as provided by NOD
Facility	Facility name as provided by NOD
Location	Name of drilling location
GasType	• Hydrokarbongass • HFK • PFK • SF6 • KFK, HKFK • HFO - gasser • Annet
EventType	Removed from the 2023 reporting
EventDate	Event date
EventCause	Event cause
ImplementedMeasures	Implemented measures
NumberOfOccurences	Number of emission incidents
AuthoritiesNotified	Yes/No
Amount (kg)	Mass emitted

8.2.4 Deviations that are not defined as unintentional discharges

TABLE 56 FOOTPRINT INPUT TABLE: PERMITDEVIATION

Column	Normal Value / Content
Operator	Name of the operating company
StructureType	PermitDeviation
ReportYear	Year (current reporting year)
ActualYear	Year (actual year for exploration drilling)
Field	Field name as provided by NOD
Facility	Facility name as provided by NOD
Location	Name of drilling location
PermitOrRegulation	Permit/Regulation
DescriptionOfDeviation	A short description of the deviation
ActionTaken	A short description of action taken

8.3 Calculation methodology

No direct calculations, but all separate emissions must be categorized in one of the categories listed in Table 49, Table 50 and Table 52.

9 WASTE

9.1 Definitions and explanations

9.1.1 General

It is recommended that Operators of waste management and waste reporting is organized according to the Offshore Norge guidance, "093 Guidelines for waste management in offshore operations" (Waste Guidelines) and Norsas "Guidance on submission and declaration of hazardous waste, edition 2015".

Only waste that is generated or received at the facility / field should be reported. Waste from onshore base and marine support vessels shall not be reported, unless it is physically transferred to the facility and transported or disposed of in some way. This information is normally sorted and entered the waste handler.

Emissions report shall provide information on how the waste disposal onshore and the company that is responsible for processing must be specified.

Waste Disposal by dismantling the platform is not reported in Footprint, but amounts should be stated in the written report.

9.1.2 Segregated waste

TABLE 57 CATEGORIES OF SEGREGATED WASTE

Category	Definition[4]
Food contaminated waste	Waste contaminated with food particles and other debris that can cause odors and cuts.
Wet organic waste	Food and other organic waste
Paper	All ordinary paper such as newspapers, magazines, office paper, etc.
Cardboard (brown paper)	Cardboard and other brown paper
Wood	Defective pallets, planks, assorted wood.
Glass	Flushed (not washed) clear and colored glass.
Plastics	Plastic cans, cans, foil, plastic bags and other plastic packaging.
EE-Disposal	All equipment that requires electrical power or batteries to operate. Cables and wires.
Residual waste	What remains after recoverable waste and hazardous waste is sorted out.
Metal	Metal cans, pipes, scrap metal, wire
Sandblasting sand	Waste from sandblasting not containing dangerous substances
Explosives	Distress flares and other explosives taken to shore
Other	Waste that cannot be categorized into categories above

[4] *Appendix 1 to the Offshore Norge Guidelines for waste management in offshore operations.*

9.1.3 Hazardous waste

Hazardous waste shall be reported according to the Offshore Norge guidelines for waste management in offshore operations.

Drill cuttings and mud are reported here as treated onshore but must also be reported in chapter 2.

Note regarding the amount of waste generated and the amount of waste end treated:
It is not necessarily correlation between the quantity of drilling waste in Chapters 2 and 9, although the waste originating from identical drilling operations. There are three reasons for this:

- Lags in recording and reporting. Generated waste one year could eventually be treated in waste treatment plant the following year.
  The data in Chapter 2 is estimated values of offshore drilling operations, while in Chapter 9 the values are based on actual weight.
    - In table 2.2 and 2.4 in the annual report total amount of cuttings is calculated from theoretical hole volume and hole factor. Drilling fluid is not included here.
    - Imported and exported cuttings in chapter 2 contains cuttings with appendages of drilling fluid
    - Drilling waste given in chapter 9 is weighted amount of cuttings with appendages of drilling fluid
- The waste is transported to shore. It may be minor adjustments to the amount of waste due to changes in the moisture content of the waste.

The Operator should have procedures to ensure that reporting of waste is consistent and complete, and that there is no double reported.

Pre-defined categories of hazardous waste that must be reported to Footprint is no longer used, therefore, table 52 in last year's guideline (Pre-defined categories of hazardous waste that must be reported to Footprint) is deleted. The waste is reported based on EWC code and waste substance number. Footprint does an automatic mapping against the classification given in the Offshore Norge guideline '093 Guidelines for waste management in the offshore industry', Appendix 2.

9.2 Reporting Tables to Footprint

Footprint table updates in chapter 9

No updates.

9.2.1 Segregated waste

TABLE 58 FOOTPRINT INPUT TABLE: NON HAZARDOUS WASTE

Column	Normal Value / Content
Operator	Name of the operating company
StructureType	NonHazardousWaste
ReportYear	Year (current reporting year)
ActualYear	Year (actual year for exploration drilling)
Field	Field name as provided by NOD
Facility	Facility name as provided by NOD
Location	Name of drilling location
Category	Choose the category for the segregated waste. Ref Table 51
SentOnshore (tonnes)	Amount of waste in each category

9.2.2 Hazardous Waste

TABLE 59 FOOTPRINT INPUT TABLE: HAZARDOUSWASTE

Column	Normal Value / Content
Operator	Name of the operating company
StructureType	HazardousWaste
ReportYear	Name of the operating company
ActualYear	Year (actual year for exploration drilling)
Field	Field name as provided by NOD
Facility	Facility name as provided by NOD
Location	Name of drilling location
Description	
EALCode	Waste code according to the European Waste List
WasteCode	NORSAS code of waste
SentOnShore (tonnes)	Amount of waste in each category that are sent onshore

9.3 Calculation methodology

Normally, the subcontractor that handles waste have already reported the required information to the Operator. This information is typically provided on a monthly level, with an annual summary.

PART II REPORTING TO THE NORWEGIAN RADIATION AND NUCLEAR SAFETY AUTHORITY

A separate report to the NRPA must be submitted. Footprint is adapted for transmitting the figures for reporting and uploading the finished report in pdf format. From the 2020 reporting, QA questions for each table in Footprint can be answered.

Introduction to how to report to the Norwegian Radiation and Nuclear Safety Authority

Pollution Control Act from 1 January 2011 applies to radioactive contamination and radioactive waste. This is determined by regulation 1 November 2010 No. 1394 on pollution law applicable to radioactive contamination and radioactive waste. It is also issued a new chapter 16 about radioactive waste in the "avfallsforskriften". This means that radioactive contamination and radioactive waste now is governed by the same rules as other discharges contaminants and waste.

All Operators on the Norwegian continental shelf shall submit annual reports of releases of radioactive materials to the Norwegian Radiation and Nuclear Safety Authority (DSA) under the Pollution Control Act and the individual companies' approvals/permits. Operators who have a permit, but who do not have any data to report, can enter this as a comment in Footprint where it is emphasized that the operator does not have reportable emissions (see explanation in PART I, Reporting process). The Operators who neither have a permit for radioactive contamination and radioactive waste nor have this type of release do not need to send a report/enter a comment in Footprint.

It is emphasized in the introduction of the guidelines for reporting of radioactive substances from the petroleum industry[5] that the reporting obligation includes emissions of radioactive substances in produced water, use and discharge of radioactive tracers and accidental spills of radioactive materials and waste.

Reporting requirements

The Operators shall prepare emission reports where all operational discharges and all acute pollution shall be reported. For fields with multiple installations covered by an emissions permit, the figures shall be reported for each installation. Use of trace elements in connection

5 Norwegian Radiation and Nuclear Safety Authority. Retningslinjer for rapportering av radioaktive stoffer fra petroleumsvirksomheten. Available from: https://dsa.no/regelverk/retningslinjer-for-rapportering-av-utslipp-fra-petroleumsvirksomhet.pdf (Norwegian only) with exploration drilling shall be reported separately.

Operators shall enter all discharge data and text required to generate the emissions report in the common discharge database Footprint. This should be done by the 1st of March, the following year. The text shall be in Norwegian.

A contact person for the report shall be provided. Reported data should be checked according to the Offshore Norge Guidelines. If any sections are not relevant to the individual fields / installations, it shall briefly be indicated why. The design, numbering and sections of the tables should not be changed.

The uncertainty of the measurements and/or calculations of the individual discharges shall be considered and indicated in the report.[6]

The guidelines for reporting radioactive substances indicate the template to be used for the annual report[5].

10 INFORMATION

General information about the installation is to be specified in this chapter.

This corresponds to Chapter 1 of the annual report to the Norwegian Environment Agency.

11 DISCHARGES OF RADIOACTIVE SUBSTANCES WITH PRODUCED WATER

11.1 Reporting requirements

This chapter shall provide information about the monitoring program, including measuring method. The number of measurements that are the basis for the results shall also be included. The quantification limit for individual nuclides shall be listed in Annex in cases where specific activity is below the quantification limit. There might be cases where the analytical results show that the specific activity of that nuclide is below the quantification limit. Then 50% of the quantification limit will be used for calculating the discharges.

All facilities shall send four samples for analysis each year, the difference is in the sampling requirements. For installations with an annual produced water volume exceeding 3 million m3,

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6 Offshore Norge. 085 Anbefalte retningslinjer for prøvetaking og analyse av produsert vann. (Norwegian only)

ISO/IEC Guide 98-3:2008, Guide to the expression of uncertainty in measurement (GUM).

the samples shall be based on samples from each day throughout the quarter. If the volume of produced water is below this limit, it is sufficient to make samples consisting of partial samples from each day for one month per quarter. The limit of 3 million m3 applies to discharges to sea.

Any other information of significance for the results should also be mentioned in this chapter.

Monthly Summary for each nuclide for each installation should be provided in an attachment.

If scale dissolvers, other chemicals or other form of removal of deposits have been used, this may be affect the specific activity of radioactive substances in the produced water, and should be discussed separately. A description of the operations performed, including type and quantity of chemicals used must be included. Make also an assessment of the additional discharges that such operations can result in, in each case. The months when such operations are in progress shall be stated, and analytical value for Th-228 shall be specified in Chapter 6, Appendix.

The type and amount of chemicals which have been used, and/or the kind of removal method shall be indicated.

Radioactivity is reported in Bq/l. Total activity in Bq (from produced water) shall be indicated.

Radioactivity
Note especially that the radioactive components 226Ra, 228Ra, 210Pb and 228Th are removed from the Norwegian Environment Agency guidelines since this information now is reported to NRPA. These components must be reported to Footprint as "Produced Water Radioactivity".

11.2 Reporting tables in Footprint

Footprint-table updates in chapter 11

No updates.

TABLE 60 FOOTPRINT INPUT TABLE: PRODUCEDWATERRADIOACTIVITY

Column	Normal Value / Comments
Operator	The name of the Operator
StructureType	ProducedWaterRadioactivity
ReportYear	Year (current reporting year)
ActualYear	Year (actual year for exploration drilling)
Field	The field name as given by NOD
Facility	Facility name as provided by NOD
Location	Name of drilling location
ReportMonth	The number of the month

Column	Normal Value / Comments
DischargePoint	Can be used to separate the emissions of installations with multiple emission points
NuclideName	226Ra, 228Ra, 210Pb eller 228Th
SpecificActivity (Bq/l)	The concentration of radioactivity in the sample
TotalUncertaintyInActivityDischarged (%)	Total uncertainty on the discharge to sea (% uncertainty)
UncertaintyInLabAnalysis (Bq/l)	The uncertainty given for the analysis of the component
DetectionLimit (Bq/l)	The quantification limit for the radioactive component in the sample
Laboratory	The laboratory that conducted the analysis
Technique	The technique used in the analysis
Methodology	The method used in the analysis

TABLE 61 FOOTPRINT INPUT TABLE: PRODUCEDWATER

Column	Normal Value / Comments
Operator	The name of the Operator
StructureType	ProducedWaterRadioactivity
ReportYear	Year (current reporting year)
ActualYear	Year (actual year for exploration drilling)
Field	The field name as given by NOD
Facility	Facility name as provided by NOD
Location	Name of drilling location
ReportMonth	The number of the month
DischargePoint	Can be used to separate the emissions on installations with multiple emission points
WaterToSea (m3)	Amount of water discharged to sea
WaterInjected (m3)	Amount of water injected

11.3 Reporting tables

The following tables should be included in Chapter 2:

Table 2.1 Emissions of radioactive substances to sea with produced water

Amount of produced water discharged:			m^3	
Nuclide	Specific activity (Bq/l)	Discharge (Bq)	Uncertainty in amount discharged (Bq)	Limit in the permission (Bq)
Ra-226				
Ra-228				
Ra-210				
Th-228				

Table 2.2 Amount of radioactive substances to ground/injected with produced water

Amount of produced water to ground/injected: m^3	
Nuclide	**Discharged/Injected amount (Bq)**
Ra-226	
Ra-228	
Ra-210	
Th-228	

Monthly overview per nuclide shall be given in the appendix.

12 USE AND RELEASE OF RADIOACTIVE TRACE ELEMENT

12.1 Reporting requirements

The chapter will provide information on the use and release of radioactive tracers during the reporting year. The report shall include information on which company has performed tracer test and the purpose of the test. Under "Type" in Table 3.1 it should be indicated if the nuclides that are reported are water- or oil tracer.

12.2 Reporting Tables to Footprint

Footprint-table updates in chapter 12

No updates.

TABLE 62 FOOTPRINT INPUT TABLE: RADIOACTIVETRACER

Column	Normal Value / Content
Operator	Name of the operating company
StructureType	RadioactiveTracer
ReportYear	Year (current reporting year)
ActualYear	Year (actual year for exploration drilling)
Field	Field name as provided by NOD
Facility	Facility name as provided by NOD
Location	Name of drilling location
Wellbore	Well bore name given by NOD
Type	Water-/Oil tracer
NuclideName	Name of Nuclide used as tracer
ActivityUsed (GBq)	Consumption of nuclide
ActivityDischarged (GBq)	Discharge of nuclide
ActivityInjected (GBq)	Injection of nuclide
ActivityLeftInWell (GBq)	Nuclide left in the well
ActivitySentToShore (GBq)	Nuclide sent onshore as waste
ActivityInOilExported (GBq)	Nuclide in oil exported

12.3 Reporting tables

The following tables should be included in chapter 3:

Table 3.1 Use and emissions of radioactive trace substances (fields in operation, including production drilling)

Nuclide	Type	Consumption (Bq)	Discharges to sea (Bq)	Injected amount (Bq)	Followed hydrocarbon phase (Bq)

Table 3.2 Use and disposal of radioactive trace substances (drilling)

Nuclide:					
Well	Added (Bq)	Discharges to sea (Bq)	Left in well (Bq)	Sent onshore (Bq)	Injected (Bq)

13 ACCIDENTAL DISCHARGES, ACCIDENT ETC.

This chapter shall provide an overview of accidental discharges of radioactive substances in the reporting year. Furthermore, it must be stated how the lessons learned with regard to the follow-up of spills are addressed.

Footprint-table updates in chapter 13

No updates.

TABLE 63 FOOTPRINT INPUTTABELL: UNINTENTIONALRADIOACTIVEDISCHARGE

Column	Normal Value / Content
Operator	Name of the operating company
StructureType	UnintentionalRadioactiveDischarge
ReportYear	Year (current reporting year)
ActualYear	Year (actual year for exploration drilling)
Field	Field name as provided by NOD
Facility	Facility name as provided by NOD
Location	Name of drilling location
EventDate	
EventCause	
NuclideName	
ActivityDischarged(GBq)	
ImplementedMeasures	

14 WASTE

This chapter will give a brief presentation of the system for management of radioactive waste which are generated at the installation and taken ashore. See guidelines for completing the declaration form. The report only includes waste generated at the facility.

The company who is responsible for managing the waste onshore shall be specified.

Quantity in tons and total activity in GBq of waste taken onshore are based on data from the receiving location, or any other company that has cleaned equipment for radioactive materials before further handling.

From 2011, a new 5-digit waste material number is incorporated for radioactive waste. The first digit is "3". The last digit indicates if the waste is disposal required or not[7].

14.1 Reporting Tables for Footprint

Footprint-table updates in chapter 14

No updates.

The following table is to be reported to Footprint:

TABLE 64 FOOTPRINT INPUT TABLE: RADIOACTIVEWASTE

Column	Normal Value / Content
Operator	Name of the operating company
StructureType	RadioactiveWaste
ReportYear	Year(current reporting year)
ActualYear	Year (actual year for exploration drilling)
Field	Field name as provided by NOD
Facility	Facility name as provided by NOD
Location	Name of drilling location
Description	Description of waste
EALCode	Waste code according to the European Waste List
WasteCode	NORSAS code for the waste
NuclideNames	
SentOnShore (tonnes)	Amount of waste in each category that are sent onshore
TotalActivity (GBq)	

Previously, hazardous waste including radioactive waste was reported in the same table, 'HazardousWasteOther', and information from the table were reported to both the Norwegian

[7] *NORSAS. Radioaktivt avfall. Available from:http://www.norsas.no/Radioaktivt-avfall (Norwegian only)*

Environment Agency and the Norwegian Radiation and Nuclear Safety Authority. Now there are two input tables for hazardous waste; 'HazardousWaste' in chapter 9 and 'Radioactive Waste' in Chapter 14, which are reported separately for the Norwegian Environment Agency and the Norwegian Radiation and Nuclear Safety Authority.

14.2 Reporting tables

Reporting Tables

The following table should be included chapter 5:

Table 5.1 Radioactive waste

1.1

Waste Type	Description	Waste no.[1)]	Nuclide	Waste taken onshore	
				Quantity (ton)	Total Activity (GBq)

1) Waste number as defined in the declaration form

LIST OF TABLES

LIST OF FIGURES

15 APPENDIX A SPECIFICATION OF AMENDMENTS TO THE GUIDELINES

Summary

Revision 23

- General updates
    - Contact information updated
- Chapter 2.2
    - Table for handling of old well fluids in connection with plugging operations added (Table 5).
- Chapter 3.2.3
    - Naften acid moved from unorganic to organic acids (Table 11)
- Chapter 4.2
    - New column for reporting discharge reduction measures added to Chemical substitution table (Table 13)
- Chapter 7.2.1
    - Emission of CO added to Combustion table (Table 29)
- Chapter 7.2.2
    - CO concentration added to Table 30.
    - Generic NOx concentration indicator replacing equipment specific indicator for turbine and boiler in Table 30. This is to align guidelines with actual setup in Footprint. Chosen emission source is sufficient to differ between emissions from turbines and boilers.

Revision 24

- Chapter 7.1.7
    - The column 'CO_2 tax' has been deleted from table 25
    - New text has been added under table 25 due to the new requirement that all sources are now taxable