Ethylene Oxide

For use as a gaseous sterilant (PT2)

Document IIIA

Section 7.4 to 7.6

Ecotoxicological profile including environmental fate and behaviour
Part 2

March 2020

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Please refer to “Technical Notes for Guidance on Dossier Preparation including preparation and evaluation of study summaries under Directive 98/8 EC Concerning the Placing of Biocidal Products on the Market (Appendix 7.1 and 7.2)” for a list of the Standard Terms and Abbreviations used in this document.

7.4 Effects on Aquatic Organisms

7.4.1 Aquatic toxicity, initial tests

7.4.1.1 Acute toxicity to fish

Section A7.4.1.1 **Annex Point IIA 7.1**	**Acute toxicity to fish** *Fathead minnow*	
	1 Reference	**Official use only**
1.1 Reference	R.A. Conway, G.T.Waggy, M.H.Spiegel, R.L. Berglund (1983) Environmental fate and effects of ethylene oxide. Published report, Environmental Science and Technology **17** (2), pp 107-112	
1.2 Data protection		
1.2.1 Data owner	Not applicable	
1.2.3 Criteria for data protection	No data protection claimed	
	2 Guidelines and Quality Assurance	
2.1 Guideline study	Yes Committee on methods for toxicity tests with aquatic organisms "Methods for Acute Toxicity Tests with Fish, Macroinvertebrates and Amphibians EPA. 660/3-75-009 Apr 1975	X
2.2 GLP	No	
2.3 Deviations	Some test modifications were required to meet sample size limitations and dissolved oxygen requirements.	X
	3 Materials and Methods	
3.1 Test material	Ethylene oxide, ethylene chlorohydrin and ethylene glycol	
3.1.1 Lot/Batch number	Not reported	
3.1.2 Specification	Not reported	
3.1.3 Purity	Not reported	X
3.1.4 Composition of Product	Not reported	
3.1.5 Further relevant properties	Not reported	
3.1.6 Method of analysis	Not reported	
3.2 Preparation of TS solution for poorly soluble or volatile test substances	Not applicable	

3.3 Reference substance	Sodium lauryl sulphate	
3.3.1 Method of analysis for reference substance	Not reported	
3.4 Testing procedure		
3.4.1 Dilution water	Details are given in Table A7.4.1.1-01	
3.4.2 Test organisms	Details are given in Table A7.4.1.1-02	
3.4.3 Test system	Details are given in Table A7.4.1.1-03	
3.4.4 Test conditions	Details are given in Table A7.4.1.1-04	
3.4.5 Duration of the test	96 hours	
3.4.6 Test parameter	Mortality	
3.4.7 Sampling	Fish were observed after 24, 46 and 96 hours.	
3.4.8 Monitoring of TS concentration	Not reported	
3.4.9 Statistics	Not reported	
	4 Results and Discussion	
4.1 Limit Test		
4.1.1 Concentration	Range finding study procedures used 2 minnows/test concentration. Moreover one of the procedure is performed under static and aerated medium. The other one is performed under static and sealed under oxygen. Study reports 24 h LC_{50} values for ethylene oxide as 274 mg/L (95% CL 150-500 mg/L) for a static aerated test and 86 mg/L (95% CL 50-150 mg/L) for a static test sealed under oxygen	
4.1.2 Number/ percentage of animals showing adverse effects	Not reported	
4.1.3 Nature of adverse effects	Not reported	
4.2 Results test substance		
4.2.1 Initial concentrations of test substance	Not reported	
4.2.2 Actual concentrations of test substance	Not reported	
4.2.3 Effect data (Mortality)	LC_{50}values are given in Table A7.4.1.1-05	
4.2.4 Concentration / response curve	Not reported	
4.2.5 Other effects	Not reported	

4.3 Results of controls		
4.3.1 Number/ percentage of animals showing adverse effects	Not reported	
4.3.2 Nature of adverse effects	Not reported	
4.4 Test with reference substance	sodium lauryl sulfate	
4.4.1 Concentrations	Not reported	
4.4.2 Results	96 h LC_{50} values in 2 tests were 6.6 mg/L (95% CL 5.8-7.5mg/L) and 6.9 mg/L (95% CL 5.3-9.0)	
	5 Applicant's Summary and conclusion	
5.1 Materials and methods	The 96 hour LC_{50} values of ethylene oxide, ethylene chlorohydrin and ethylene glycol to the Fathead minnow were assessed according to the "Methods for Acute Toxicity Tests with Fish, Macroinvertebrates and Amphibians" published by the US EPA. Tests were performed in dechlorinated Charleston tap water.	
5.2 Results and discussion		
5.2.1 LC_0		
5.2.2 LC_{50} (96 h)	Ethylene oxide: 84 mg/L (95% CL 73-96 mg/L) Ethylene chlorohydrin: values of 67 and 112 are reported (95% CL values of 49-84 and 90-131 mg/L, respectively) Ethylene glycol: >10000 mg/L	
5.2.3 LC_{100}		
5.3 Conclusion	The 96 hour LC_{50} of ethylene oxide to fathead minnows was determined to be 84 mg/L. Upon hydrolysis to ethylene glycol the LC_{50} value rises to >10000 mg/L. If ethylene chlorohydrin is formed then the LC_{50} value is around 90 mg/L.	
5.3.1 Other Conclusions	None of the materials tested are very persistent and between biochemical oxidation, reactivity, volatilisation and dilution it is unlikely that toxic concentrations would be reached.	
5.3.2 Reliability	2	x
5.3.3 Deficiencies	This report is the published summary of work performed to EPA guidelines. Much of the detail is not reported, however the results are scientifically valid.	x
	Evaluation by Competent Authorities	
	Evaluation by Rapporteur Member State	
Date	26 February 2020	

Materials and Methods	**Comment (2.1)**: This is an old guideline. However, as far as the eCA knows, it was considered a highly regarded standard at the time of publishing the article. **Comment (2.3)**: The specific deviations should have been listed – but we agree with the applicant that this is the wording in the published article. Regarding dissolved oxygen levels, the method described in Table A7.4.1.1-04 below was used. **Comment (3.1.3)**: The purity is not reported in the published article. As discussed in the CAR, section A.1.2. Composition of the substance (reference specifications), the production of ethylene oxide consistently yields the active substance in high purity (generally above 99 %). It is not expected that today's production process is significantly different from the production process at the time when this article was written. The principles of the ethylene oxide production has remained unchanged since the 1930s. In the current production of ethylene oxide, some impurities are identified, but none detected above significant level (all below 0.01 %). Furthermore, based on the identity of these impurities and the hazardous profile of the active substance itself, the eCA has no reason to believe that the impurities will have any impact on the findings of this study.
Results and discussion	Agree with applicant's version.
Conclusion	**Comment (5.3.3)**: There are many shortcomings to the reporting. However, we agree that the results are valid for the purpose of this qualitative risk assessment. Agree with applicant's version, with some doubts regarding reliability (see below).
Reliability	**Comment (5.3.2)**: It may be that the reliability should be set to 3 due to the very limited reporting. Regardless of a reliability of 2 or 3, the eCA is of the opinion that the information is sufficient for the purpose of this risk assessment (see below).
Acceptability	Acceptable for the purpose of this risk assessment, to indicate that ethylene oxide is moderately toxic to fish and that ethylene glycol is of low toxicity to fish. The results are in line with Bridié *et al.* (1979, IIIA7.4.1.1/02) and with the QSAR estimated (ECOSAR v. 1.11) 96-h LC_{50} values for fish, which are approximately 80 mg/L and 38 000 mg/L for ethylene oxide and ethylene glycol, respectively.
Remarks	-

Table A7.4.1.1-01
Dilution water

Criteria	Details
Source	Dechlorinated (carbon treated) Charleston tap water
Alkalinity	Not reported
Hardness	Not reported
pH	Not reported
Oxygen content	Not reported
Conductance	Not reported
Holding water different from dilution water	Not reported

Table A7.4.1.1-02
Test organisms

Criteria	Details
Species/strain	Fathead minnow
Source	Not reported
Wild caught	Not reported
Age/size	Not reported
Kind of food	Not reported
Amount of food	Not reported
Feeding frequency	Not reported
Pretreatment	Not reported
Feeding of animals during test	Not reported

Table A7.4.1.1-03
Test system

Criteria	Details
Test type	Static
Renewal of test solution	No
Volume of test vessels	10-15 L
Volume/animal	1-1.5 L/fish
Number of animals/vessel	10
Number of vessels/ concentration	1
Test performed in closed vessels due to significant volatility of TS	

Table A7.4.1.1-04
Test conditions

Criteria	Details
Test temperature	Not reported
Dissolved oxygen	15-20 mg/L
pH	Not reported
Adjustment of pH	Not reported
Aeration of dilution water	Only minimal aeration or oxygen blankets were used to maintain sufficient dissolved oxygen in test series. The oxygen blanket involves raising the dissolved oxygen content to 15-20 mg/L with a quick sparging with pure oxygen and sealing the container under a highly oxygenated atmosphere i.e. no aeration during the test.
Intensity of irradiation	Not reported
Photoperiod	Not reported

Table A7.4.1.1-05
Effect data

	24 h [mg/L]	95 % c.l	48 h [mg/L]	95 % c.l.	72 h [mg/L]	95 % c.l.	96 h [mg/L]	95 % c.l.
Ethylene oxide	90	63-125	89	63-125	Not reported	Not reported	84	73-96
Ethylene chlorohydrin	995		164	120-236	Not reported	Not reported	67	49-84
Ethylene chlorohydrin	768		163	140-185	Not reported	Not reported	112	90-131
Ethylene glycol	>10000		>10000		Not reported	Not reported	>10000	
Sodium lauryl sulphate	7.4	6.1-8.9	6.6	5.8-7.5	Not reported	Not reported	6.6	5.8-7.5
Sodium lauryl sulphate	8.5	6.8-10.5	7.3	5.8-9.3	Not reported	Not reported	6.9	5.3-9.0

Effect data are based on nominal (n) concentrations

Section A7.4.1.1 **Annex Point IIA 7.1**	**Acute toxicity to fish** *Goldfish*	
	1 Reference	**Official use only**
1.1 Reference	A.L. Bridié, C.J.M. Wolff, M.Winter (1979b) The acute toxicity of some petrochemicals to goldfish. Published report, Water Research **13**, pp 623-626	
1.2 Data protection		
1.2.1 Data owner	Not applicable	
1.2.3 Criteria for data protection	No data protection claimed	
	2 Guidelines and Quality Assurance	
2.1 Guideline study	Guideline laid down by the American Public Health Association (APHA, 1971) for static-tank acute toxicity tests.	
2.2 GLP	No	
2.3 Deviations	The procedure had to be adapted slightly in the case of volatile compounds. The deviation did not affect the conclusions.	X
	3 Materials and Methods	
3.1 Test material	Ethylene oxide	
3.1.1 Lot/Batch number	Not reported	
3.1.2 Specification	Not reported	
3.1.3 Purity	Not reported	X
3.1.4 Composition of Product	Not reported	
3.1.5 Further relevant properties	Not reported	
3.1.6 Method of analysis	Not reported	
3.2 Preparation of TS solution for poorly soluble or volatile test substances	Not reported	
3.3 Reference substance	Not reported in the study. Result was a published as part of a report on a number of petrochemicals	
3.3.1 Method of analysis for reference substance	Not reported	
3.4 Testing procedure		
3.4.1 Dilution water	Details are given in Table A7.4.1.1-06	

3.4.2 Test organisms	Details are given in Table A7.4.1.1-07	
3.4.3 Test system	Details are given in Table A7.4.1.1-08	
3.4.4 Test conditions	Details are given in Table A7.4.1.1-09	
3.4.5 Duration of the test	24 hours	
3.4.6 Test parameter	Mortality	
3.4.7 Sampling	Fish were observed after 24 hours.	
3.4.8 Monitoring of TS concentration	Concentrations of chemicals tested were determined before and after each test either with a total organic carbon analyser or by extraction and subsequent GC analysis. As Ethylene oxide was considered a volatile compound that could not be aerated without more than 10% loss by evaporation, only 6 fish were used in the tanks and test duration was limited to 24 hours	
3.4.9 Statistics	Not reported	
	4 Results and Discussion	
4.1 Limit Test	Not performed	
4.1.1 Concentration		
4.1.2 Number/ percentage of animals showing adverse effects	Not reported	
4.1.3 Nature of adverse effects	Not reported	
4.2 Results test substance		
4.2.1 Initial concentrations of test substance	Not reported	
4.2.2 Actual concentrations of test substance	Not reported	
4.2.3 Effect data (Mortality)	LC_{50}values are given in Table A7.4.1.1-10	
4.2.4 Concentration / response curve	Not reported	
4.2.5 Other effects	Not reported	
4.3 Results of controls		
4.3.1 Number/ percentage of animals showing adverse effects	Not reported	
4.3.2 Nature of adverse effects	Not reported	

4.4 Test with reference substance	Not performed	
4.4.1 Concentrations		
4.4.2 Results		
	5 Applicant's Summary and conclusion	
5.1 Materials and methods	Static tank acute toxicity tests were for ethylene oxide and ethylene glycol were performed using goldfish (C*arassius auratus*).	
5.2 Results and discussion		
5.2.1 LC_0		
5.2.2 LC_{50}	Ethylene oxide: 90 mg/L Ethylene glycol: >5000 mg/L	
5.2.3 LC_{100}		
5.3 Conclusion	The 24-hour LC_{50} of ethylene oxide to goldfish was determined to be 90 mg/L. The 24-hour LC_{50} value for ethylene glycol was >5000 mg/L.	
5.3.1 Other Conclusions		
5.3.2 Reliability	2	x
5.3.3 Deficiencies	This result was part of a larger project looking at a range of petrochemicals. Much of the detail of the work carried out is not reported, however the results are scientifically valid.	
	Evaluation by Competent Authorities	
	Evaluation by Rapporteur Member State	
Date	26 Febrduary 2020	
Materials and Methods	**Comment (2.3)**: In the article (Doc IV), it is stated that the procedure had to be adapted slightly in the case of volatile compounds, where the solutions could not be aerated without more than 10 % loss by evaporation. For such compounds, only 6 fish were used, and the test duration was limited to 24 h, in order to ensure that the dissolved oxygen content did not fall below 4 mg/l. **Comment (3.1.3)**: The purity is not reported in the published article. As discussed in the CAR, section A.1.2. Composition of the substance (reference specifications), the production of ethylene oxide consistently yields the active substance in high purity (generally above 99 %). It is not expected that today's production process is significantly different from the production process at the time when this article was written. The principles of the ethylene oxide production has remained unchanged since the 1930s. In the current production of ethylene oxide, some impurities are identified, but none detected above significant level (all below 0.01 %). Furthermore, based on the identity of these impurities and the hazardous profile of the active substance itself, the eCA has no reason to believe that the impurities will have any impact on the findings of this study.	

Results and discussion	Agree with applicant's version.
Conclusion	Agree with applicant's version, with some doubts regarding reliability (see below).
Reliability	**Comment (5.3.2)**: It may be that the reliability should be set to 3 due to the very limited reporting. Regardless of a reliability of 2 or 3, the eCA is of the opinion that the results can be used as supporting information / together with other information in a weight of evidence approach.
Acceptability	Acceptable for the purpose of this qualitative risk assessment, to indicate the moderate toxicity of ethylene oxide to fish and the low toxicity of ethylene glycol to fish. The results are in line with Conway *et al.* (1983, IIIA7.4.1.1/01) and with the QSAR estimated (ECOSAR v. 1.11) 96-h LC_{50} values for fish, which are approximately 80 mg/L and 38 000 mg/L for ethylene oxide and ethylene glycol, respectively.
Remarks	-

Table A7.4.1.1-06
Dilution water

Criteria	Details
Source	Local tap water
Alkalinity	Alkalinity as Na^+ = 30
Hardness	Ca^{2+} = 100
pH	7.8
Oxygen content	Dissolved oxygen content did not fall below 4 mg/L
Conductance	Not reported
Holding water different from dilution water	Not reported

Table A7.4.1.1-07
Test organisms

Criteria	Details
Species/strain	Goldfish (*Carassius auratus*)
Source	Not reported
Wild caught	Not reported
Age/size	Length: 6.2 ± 0.7 cm, Weight: 3.3 ± 1.0g
Kind of food	Not reported
Amount of food	Not reported
Feeding frequency	Not reported
Pretreatment	Not reported
Feeding of animals during test	Not reported

Table A7.4.1.1-08
Test system

Criteria	Details
Test type	Static
Renewal of test solution	No
Volume of test vessels	48 x 28 x 28 cm
Volume/animal	Not reported
Number of animals/vessel	6
Number of vessels/ concentration	Not reported
Test performed in closed vessels due to significant volatility of TS	No

Table A7.4.1.1-09
Test conditions

Criteria	Details
Test temperature	20 ± 1ºC
Dissolved oxygen	The dissolved oxygen content did not fall below 4 mg/L
pH	7.8
Adjustment of pH	Adjustment with NaOH or H_2SO_4 to keep pH values between 6 and 8
Aeration of dilution water	Solutions were aerated throughout the test period.
Intensity of irradiation	Not reported
Photoperiod	Not reported

Table A7.4.1.1-10
Effect data

Substance	Time	LC_{50} (mg/L)
Ethylene Oxide	24 hours	90
Ethylene glycol	24 hours	>5000

Section A7.4.1.1 **Annex Point IIA 7.1**	**Acute toxicity to fish** *EPISuite Fish*	
	1 Reference	**Official use only**
1.1 Reference	C.A. Staples, W. Gulledge (2006) An environmental fate, exposure and risk assessment of ethylene oxide from diffuse emissions. Published report, Chemosphere **65**, pp 691-698	
1.2 Data protection		
1.2.1 Data owner	Not applicable	
1.2.3 Criteria for data protection	No data protection claimed	
	2 Guidelines and Quality Assurance	
2.1 Guideline study	No	
2.2 GLP	No	
2.3 Deviations	Not reported	
	3 Materials and Methods	
3.1 Test material	Ethylene oxide/ Calculation performed using EPISuite v3.10, v3.12 (2000)	
3.1.1 Lot/Batch number	Not applicable	
3.1.2 Specification	Not applicable	
3.1.3 Purity	Not applicable	
3.1.4 Composition of Product	Not applicable	
3.1.5 Further relevant properties	Not applicable	
3.1.6 Method of analysis	Not applicable	
3.2 Preparation of TS solution for poorly soluble or volatile test substances	Not applicable	
3.3 Reference substance	Not applicable	
3.3.1 Method of analysis for reference substance	Not applicable	
3.4 Testing procedure		X
3.4.1 Dilution water	Not applicable	
3.4.2 Test organisms	Not applicable	

3.4.3 Test system	Not applicable	
3.4.4 Test conditions	Not applicable	
3.4.5 Duration of the test	Not applicable	
3.4.6 Test parameter	Predicted 96h LC_{50}	
3.4.7 Sampling	Not applicable	
3.4.8 Monitoring of TS concentration	Not applicable	
3.4.9 Statistics	Not applicable	
	4 Results and Discussion	
4.1 Limit Test	Not performed	
4.1.1 Concentration		
4.1.2 Number/ percentage of animals showing adverse effects	Not reported	
4.1.3 Nature of adverse effects	Not reported	
4.2 Results test substance		
4.2.1 Initial concentrations of test substance	Not reported	
4.2.2 Actual concentrations of test substance	Not reported	
4.2.3 Effect data (Mortality)	Predicted 96 h LC_{50} value 23.6 mg/L	
4.2.4 Concentration / response curve	Not applicable	
4.2.5 Other effects	Not applicable	
4.3 Results of controls		
4.3.1 Number/ percentage of animals showing adverse effects	Not applicable	
4.3.2 Nature of adverse effects	Not applicable	
4.4 Test with reference substance	Not applicable	
4.4.1 Concentrations		
4.4.2 Results		

	5 Applicant's Summary and conclusion	
5.1 Materials and methods	The US Environmental Protection Agency model EPISuite (versions 3.10 and 3.12) was used to predict fish acute toxicity data for ethylene oxide.	
5.2 Results and discussion		
5.2.1 LC_0		
5.2.2 LC_{50}	The calculated 96h LC_{50} value for fish was 23.6 mg/L	
5.2.3 LC_{100}		
5.3 Conclusion		
5.3.1 Other Conclusions		
5.3.2 Reliability	2	x
5.3.3 Deficiencies	This result is the reported value calculated using EPISuite (v3.10 and v3.12), rather than coming from an acute toxicity study.	
	Evaluation by Competent Authorities	
	Evaluation by Rapporteur Member State	
Date	20 January 2020	
Materials and Methods	**Comment (3.4)**: In general, the eCA considers that more information should be presented when using QSARs for risk assessment purposes. Relevant background information on the model (which is available in the EpiSuite User Guide) should be described. Examples of such information are calculations, underlying assumptions, and information on applicability domain.	
Results and discussion	-	
Conclusion	-	
Reliability	Changed from 2 to 0 – not applicable – due to this being a calculation method.	
Acceptability	The applicant's provided QSAR estimation is acceptable. However, in the CAR a more recent estimation is reflected and described by the eCA.	
Remarks	A more recent QSAR estimation for ethylene oxide, run by the eCA using ECOSAR v. 1.11 within EPISuite v.4.11, gives a predicted 96-h LC_{50} for fish of approximately 80 mg/L.	

7.4.1.2 Acute toxicity to invertebrates

Section A7.4.1.2 **Annex Point IIA 7.2**	**Acute toxicity to invertebrates** *Daphnia magna*	
	1 Reference	**Official use only**
1.1 Reference	R.A. Conway, G.T. Waggy, M.H. Spiegel, R.L. Berglund (1983) Environmental fate and effects of ethylene oxide. Published report, Environmental Science and Technology **17** (2), pp 107-112	
1.2 Data protection		
1.2.1 Data owner	Not applicable	
1.2.3 Criteria for data protection	No data protection claimed	
	2 Guidelines and Quality Assurance	
2.1 Guideline study	Yes Committee on methods for toxicity tests with aquatic organisms "Methods for Acute Toxicity Tests with Fish, Macroinvertebrates and Amphibians EPA. 660/3-75-009 Apr 1975	X
2.2 GLP	No	
2.3 Deviations	Some test modifications were required to meet sample size limitations and dissolved oxygen requirements	X
	3 Materials and Methods	
3.1 Test material	Ethylene oxide, Ethylene chlorohydrin and Ethylene glycol	
3.1.1 Lot/Batch number	Not reported	
3.1.2 Specification	Not reported	
3.1.3 Purity	Not reported	X
3.1.4 Composition of Product	Not reported	
3.1.5 Further relevant properties	Not reported	
3.1.6 Method of analysis	Not reported	
3.2 Preparation of TS solution for poorly soluble or volatile test substances	Not applicable	
3.3 Reference substance	Sodium lauryl sulphate	

3.3.1 Method of analysis for reference substance	Not reported	
3.4 Testing procedure		
3.4.1 Dilution water	Details are given in Table A7.4.1.2-01	
3.4.2 Test organisms	Details are given in Table A7.4.1.2-02	
3.4.3 Test system	Details are given in Table A7.4.1.2-03	
3.4.4 Test conditions	Details are given in Table A7.4.1.2-04	
3.4.5 Duration of the test	48 hours	
3.4.6 Test parameter	Mortality	
3.4.7 Sampling	*Daphnia* were assessed after 24 and 48 hours exposure	
3.4.8 Monitoring of TS concentration	Not reported	
3.4.9 Statistics	Not reported	
	4 Results and Discussion	
4.1 Limit Test	Not performed	
4.1.1 Concentration		
4.1.2 Number/ percentage of animals showing adverse effects		
4.1.3 Nature of adverse effects		
4.2 Results test substance		
4.2.1 Initial concentrations of test substance	Not reported	
4.2.2 Actual concentrations of test substance	Not reported	
4.2.3 Effect data (Immobilisation)	L48 h EC_{50} values for Ethylene oxide, ethylene chlorohydrin and ethylene glycol were: Ethylene oxide: 300 mg/L, 137 mg/L (95% CL 83-179 mg/L), 200 mg/L (95% CL 150-243 mg/L); mean 212 mg/L Ethylene chlorohydrin: 100 mg/L (50-200) Ethylene glycol: >10000 mg/L	
4.2.4 Concentration / response curve	Not reported	
4.2.5 Other effects	Not reported	

4.3 Results of controls	Not reported	
4.4 Test with reference substance		
4.4.1 Concentrations		
4.4.2 Results	48-hour EC_{50} values of 5.6, 4.8 and 4.6 are reported for sodium lauryl sulphate	
	5 Applicant's Summary and conclusion	
5.1 Materials and methods	The 48 hour EC_{50} value for *Daphnia magna* exposed to ethylene oxide, ethylene chlorohydrin and ethylene glycol were assessed according to the "Methods for Acute Toxicity Tests with Fish, Macroinvertebrates and Amphibians" published by the US EPA. Tests were performed in dechlorinated Charleston tap water.	
5.2 Results and discussion		
5.2.1 EC_0		
5.2.2 EC_{50}	Ethylene oxide: 212 mg/L (mean value of 3 values) Ethylene chlorohydrin: 100 mg/L Ethylene glycol: >10000 mg/L	
5.2.3 EC_{100}		
5.3 Conclusion	The 48-hour EC_{50} value for ethylene oxide was determined to be 212 mg/L (mean of 3 values). Following hydrolysis to ethylene glycol this value rose to >10000 mg/L. If reacted to form ethylene chlorohydrin the EC_{50} is 100 mg/L	
5.3.1 Reliability	2	x
5.3.2 Deficiencies	This report is the published summary of work performed to EPA guidelines. Much of the detail is not reported, however the results are scientifically valid.	
	Evaluation by Competent Authorities	
	Evaluation by Rapporteur Member State	
Date	26 February 2020	
Materials and Methods	**Comment (2.1)**: This is an old guideline. However, as far as the eCA knows, it was considered a highly regarded standard at the time of publishing the article. **Comment (2.3)**: The specific deviations should have been listed – but we agree with the applicant that this is the wording in the published article. **Comment (3.1.3)**: The purity is not reported in the published article. As discussed in the CAR, section A.1.2. Composition of the substance (reference specifications), the production of ethylene oxide consistently yields the active substance in high purity (generally above 99 %). It is not expected that today's production process is significantly different from the production process at the	

	time when this article was written. The principles of the ethylene oxide production has remained unchanged since the 1930s. In the current production of ethylene oxide, some impurities are identified, but none detected above significant level (all below 0.01 %). Furthermore, based on the identity of these impurities and the hazardous profile of the active substance itself, the eCA has no reason to believe that the impurities will have any impact on the findings of this study.
Results and discussion	Agree with applicant's version.
Conclusion	**Comment (5.3.2)**: There are many shortcomings to the reporting. However, we agree that the results are valid for the purpose of this qualitative risk assessment. Agree with applicant's version, with some doubts regarding reliability (see below).
Reliability	**Comment (5.3.1)**: It may be that the reliability should be set to 3 due to the very limited reporting. Regardless of a reliability of 2 or 3, the eCA is of the opinion that the results can be used as supporting information / together with other information in a weight of evidence approach.
Acceptability	Acceptable for the purpose of this risk assessment, to indicate that ethylene oxide is of relatively low toxicity to daphnids and that ethylene glycol is of low toxicity to daphnids. The results are in line with QSAR estimated (ECOSAR v. 1.11) 48-h LC_{50} values for daphnids, which are approximately 420 mg/L and 16 000 mg/L for ethylene oxide and ethylene glycol, respectively.
Remarks	-

Table A7.4.1.2-01
Dilution water

Criteria	Details
Source	Dechlorinated (carbon treated) Charleston tap water
Alkalinity	Not reported
Hardness	Not reported
pH	Not reported
Ca / Mg ratio	Not reported
Na / K ratio	Not reported
Oxygen content	10-15 mg/L
Conductance	Not reported
Holding water different from dilution water	Not reported

Table A7.4.1.2-02
Test organisms

Criteria	Details
Strain	Not reported
Source	Not reported
Age	Not reported
Breeding method	Not reported

Kind of food	Not reported
Amount of food	Not reported
Feeding frequency	Not reported
Pretreatment	Not reported
Feeding of animals during test	Not reported

Table A7.4.1.2-03
Test system

Criteria	Details
Renewal of test solution	Not performed
Volume of test vessels	Not reported
Volume/animal	Not reported
Number of animals/vessel	10
Number of vessels/ concentration	10
Test performed in closed vessels due to significant volatility of TS	Not reported

Table A7.4.1.2-04
Test conditions

Criteria	Details
Test temperature	Not reported
Dissolved oxygen	Not reported
pH	Not reported
Adjustment of pH	Not reported
Aeration of dilution water	Not reported
Quality/Intensity of irradiation	Not reported
Photoperiod	Not reported

Table A7.4.1.2-05
Effect data

Substance	24 hours		48 hours	
	EC_{50}	95 % c.l.	EC_{50}	95% CL
Ethylene oxide	>300	Not reported	300	Not reported
Ethylene oxide	270	Not reported	137	83-179
Ethylene oxide	260	Not reported	200	150-243
Ethylene chlorohydrin	675	Not reported	100	50-200
Ethylene glycol	>10 000	Not reported	>10 000	Not reported
Sodium lauryl sulphate	10	Not reported	5.6	3.3-8.2
Sodium lauryl sulphate	12	Not reported	4.8	3.1-6.5

Suodium lauryl sulphate	7.2	Not reported	4.6	2.8-6.4

Table A7.4.1.2-08
Validity criteria for acute daphnia immobilisation test according to OECD Guideline 202

	fulfilled	Not fulfilled
Immobilisation of control animals <10%		
Control animals not staying at the surface		
Concentration of dissolved oxygen in all test vessels >3 mg/l		
Concentration of test substance ≥80% of initial concentration during test		

Section A7.4.1.2 **Annex Point IIA 7.2**	**Acute toxicity to invertebrates** *Brine shrimp*	
	1 Reference	**Official use only**
1.1 Reference	R.A. Conway, G.T. Waggy, M.H. Spiegel, R.L. Berglund (1983) Environmental fate and effects of ethylene oxide. Environmental Science and Technology **17** (2), pp 107-112	
1.2 Data protection		
1.2.1 Data owner	Not applicable	
1.2.3 Criteria for data protection	No data protection claimed	
	2 Guidelines and Quality Assurance	
2.1 Guideline study	Brine shrimp bioassay and seawater BOD of petrochemicals (Price *et al.* (1974) P).	X
2.2 GLP	No	
2.3 Deviations	Some test modifications were required to meet sample size limitations and dissolved oxygen requirements	
	3 Materials and Methods	
3.1 Test material	Ethylene oxide, Ethylene chlorohydrin and Ethylene glycol	
3.1.1 Lot/Batch number	Not reported	
3.1.2 Specification	Not reported	
3.1.3 Purity	Not reported	X
3.1.4 Composition of Product	Not reported	
3.1.5 Further relevant properties	Not reported	
3.1.6 Method of analysis	Not reported	
3.2 Preparation of TS solution for poorly soluble or volatile test substances	Not applicable	
3.3 Reference substance	Sodium lauryl sulphate	
3.3.1 Method of analysis for reference substance	Not reported	
3.4 Testing procedure		
3.4.1 Dilution water	Not reported	

3.4.2 Test organisms	Brine shrimp (*Atemia salina*)	
3.4.3 Test system	Not reported	
3.4.4 Test conditions	Not reported	
3.4.5 Duration of the test	48 hours	
3.4.6 Test parameter	Mortality	
3.4.7 Sampling	Brine shrimp were assessed after 24 and 48 hours exposure	
3.4.8 Monitoring of TS concentration	Not reported	
3.4.9 Statistics	Not reported	
	4 Results and Discussion	
4.1 Limit Test	Not performed	
4.1.1 Concentration		
4.1.2 Number/ percentage of animals showing adverse effects		
4.1.3 Nature of adverse effects		
4.2 Results test substance		
4.2.1 Initial concentrations of test substance	Not reported	
4.2.2 Actual concentrations of test substance	Not reported	
4.2.3 Effect data (Immobilisation)	48 h LC_{50} values for Ethylene oxide, ethylene chlorohydrin and ethylene glycol were: Ethylene oxide: >500 mg/L, 1000 mg/L, 490 mg/L; mean 745 mg/L Ethylene chlorohydrin: 680 mg/L Ethylene glycol: >20000 mg/L	
4.2.4 Concentration / response curve	Not reported	
4.2.5 Other effects		
4.3 Results of controls	Not reported	
4.4 Test with reference substance		
4.4.1 Concentrations		

4.4.2 Results	A 48-hour LC_{50} value of 1.5 mg/L is reported for sodium lauryl sulphate	
	5 Applicant's Summary and conclusion	
5.1 Materials and methods	The 48-hour LC_{50} values for brine shrimp (*Artemia salina*) exposed to ethylene oxide, ethylene chlorohydrin and ethylene glycol were assessed in a toxicity bioassay, following the method of Price et al (1974).	
5.2 Results and discussion		
5.2.1 EC_0		
5.2.2 EC_{50}	Ethylene oxide: 745 mg/L Ethylene chlorohydrin: 680 mg/L Ethylene glycol: >20000 mg/L	
5.2.3 EC_{100}		
5.3 Conclusion	The 48-hour LC_{50} value for ethylene oxide was determined to be 745 mg/L (mean of 2 values). If reacted to form ethylene chlorohydrin the LC_{50} is 680 mg/L The 24-hour LC_{50} value for ethylene glycol was >20000mg/L.	
5.3.1 Reliability	2	x
5.3.2 Deficiencies	This report is the published summary of work performed.. Much of the detail is not reported, however the results are scientifically valid.	
	Evaluation by Competent Authorities	
	Evaluation by Rapporteur Member State	
Date	26 February 2020	
Materials and Methods	**Comment (2.3)**: The specific deviations should have been listed – but we agree with the applicant that this is the wording in the published article. **Comment (3.1.3)**: The purity is not reported in the published article. As discussed in the CAR, section A.1.2. Composition of the substance (reference specifications), the production of ethylene oxide consistently yields the active substance in high purity (generally above 99 %). It is not expected that today's production process is significantly different from the production process at the time when this article was written. The principles of the ethylene oxide production has remained unchanged since the 1930s. In the current production of ethylene oxide, some impurities are identified, but none detected above significant level (all below 0.01 %). Furthermore, based on the identity of these impurities and the hazardous profile of the active substance itself, the eCA has no reason to believe that the impurities will have any impact on the findings of this study.	
Results and discussion	Agree with applicant's version.	
Conclusion	Agree with applicant's version, with some doubts regarding reliability (see below).	

Reliability	**Comment (5.3.1)**: It may be that the reliability should be set to 3 due to the very limited reporting. Regardless of a reliability of 2 or 3, the eCA is of the opinion that the results can be used as supporting information.
Acceptability	Acceptable for the purpose of this qualitative risk assessment, as an indication of the low toxicity of ethylene oxide and ethylene glycol to brine shrimp.
Remarks	-

Table A7.4.1.2-01
Dilution water

Criteria	Details
Source	Not reported
Alkalinity	Not reported
Hardness	Not reported
pH	Not reported
Ca / Mg ratio	Not reported
Na / K ratio	Not reported
Oxygen content	10-15 mg/L
Conductance	Not reported
Holding water different from dilution water	Not reported

Table A7.4.1.2-02
Test organisms

Criteria	Details
Strain	Not reported
Source	Not reported
Age	Not reported
Breeding method	Not reported
Kind of food	Not reported
Amount of food	Not reported
Feeding frequency	Not reported
Pretreatment	Not reported
Feeding of animals during test	Not reported

Table A7.4.1.2-03
Test system

Criteria	Details
Renewal of test solution	Not performed
Volume of test vessels	Not reported
Volume/animal	Not reported
Number of animals/vessel	Not reported
Number of vessels/ concentration	Not reported

Test performed in closed vessels due to significant volatility of TS	Not reported

Table A7.4.1.2-04
Test conditions

Criteria	Details
Test temperature	Not reported
Dissolved oxygen	Not reported
pH	Not reported
Adjustment of pH	Not reported
Aeration of dilution water	Not reported
Quality/Intensity of irradiation	Not reported
Photoperiod	Not reported

Table A7.4.1.2-05
Effect data

Substance	24 hours		48 hours	
	EC_{50}	95 % c.l.	EC_{50}	95% CL
Ethylene oxide	>500	Not reported	>500	Not reported
Ethylene oxide	350	Not reported	1000	Not reported
Ethylene oxide	570	Not reported	490	Not reported
Ethylene chlorohydrin	>1000	Not reported	680	Not reported
Ethylene glycol	>20000	Not reported		
Sodium lauryl sulphate	13	Not reported	1.5	Not reported

Section A7.4.1.2 **Annex Point IIA 7.2**	**Acute toxicity to invertebrates** *EPISuite Daphnids*	
	1 Reference	**Official use only**
1.1 Reference	C.A. Staples, W. Gulledge (2006) An environmental fate, exposure and risk assessment of ethylene oxide from diffuse emissions. Published report, Chemosphere **65**, pp 691-698	
1.2 Data protection		
1.2.1 Data owner	Not applicable	
1.2.3 Criteria for data protection	No data protection claimed	
	2 Guidelines and Quality Assurance	
2.1 Guideline study	No.	
2.2 GLP	No	
2.3 Deviations	Not reported	
	3 Materials and Methods	
3.1 Test material	Ethylene oxide calculation performed using EPISuite v3.10, v3.12 (2000)	
3.1.1 Lot/Batch number	Not applicable	
3.1.2 Specification	Not applicable	
3.1.3 Purity	Not applicable	
3.1.4 Composition of Product	Not applicable	
3.1.5 Further relevant properties	Not applicable	
3.1.6 Method of analysis	Not applicable	
3.2 Preparation of TS solution for poorly soluble or volatile test substances	Not applicable	
3.3 Reference substance	Not applicable	
3.3.1 Method of analysis for reference substance	Not applicable	
3.4 Testing procedure		
3.4.1 Dilution water	Not applicable	

3.4.2 Test organisms	Not applicable	
3.4.3 Test system	Not applicable	
3.4.4 Test conditions	Not applicable	
3.4.5 Duration of the test	Not applicable	
3.4.6 Test parameter	Predicted 48h LC_{50}	
3.4.7 Sampling	Not applicable	
3.4.8 Monitoring of TS concentration	Not applicable	
3.4.9 Statistics	Not applicable	
	4 Results and Discussion	
4.1 Limit Test	Not applicable	
4.1.1 Concentration		
4.1.2 Number/ percentage of animals showing adverse effects		
4.1.3 Nature of adverse effects		
4.2 Results test substance		
4.2.1 Initial concentrations of test substance	Not applicable	
4.2.2 Actual concentrations of test substance	Not applicable	
4.2.3 Effect data (Immobilisation)	The predicted 48 h LC_{50} values for Ethylene oxide was 51.1 mg/L	
4.2.4 Concentration / response curve	Not applicable	
4.2.5 Other effects	Not applicable	
4.3 Results of controls	Not applicable	
4.4 Test with reference substance	Not applicable	
4.4.1 Concentrations		
4.4.2 Results		

	5 Applicant's Summary and conclusion	
5.1 Materials and methods	The US Environmental Protection Agency model EPISuite (versions 3.10 and 3.12) was used to predict daphnid acute toxicity data for ethylene oxide.	
5.2 Results and discussion		
5.2.1 EC_0		
5.2.2 EC_{50}	The calculated 48 LC_{50} value for daphnids was 51.1 mg/L	
5.2.3 EC_{100}		
5.3 Conclusion		
5.3.1 Reliability	2	
5.3.2 Deficiencies	This result is the reported value calculated using EPISuite (v3.10 and v3.12) rather than coming from an acute toxicity study.	
	Evaluation by Competent Authorities	
	Evaluation by Rapporteur Member State	
Date	20 January 2020	
Materials and Methods	**Comment (3.4)**: In general, the eCA considers that more information should be presented when using QSARs for risk assessment purposes. Relevant background information on the model (which is available in the EpiSuite User Guide) should be described. Examples of such information are calculations, underlying assumptions, and information on applicability domain.	
Results and discussion	-	
Conclusion	-	
Reliability	Changed from 2 to 0 – not applicable – due to this being a calculation method.	
Acceptability	The applicant's provided QSAR estimation is acceptable. However, in the CAR a more recent estimation is reflected and described by the eCA.	
Remarks	A more recent QSAR estimation for ethylene oxide, run by the eCA using ECOSAR v. 1.11 within EPISuite v.4.11, gives a predicted 48-h LC_{50} value for daphnids of approximately 420 mg/L.	

7.4.1.3 Growth inhibition test on algae

Section A7.4.1.3/01 Growth inhibition test on algae

Annex Point IIA 7.3

	1 Reference	**Official use only**
1.1 Reference	Stephenson, R. R., 1986. Propylene oxide: Acute toxicity (*Salmo gairdneri*, *Daphnia magna* and *Selenastrum caprocornium*) and N-octanol/water partition coefficient. SGBR.85.250. 16th April 1986.	
1.2 Data protection	Yes	
1.2.1 Data owner / Data Submitter	Shell Research Limited London, Sittingbourne Research Centre, Biottechnlogy and Toxicology Directorate, Sittingbourne, Kent, UK. ME9 8AG	
1.2.3 Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing a.s. for the purpose of its entry into Annex I	
	2 Guidelines and Quality Assurance	
2.1 Guideline study	No	
2.2 GLP	Yes	
2.3 Deviations	No	
	3 Materials and Methods	
3.1 Test material	Propylene oxide (CAS: 75-56-9) Source: Shell Nederland Chemie, Moerdijk	
3.1.1 Lot/Batch number	Batch No. Ex tank 1306, 15/9-84 @19:00hrs; KLUN 2292/84; Indent 9200/9037-1	
3.1.2 Specification	Colourless, clear liquid Density: 829 kg/m^3 at 20°C (ASTM D 4052)	
3.1.3 Purity	99.9% (m/m)	
3.1.4 Composition of Product	99.9% propylene oxide. Full composition described in the test report.	
3.1.5 Further relevant properties	None	
3.1.6 Method of analysis	Infra-red spectra of the test material were taken on 17/10/1984 and 1/10/1985. No significant differences between the spectra were observed. Therefore test material judges as stable.	
3.2 Preparation of TS solution for poorly soluble or volatile test substances	Not reported.	

3.3 Reference substance	No	
3.3.1 Method of analysis for reference substance	No reference substance was used.	
3.4 Testing procedure	4 day growth study 16 Erlenmeyer flasks filled with 295 ml culture medium were prepared. Stock solutions of propylene oxide in Analar acetone were added to ten of the flasks to give a range of concentrations: 1.0 – 1000 mg l^{-1}. The 6 untreated flask acted as controls. The concentration of acetone in all test flasks was 0.1 ml l^{-1}. Flasks were innoculted with *S. capricornium* to give an initial concentration of 500 cells ml^{-1}. Flasks were sealed to exclude air and prevent evaporation of the test substance. Flasks were incubated in an orbital shaker (100 cycles min^{-1}) at 22-26°C under full constant illumination (approx.. 3000 lux). After 2 and 4 days cell counts were made using a Coulter Counter. The pH of during the test was 7.2 -7.5.	x
3.4.1 Culture medium	A nutrient medium was prepared by dissolving Analar grade salts in distilled, deionised water as described by Miller and Green (1978). Boric acid was present at 105ug l^{-1} and sodium bicarbonate at 50mg l^{-1}. Medium was autoclaved for 15 minutes at 1,0 kg cm^{-2}. Upon cooling Millipore-sterilised sodium bicarbonate (2.5g l^{-1}) was added.	
3.4.2 Test organisms	*Selenastrum caprocornium* (Prinz). ATCC 22662.	
3.4.3 Test system	Cultures of *S. capricornium* were maintained as 50ml batch cultures in 250ml Erlenmeyer flasks at 22-26°C under full constant illumination (approx. 3000 lux).	
3.4.4 Test conditions	Axenic stock cultures of *S. capricornium* were maintained on agar plates ad used to inoculate liquid cultures. Cultures in exponential growth phase were utilised for tests. Agar plates were maintained at 18-22° under cyclic illumination (18hrs light, 6hrs dark). Liquid cultures at 22-26°C under full constant illumination (approx. 3000 lux). Details of the water quality during the study are presented in Appendix C of the study report.	
3.4.5 Duration of the test	96 hours	
3.4.6 Test parameter	Cell multiplication inhibition	
3.4.7 Sampling	Cell counting: 48, 96 h	
3.4.8 Monitoring of TS concentration	Not reported. All concentrations of test substance are expressed in terms of the quantity initially added to the test vessels.	
3.4.9 Statistics	Probit analysis using log transformed values (Finney, 1971)	
	4 Results and Discussion	
4.1 Limit Test	Not performed	

4.1.1 Concentration	Not applicable	
4.1.2 Number/ percentage of animals showing adverse effects	Not applicable	
4.2 Results test substance	The results of the toxicity test are given in Table 3 of the study report and are reported in section 5.2 below.	
4.2.1 Initial concentrations of test substance	Loading rates (mg/L) 1.0, 2.2, 4.6, 10, 22, 46, 100, 220, 460, 1000	
4.2.3 Growth curves	No growth curves are presented in the study report.	
4.2.4 Concentration / response curve	No concentration/response curve is presented in the study report.	
4.2.5 Cell concentration data	Full details are given in section 5.2. Initial cell concentrations were 500 cells ml^{-1} Controls: Typical Day 2 cell concentrations were 30000 - 45000 cells ml^{-1} Typical Day 4 cell concentrations were 320000 - 470000 cells ml-1 These values confirm growth of the test organism. Test flasks: 1.0 mg l^{-1} propylene oxide: Day 2 cell concentrations was 30000 cells ml^{-1} Day 4 cell concentrations were 330000 cells ml^{-1} 1000 mg l^{-1} propylene oxide: Day 2 cell concentrations were 31000 cells ml^{-1} Day 4 cell concentrations were 28000 cells ml^{-1}	
4.2.6 Effect data (cell multiplication inhibition)	The 96 hr EC^{50}, based on cell number on day 4 was calculated to be 240 mg l^{-1}.	
4.2.7 Other observed effects	None	
4.3 Results of controls	Mean values (n=6 flasks: 0 hour 500 cells/ml 48 hour 37000 cells/ml 96 hour 353000 cells/ml	
4.4 Test with reference substance	Not performed	

4.4.1 Concentrations	Not applicable	
	5 Applicant's Summary and Conclusion	
5.1 Materials and methods	16 Erlenmeyer flasks filled with 295 ml culture medium were prepared. Stock solutions of propylene oxide in Analar acetone were added to ten of the flasks to give a range of concentrations: 1.0 – 1000 mg l^{-1}. The 6 untreated flask acted as controls. The concentration of acetone in all test flasks was 0.1 ml l^{-1}. Flasks were innoculted with *S. capricornium* to give an initial concentration of 500 cells ml^{-1}. Flasks were sealed to exclude air and prevent evaporation of the test substance. Flasks were incubated in an orbital shaker (100 cycles min^{-1}) at 22-26°C under full constant illumination (approx.. 3000 lux). After 2 and 4 days cell counts were made using a Coulter Counter. The pH of during the test was 7.2 -7.5.	
5.2 Results and discussion	Results from the *Selenastrum capricornium* growth inhibition test (0-96 hours) give the 96 hr EC_{50}, based on cell number on day 4, as 240 mg l^{-1}. Control flasks all demonstrate growth of the test organisms. The results for individual flasks and the propylene oxide concentrations are as presented in Figure 1. Growth of the test organisms is inhibited at levels of propylene oxide exceeding 100 mg l^{-1}	
5.2.1NOE_rC	Not reported	
5.2.2 ErC_{50}	240 mg/L	
5.2.3 E_bC_{50}	Not reported	
5.3 Conclusion	Growth of the test organisms is inhibited at levels of propylene oxide exceeding 100 mg l^{-1}. Based on cell number on day 4, the propylene oxide 96 hr EC_{50} for *Selenastrum capricornium* growth inhibition test is 240 mg l^{-1}.	
5.3.1 Reliability	2	
5.3.2 Deficiencies	No	
	Evaluation by Competent Authorities	
	EVALUATION BY RAPPORTEUR MEMBER STATE	
Date	28 January 2020	
Materials and Methods	Agree with applicant's version. **Comment (3.4)**: Additional information on fish and invertebrate toxicity: Toxicity of propylene oxide towards rainbow trout (formerly *Salmo gairdneri*, now *Oncorhynchus mykiss*) was tested in a 96-h toxicity test. Eight glass aquaria were filled with 11.5 L filtered dechlorinated water. Seven of them contained propylene oxide in concentrations between 10 and 1000 mg/L, and the eighth aquarium served as the control. Five fish (not fed during the test) were placed in each aquarium. The aquaria were sealed to prevent loss of propylene oxide by evaporation. At 24-h	

	intervals, dead fish were removed and recorded, pH and dissolved oxygen concentrations were measured and the test solutions were renewed. The temperature during the test was approx. 18.5 °C, the pH was 8.0-8.4, and the dissolved oxygen concentrations were 8.0-10.2 mg/L. The study also describes the toxicity of propylene oxide towards *Daphnia magna* in a 48-h static toxicity test. Triplicate sets of 140 mL glass flasks with reconstituted freshwater contained propylene oxide in concentrations between 10 and 1000 mg/L, and three flasks served as controls. Ten daphnids were placed in each flask. The flasks were sealed to prevent loss of propylene oxide by evaporation. After 24 and 48 h, the numbers of immobilised daphnids (not swimming for 10 seconds after stirring the flask) were recorded. The temperature during the test was 18-22 °C, the pH was 8.0-8.1, and the dissolved oxygen concentrations were 9.0-9.2 mg/L.
Results and discussion	Agree with applicant's version.
Conclusion	Agree with applicant's version. Furthermore, the results for fish and daphnids are as follows, and provide an extended background for validating the use of propylene oxide data as read-across data for ethylene oxide: Daphnids (*Daphnia magna*): 48-h EC_{50} (probit analysis after log transformation according to Finney (1971)) of 350 mg/L. Fish (*Salmo gairdneri*): 96-h LC_{50} (graphical interpretation, log/probit graph paper) of 52 mg/L.
Reliability	Agree with the applicant's version.
Acceptability	Acceptable for the purpose of this risk assessment, as read-across information. Propylene oxide has a methyl group which ethylene oxide does not have, and hence has a higher log Kow. It is therefore not expected that ethylene oxide would exhibit a higher toxicity towards aquatic organisms than propylene oxide does, and following from this it is not expected that an algal EC_{50} of ethylene oxide would be significantly lower than the result from this study with propylene oxide.
Remarks	-

Figure 1: Results from the *Selenastrum capricornium* growth inhibition test (0-96 hours)

Concentration of propylene oxide (mg l-1)	Cell concentration (cells ml^{-1} x 10^6)		Cell number on day 4 as % of mean control cell number on day 4
	Day 2	Day 4	
0 (control)	0.042	0.34	
	0.035	0.32	
	0.036	0.47	
	0.030	0.32	
	0.034	0.34	
	0.045	0.33	
1.0	0.030	0.33	92
2.2	0.035	0.34	96
4.6	0.030	0.33	94
10	0.034	0.42	117
22	0.034	0.34	95
46	0.033	0.40	112
100	0.036	0.44	125
220	0.032	0.14	39
460	0.037	0.041	12
1000	0.031	0.028	8

7.4.1.4 Inhibition to microbiological activity

Section A7.4.1.4/01 **Annex Point IIA 7.4**	**Inhibition to microbial activity (aquatic)**	
	1 Reference	**Official use only**
1.1 Reference	R.A. Conway, G.T. Waggy, M.H. Spiegel, R.L. Berglund (1983) Environmental fate and effects of ethylene oxide. Environmental Science and Technology **17** (2), pp 107-112	
1.2 Data protection		
1.2.1 Data owner	Not applicable	
1.2.3 Criteria for data protection	No data protection claimed	
	2 Guidelines and Quality Assurance	
2.1 Guideline study	No	
2.2 GLP	No	
2.3 Deviations	Not applicable	
	3 Materials and Methods	
3.1 Test material	Ethylene oxide, ethylene glycol	
3.1.1 Lot/Batch number	Not reported	
3.1.2 Specification	Not reported	
3.1.3 Purity	Not reported	X
3.1.4 Composition of Product	Not reported	
3.1.5 Further relevant properties	Not reported	
3.1.6 Method of analysis	Not reported	
3.2 Preparation of TS solution for poorly soluble or volatile test substances	Not performed	
3.3 Reference substance	Not performed	
3.3.1 Method of analysis for reference substance		
3.4 Testing procedure		

3.4.1 Culture medium	Medium made up of nutrients, buffers, growth substrate and sewage microorganisms.	
3.4.2 Inoculum / test organism	Details on the inoculum are given in Table A7.4.1.4-2	
3.4.3 Test system	Details are given in Table A7.4.1.4-3	
3.4.4 Test conditions	Test material was incubated for 16 hours at 22ºC on a shaker.	
3.4.5 Duration of the test	16 h	
3.4.6 Test parameter	Toxicity was indicated when the resulting turbidity was less than 50% of the control	
3.4.7 Analytical parameter	Not reported	
3.4.8 Sampling	Not reported	
3.4.9 Monitoring of TS concentration	Not reported	
3.4.10 Controls	Performed but not reported	
3.4.11 Statistics	Not reported	
	4 Results and Discussion	
4.1 Preliminary test	Not reported	
4.1.1 Concentration		
4.1.2 Effect data		
4.2 Results test substance		
4.2.1 Initial concentrations of test substance	Not reported	
4.2.2 Actual concentrations of test substance	Not reported	
4.2.3 Growth curves	Not reported	
4.2.4 Cell concentration data	Not reported	
4.2.5 Concentration/ response curve	Not reported	
4.2.6 Effect data	The adverse effect level (for growth) of ethylene oxide on activated sludge microorganisms or the IC_{50} was determined to be in the range of 10-100 mg/L. The IC_{50} for ethylene glycol was above 10000 mg/L	
4.2.7 Other observed effects	Not reported	
4.3 Results of controls	Not reported	

4.4 Test with reference substance		
4.4.1 Concentrations		
4.4.2 Results		
	5 Applicant's Summary and conclusion	
5.1 Materials and methods	Activated sludge growth inhibition tests were performed using ethylene oxide and ethylene glycol. Selected concentrations of the test material were incubated for 16 hours at 22ºC on a shaker in the presence of nutrients, buffers, growth substrate and sewage microorganisms. Toxicity was indicated when the resulting turbidity was less than 50% of the control.	
5.2 Results and discussion		
5.2.1 IC_{20}	Not reported	
5.2.2 IC_{50}	Ethylene oxide: 10-100 mg/L Ethylene glycol: 10000 mg/L	
5.2.3 EC_{80}	Not reported	
5.3 Conclusion		
5.3.1 Reliability	2	x
5.3.2 Deficiencies	This report is the published summary of work performed. Much of the detail is not reported, however the results are scientifically valid.	
	Evaluation by Competent Authorities	
	Evaluation by Rapporteur Member State	
Date	20 January 2020	
Materials and Methods	**Comment (3.1.3)**: The purity is not reported in the published article. As discussed in the CAR, section A.1.2. Composition of the substance (reference specifications), the production of ethylene oxide consistently yields the active substance in high purity (generally above 99 %). It is not expected that today's production process is significantly different from the production process at the time when this article was written. The principles of the ethylene oxide production has remained unchanged since the 1930s. In the current production of ethylene oxide, some impurities are identified, but none detected above significant level (all below 0.01 %). Furthermore, based on the identity of these impurities and the hazardous profile of the active substance itself, the eCA has no reason to believe that the impurities will have any impact on the findings of this study.	
Results and discussion	Agree with applicant's version.	
Conclusion	Agree with applicant's version, except for the reliability (see below).	

	Comment (5.3.1): Changed from 2 to 3.
Reliability	The reliability should be set to 3 due to the very limited reporting combined with no reference to any test guideline. Nevertheless, the eCA is of the opinion that the results can be used as supporting information.
Acceptability	Acceptable for the purpose of this qualitative risk assessment.
Remarks	-

Table A7.4.1.4-01
Inoculum / Test organism

Criteria	Details
Nature	Solution of nutrients, buffers, growth substrate and sewage microorganisms
Species	Not reported
Strain	Not reported
Source	Not reported
Sampling site	Not reported
Laboratory culture	Not reported
Method of cultivation	Not reported
Preparation of inoculum for exposure	Not reported
Pretreatment	Not reported
Initial cell concentration	Not reported

Table A7.4.1.4-03
Test system

Criteria	Details
Culturing apparatus	Not reported
Number of culture flasks/concentration	Not reported
Aeration device	Not reported
Measuring equipment	Not reported
Test performed in closed vessels due to significant volatility of TS	Not reported

Table A7.4.1.4-04
Test conditions

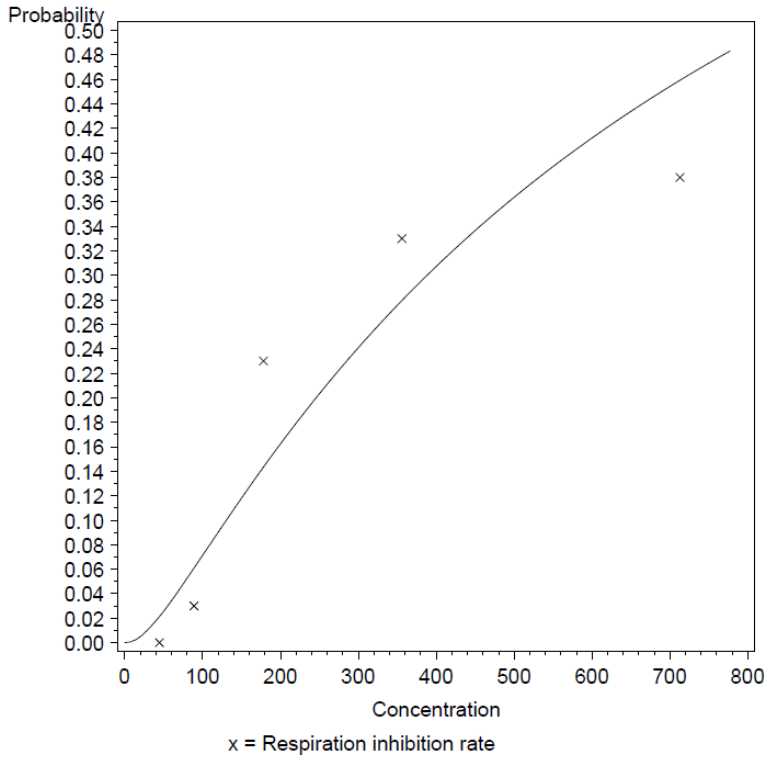
Criteria	Details
Test temperature	22º
pH	Not reported
Aeration of dilution water	Not reported
Suspended solids concentration	Not reported

Section A7.4.1.4/02 **Annex Point IIA 7.4**	**Inhibition to microbial activity (aquatic)**	
	1 Reference	**Official use only**
1.1 Reference	Determination of the inhibition of Oxygen Consumption in the Activated Sludge Respiration Inhibition Test. Report no: 08G0541/093155	
1.2 Data protection	Yes	
1.2.1 Data owner	BASF SE, 67056 Ludwigshafen, Germany	
1.2.3 Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing a.s. for the purpose of its entry into Annex I	
	2 Guidelines and Quality Assurance	
2.1 Guideline study	Yes, OECD guideline 209 (activated sludge, respiration inhibition test)	x
2.2 GLP	Yes	
2.3 Deviations	Guideline study without restrictions. All validity criteria were met. No deficiencies are mentioned throughout the report.	
	3 Materials and Methods	
3.1 Test material	Ethylene oxide	
3.1.1 Lot/Batch number	09/0541-1, Lösung vom 16.09.09	
3.1.2 Specification	n.a.	
3.1.3 Purity	Aqueous solution with 1425 mg/L EO	x
3.1.4 Composition of Product	n.a.	
3.1.5 Further relevant properties	n.a.	
3.1.6 Method of analysis	GC	
3.2 Preparation of TS solution for poorly soluble or volatile test substances	<u>Details on test solutions</u> – An aqueous stock solution with about 2.0 g/L of the test item was prepared at day of begin of exposure. – The really concentration of ethylene oxide in stock solution was determined after preparation of the stock solution, furthermore after addition of the aliquots to the test vessels. – Aliquots of the stock solutions with test- or reference item were pipetted into test vessels and made up with demineralized water to a volume of 150 mL. After that 8 mL synthetic medium were given to the test vessel. – The pH-values were measured in all test vessels. An adjustment was not necessary.	x

	– 42 mL demineralized water were added to each test vessel. After addition of 50 mL of the inoculum suspension (dry weight 7.5 g/L) the incubation was started by aeration of the test vessels with pressure air. – The vessels for the blank control assays were prepared according to the same procedure.	
3.3 Reference substance	3,5-dichlorophenol	
3.3.1 Method of analysis for reference substance		x
3.4 Testing procedure		
3.4.1 Culture medium	Activated sludge from the municipal wastewater treatment plant of Mannheim, Germany was collected on 15 Sep 2009 from the aeration tank of the plant. The activated sludge suspension was sieved with a fine woven mesh (mesh size about 1 mm). This suspension was pre-aerated over night at room temperature. At the next day the sludge suspension was washed with tap water one time. After that the suspension was adjusted to 7.5 g/L dry matter. An aliquot of this suspension was added to the test vessels to obtain a sludge concentration of 1.5 g/L dry substance.	
3.4.2 Inoculum / test organism	Activated sludge, domestic Details on the inoculum are given in Table A7.4.1.4-2	
3.4.3 Test system	Static freshwater Details are given in Table A7.4.1.4-3	
3.4.4 Test conditions	Test temperature: 20 +/- 2 °C pH: The pH-values were measured in all test vessels. An adjustment was not necessary. Dissolved oxygen – Oxygen concentration during aeration: > 2.5 mg/L – Oxygen concentration immediately before measurement: > 6.5 mg/L Nominal and measured concentrations Test concentrations (nominal): 1000, 500, 250, 125, 62.5 mg/L and blank controls. Details on test conditions – Test vessels: Erlenmeyer-vessel (nominal volume 250 mL) – Test volume: 250 mL – Synthetic medium: 8 mL/vessel 100-fold concentrated OECD medium	
3.4.5 Duration of the test	180 min	
3.4.6 Test parameter	Inhibition of respiration rate	
3.4.7 Analytical parameter	Oxygen consumption, pH	
3.4.8 Sampling	O_2 measurement after 180 minutes incubation	

3.4.9 Monitoring of TS concentration	After test item application to the test a further analysis of the stock solution was performed with a result of 1380 mg/L EO concentration. Therefore, a nominal value for test item concentration was used.	x
3.4.10 Controls	1 blank control	
3.4.11 Statistics	In order to calculate the inhibition effects of the test item at a particular concentration, the respiration rate was expressed as percentage of the mean of the 2 control respiration rates. The degree of inhibition (EC10; EC20; EC50 and EC80) of the test item was evaluated by Probit analysis according to Finney. The values were given with an accuracy of 2 significant digits. The degree of inhibition (EC20; EC5o and EC8o) of the reference item was evaluated by Probit analysis according to Finney.	
	4 Results and Discussion	
4.1 Preliminary test	N.A.	
4.1.1 Concentration	N.A.	
4.1.2 Effect data	N.A.	
4.2 Results test substance		
4.2.1 Initial concentrations of test substance	1000, 500, 250, 125, 62,5 mg/L and blank controls	
4.2.2 Actual concentrations of test substance	N.A.	
4.2.3 Growth curves	N.A.	
4.2.4 Cell concentration data	N.A.	

4.2.5 Concentration/ response curve



x = Respiration inhibition rate

4.2.6 Effect data

180 min effect concentrations, based on nominal concentrations:

EC_{10} = 130 mg/L

EC_{20} = 250 mg/L

EC_{50} > 713 mg/L

4.2.7 Other observed effects

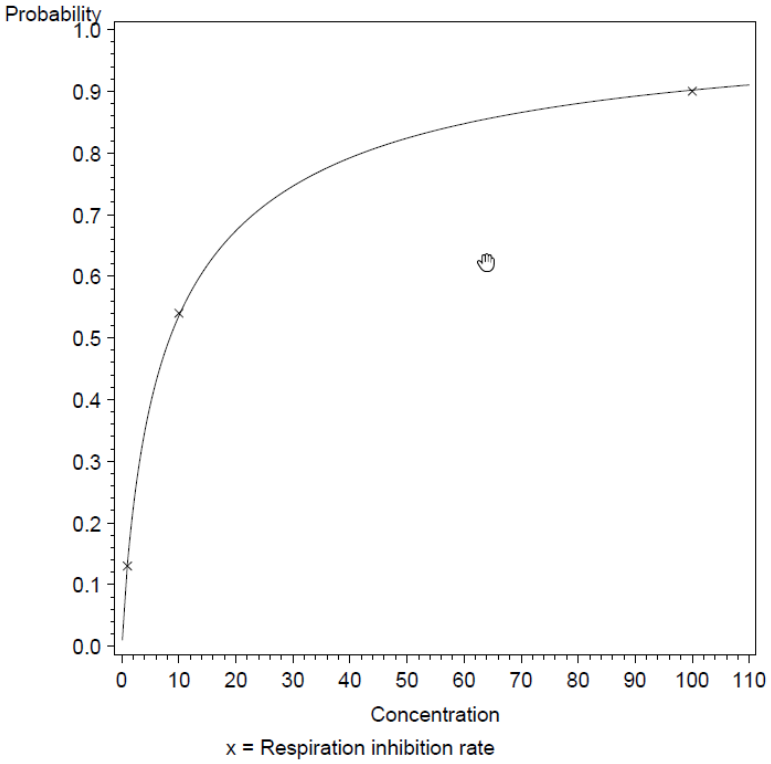
N.A.

4.3 Results of controls

Measured data of oxygen content of the test assays at the begin and end of the evaluation time

Assay idenification	**BC1**	**BC2**	**RS1**	**RS2**	**RS3**	**TS1**	**TS2**	**TS3**	**TS4**	**TS5**
O_2 concencentration Start [mg/L]	7.9	7.5	7.7	7.9	8.7	8.2	7.8	8.0	7.9	7.1
O_2 concentration after 6 minutes [mg/L]	6.0	5.5	6.0	7.0	8.5	7.0	6.5	6.5	6.0	4.5
O_2 consumption rate [mg/L in 6 min]	1.9	2.0	1.7	0.9	0.2	1.2	1.3	1.5	1.9	2.6
O_2 consumption rate [mg/L×h]	19	20	17	9	2	12	13	15	19	26
Specific O_2 consumption rate [mg O_2/g×h]	13	13	11	6	1	8	9	10	13	17
RS / TS concentrations [mg/L]	-		1	10	100	713	356	178	88.9	44.5
Calculation of inhibition respiration [%]	**-**	**-**	**13**	**54**	**90**	**38**	**33**	**23**	**3**	**-33**

Legend: TS = test item, RS = reference item,
BC = blank control,

4.4 Test with reference substance		
4.4.1 Concentrations	Results of the Probit analysis according to Finney of the reference item Test concentration [mg/L] — Respiration Inhibition 1 — 0.13 10 — 0.54 100 — 0.90 EC_{20} = 1.7; EC_{50} = 8.4; EC_{80} = 42.2	
4.4.2 Results		
	5 Applicant's Summary and conclusion	
5.1 Materials and methods	An OECD 209 study was performed with activated sludge from the municipal wastewater treatment plant of Mannheim, Germany. Nominal concentrations of 1000, 500, 250, 125, 62.5 mg/L and blank controls were used. The method of analysis was GC and the reference substance was 3,5-dichlorophenol. Probit analysis were performed to determined results.	
5.2 Results and discussion	Initial concentrations of test substance were 1000, 500, 250, 125, 62,5 mg/L and blank controls. The 180 min effect concentrations, based on nominal concentrations are: EC_{10} = 130 mg/L EC_{20} = 250 mg/L EC_{50} > 713 mg/L	
5.2.1 IC_{20}	250 mg/L	

5.2.2 IC_{50}	> 713 mg/L	
5.2.3 EC_{80}	> 713 mg/L	
5.3 Conclusion	OECD 209 (ASRIT) has been performed to determine the toxicity of the test substance on activated, domestic sludge. Results are: EC_{10} = 130 mg/L EC_{20} = 250 mg/L EC_{50} > 713 mg/L There were no deviations in the study, and the study is therefore considered to be valid.	
5.3.1 Reliability	1	x
5.3.2 Deficiencies	Guideline study without restrictions. All validity criteria were met. No deficiencies are mentioned throughout the report.	x
	Evaluation by Competent Authorities	
	Evaluation by Rapporteur Member State	
Date	02 March 2020	
Materials and Methods	**Comment (2.1)**: According to the study report, the test guideline followed was EC No 440/2008, C. 11 Biodegradation – Activated Sludge Respiration Inhibition Test. This has some differences from the OECD 209 test guideline (adopted in 2010), e.g. with regard to the requirement for analytical measurements of test substance. **Comment (3.1.3)**: The concentration of ethylene oxide in solution is listed here, but not the purity of ethylene oxide. As discussed in the CAR, section A.1.2. Composition of the substance (reference specifications), the production of ethylene oxide consistently yields the active substance in high purity (generally above 99 %). It is not expected that today's production process is significantly different from the production process at the time when this article was written. The principles of the ethylene oxide production has remained unchanged since the 1930s. In the current production of ethylene oxide, some impurities are identified, but none detected above significant level (all below 0.01 %). Furthermore, based on the identity of these impurities and the hazardous profile of the active substance itself, the eCA has no reason to believe that the impurities will have any impact on the findings of this study. **Comment (3.2)**: Nothing is mentioned on the prevention of volatilisation of ethylene oxide from the test vessels. If compared to the OECD 209 guideline, it is stated there that special caution is recommended for volatile substances, e.g. "by performing substance specific analysis of control mixtures containing the substance and modifying the aeration regime". Valid results with volatile chemicals may be obtained providing that > 80 % of the test substance remains in the reaction mixture at the end of the exposure period. Furthermore, reducing the the test duration is also given as an option in the OECD 209 guideline, for volatile substances. Even though this study has not been conducted following the OECD 209 guideline, such considerations are important for volatile substances	

	such as ethylene oxide. This has not been discussed in the present study. See next comment. **Comment (3.3.1)**: Information should have been given. **Comment (3.4.9)**: The ethylene oxide concentration was not determined at the end of the exposure period, but a new analysis of the stock solution was performed "after test item application to the test". The concentration in the stock solution 1425 mg/L ethylene oxide, and at the next analysis it was 1380 mg/L ethylene oxide, i.e. approx. 97 % of the original concentration. The applicant argues that therefore, a nominal value for test item concentration was used. However, in order for nominal concentrations to be used as the basis for the test results, an analysis of test substance concentration (showing > 80 % of initial concentration) at the end of the exposure period should ideally have been performed.
Results and discussion	Agree with applicant's version.
Conclusion	**Comment (5.3.2)**: The EC_{50} of 3,5-dichlorophenol lies within the expected range given in the OECD 209 guideline. However, information on the blank controls' oxygen uptake rate is not given.
Reliability	Due to the uncertainty of such tests for volatile compounds, the eCA cannot agree to a reliability of 1. It should be reduced to 2.
Acceptability	Given the limited exposure of ethylene oxide to the environment from the intended use, the study is acceptable as information supporting that the microbial acute toxicity of ethylene oxide is not of concern for the sake of this risk assessment. No release to STPs is foreseen.
Remarks	-

Table A7.4.1.4-01
Inoculum / Test organism

Criteria	Details
Nature	Activated sludge, domestic
Species	N.A.
Strain	N.A.
Source	Municipal wastewater treatment plant of Mannheim, Germany
Sampling site	Aeration tank of the plant
Laboratory culture	N.A.
Method of cultivation	N.A.
Preparation of inoculum for exposure	The activated sludge suspension was sieved with a fine woven mesh (mesh size about 1 mm). This suspension was pre-aerated over night at room temperature. At the next day the sludge suspension was washed with tap water one time. After that the suspension was adjusted to 7.5 g/L dry matter.

	An aliquot of this suspension was added to the test vessels to obtain a sludge concentration of 1.5 g/L dry substance.
Pretreatment	See “Preparation of inoculum for exposure”
Initial cell concentration	N.A.

Table A7.4.1.4-03
Test system

Criteria	Details
Culturing apparatus	Erlenmeyer flasks (250ml nominal volume)
Number of culture flasks/concentration	2 blank controls, 5 test item concentrations, 3 reference substance concentrations
Aeration device	N.A.
Measuring equipment	Closed oxygen measuring cells
Test performed in closed vessels due to significant volatility of TS	no

Table A7.4.1.4-04
Test conditions

Criteria	Details
Test temperature	20 ± 2 ºC
pH	7.1 – 7.3
Aeration of dilution water	Oxygen concentration during aeration: > 2.5 mg/L Oxygen concentration immediately before measurement: > 6.5 mg/L
Suspended solids concentration	N.A.

7.4.2 Bioconcentration

Section 7.4.2 **Annex Point IIA 7.5**	**Bioaccumulation in an appropriate species of fish**	
	JUSTIFICATION FOR NON-SUBMISSION OF DATA *As outlined in the TNsG on data requirements, the applicant must always be able to justify the suggested exemptions from the data requirements. The justifications are to be included in the respective location (section) of the dossier.* *If one of the following reasons is marked, detailed justification has to be given below. General arguments are not acceptable*	Official use only
Other existing data [ ] **Limited exposure [X]**	**Technically not feasible [ ]** **Scientifically unjustified [X]** **Other justification [ ]**	
Detailed justification:	Following the use of ethylene oxide as a gaseous sterilising agent, release into the atmosphere will be the main potential route of environmental exposure. However, the gas is exhausted via a catalytic converter which converts ethylene oxide to carbon dioxide and water, typically with efficiency greater than 99.9%. In a relatively small number of sterilisation plants, acid scrubbers containing a solution of water and 5% sulphuric acid (H_2SO_4) are used as an alternative to the catalytic conversion system. Ethylene oxide from the sterilisation chamber is dissolved in the acid solution which converts ethylene oxide to ethylene glycol with efficiency typically in the range of 99.5 to 99.9%. The level of atmospheric exposure associated with these processes is expected to be extremely minimal. Any aquatic exposure will therefore be indirect and negligible. Exposure to water might occur via washout from the atmosphere. However, the high vapour pressure of ethylene oxide (~1.46 x 10^5 Pa) and its rapid volatilisation rate (volatilisation half-life in water ~1 hour), are expected to limit the effectiveness of this process and ethylene oxide is not readily removed from the atmosphere by adsorption into aqueous aerosols (see Document IIIA, Section 7.3.2). In addition, ethylene oxide is expected to undergo numerous fate processes in water, including hydrolysis and aerobic and anaerobic biodegradation (see Document IIIA, Section 7.1), and the duration and extent of any potential indirect exposure will therefore be extremely short-lived. In such circumstances there will be no significant risk of bioconcentration in aquatic organisms and data to assess this are therefore not required.	
Undertaking of intended data submission [ ]	No undertaking provided; submission of data/information is not considered necessary.	
	Evaluation by Competent Authorities	
	EVALUATION BY RAPPORTEUR MEMBER STATE	
Date	20 January 2020	

Evaluation of applicant's justification	The eCA considers that the estimated BCF_{fish} value based on the log Kow of -0.30 is sufficient, due to the minimal exposure to other environmental compartments than air. The low log Kow and hence estimated BCF is furthermore far below any trigger value for the indication of a bioaccumulation potential.
Conclusion	Acceptable. A study is not needed.
Remarks	-

7.4.3 Effects on aquatic organisms, further studies

7.4.3.1 Prolonged toxicity to an appropriate species of fish

Section 7.4.3.1 **Annex Point XIII 2.1**	**Prolonged toxicity to an appropriate species of fish**	
	JUSTIFICATION FOR NON-SUBMISSION OF DATA *As outlined in the TNsG on data requirements, the applicant must always be able to justify the suggested exemptions from the data requirements. The justifications are to be included in the respective location (section) of the dossier.* *If one of the following reasons is marked, detailed justification has to be given below. General arguments are not acceptable*	Official use only
Other existing data [ ] **Limited exposure [X]**	**Technically not feasible [ ]** **Scientifically unjustified [X]** **Other justification [ ]**	
Detailed justification:	Following the use of ethylene oxide as a gaseous sterilising agent, release into the atmosphere will be the main potential route of environmental exposure. However, the gas is exhausted via a catalytic converter which converts ethylene oxide to carbon dioxide and water, typically with efficiency greater than 99.9%. In a relatively small number of sterilisation plants, acid scrubbers containing a solution of water and 5% sulphuric acid (H_2SO_4) are used as an alternative to the catalytic conversion system. Ethylene oxide from the sterilisation chamber is dissolved in the acid solution which converts ethylene oxide to ethylene glycol with efficiency typically in the range of 99.5 to 99.9%. The level of atmospheric exposure associated with these processes is expected to be extremely minimal. Exposure to water might occur via washout from the atmosphere. However, the high vapour pressure of ethylene oxide (~1.46 x 10^5 Pa) and its rapid volatilisation rate (volatilisation half-life in water ~1 hour), are expected to limit the effectiveness of this process and ethylene oxide is not readily removed from the atmosphere by adsorption into aqueous aerosols (see Document IIIA, Section 7.3.2). In addition, ethylene oxide is expected to undergo numerous fate processes in water, including hydrolysis and aerobic and anaerobic biodegradation (see Document IIIA, Section 7.1), and the duration and extent of any potential indirect exposure will therefore be extremely short-lived. In such circumstances there will be no significant exposure of natural water bodies and in addition ethylene oxide is of low acute toxicity to fish (see Document IIIA, Section 7.4.1.1). Data on the prolonged toxicity to fish are therefore not required.	
Undertaking of intended data submission [ ]	No undertaking provided; submission of data/information is not considered necessary.	
	Evaluation by Competent Authorities	
	EVALUATION BY RAPPORTEUR MEMBER STATE	

Date	20 January 2020
Evaluation of applicant's justification	The eCA agrees that further ecotoxicity testing on aquatic organisms does not seem necessary due to the lack of direct exposure of the substance to freshwater and the high vapour pressure leading to rapid volatilisation / minimal deposition from air.
Conclusion	Acceptable. A study is not needed.
Remarks	-

7.4.3.2 Effects on reproduction and growth rate on an appropriate species of fish

Section 7.4.3.2 **Annex Point XIII.2.2**	**Effects on reproduction and growth rate of fish**	
	JUSTIFICATION FOR NON-SUBMISSION OF DATA *As outlined in the TNsG on data requirements, the applicant must always be able to justify the suggested exemptions from the data requirements. The justifications are to be included in the respective location (section) of the dossier.* *If one of the following reasons is marked, detailed justification has to be given below. General arguments are not acceptable*	Official use only
Other existing data [ ] **Limited exposure [X]**	**Technically not feasible [ ]** **Scientifically unjustified [X]** **Other justification [ ]**	
Detailed justification:	Following the use of ethylene oxide as a gaseous sterilising agent, release into the atmosphere will be the main potential route of environmental exposure. However, the gas is exhausted via a catalytic converter which converts ethylene oxide to carbon dioxide and water, typically with efficiency greater than 99.9%. In a relatively small number of sterilisation plants, acid scrubbers containing a solution of water and 5% sulphuric acid (H_2SO_4) are used as an alternative to the catalytic conversion system. Ethylene oxide from the sterilisation chamber is dissolved in the acid solution which converts ethylene oxide to ethylene glycol with efficiency typically in the range of 99.5 to 99.9%. The level of atmospheric exposure associated with these processes is expected to be extremely minimal. Exposure to water might occur via washout from the atmosphere. However, the high vapour pressure of ethylene oxide (~1.46 x 10^5 Pa) and its rapid volatilisation rate (volatilisation half-life in water ~1 hour), are expected to limit the effectiveness of this process and ethylene oxide is not readily removed from the atmosphere by adsorption into aqueous aerosols (see Document IIIA, Section 7.3.2). In addition, ethylene oxide is expected to undergo numerous fate processes in water, including hydrolysis and aerobic and anaerobic biodegradation (see Document IIIA, Section 7.1), and the duration and extent of any potential indirect exposure will therefore be extremely short-lived. In such circumstances there will be no significant exposure of natural water bodies and in addition ethylene oxide is of low acute toxicity to fish (see Document IIIA, Section 7.4.1.1). Data on reproduction and growth of fish are therefore not required.	
Undertaking of intended data submission [ ]	No undertaking provided; submission of data/information is not considered necessary.	
Evaluation by Competent Authorities		
	EVALUATION BY RAPPORTEUR MEMBER STATE	

Date	20 January 2020
Evaluation of applicant's justification	The eCA agrees that further ecotoxicity testing on aquatic organisms does not seem necessary due to the lack of direct exposure of the substance to freshwater and the high vapour pressure leading to rapid volatilisation / minimal deposition from air.
Conclusion	Acceptable. A study is not needed.
Remarks	-

7.4.3.3 Bio-accumulation in an aquatic organism

7.4.3.3.1 Bioaccumulation in an appropriate species of fish

Section 7.4.3.3.1 **Annex Point XIII.2.3**	**Bioaccumulation in an appropriate species of fish**	
	JUSTIFICATION FOR NON-SUBMISSION OF DATA *As outlined in the TNsG on data requirements, the applicant must always be able to justify the suggested exemptions from the data requirements. The justifications are to be included in the respective location (section) of the dossier.* *If one of the following reasons is marked, detailed justification has to be given below. General arguments are not acceptable*	Official use only
Other existing data [ ] **Limited exposure [X]**	**Technically not feasible [ ]** **Scientifically unjustified [X]** **Other justification [ ]**	
Detailed justification:	Following the use of ethylene oxide as a gaseous sterilising agent, release into the atmosphere will be the main potential route of environmental exposure. However, the gas is exhausted via a catalytic converter which converts ethylene oxide to carbon dioxide and water, typically with efficiency greater than 99.9%. In a relatively small number of sterilisation plants, acid scrubbers containing a solution of water and 5% sulphuric acid (H_2SO_4) are used as an alternative to the catalytic conversion system. Ethylene oxide from the sterilisation chamber is dissolved in the acid solution which converts ethylene oxide to ethylene glycol with efficiency typically in the range of 99.5 to 99.9%. The level of atmospheric exposure associated with these processes is expected to be extremely minimal. Any aquatic exposure will therefore be indirect and negligible. Exposure to water might occur via washout from the atmosphere. However, the high vapour pressure of ethylene oxide (~1.46 x 10^5 Pa) and its rapid volatilisation rate (volatilisation half-life in water ~1 hour), are expected to limit the effectiveness of this process and ethylene oxide is not readily removed from the atmosphere by adsorption into aqueous aerosols (see Document IIIA, Section 7.3.2). In addition, ethylene oxide is expected to undergo numerous fate processes in water, including hydrolysis and aerobic and anaerobic biodegradation (see Document IIIA, Section 7.1), and the duration and extent of any potential indirect exposure will therefore be extremely short-lived. In such circumstances there will be no significant risk of bioaccumulation in fish and data to assess this are therefore not required.	
Undertaking of intended data submission [ ]	No undertaking provided; submission of data/information is not considered necessary.	
Evaluation by Competent Authorities		
	EVALUATION BY RAPPORTEUR MEMBER STATE	

Date	20 January 2020
Evaluation of applicant's justification	The eCA considers that the estimated BCF_{fish} value based on the log Kow of -0.30 is sufficient, due to the minimal exposure to other environmental compartments than air. The low log Kow and hence estimated BCF is furthermore far below any trigger value for the indication of a bioaccumulation potential.
Conclusion	Acceptable. A study is not needed.
Remarks	-

7.4.3.3.2 Bioaccumulation in an appropriate invertebrate species

Section 7.4.3.3.2 **Annex Point XIII.2.3**	**Bioaccumulation in an appropriate invertebrate species**	
	JUSTIFICATION FOR NON-SUBMISSION OF DATA *As outlined in the TNsG on data requirements, the applicant must always be able to justify the suggested exemptions from the data requirements. The justifications are to be included in the respective location (section) of the dossier.* *If one of the following reasons is marked, detailed justification has to be given below. General arguments are not acceptable*	Official use only
Other existing data [ ] **Limited exposure [X]**	**Technically not feasible [ ]** **Scientifically unjustified [X]** **Other justification [ ]**	
Detailed justification:	Following the use of ethylene oxide as a gaseous sterilising agent, release into the atmosphere will be the main potential route of environmental exposure. However, the gas is exhausted via a catalytic converter which converts ethylene oxide to carbon dioxide and water, typically with efficiency greater than 99.9%. In a relatively small number of sterilisation plants, acid scrubbers containing a solution of water and 5% sulphuric acid (H_2SO_4) are used as an alternative to the catalytic conversion system. Ethylene oxide from the sterilisation chamber is dissolved in the acid solution which converts ethylene oxide to ethylene glycol with efficiency typically in the range of 99.5 to 99.9%. The level of atmospheric exposure associated with these processes is expected to be extremely minimal. Any aquatic exposure will therefore be indirect and negligible. Exposure to water might occur via washout from the atmosphere. However, the high vapour pressure of ethylene oxide (~1.46×10^5 Pa) and its rapid volatilisation rate (volatilisation half-life in water ~1 hour), are expected to limit the effectiveness of this process and ethylene oxide is not readily removed from the atmosphere by adsorption into aqueous aerosols (see Document IIIA, Section 7.3.2). In addition, ethylene oxide is expected to undergo numerous fate processes in water, including hydrolysis and aerobic and anaerobic biodegradation (see Document IIIA, Section 7.1), and the duration and extent of any potential indirect exposure will therefore be extremely short-lived. In such circumstances there will be no significant risk of bioaccumulation in aquatic invertebrates and data to assess this are therefore not required.	
Undertaking of intended data submission [ ]	No undertaking provided; submission of data/information is not considered necessary.	
	Evaluation by Competent Authorities	
	EVALUATION BY RAPPORTEUR MEMBER STATE	
Date	20 January 2020	

Evaluation of applicant's justification	The eCA considers that the estimated BCF_{fish} value based on the log Kow of -0.30 is sufficient, due to the minimal exposure to other environmental compartments than air. The low log Kow and hence estimated BCF is furthermore far below any trigger value for the indication of a bioaccumulation potential in the aquatic compartment.
Conclusion	Acceptable. A study is not needed.
Remarks	-

7.4.3.4 Effects on reproduction and growth rate with an appropriate invertebrate species

Section 7.4.3.4 **Annex Point XIII.2.4**	**Effects on reproduction and growth rate with an invertebrate species**	
	JUSTIFICATION FOR NON-SUBMISSION OF DATA *As outlined in the TNsG on data requirements, the applicant must always be able to justify the suggested exemptions from the data requirements. The justifications are to be included in the respective location (section) of the dossier.* *If one of the following reasons is marked, detailed justification has to be given below. General arguments are not acceptable*	Official use only
Other existing data [ ] **Limited exposure [X]**	**Technically not feasible [ ]** **Scientifically unjustified [X]** **Other justification [ ]**	
Detailed justification:	Following the use of ethylene oxide as a gaseous sterilising agent, release into the atmosphere will be the main potential route of environmental exposure. However, the gas is exhausted via a catalytic converter which converts ethylene oxide to carbon dioxide and water, typically with efficiency greater than 99.9%. In a relatively small number of sterilisation plants, acid scrubbers containing a solution of water and 5% sulphuric acid (H_2SO_4) are used as an alternative to the catalytic conversion system. Ethylene oxide from the sterilisation chamber is dissolved in the acid solution which converts ethylene oxide to ethylene glycol with efficiency typically in the range of 99.5 to 99.9%. The level of atmospheric exposure associated with these processes is expected to be extremely minimal. Exposure to water might occur via washout from the atmosphere. However, the high vapour pressure of ethylene oxide (~1.46 x 10^5 Pa) and its rapid volatilisation rate (volatilisation half-life in water ~1 hour), are expected to limit the effectiveness of this process and ethylene oxide is not readily removed from the atmosphere by adsorption into aqueous aerosols (see Document IIIA, Section 7.3.2). In addition, ethylene oxide is expected to undergo numerous fate processes in water, including hydrolysis and aerobic and anaerobic biodegradation (see Document IIIA, Section 7.1), and the duration and extent of any potential indirect exposure will therefore be extremely short-lived. In such circumstances there will be no significant exposure of natural water bodies and in addition ethylene oxide is of low acute toxicity to *Daphnia magna* (see Document IIIA, Section 7.4.1.2). Data on reproduction and growth of aquatic invertebrates are therefore not required.	
Undertaking of intended data submission [ ]	No undertaking provided; submission of data/information is not considered necessary.	
	Evaluation by Competent Authorities	
	EVALUATION BY RAPPORTEUR MEMBER STATE	

Date	20 January 2020
Evaluation of applicant's justification	The eCA agrees that further ecotoxicity testing on aquatic organisms does not seem necessary due to the lack of direct exposure of the substance to freshwater and the high vapour pressure leading to rapid volatilisation / minimal deposition from air.
Conclusion	Acceptable. A study is not needed.
Remarks	-

7.4.3.5 Effects on any other specific non-target organisms (flora and fauna) believed to be at risk

7.4.3.5.1 Effects on sediment dwelling organisms

Section 7.4.3.5.1 **Annex Point XIII.3.4**	**Effects on sediment dwelling organisms**	
	JUSTIFICATION FOR NON-SUBMISSION OF DATA *As outlined in the TNsG on data requirements, the applicant must always be able to justify the suggested exemptions from the data requirements. The justifications are to be included in the respective location (section) of the dossier.* *If one of the following reasons is marked, detailed justification has to be given below. General arguments are not acceptable*	Official use only
Other existing data [ ] **Limited exposure [X]**	**Technically not feasible [ ]** **Scientifically unjustified [X]** **Other justification [ ]**	
Detailed justification:	Following the use of ethylene oxide as a gaseous sterilising agent, release into the atmosphere will be the main potential route of environmental exposure. However, the gas is exhausted via a catalytic converter which converts ethylene oxide to carbon dioxide and water, typically with efficiency greater than 99.9%. In a relatively small number of sterilisation plants, acid scrubbers containing a solution of water and 5% sulphuric acid (H_2SO_4) are used as an alternative to the catalytic conversion system. Ethylene oxide from the sterilisation chamber is dissolved in the acid solution which converts ethylene oxide to ethylene glycol with efficiency typically in the range of 99.5 to 99.9%. The level of atmospheric exposure associated with these processes is expected to be extremely minimal. Exposure to water might occur via washout from the atmosphere. However, the high vapour pressure of ethylene oxide (~1.46 x 10^5 Pa) and its rapid volatilisation rate (volatilisation half-life in water ~1 hour), are expected to limit the effectiveness of this process and ethylene oxide is not readily removed from the atmosphere by adsorption into aqueous aerosols (see Document IIIA, Section 7.3.2). In addition, ethylene oxide is expected to undergo numerous fate processes in water, including hydrolysis and aerobic and anaerobic biodegradation (see Document IIIA, Section 7.1), and the duration and extent of any potential indirect exposure will therefore be extremely short-lived. The estimated K_{oc} value for ethylene oxide is 3.237 L/kg, indicating that it is not strongly adsorbed to sediment and is therefore unlikely to accumulate in this compartment. In such circumstances there will be no significant exposure of natural water bodies and in addition ethylene oxide is of low acute toxicity to aquatic invertebrates as represented by *Daphnia magna* (see Document IIIA, Section 7.4.1.2). Toxicity data to sediment dwelling organisms are therefore not required.	
Undertaking of intended data submission [ ]	No undertaking provided; submission of data/information is not considered necessary.	
	Evaluation by Competent Authorities	
	EVALUATION BY RAPPORTEUR MEMBER STATE	

Date	20 January 2020
Evaluation of applicant's justification	The eCA agrees that further ecotoxicity testing on sediment organisms does not seem necessary due to the lack of direct exposure of the substance to freshwater and hence sediment and the high vapour pressure leading to rapid volatilisation / minimal deposition from air.
Conclusion	Acceptable. A study is not needed.
Remarks	-

7.4.3.5.2 Aquatic plant toxicity

Section 7.4.3.5.2 **Annex Point XIII.3.4**	**Aquatic plant toxicity**	
	JUSTIFICATION FOR NON-SUBMISSION OF DATA *As outlined in the TNsG on data requirements, the applicant must always be able to justify the suggested exemptions from the data requirements. The justifications are to be included in the respective location (section) of the dossier.* *If one of the following reasons is marked, detailed justification has to be given below. General arguments are not acceptable*	Official use only
Other existing data [ ] **Limited exposure [X]**	**Technically not feasible [ ]** **Scientifically unjustified [X]** **Other justification [ ]**	
Detailed justification:	Following the use of ethylene oxide as a gaseous sterilising agent, release into the atmosphere will be the main potential route of environmental exposure. However, the gas is exhausted via a catalytic converter which converts ethylene oxide to carbon dioxide and water, typically with efficiency greater than 99.9%. In a relatively small number of sterilisation plants, acid scrubbers containing a solution of water and 5% sulphuric acid (H_2SO_4) are used as an alternative to the catalytic conversion system. Ethylene oxide from the sterilisation chamber is dissolved in the acid solution which converts ethylene oxide to ethylene glycol with efficiency typically in the range of 99.5 to 99.9%. The level of atmospheric exposure associated with these processes is expected to be extremely minimal. Exposure to water might occur via washout from the atmosphere. However, the high vapour pressure of ethylene oxide (~1.46 x 10^5 Pa) and its rapid volatilisation rate (volatilisation half-life in water ~1 hour), are expected to limit the effectiveness of this process and ethylene oxide is not readily removed from the atmosphere by adsorption into aqueous aerosols (see Document IIIA, Section 7.3.2). In addition, ethylene oxide is expected to undergo numerous fate processes in water, including hydrolysis and aerobic and anaerobic biodegradation (see Document IIIA, Section 7.1), and the duration and extent of any potential indirect exposure will therefore be extremely short-lived. The estimated K_{oc} value for ethylene oxide is 3.237 L/kg, indicating that the compound is not strongly adsorbed to soil or sediment and is therefore unlikely to accumulate in these compartments. In such circumstances there will be no significant exposure of natural water bodies. Toxicity data to sediment dwelling organisms are therefore not required.	
Undertaking of intended data submission [ ]	No undertaking provided; submission of data/information is not considered necessary.	
	Evaluation by Competent Authorities	
	EVALUATION BY RAPPORTEUR MEMBER STATE	
Date	20 January 2020	
Evaluation of applicant's justification	The eCA agrees that further ecotoxicity testing on aquatic organisms does not seem necessary due to the lack of direct exposure of the substance to freshwater	

	and the high vapour pressure leading to rapid volatilisation / minimal deposition from air.
Conclusion	Acceptable. A study is not needed.
Remarks	-

7.5 Effects on terrestrial organisms

7.5.1 Terrestrial toxicity, initial tests.

7.5.1.1 Inhibition to microbiological activity

Section 7.5.1.1 **Annex Point x.y**	**Inhibition of microbial activity**	
	JUSTIFICATION FOR NON-SUBMISSION OF DATA *As outlined in the TNsG on data requirements, the applicant must always be able to justify the suggested exemptions from the data requirements. The justifications are to be included in the respective location (section) of the dossier.* *If one of the following reasons is marked, detailed justification has to be given below. General arguments are not acceptable*	Official use only
Other existing data [ ] **Limited exposure [X]**	**Technically not feasible [ ]** **Scientifically unjustified [X]** **Other justification [ ]**	
Detailed justification:	Following the use of ethylene oxide as a gaseous sterilising agent, release into the atmosphere will be the main potential route of environmental exposure. However, the gas is exhausted via a catalytic converter which converts ethylene oxide to carbon dioxide and water, typically with efficiency greater than 99.9%. In a relatively small number of sterilisation plants, acid scrubbers containing a solution of water and 5% sulphuric acid (H_2SO_4) are used as an alternative to the catalytic conversion system. Ethylene oxide from the sterilisation chamber is dissolved in the acid solution which converts ethylene oxide to ethylene glycol with efficiency typically in the range of 99.5 to 99.9%. The level of atmospheric exposure associated with these processes is expected to be extremely minimal. Exposure of soil might occur via washout from the atmosphere. However, the high vapour pressure of ethylene oxide (~1.46 x 10^5 Pa) and its rapid volatilisation rate (volatilisation half-life in water ~1 hour), are expected to limit the effectiveness of this process and ethylene oxide is not readily removed from the atmosphere by adsorption into aqueous aerosols (see Document IIIA, Section 7.3.2). In addition, ethylene oxide is expected to undergo numerous fate processes in soil, including hydrolysis and biodegradation (see Document IIIA, Section 7.2), and the duration and extent of any potential indirect exposure will therefore be extremely short-lived. The estimated K_{oc} value for ethylene oxide is 3.237 L/kg, indicating that it is not strongly adsorbed to soil and is therefore unlikely to accumulate in this compartment. In such circumstances there will be no significant exposure of soil and in addition ethylene oxide is of low toxicity to aquatic (sewage) microorganisms (see Document IIIA, Section 7.4.1.4). Data on inhibition of soil microbial activity are therefore not required.	

Undertaking of intended data submission [ ]	No undertaking provided; submission of data/information is not considered necessary.

Evaluation by Competent Authorities

EVALUATION BY RAPPORTEUR MEMBER STATE

Date	20 January 2020
Evaluation of applicant's justification	The eCA agrees that further ecotoxicity testing on terrestrial organisms does not seem necessary due to the lack of direct exposure of the substance to soil and the high vapour pressure leading to rapid volatilisation / minimal deposition from air.
Conclusion	Acceptable. A study is not needed.
Remarks	-

7.5.1.2 Acute toxicity test to earthworms or other soil non-target organisms

Section A7.5.1.2 **Annex Point IIIA XIII.3.2**	**Earthworm, acute toxicity test**	
	1 Reference	**Official use only**
1.1 Reference	C.A. Staples, W. Gulledge (2006) An environmental fate, exposure and risk assessment of ethylene oxide from diffuse emissions. Chemosphere **65**, pp 691-698	
1.2 Data protection		
1.2.1 Data owner	Not applicable	
1.2.3 Criteria for data protection	No data protection claimed	
	2 Guidelines and Quality Assurance	
2.1 Guideline study	No	
2.2 GLP	No	
2.3 Deviations	Not applicable	
	3 Materials and Methods	
3.1 Test material	Ethylene oxide. Calculation carried out using EPISuite v 3.10 (2000)	
3.1.1 Lot/Batch number	Not applicable	
3.1.2 Specification	Not applicable	
3.1.3 Purity	Not applicable	
3.1.4 Composition of Product	Not applicable	
3.1.5 Further relevant properties	Not applicable	
3.1.6 Method of analysis	Not applicable	
3.2 Reference substance		
3.2.1 Method of analysis for reference substance	Not applicable	
3.3 Testing procedure		X
3.3.1 Preparation of the test substance	Not applicable	

3.3.2 Application of the test substance	Not applicable	
3.3.3 Test organisms	Earthworm	
3.3.4 Test system	Not applicable	
3.3.5 Test conditions	Not applicable	
3.3.6 Test duration	Not applicable	
3.3.7 Test parameter	The critical toxicity value for earthworms was calculated from a regression equation based on the log K_{OW} value and molecular weight of ethylene oxide. The calculated concentration was then divided by an assessment factor of 1000 reflecting the absence of chronic data.	
3.3.8 Examination	Not applicable	
3.3.9 Monitoring of test substance concentration	Not applicable	
3.3.10 Statistics	Not applicable	
	4 Results and Discussion	
4.1 Range finding test	Not applicable	
4.1.1 Concentration		
4.1.2 Number/ percentage of animals showing adverse effects		
4.1.3 Nature of adverse effects		
4.2 Soil test		
4.2.1 Initial concentrations of test substance	Not applicable	
4.2.2 Effect data (Mortality)	The critical toxicity value was determined to be 57.82 ng/g dry weight soil. This includes an Assessment Factor of 1000 (reflecting the absence of chronic toxicity data). Removing this (safety factors to be considered in risk assessment) gives an equivalent toxicity value of 58 mg/kg dry weight soil.	
4.2.3 Concentration / effect curve	Not applicable	
4.2.4 Other effects	Not applicable	
4.3 Results of controls		
4.3.1 Mortality	Not applicable	

4.3.2 Number/ percentage of earthworms showing adverse effects	Not applicable	
4.3.3 Nature of adverse effects	Not applicable	
4.4 Test with reference substance		
4.4.1 Concentrations	Not applicable	
4.4.2 Results	Not applicable	
	5 Applicant's Summary and conclusion	
5.1 Materials and methods	The critical toxicity value for earthworms was calculated from a regression equation based on the compounds log K_{OW} value and molecular weight. The calculated concentration was then divided by an assessment factor of 1000 reflecting the absence of chronic data.	
5.2 Results and discussion		
5.2.1 LC_0	Not applicable	
5.2.2 LC_{50}	Not applicable	
5.2.3 LC_{100}	Not applicable	
5.2.4 Critical toxicity value	57.82 ng/g dry weight soil: removing the 1000-fold safety factor to give the toxicity endpoint for risk assessment gives an equivalent value of 58 mg/kg dry weight soil.	
5.3 Conclusion		
5.3.1 Other Conclusions		
5.3.2 Reliability	3	x
5.3.3 Deficiencies	This value was calculated using EPISuite and an assessment factor of 1000 was then applied in the absence of chronic data.	
	Evaluation by Competent Authorities	
	Evaluation by Rapporteur Member State	
Date	20 January 2020	
Materials and Methods	**Comment (3.3)**: In general, the eCA considers that more information should be presented when using QSARs for risk assessment purposes. Relevant background information on the model should be described. Examples of such information are calculations, underlying assumptions, and information on applicability domain.	
Results and discussion	Agree with applicant's version.	

Conclusion	**Comment (5.3.2)**: Changed from 3 to 0 – not applicable – due to it being a calculation method.
Reliability	0
Acceptability	Acceptable as an estimation method. However, the estimation is in the opinion of the eCA not needed for the risk assessment, due to the lack of direct exposure to soil and the minimal deposition from air to soil because of the high vapour pressure.
Remarks	-

7.5.1.3 Acute toxicity to plants

Section 7.5.1.3 **Annex Point x.y**	**Acute toxicity to plants**	
	JUSTIFICATION FOR NON-SUBMISSION OF DATA *As outlined in the TNsG on data requirements, the applicant must always be able to justify the suggested exemptions from the data requirements. The justifications are to be included in the respective location (section) of the dossier.* *If one of the following reasons is marked, detailed justification has to be given below. General arguments are not acceptable*	Official use only
Other existing data [ ]	**Technically not feasible [ ]** **Scientifically unjustified [X]**	
Limited exposure [X]	**Other justification [ ]**	
Detailed justification:	Following the use of ethylene oxide as a gaseous sterilising agent, release into the atmosphere will be the main potential route of environmental exposure. However, the gas is exhausted via a catalytic converter which converts ethylene oxide to carbon dioxide and water, typically with efficiency greater than 99.9%. In a relatively small number of sterilisation plants, acid scrubbers containing a solution of water and 5% sulphuric acid (H_2SO_4) are used as an alternative to the catalytic conversion system. Ethylene oxide from the sterilisation chamber is dissolved in the acid solution which converts ethylene oxide to ethylene glycol with efficiency typically in the range of 99.5 to 99.9%. The level of atmospheric exposure associated with these processes is expected to be extremely minimal. Exposure of plants might also occur via washout from the atmosphere into the soil. However, the high vapour pressure of ethylene oxide (~1.46 x 10^5 Pa) and its rapid volatilisation rate (volatilisation half-life in water ~1 hour), are expected to limit the effectiveness of this process and ethylene oxide is not readily removed from the atmosphere by adsorption into aqueous aerosols (see Document IIIA, Section 7.3.2). In addition, ethylene oxide is expected to undergo numerous fate processes in soil, including hydrolysis and biodegradation (see Document IIIA, Section 7.2), and the duration and extent of any potential indirect exposure will therefore be extremely short-lived. The estimated K_{oc} value for ethylene oxide is 3.237 L/kg, indicating that it is not strongly adsorbed to soil and is therefore unlikely to accumulate in this compartment. Given this fate profile, there will be no significant exposure of plants (via atmosphere or soil). In addition, ethylene oxide is known to be produced from natural sources (CEPA, 2001)[1]. Thus, in some plants, ethylene (a natural plant growth regulator) is degraded to ethylene oxide (Abeles and Dunn, 1985, cited by CEPA, 2001). In this context of natural exposure any additional exposure resulting from its use will be negligible. Data on toxicity to plants are therefore not required.	

[1] CEPA (2001) Priority Substances List Assessment Report: Ethylene Oxide. Canadian Environmental Protection Act, 1999. Environment Canada and Health Canada, Government of Canada.

Undertaking of intended data submission [ ]	No undertaking provided; submission of data/information is not considered necessary.

Evaluation by Competent Authorities

EVALUATION BY RAPPORTEUR MEMBER STATE

Date	20 January 2020
Evaluation of applicant's justification	The eCA agrees that further ecotoxicity testing on terrestrial organisms does not seem necessary due to the lack of direct exposure of the substance to soil and the high vapour pressure leading to rapid volatilisation / minimal deposition from air.
Conclusion	Acceptable. A study is not needed.
Remarks	-

7.5.2 Terrestrial tests, long term tests

7.5.2.1 Reproduction study with other soil non-target macro-organisms

Section 7.5.2.1 **Annex Point XIII.3.2**	**Reproduction study with other soil non-target macro-organisms**	
	JUSTIFICATION FOR NON-SUBMISSION OF DATA *As outlined in the TNsG on data requirements, the applicant must always be able to justify the suggested exemptions from the data requirements. The justifications are to be included in the respective location (section) of the dossier.* *If one of the following reasons is marked, detailed justification has to be given below. General arguments are not acceptable*	Official use only
Other existing data [ ] **Limited exposure [X]**	**Technically not feasible [ ]** **Scientifically unjustified [X]** **Other justification [ ]**	
Detailed justification:	Following the use of ethylene oxide as a gaseous sterilising agent, release into the atmosphere will be the main potential route of environmental exposure. However, the gas is exhausted via a catalytic converter which converts ethylene oxide to carbon dioxide and water, typically with efficiency greater than 99.9%. In a relatively small number of sterilisation plants, acid scrubbers containing a solution of water and 5% sulphuric acid (H_2SO_4) are used as an alternative to the catalytic conversion system. Ethylene oxide from the sterilisation chamber is dissolved in the acid solution which converts ethylene oxide to ethylene glycol with efficiency typically in the range of 99.5 to 99.9%. The level of atmospheric exposure associated with these processes is expected to be extremely minimal. Exposure of soil might occur via washout from the atmosphere. However, the high vapour pressure of ethylene oxide (~1.46 x 10^5 Pa) and its rapid volatilisation rate (volatilisation half-life in water ~1 hour), are expected to limit the effectiveness of this process and ethylene oxide is not readily removed from the atmosphere by adsorption into aqueous aerosols (see Document IIIA, Section 7.3.2). In addition, ethylene oxide is expected to undergo numerous fate processes in soil, including hydrolysis and biodegradation (see Document IIIA, Section 7.2), and the duration and extent of any potential indirect exposure will therefore be extremely short-lived. The estimated K_{oc} value for ethylene oxide is 3.237 L/kg, indicating that it is not strongly adsorbed to soil and is therefore unlikely to accumulate in this compartment. In such circumstances there will be no significant long-term exposure of soil. Data on the effects on soil macro-organism reproduction are therefore not required.	
Undertaking of intended data submission [ ]	No undertaking provided; submission of data/information is not considered necessary.	

Evaluation by Competent Authorities

EVALUATION BY RAPPORTEUR MEMBER STATE

Date	20 January 2020
Evaluation of applicant's justification	The eCA agrees that further ecotoxicity testing on terrestrial organisms does not seem necessary due to the lack of direct exposure of the substance to soil and the high vapour pressure leading to rapid volatilisation / minimal deposition from air.
Conclusion	Acceptable. A study is not needed.
Remarks	-

7.5.2.2 Long-term test with terrestrial plants

Section 7.5.1.3 **Annex Point x.y**	**Acute toxicity to plants**	
	JUSTIFICATION FOR NON-SUBMISSION OF DATA *As outlined in the TNsG on data requirements, the applicant must always be able to justify the suggested exemptions from the data requirements. The justifications are to be included in the respective location (section) of the dossier.* *If one of the following reasons is marked, detailed justification has to be given below. General arguments are not acceptable*	Official use only
Other existing data [ ] **Limited exposure [X]**	**Technically not feasible [ ]** **Scientifically unjustified [X]** **Other justification [ ]**	
Detailed justification:	Following the use of ethylene oxide as a gaseous sterilising agent, release into the atmosphere will be the main potential route of environmental exposure. However, the gas is exhausted via a catalytic converter which converts ethylene oxide to carbon dioxide and water, typically with efficiency greater than 99.9%. In a relatively small number of sterilisation plants, acid scrubbers containing a solution of water and 5% sulphuric acid (H_2SO_4) are used as an alternative to the catalytic conversion system. Ethylene oxide from the sterilisation chamber is dissolved in the acid solution which converts ethylene oxide to ethylene glycol with efficiency typically in the range of 99.5 to 99.9%. The level of atmospheric exposure associated with these processes is expected to be extremely minimal. Exposure of plants might also occur via washout from the atmosphere into the soil. However, the high vapour pressure of ethylene oxide (~1.46 x 10^5 Pa) and its rapid volatilisation rate (volatilisation half-life in water ~1 hour), are expected to limit the effectiveness of this process and ethylene oxide is not readily removed from the atmosphere by adsorption into aqueous aerosols (see Document IIIA, Section 7.3.2). In addition, ethylene oxide is expected to undergo numerous fate processes in soil, including hydrolysis and biodegradation (see Document IIIA, Section 7.2), and the duration and extent of any potential indirect exposure will therefore be extremely short-lived. The estimated K_{oc} value for ethylene oxide is 3.237 L/kg, indicating that it is not strongly adsorbed to soil and is therefore unlikely to accumulate in this compartment. Given this fate profile, there will be no long-term significant exposure of plants (via atmosphere or soil). In addition, ethylene oxide is known to be produced from natural sources (CEPA, 2001)[2]. Thus, in some plants, ethylene (a natural plant growth regulator) is degraded to ethylene oxide (Abeles and Dunn, 1985, cited by CEPA, 2001). In this context of natural exposure any additional exposure resulting from its use will be	

[2] CEPA (2001) Priority Substances List Assessment Report: Ethylene Oxide. Canadian Environmental Protection Act, 1999. Environment Canada and Health Canada, Government of Canada.

	negligible. Data on long-term effects on plants are therefore not required.	
Undertaking of intended data submission [ ]	No undertaking provided; submission of data/information is not considered necessary.	

Evaluation by Competent Authorities

EVALUATION BY RAPPORTEUR MEMBER STATE

Date	20 January 2020
Evaluation of applicant's justification	The eCA agrees that further ecotoxicity testing on terrestrial organisms does not seem necessary due to the lack of direct exposure of the substance to soil and the high vapour pressure leading to rapid volatilisation / minimal deposition from air.
Conclusion	Acceptable. A study is not needed.
Remarks	-

7.5.3 Effect on Birds

7.5.3.1.1 Acute oral toxicity

Section 7.5.3.1.1 **Annex Point x.y**	**Acute oral toxicity to birds**	
	JUSTIFICATION FOR NON-SUBMISSION OF DATA *As outlined in the TNsG on data requirements, the applicant must always be able to justify the suggested exemptions from the data requirements. The justifications are to be included in the respective location (section) of the dossier.* *If one of the following reasons is marked, detailed justification has to be given below. General arguments are not acceptable*	Official use only
Other existing data [ ]	**Technically not feasible [ ]** **Scientifically unjustified [X]**	
Limited exposure [X]	**Other justification [ ]**	
Detailed justification:	Following the use of ethylene oxide as a gaseous sterilising agent, release into the atmosphere will be the main potential route of environmental exposure. However, the gas is exhausted via a catalytic converter which converts ethylene oxide to carbon dioxide and water, typically with efficiency greater than 99.9%. In a relatively small number of sterilisation plants, acid scrubbers containing a solution of water and 5% sulphuric acid (H_2SO_4) are used as an alternative to the catalytic conversion system. Ethylene oxide from the sterilisation chamber is dissolved in the acid solution which converts ethylene oxide to ethylene glycol with efficiency typically in the range of 99.5 to 99.9%. The level of atmospheric exposure associated with these processes is expected to be extremely minimal. Exposure of birds might also occur via washout from the atmosphere onto food items (e.g. in the soil). However, the high vapour pressure of ethylene oxide (~1.46 x 10^5 Pa) and its rapid volatilisation rate (volatilisation half-life in water ~1 hour), are expected to limit the effectiveness of this process and ethylene oxide is not readily removed from the atmosphere by adsorption into aqueous aerosols (see Document IIIA, Section 7.3.2). In addition, ethylene oxide is expected to undergo numerous fate processes in soil, including hydrolysis and biodegradation (see Document IIIA, Section 7.2), and the duration and extent of any potential indirect exposure will therefore be extremely short-lived. The estimated K_{oc} value for ethylene oxide is 3.237 L/kg, indicating that it is not strongly adsorbed to soil and is therefore unlikely to accumulate in this compartment. Given this fate profile, there will be no significant exposure of birds (via inhalation or ingestion in food items). In addition, ethylene oxide is known to be produced from natural sources (CEPA, 2001)[3]. Thus, in some plants, ethylene (a natural plant growth regulator) is degraded to ethylene oxide (Abeles and Dunn, 1985, cited by CEPA, 2001). In this context of natural	

[3] CEPA (2001) Priority Substances List Assessment Report: Ethylene Oxide. Canadian Environmental Protection Act, 1999. Environment Canada and Health Canada, Government of Canada.

	exposure on potential food items any additional exposure resulting from its use will be negligible. Data on acute toxicity to birds are therefore not required.	
Undertaking of intended data submission [ ]	No undertaking provided; submission of data/information is not considered necessary.	

Evaluation by Competent Authorities

EVALUATION BY RAPPORTEUR MEMBER STATE

Date	20 January 2020
Evaluation of applicant's justification	Agree that no data is necessary. Even though birds could be exposed in the atmospheric compartment, the eCA is of the opinion that no further studies are needed. The intrinsic properties of the substance and the risk assessment on human health are sufficient to warrant restrictions on emissions, i.e. that they should be kept as low as possible. A new study on birds would not change this fact.
Conclusion	Acceptable.
Remarks	-

7.5.3.1.2 Short-term toxicity

Section 7.5.3.1.2 **Annex Point x.y**	**Short-term toxicity to birds**	
	JUSTIFICATION FOR NON-SUBMISSION OF DATA *As outlined in the TNsG on data requirements, the applicant must always be able to justify the suggested exemptions from the data requirements. The justifications are to be included in the respective location (section) of the dossier.* *If one of the following reasons is marked, detailed justification has to be given below. General arguments are not acceptable*	Official use only
Other existing data [ ] **Limited exposure [X]**	**Technically not feasible [ ]** **Scientifically unjustified [X]** **Other justification [ ]**	
Detailed justification:	Following the use of ethylene oxide as a gaseous sterilising agent, release into the atmosphere will be the main potential route of environmental exposure. However, the gas is exhausted via a catalytic converter which converts ethylene oxide to carbon dioxide and water, typically with efficiency greater than 99.9%. In a relatively small number of sterilisation plants, acid scrubbers containing a solution of water and 5% sulphuric acid (H_2SO_4) are used as an alternative to the catalytic conversion system. Ethylene oxide from the sterilisation chamber is dissolved in the acid solution which converts ethylene oxide to ethylene glycol with efficiency typically in the range of 99.5 to 99.9%. The level of atmospheric exposure associated with these processes is expected to be extremely minimal. Exposure of birds might also occur via washout from the atmosphere onto food items (e.g. in the soil). However, the high vapour pressure of ethylene oxide (~1.46 x 10^5 Pa) and its rapid volatilisation rate (volatilisation half-life in water ~1 hour), are expected to limit the effectiveness of this process and ethylene oxide is not readily removed from the atmosphere by adsorption into aqueous aerosols (see Document IIIA, Section 7.3.2). In addition, ethylene oxide is expected to undergo numerous fate processes in soil, including hydrolysis and biodegradation (see Document IIIA, Section 7.2), and the duration and extent of any potential indirect exposure will therefore be extremely short-lived. The estimated K_{oc} value for ethylene oxide is 3.237 L/kg, indicating that it is not strongly adsorbed to soil and is therefore unlikely to accumulate in this compartment. Given this fate profile, there will be no significant short-term exposure of birds (via inhalation or ingestion in food items). In addition, ethylene oxide is known to be produced from natural sources (CEPA, 2001)[4]. Thus, in some plants, ethylene (a natural plant growth regulator) is degraded to ethylene oxide (Abeles and Dunn, 1985, cited by CEPA, 2001). In this context of natural exposure on potential food items any additional	

[4] CEPA (2001) Priority Substances List Assessment Report: Ethylene Oxide. Canadian Environmental Protection Act, 1999. Environment Canada and Health Canada, Government of Canada.

	exposure resulting from its use will be negligible. Data on short term toxicity to birds are therefore not required.	
Undertaking of intended data submission [ ]	No undertaking provided; submission of data/information is not considered necessary.	

Evaluation by Competent Authorities

EVALUATION BY RAPPORTEUR MEMBER STATE

Date	20 January 2020
Evaluation of applicant's justification	Agree that no data is necessary. Even though birds could be exposed in the atmospheric compartment, the eCA is of the opinion that no further studies are needed. The intrinsic properties of the substance and the risk assessment on human health are sufficient to warrant restrictions on emissions, i.e. that they should be kept as low as possible. A new study on birds would not change this fact.
Conclusion	Acceptable.
Remarks	-

7.5.3.1.3 Effects on reproduction

Section 7.5.3.1.3 **Annex Point x.y**	**Effects on avian reproduction**	
	JUSTIFICATION FOR NON-SUBMISSION OF DATA *As outlined in the TNsG on data requirements, the applicant must always be able to justify the suggested exemptions from the data requirements. The justifications are to be included in the respective location (section) of the dossier.* *If one of the following reasons is marked, detailed justification has to be given below. General arguments are not acceptable*	Official use only
Other existing data [ ]	**Technically not feasible [ ]** **Scientifically unjustified [X]**	
Limited exposure [X]	**Other justification [ ]**	
Detailed justification:	Following the use of ethylene oxide as a gaseous sterilising agent, release into the atmosphere will be the main potential route of environmental exposure. However, the gas is exhausted via a catalytic converter which converts ethylene oxide to carbon dioxide and water, typically with efficiency greater than 99.9%. In a relatively small number of sterilisation plants, acid scrubbers containing a solution of water and 5% sulphuric acid (H_2SO_4) are used as an alternative to the catalytic conversion system. Ethylene oxide from the sterilisation chamber is dissolved in the acid solution which converts ethylene oxide to ethylene glycol with efficiency typically in the range of 99.5 to 99.9%. The level of atmospheric exposure associated with these processes is expected to be extremely minimal. Exposure of birds might also occur via washout from the atmosphere onto food items (e.g. in the soil). However, the high vapour pressure of ethylene oxide (~1.46 x 10^5 Pa) and its rapid volatilisation rate (volatilisation half-life in water ~1 hour), are expected to limit the effectiveness of this process and ethylene oxide is not readily removed from the atmosphere by adsorption into aqueous aerosols (see Document IIIA, Section 7.3.2). In addition, ethylene oxide is expected to undergo numerous fate processes in soil, including hydrolysis and biodegradation (see Document IIIA, Section 7.2), and the duration and extent of any potential indirect exposure will therefore be extremely short-lived. The estimated K_{oc} value for ethylene oxide is 3.237 L/kg, indicating that it is not strongly adsorbed to soil and is therefore unlikely to accumulate in this compartment. Given this fate profile, there will be no significant long-term exposure of birds (via inhalation or ingestion in food items). In addition, ethylene oxide is known to be produced from natural sources (CEPA, 2001)[5]. Thus, in some plants, ethylene (a natural plant growth regulator) is degraded to ethylene oxide (Abeles and Dunn, 1985, cited by CEPA, 2001). In this context of natural exposure on potential food items any additional	

[5] CEPA (2001) Priority Substances List Assessment Report: Ethylene Oxide. Canadian Environmental Protection Act, 1999. Environment Canada and Health Canada, Government of Canada.

	exposure resulting from its use will be negligible. Data on effects on avian reproduction are therefore not required.	
Undertaking of intended data submission [ ]	No undertaking provided; submission of data/information is not considered necessary.	

Evaluation by Competent Authorities

EVALUATION BY RAPPORTEUR MEMBER STATE

Date	20 January 2020
Evaluation of applicant's justification	Agree that no data is necessary. Even though birds could be exposed in the atmospheric compartment, the eCA is of the opinion that no further studies are needed. The intrinsic properties of the substance and the risk assessment on human health are sufficient to warrant restrictions on emissions, i.e. that they should be kept as low as possible. A new study on birds would not change this fact.
Conclusion	Acceptable.
Remarks	-

7.5.4 Effects on honeybees

7.5.4.1 Acute toxicity to honeybees and other beneficial arthropods, for example predators

Section 7.5.4.1 **Annex Point x.y**	**Acute toxicity to honeybees and other beneficial arthropods, for example predators**	
	JUSTIFICATION FOR NON-SUBMISSION OF DATA *As outlined in the TNsG on data requirements, the applicant must always be able to justify the suggested exemptions from the data requirements. The justifications are to be included in the respective location (section) of the dossier.* *If one of the following reasons is marked, detailed justification has to be given below. General arguments are not acceptable*	Official use only
Other existing data [ ] **Limited exposure [X]**	**Technically not feasible [ ]** **Scientifically unjustified [X]** **Other justification [ ]**	
Detailed justification:	Following the use of ethylene oxide as a gaseous sterilising agent, release into the atmosphere will be the main potential route of environmental exposure. However, the gas is exhausted via a catalytic converter which converts ethylene oxide to carbon dioxide and water, typically with efficiency greater than 99.9%. In a relatively small number of sterilisation plants, acid scrubbers containing a solution of water and 5% sulphuric acid (H_2SO_4) are used as an alternative to the catalytic conversion system. Ethylene oxide from the sterilisation chamber is dissolved in the acid solution which converts ethylene oxide to ethylene glycol with efficiency typically in the range of 99.5 to 99.9%. The level of atmospheric exposure associated with these processes is expected to be extremely minimal. Exposure of bees and other beneficial plants might also occur via washout from the atmosphere onto plants and into the soil. However, the high vapour pressure of ethylene oxide (~1.46 x 10^5 Pa) and its rapid volatilisation rate (volatilisation half-life in water ~1 hour), are expected to limit the effectiveness of this process and ethylene oxide is not readily removed from the atmosphere by adsorption into aqueous aerosols (see Document IIIA, Section 7.3.2). In addition, ethylene oxide is expected to undergo numerous fate processes in soil, including hydrolysis and biodegradation (see Document IIIA, Section 7.2), and the duration and extent of any potential indirect exposure will therefore be extremely short-lived. The estimated K_{oc} value for ethylene oxide is 3.237 L/kg, indicating that it is not strongly adsorbed to soil and is therefore unlikely to accumulate in this compartment. Given this fate profile, there will be no significant exposure of bees and other beneficial arthropods (via inhalation or contact). In addition, ethylene oxide is known to be produced from natural sources (CEPA, 2001)[6]. Thus, in some plants, ethylene	

[6] CEPA (2001) Priority Substances List Assessment Report: Ethylene Oxide. Canadian Environmental Protection Act, 1999. Environment Canada and Health Canada, Government of Canada.

	(a natural plant growth regulator) is degraded to ethylene oxide (Abeles and Dunn, 1985, cited by CEPA, 2001). In this context of natural exposure on potential food items any additional exposure resulting from its use will be negligible. Data on acute toxicity to bees and other beneficial arthropods are therefore not required.	
Undertaking of intended data submission [ ]	No undertaking provided; submission of data/information is not considered necessary.	
Evaluation by Competent Authorities		
	EVALUATION BY RAPPORTEUR MEMBER STATE	
Date	20 January 2020	
Evaluation of applicant's justification	Agree that no data is necessary. Even though honeybees theoretically could be exposed in the atmospheric compartment, the eCA is of the opinion that no further studies are needed. The intrinsic properties of the substance and the risk assessment on human health are sufficient to warrant restrictions on emissions, i.e. that they should be kept as low as possible. A new study on honeybees would not change this fact.	
Conclusion	Acceptable.	
Remarks	-	

7.5.5 Bioconcentration, terrestrial

7.5.5.1 Bioconcentration, further studies

Section 7.5.5.1 **Annex Point IIA 7.5**	**Bioaccumulation in terrestrial organisms**	
	JUSTIFICATION FOR NON-SUBMISSION OF DATA *As outlined in the TNsG on data requirements, the applicant must always be able to justify the suggested exemptions from the data requirements. The justifications are to be included in the respective location (section) of the dossier.* *If one of the following reasons is marked, detailed justification has to be given below. General arguments are not acceptable*	Official use only
Other existing data [ ] **Limited exposure [X]**	**Technically not feasible [ ]** **Scientifically unjustified [X]** **Other justification [ ]**	
Detailed justification:	Following the use of ethylene oxide as a gaseous sterilising agent, release into the atmosphere will be the main potential route of environmental exposure. However, the gas is exhausted via a catalytic converter which converts ethylene oxide to carbon dioxide and water, typically with efficiency greater than 99.9%. In a relatively small number of sterilisation plants, acid scrubbers containing a solution of water and 5% sulphuric acid (H_2SO_4) are used as an alternative to the catalytic conversion system. Ethylene oxide from the sterilisation chamber is dissolved in the acid solution which converts ethylene oxide to ethylene glycol with efficiency typically in the range of 99.5 to 99.9%. The level of atmospheric exposure associated with these processes is expected to be extremely minimal. Exposure of terrestrial organisms might also occur via washout from the atmosphere onto food items (e.g. in the soil). However, the high vapour pressure of ethylene oxide (~1.46 x 10^5 Pa) and its rapid volatilisation rate (volatilisation half-life in water ~1 hour), are expected to limit the effectiveness of this process and ethylene oxide is not readily removed from the atmosphere by adsorption into aqueous aerosols (see Document IIIA, Section 7.3.2). In addition, ethylene oxide is expected to undergo numerous fate processes in soil, including hydrolysis and biodegradation (see Document IIIA, Section 7.2), and the duration and extent of any potential indirect exposure will therefore be extremely short-lived. The estimated K_{oc} value for ethylene oxide is 3.237 L/kg, indicating that it is not strongly adsorbed to soil and is therefore unlikely to accumulate in this compartment. In such circumstances there will be no significant risk of bioconcentration in terrestrial organisms and data to assess this are therefore not required.	
Undertaking of intended data submission [ ]	No undertaking provided; submission of data/information is not considered necessary.	

Evaluation by Competent Authorities	
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	20 January 2020
Evaluation of applicant's justification	The eCA considers that the estimated $BCF_{earthworm}$ value based on the log Kow of -0.30 is sufficient, due to the minimal exposure to other environmental compartments than air. The low log Kow and hence estimated BCF is furthermore far below any trigger value for the indication of a bioaccumulation potential.
Conclusion	Acceptable. A study is not needed.
Remarks	-

7.5.6 Effects on terrestrial non-target organisms

Section 7.5.6 **Annex Point IIA 7.5**	**Effects on terrestrial non-target organisms**	
	JUSTIFICATION FOR NON-SUBMISSION OF DATA *As outlined in the TNsG on data requirements, the applicant must always be able to justify the suggested exemptions from the data requirements. The justifications are to be included in the respective location (section) of the dossier.* *If one of the following reasons is marked, detailed justification has to be given below. General arguments are not acceptable*	Official use only
Other existing data [ ]	**Technically not feasible [ ]** **Scientifically unjustified [X]**	
Limited exposure [X]	**Other justification [ ]**	
Detailed justification:	Following the use of ethylene oxide as a gaseous sterilising agent, release into the atmosphere will be the main potential route of environmental exposure. However, the gas is exhausted via a catalytic converter which converts ethylene oxide to carbon dioxide and water, typically with efficiency greater than 99.9%. In a relatively small number of sterilisation plants, acid scrubbers containing a solution of water and 5% sulphuric acid (H_2SO_4) are used as an alternative to the catalytic conversion system. Ethylene oxide from the sterilisation chamber is dissolved in the acid solution which converts ethylene oxide to ethylene glycol with efficiency typically in the range of 99.5 to 99.9%. The level of atmospheric exposure associated with these processes is expected to be extremely minimal. Exposure of terrestrial organisms might also occur via washout from the atmosphere. However, the high vapour pressure of ethylene oxide (~1.46 x 10^5 Pa) and its rapid volatilisation rate (volatilisation half-life in water ~1 hour), are expected to limit the effectiveness of this process and ethylene oxide is not readily removed from the atmosphere by adsorption into aqueous aerosols (see Document IIIA, Section 7.3.2). In addition, ethylene oxide is expected to undergo numerous fate processes in soil, including hydrolysis and biodegradation (see Document IIIA, Section 7.2), and the duration and extent of any potential indirect exposure will therefore be extremely short-lived. The estimated K_{oc} value for ethylene oxide is 3.237 L/kg, indicating that it is not strongly adsorbed to soil and is therefore unlikely to accumulate in this compartment. Given this fate profile, there will be no significant exposure of terrestrial organisms (via atmosphere or following wash-out). In addition, ethylene oxide is known to be produced from natural sources (CEPA, 2001)[7]. Thus, in some plants, ethylene (a natural plant growth regulator) is degraded to ethylene oxide (Abeles and Dunn, 1985, cited by CEPA, 2001). It is also a product of ethylene catabolism in certain micro-organisms (De	

[7] CEPA (2001) Priority Substances List Assessment Report: Ethylene Oxide. Canadian Environmental Protection Act, 1999. Environment Canada and Health Canada, Government of Canada.

	Bont and Albers, 1976, cited by CEPA, 2001). Ethylene oxide can be generated from water-logged soil (Smith and Jackson, 1974; Jackson *et al*., 1978, cited by CEPA, 2001) and from manure and sewage sludge (Wong *et al*., 1983, cited by CEPA, 2001). In this context of natural exposure any additional exposure resulting from its use will be negligible. Data on effects on additional terrestrial organisms are therefore not required.	
Undertaking of intended data submission [ ]	No undertaking provided; submission of data/information is not considered necessary.	

Evaluation by Competent Authorities

EVALUATION BY RAPPORTEUR MEMBER STATE

Date	20 January 2020
Evaluation of applicant's justification	The eCA agrees that further ecotoxicity testing on terrestrial organisms does not seem necessary due to the lack of direct exposure of the substance to soil and the high vapour pressure leading to rapid volatilisation / minimal deposition from air.
Conclusion	Acceptable. A study is not needed.
Remarks	-

7.5.7 Effects on mammals

7.5.7.1 For some product types, direct and/or indirect exposure for mammals is possible and some tests with mammals may be required in rare cases on the basis of concern for severe risk for the terrestrial environment

7.5.7.1.1 Acute oral toxicity

Section 7.5.7.1 **Annex Point x.y**	**Acute oral toxicity to mammals**	
	JUSTIFICATION FOR NON-SUBMISSION OF DATA *As outlined in the TNsG on data requirements, the applicant must always be able to justify the suggested exemptions from the data requirements. The justifications are to be included in the respective location (section) of the dossier.* *If one of the following reasons is marked, detailed justification has to be given below. General arguments are not acceptable*	Official use only
Other existing data [ ]	**Technically not feasible [ ]** **Scientifically unjustified [X]**	
Limited exposure [X]	**Other justification [ ]**	
Detailed justification:	Following the use of ethylene oxide as a gaseous sterilising agent, release into the atmosphere will be the main potential route of environmental exposure. However, the gas is exhausted via a catalytic converter which converts ethylene oxide to carbon dioxide and water, typically with efficiency greater than 99.9%. In a relatively small number of sterilisation plants, acid scrubbers containing a solution of water and 5% sulphuric acid (H_2SO_4) are used as an alternative to the catalytic conversion system. Ethylene oxide from the sterilisation chamber is dissolved in the acid solution which converts ethylene oxide to ethylene glycol with efficiency typically in the range of 99.5 to 99.9%. The level of atmospheric exposure associated with these processes is expected to be extremely minimal. Exposure of mammals might also occur via washout from the atmosphere onto food items (e.g. in the soil). However, the high vapour pressure of ethylene oxide (~1.46 x 10^5 Pa) and its rapid volatilisation rate (volatilisation half-life in water ~1 hour), are expected to limit the effectiveness of this process and ethylene oxide is not readily removed from the atmosphere by adsorption into aqueous aerosols (see Document IIIA, Section 7.3.2). In addition, ethylene oxide is expected to undergo numerous fate processes in soil, including hydrolysis and biodegradation (see Document IIIA, Section 7.2), and the duration and extent of any potential indirect exposure will therefore be extremely short-lived. The estimated K_{oc} value for ethylene oxide is 3.237 L/kg, indicating that it is not strongly adsorbed to soil and is therefore unlikely to accumulate in this compartment. Given this fate profile, there will be no significant exposure of mammals (via inhalation or ingestion in food items). In addition, ethylene oxide is known to be produced from natural	

	sources (CEPA, 2001)[8]. Thus, in some plants, ethylene (a natural plant growth regulator) is degraded to ethylene oxide (Abeles and Dunn, 1985, cited by CEPA, 2001). In this context of natural exposure on potential food items any additional exposure resulting from its use will be negligible. Data on acute toxicity to mammals are therefore not required.	
Undertaking of intended data submission [ ]	No undertaking provided; submission of data/information is not considered necessary.	
	Evaluation by Competent Authorities	
	EVALUATION BY RAPPORTEUR MEMBER STATE	
Date	20 January 2020	
Evaluation of applicant's justification	Agree with applicant's view that further data are not required. Data on mammals are considered covered by the section on human health effects.	
Conclusion	Acceptable. No further studies are considered necessary.	
Remarks	-	

[8] CEPA (2001) Priority Substances List Assessment Report: Ethylene Oxide. Canadian Environmental Protection Act, 1999. Environment Canada and Health Canada, Government of Canada.

7.5.7.1.2 Short term toxicity

Section 7.5.3.1.2 **Annex Point x.y**	**Short-term toxicity to mammals**	
	JUSTIFICATION FOR NON-SUBMISSION OF DATA *As outlined in the TNsG on data requirements, the applicant must always be able to justify the suggested exemptions from the data requirements. The justifications are to be included in the respective location (section) of the dossier.* *If one of the following reasons is marked, detailed justification has to be given below. General arguments are not acceptable*	Official use only
Other existing data [ ] **Limited exposure [X]**	**Technically not feasible [ ]** **Scientifically unjustified [X]** **Other justification [ ]**	
Detailed justification:	Following the use of ethylene oxide as a gaseous sterilising agent, release into the atmosphere will be the main potential route of environmental exposure. However, the gas is exhausted via a catalytic converter which converts ethylene oxide to carbon dioxide and water, typically with efficiency greater than 99.9%. In a relatively small number of sterilisation plants, acid scrubbers containing a solution of water and 5% sulphuric acid (H_2SO_4) are used as an alternative to the catalytic conversion system. Ethylene oxide from the sterilisation chamber is dissolved in the acid solution which converts ethylene oxide to ethylene glycol with efficiency typically in the range of 99.5 to 99.9%. The level of atmospheric exposure associated with these processes is expected to be extremely minimal. Exposure of mammals might also occur via washout from the atmosphere onto food items (e.g. in the soil). However, the high vapour pressure of ethylene oxide (~1.46 x 10^5 Pa) and its rapid volatilisation rate (volatilisation half-life in water ~1 hour), are expected to limit the effectiveness of this process and ethylene oxide is not readily removed from the atmosphere by adsorption into aqueous aerosols (see Document IIIA, Section 7.3.2). In addition, ethylene oxide is expected to undergo numerous fate processes in soil, including hydrolysis and biodegradation (see Document IIIA, Section 7.2), and the duration and extent of any potential indirect exposure will therefore be extremely short-lived. The estimated K_{oc} value for ethylene oxide is 3.237 L/kg, indicating that it is not strongly adsorbed to soil and is therefore unlikely to accumulate in this compartment. Given this fate profile, there will be no significant short-term exposure of mammals (via inhalation or ingestion in food items). In addition, ethylene oxide is known to be produced from natural sources (CEPA, 2001)[9]. Thus, in some plants, ethylene (a natural plant growth regulator) is degraded to ethylene oxide (Abeles and Dunn, 1985, cited by CEPA, 2001). In this context of natural exposure on potential food items any additional exposure resulting from its use will be negligible.	

[9] CEPA (2001) Priority Substances List Assessment Report: Ethylene Oxide. Canadian Environmental Protection Act, 1999. Environment Canada and Health Canada, Government of Canada.

	Data on short term toxicity to mammals are therefore not required.	
Undertaking of intended data submission [ ]	No undertaking provided; submission of data/information is not considered necessary.	
	Evaluation by Competent Authorities	
	EVALUATION BY RAPPORTEUR MEMBER STATE	
Date	20 January 2020	
Evaluation of applicant's justification	Agree with applicant's view that further data are not required. Data on mammals are considered covered by the section on human health effects.	
Conclusion	Acceptable. No further studies are considered necessary.	
Remarks	-	