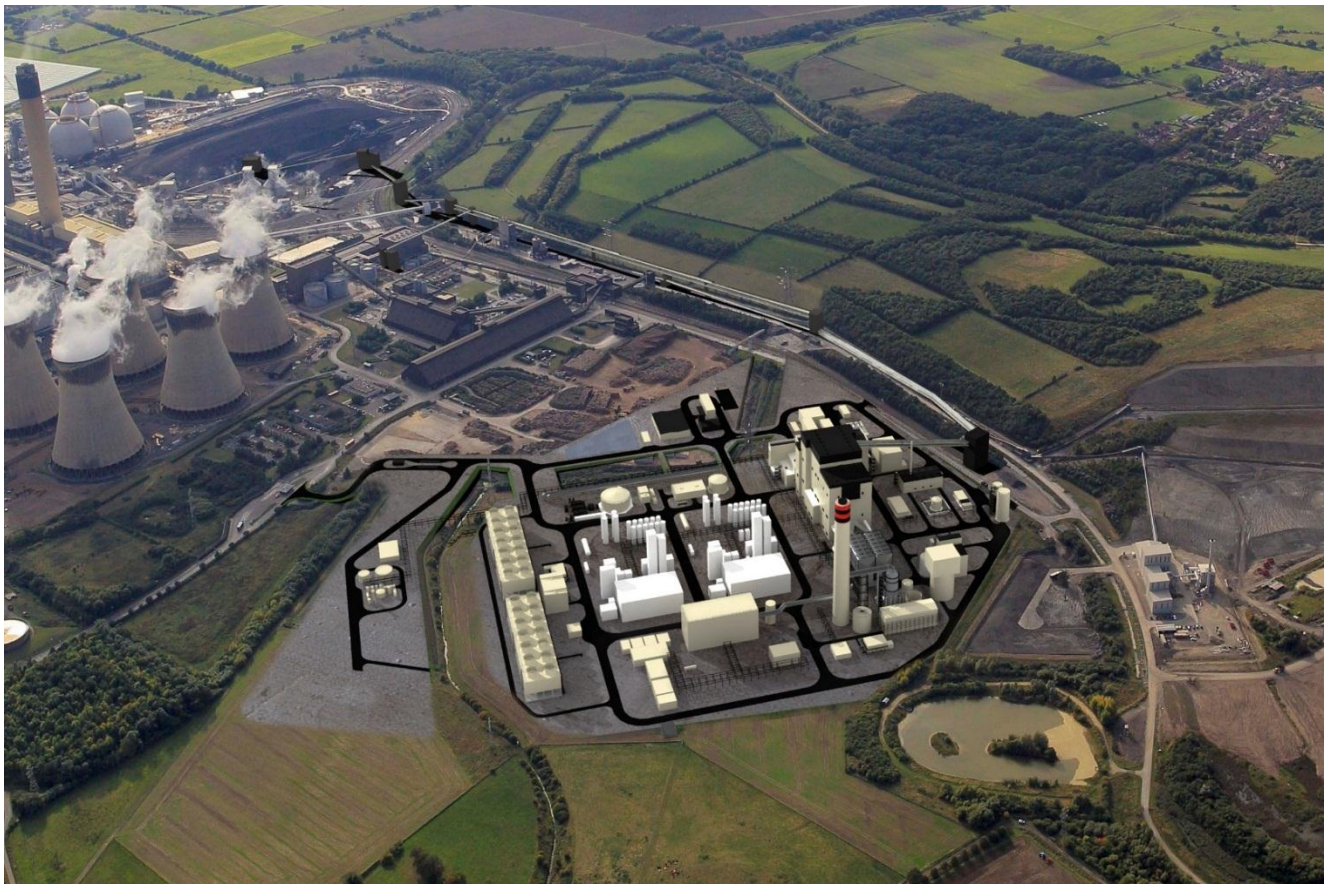
White Rose Carbon Capture and Storage (CCS) Project

Land Adjacent to and within the Drax Power Station Site, Drax, Near Selby, North Yorkshire

Environmental Permit
Chapter VII – H1 Assessment



Applicant: Drax Power Limited
Date: April 2015

Document Number			
Revision			
Author	Jim Doyle		
Signed	Jim Doyle	**Date**	
Approved By			
Signed		**Date**	
Document Owner			

Revision History			
Revision No.	**Date**	**Reason for Revision**	**Authorised By**

Glossary	
AOD	Above Ordinance Datum
ASU	Air Separation Unit
BS	British Standard
CCS	Carbon Capture and Storage
CEMP	Construction Environmental Management Plan
CPL	Capture Power Limited
dB	Decibel
EA	Environment Agency
EIA	Environmental Impact Assessment
EMS	Environmental Management System
EPC	Engineering, Procurement and Construction
ES	Environmental Statement
FGD	Flue Gas Desulphurisation
FRA	Flood Risk Assessment
GPU	Gas Processing Unit
HGV	Heavy Goods Vehicle
LWS	Local Wildlife Site
MWe	Megawatt
NERC	Natural Environment and Rural Communities (Act 2006)
NSIP	Nationally Significant Infrastructure Project
NYCC	North Yorkshire County Council
PEIR	Preliminary Environmental Information Report
SAC	Special Area of Conservation
SINC	Site of Importance for Nature Conservation
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
WHO	World Health Organisation
WSI	Written Scheme of Investigation

CONTENTS

1.0 INTRODUCTION

Capture Power Ltd (CPL) plans to construct a new 448 MWe (gross output) ultra-super critical coal fired power station. The Project will have the capacity to provide electricity sufficient for 630,000 households whilst capturing two million tonnes of carbon dioxide (CO_2) per year arising from the combustion process (approximately 90% of CO_2 emissions generated by the plant). The generating station and the means to capture CO_2 together comprise the White Rose Carbon Capture and Storage (CCS) Plant.

The Project is a key part of the UK's development and commercialisation of CCS, which the Government is supporting through over £1billion of capital and research and development funding. Additionally, the Project will support the development of a CO_2 transmission pipeline (a separate project developed by National Grid Carbon Ltd (NGCL)) which it is hoped will, in the future, be used by other industries and power stations in the Yorkshire and Humber area to transport their CO_2 emissions for permanent storage in the North Sea in geological features.

The application site (henceforth the 'Project site') is located on land adjoining the existing Drax Power Station in North Yorkshire, England. CO_2 captured will not be stored on site as the Project will link to a CO_2 transport and storage solution as noted above. The Project is in line with Government strategies (for instance the CCS Roadmap (1)) for controlling the construction / operation of new electrical generation infrastructure whilst meeting carbon reduction targets for the energy sector in the UK.

A separate Development Consent Order has been submitted to The Planning Inspectorate and was 'Accepted for Examination' on 17 December 2015 but did not include application for a deemed Environmental Permit. Due to the proposed activities of White Rose Carbon Capture and Storage it has been agreed with the Environment Agency that the current Drax Power Limited Environment Permit (VP3530LS) can be varied to accommodate the operations of the White Rose Carbon Capture and Storage Plant.

This Environmental Permit application is made in order to make a variation to the existing Drax Power limited Environment Permit (VP3530LS). The application forms and the associated chapters form the application for a variation to the Environmental Permit which will seek to add the activities of the White Rose Carbon Capture and Storage project to the existing Drax Power Limited Environmental Permit.

2.0 AIR MODE H1 ASSESSMENT

3.0 OXY MODE H1 ASSESSMENT

H1

Welcome to the H1 Software

Version 2.7.2- CONSULTATION VERSION - October 201

If you find the screen fonts in the H1Tool too small to read you can use the Windows zoom feature at any time to magnify the screen by holding down the 'Windows' key and '+' key. To cancel the feature hold down the 'Windows' key and 'Esc' key.

Introduction

This version of the tool accompanies the Horizontal Guidance Note H1 and the eleven supporting technical annexes.

Important Notes:

With the exception of Annex I (Landfill) and Annex J (Groundwater) this software tool can be used to complete risk assessments within the technical annexes which support H1. However, further information may need to be provided in the following areas:

- detailed assessment of fate and effects, where required
- decision-making trails for the comparison and ranking of options

This software provides a general structure for assessing costs and environmental impacts. You may need to decide the best way to apply this structure to fit the nature and pattern of your operation, in particular:

- where load is variable, such as seasonal or demand-led operations
- where a number of processes are conducted at the same time, such as integrated operations
- where a number of products are made, with possible differences in unit operations and release points employed
- where fugitive or potential emergency releases are of particular interest

Information in this database will be used to determine your EPR permit, therefore to get the most from this software tool, you should:

- read the H1 Overview document, to understand the basic principles, module structure and methods
- use the HELP boxes and refer to the H1 guidance as you progress to ensure that the data you input is representative and accurate
- use the comments boxes to clarify assumptions and data sources

This software will also output annual emissions data to an OPRA profile(s), which you can select on the Summary Tables page.

Some basic instructions for using the software tool are provided on our web site at:
http://environment-agency.resultspage.com/search?p=Qts=ev2w=H1

Related pages on our web site including annexes

ENVIRONMENT AGENCY

In conjunction with:

www.ability-software.co.uk

Facility Reference Information

Please complete the following information:

Company Name: Drax Power Limited

Location: White Rose on Land Adjacent to Drax Power Station

Permit Number:

If you have data already stored in a previous version of the H1 software you may import it by pressing the button to the right.

Import Utility

Please note that before the import can take place any data that already exists in this copy of the tool will be removed. Please also note that any 'Operating Mode' information you had entered in your Air and Water inventories will defer to the default of 100% on data import

NOTE ON MICROSOFT ACCESS SECURITY WARNING
Depending on your security settings, you may get a security notice appearing each time the import routine connects to a table in your source database. You need to click 'Open' on this message for the Import routine to be successful. There are 18 tables to connect to in total but if you place your cursor over the 'Open' button you will be able to repeatedly click your mouse to make this process execute quickly and without too much frustration. We apologise for this inconvenience but it is an aspect of Microsoft Security provisions that are beyond our control.

Introduction to Step 1

Step 1: Describe the Scope and Options

The aim of this step is to:

- state the OBJECTIVES of the assessment

- in the case of ENVIRONMENTAL ASSESSMENT of the whole facility, describe the scope of the activities to be included in the assessment;

- in the case of OPTIONS APPRAISALS, identify candidate options for BAT by considering all relevant techniques to prevent and minimise pollution and the scope of activities covered by the techniques.

Depending on the reason for the assessment, you will need to complete different modules of the guidance. The software will automatically select the required modules according to the responses you enter.

NOTE: If you are going to complete more than one assessment or appraisal, make sure that you create a copy of the H1 file for each new assessment BEFORE you begin to input data. This is because Microsoft Access automatically saves changes to the current file you are using, rather than allowing you to save your changes at the end of your work.

TO CONTINUE WITH STEP 1, PRESS "NEXT".

Describe the Objectives

Depending on the reason for the assessment you will need to complete different parts of the tool.

Select the type of assessment:

◉ a)	to carry out an ENVIRONMENTAL ASSESSMENT of the releases resulting from the facility as a whole	Do Steps 1, 2 and 3 only
○ b)	to conduct a costs/benefits OPTIONS APPRAISAL to determine BAT or support the case for derogation under the Industrial Emission Directive.	Do Steps 1,2, 3 and 4 and continue with 5 and 6 if necessary

1.1 Briefly summarise the objectives and reason for the assessment in terms of the main environmental impacts or emissions to be controlled:

Assessment of emissions from the White Rose Carbon Capture and Storage Facility Operating in Oxy Mode (Capture - mode).

Scope of Environmental Assessment

List the activities included in the assessment

Number	Activity
1	Emissions of Flue Gas to Atmosphere
2	Emissions of Process Waters

Use the 'Add' button at the bottom left to create a new activity

Comments

Describe the Candidate Options

Identify all reasonably applicable options of techniques

You should include:

a) a brief description of individual control measures or configurations of control measures seleted for each option, and the activities with which they are associated (the existing base-case may conveniently be the first option).

b) justification why any techniques generally applicable to the regulated facility have not been selected for assessment. (see relevant H1 annex) (This should be based on regulated facility-specific technical, not economic reasons).

c) for new projects, whether any initial environmental assessment that was done at the project evaluation stage, or any screening of technology or process routes prior to this assessment, particularly where this has a bearing on environmental performance. (see H1)

In the case of b) or c)
please enter your Comments here:

Option Number	Title	Description
1	Base-Case	Assessment of emissions to atmosphere and cooling and process waters from White Rose CCS project operating in Oxy mode (Capture mode).

Once a series of options have been generated for the proposed project, it is recommended that the Operator discuss these with the local Regulator to check both parties agree that the options are satisfactory. This may save the Operator from spending resources on assessment of options which are unlikely to meet the required environmental performance.

List the main activity or activities to which the release control options are applicable and any other activities that will be affected by the candidate control option on the main activity:

Introduction to Step 2

Step 2: Emissions Inventory

The aim of this Step is to produce an inventory of sources and releases of polluting substances from each option. This is used as the basis for the subsequent evaluation of environmental impacts.

For this Step you will require information on:

- release points and sources of emissions to air, water (inc. sewer) or land

- concentration and mass rate of released substances

- frequency and duration of releases and how these relate to long term and short term effects

IMPORTANT NOTES

- you may need to consider a suitable method for assessment of groups of pollutants, such as VOCs, heavy metals, uncharacterised liquid effluents, etc (see "Grouping air emissions" in Annex F).

TO CONTINUE WITH STEP 2, PRESS "NEXT".

Air Release Points

Please define your Release Points for Releases to Air

Are there any Air emissions? Yes

Number	Description	Location or Grid Reference	Activity or Activities	Effective Height metres	Efflux Velocity m/s	Total Flow m3/hr
1	A3	WRCCS stack	Combustion	120	17.62	56994
2	A4	Aux Boiler Stack	Combustion	50	15	54000

Comments

Air Emissions Inventory

Please list all Substances released to Air for each Release Point identified in the previous page.

Number	Substance	Meas'ment Method	Operating Mode (% of	Data relating to Long Term effects			Data relating to Short Term effect			Annual Rate	ELV Conc.
				Conc. mg/m3	Release Rate g/s	Meas'ment Basis	Conc. mg/m3	Release Rate g/s	Meas'ment Basis	tonne/yr	mg/m3
1	Sulphur Dioxide (15 Min Mean)	Estimated*	100.0%	38.3	0.606353		38.3	0.606353	15 Min Mean	19.1219	
2	Sulphur Dioxide (1 Hour Mean)	Estimated*	100.0%	38.3	0.606353		38.3	0.606353	1 Hr Mean	19.1219	
3	Sulphur Dioxide (24 Hour Mean)	Estimated*	100.0%	38.3	0.606353		38.3	0.606353	24 Hr Mean	19.1219	
4	Nitrogen Dioxide	Estimated*	100.0%	79.6	1.260201		220.0	3.482967		39.7417	
5	Nitrogen Dioxide (Ecological - Daily Mean)	Estimated*	100.0%	79.6	1.260201		220.0	3.482967	Daily Mean	39.7417	
6	Particulates (PM10) (Annual Mean)	Estimated*	100.0%	15.8	0.250140		15.9	0.251724	24 hr Mean	7.8884	
7	Carbon monoxide	Estimated*	100.0%	947.5	########					473.0409	
8	Hydrogen chloride	Estimated*	100.0%	0.1	0.000950					0.0300	
9	Hydrogen fluoride (as F) (Ecological - Daily Mean)	Estimated*	100.0%	0.1	0.000950				Daily Average	0.0300	
10	Hydrogen fluoride (as F) (Ecological - Weekly Mean)	Estimated*	100.0%	0.1	0.000950				Weekly Average	0.0300	
11	Hydrogen fluoride (as F) (Monthly Mean)	Estimated*	100.0%	0.1	0.000950	Monthly Average				0.0300	
12	Arsenic and compounds (as As)	Estimated*	100.0%	0.5	0.007916					0.2496	
13	Cadmium and its compounds (as Cd)	Estimated*	100.0%	0.0	0.000475					0.0150	
14	Chromium, chromium (II) compounds and chromium (III) compounds as Cr	Estimated*	100.0%	0.2	0.002533					0.0799	
15	Chromium (VI) compounds (as Cr)	Estimated*	100.0%	0.0	0.000507					0.0160	
16	Copper dusts and mists (as CU)	Estimated*	100.0%	0.2	0.003641					0.1148	
17	Lead	Estimated*	100.0%	0.3	0.004433					0.1398	
18	Mercury and compounds, except mercury alkyls, (as	Estimated*	100.0%	0.0	0.000158					0.0050	
19	Nickel (total Ni compounds in the PM10 fraction)	Estimated*	100.0%	0.6	0.008866					0.2796	
20	Selenium and compounds, except	Estimated*	100.0%	5.2	0.082008					2.5862	

	hydrogen selenide (as Se)										
21	Vanadium	Estimated*	100.0%	0.4	0.006016					0.1897	
22	Ammonia (human health receptor)	Estimated*	100.0%	8.8	0.139002					4.3836	
23	Ammonia (ecological receptor - Sensitive Lichens)	Estimated*	100.0%	8.8	0.139002					4.3836	

Measurement method: * provide detail in comments box

Comments: Auxilliary boiler will operate whilst ASU is coming down in temperature which would take a maximum of 72 hours. In-combination effects have been checked as part of the DCO application when operating both the boiler in oxy mode and the auxilliary boiler.

Air Emissions Inventory

Please list all Substances released to Air for each Release Point identified in the previous page.

Number	Substance	Meas'ment Method	Operating Mode (% of	Data relating to Long Term effects			Data relating to Short Term effect			Annual Rate	ELV Conc.
				Conc. mg/m3	Release Rate g/s	Meas'ment Basis	Conc. mg/m3	Release Rate g/s	Meas'ment Basis	tonne/yr	mg/m3
1	Sulphur Dioxide (15 Min Mean)	Estimated*	100.0%	151.0	2.265000				15 Min Mean	71.4290	
2	Nitrogen Dioxide	Estimated*	100.0%	199.0	2.985000					94.1350	
3	Particulates (PM10) (Annual Mean)	Estimated*	100.0%	100.0	1.500000				24 hr Mean	47.3040	
4	Carbon monoxide	Estimated*	100.0%	149.0	2.235000					70.4830	

Measurement method: * provide detail in comments box

Comments: Auxilliary boiler will operate whilst ASU is coming down in temperature which would take a maximum of 72 hours. In-combination effects have been checked as part of the DCO application when operating both the boiler in oxy mode and the auxilliary boiler.

Receiving Water Body(s)

Please define the Final Discharge Locations for Releases to Water

Are there any discharges to surface waters? Yes

Use the 'Add' button below to list all final discharge points.
For discharges to sewer, this should be the point where the sewage works discharges to a surface water

N.B. For Riverine discharges (River, Upper Estuary) you only need enter the River description and flow once. Further details of individual releases can be entered on the next page. For discharges to TRaC waters, seperate Discharge Locations must be added for each release point that has a different mixing zone

Number	Description	Final Discharge Category	Freshwater Q95 flow rate	
1	Discharge into Drax Purge System and thence to	R	River Flow (m3/s):	85

Water Discharge/Release Details and Flow Data

Please define your Release Points for Releases to Water

Number	Description	Location or Grid Reference	Activity or Activities	Final Discharge Point		Discharge via Sewer?	Mean Effluent Flow Rate* m3/s	Max Effluent Flow Rate* m3/s
1	Combined flow CW/Process effluents	Drax Purge	Treated water into Drax Purge system	1	Discharge into Drax Purge System and thence to Ous	No	0.1300	0.1300

Comments: Assumptions made that Drax power station is not operating and hence discharge would enter river undiluted by Drax CW system which would significantly dilute the final discharge into the River Ouse. The assessment therefore assumes a direct discharge into the river which generates a worst case scenario.

* When operating

Release Concentrations of Substances Present in Discharges to Water

Please list all Substances released to Water for each Release Point identified in the previous page.

Which type of assessment method are you using? (See help box & H1 Annex D for information)

Continue with the method below.

Method: Chemical Specific

Reference:

Number	Substance	Meas'ment Method	Operating Mode (% of	Average Concentration in the Effluent (AA)		Maximum Concentration in the Effluent (Max)			Annual Rate	Significant Load (PHS Only)
				Conc. µg/l	Meas'ment Basis	Conc. µg/l		Meas'ment Basis	kg/yr	kg/year
1	Chloride	Estimated	100.0%	1485000	Annual Avg		X		6088024.8	
2	Sulphate	Estimated	100.0%	472000	Annual Avg		X		1935048.96	
3	Fluoride (> 50mg/l CaCO3) (dissolved)	Estimated	100.0%	111000	Annual Avg		X		455064.48	
4	Chlorine (95%ile)		100.0%	390	Annual Avg		X		1598.8752	
5	Ammonia CaCO3 >50mg/l (90 %ile)		100.0%	438	Annual Avg		X		1795.65984	3
6	Arsenic		100.0%	7	Annual Avg		X		28.69776	
7	Boron		100.0%	33300	Annual Avg		X		136519.344	
8	Cyanide		100.0%	204	Annual Avg		X		836.33472	
9	Cadmium and its compounds (100 - <200 mg/l CaCO3)		100.0%	11	Annual Avg		X		45.09648	5
10	Chromium III (95%ile) (dissolved)		100.0%	113	Annual Avg		X		463.26384	
11	Copper (100-250mg/l CaCO3) (dissolved)		100.0%	120	Annual Avg		X		491.9616	

12	Iron		100.0%	690		Annual Avg		X		2828.7792		
13	Lead and it's compounds		100.0%	25		Annual Avg		X		102.492		
14	Mercury and its compounds		100.0%	1		Annual Avg		X		4.09968		1
15	Nickel and its compounds		100.0%	337		Annual Avg		X		1381.59216		
16	Silver		100.0%		X	Annual Avg		X				
17	Tin (inorganic)		100.0%	442		Annual Avg		X		1812.05856		
18	Vanadium (0 - 200 mg/l CaCO3)		100.0%	8		Annual Avg		X		32.79744		
19	Zinc (Water Hardness 100-250mg/l)		100.0%	234		Annual Avg		X		959.32512		

Comments

Water Temperature

Where relevant, please enter temperature of effluent for each release point.

This table is to check that the effluent is acceptable, i.e. within the required temperature range. It is not used to make relative judgement between options.

Discharge Location	Release Point	Measurement Method	High Normal Rate	High Peak Rate	Max Temp. Difference	Benchmarks: Max Summer	Benchmarks: Max Winter	Benchmarks: Max Temp
1 Discharge into Drax Purg	1 Combined flow CW/Proc	Estimated*	25	30	########	21.5	10	2

Comments

Water pH

Where relevant, please enter pH of effluent for each release point.

This table is to check that the effluent is acceptable, i.e. within the required pH range. It is not used to make relative judgement between options.

Discharge Location	Release Point	Measurement Method	High Normal Rate	High Peak Rate	Low Normal Rate	Low Peak Rate	pH of Receiving Water	Do artificial variations caused by effluent exceed 0.5pH units?
1 Discharge into Drax Purg	1 Combined flow CW/Proc	Estimated*	9	9	6	6		No

Comments

Energy Consumption

Please list all Energy Sources and Annual Consumption

Select energy sources by Clicking on 'Add' and using the pull-down list.

Number	Energy Sources		Delivered MWh/yr	Conversion Factor	Primary MWh/yr	CO2 Factor	CO2 tonne/yr
1	Coal	direct emissions	3924480	1.00	3,924,480	0.30	1,177,344

Comments: The calculation being applied by the H1 tool does not take account of the fact that the plant is a CCS plant.

Raw Materials

Please list all Raw Materials Consumed:

Number	Material	Annual Consumption	Units
1	Non-potable Water	10266720	tonnes/year
2	Potable Water	3285	tonnes/year
3			

Comments: 1. Assumption of non-potable water consumption of 1500 m3/hr

Waste Inventory

Please list all Waste Streams emitted:

Are there any Waste emissions? Yes

Number	Waste Stream	Mass tonne/yr	Category of Waste	Disposal/Recovery Option
1	Activated Carbon - mercury removal	90	stable non-reactive hazardous was	Other Recycling (R3:R4:R5:R11 and R12
2	Desiccant - flue gas driers	28	other non-hazardous	Other Recycling (R3:R4:R5:R11 and R12
3	Sludge waste from water treatment process	6,000	other non-hazardous	Release into water and lagoons D4:D6 or
4	Ash	230,000	other non-hazardous	Permanent Storage D10 or D3

Comments

Introduction to Step 3

Step 3: Quantify Impacts

The aim of this Step is to quantify the effects on the environment of the releases listed in the inventory in Step 2. The guidance provides methods for assessing the eight main environmental considerations of most relevance to the EPR regime. Your releases may not result in effects to all eight of these considerations, and this tool allows you to screen out any that are not relevant.

The emissions you entered in Step 2 are automatically brought forward for assessment into each environmental consideration that is relevant for that type of release (e.g. a release may have more than one type of effect).

This part of the tool allows you to screen out any releases that are insignificant, and to identify those releases where further, detailed assessment of the potential environmental impact may be required.

IMPORTANT NOTE

This software tool only completes part of the requirements for Step 3, as described above. Depending upon the degree of risk to the environment presented by the releases, the operator may need to do further, detailed assessment of the potential effects using methodologies that are not provided here. This information should be submitted separately, as indicated within this part of the tool.

TO CONTINUE WITH STEP 3, PRESS "NEXT".

Identify Relevant Impacts

Identify any environmental impacts that are not relevant to this assessment by deselecting from the list below:

Releases in Part 2?			Justification for omission
Yes	☑	Air	
Yes	☑	Deposition from Air to Land	
Yes	☑	Water	
No	☐	Odour	
Yes	☑	Waste	
Yes	☑	Visual	
Yes	☑	Ozone Creation	
Yes	☑	Global Warming	

If you have deselected an environmental impact as not relevant to this assessment,
no further assessment of this impact will be carried out

Local Environmental Quality

Describe the Quality of the Environment:

Provide a brief description of the main local factors that may influence the importance of the impact of emissions in the surrounding environment

Air Quality

Are there any Environmental Quality Standards relating to substances released from the activities, which may be at risk due to additional contribution from the activity ? (Environmental Quality Standards for air and water are described in EPR Technical Guidance Notes)	Following analysis undertaken and detailed air quality modelling, no.
Are there any Local Air Quality Management Plans applicable to releases from the activity?	

Water Quality & Resources

Are there any Environmental Quality Standards relating to substances released from the activities, which may be at risk due to additional contribution from the activity?	No.
Are proposals to abstract water satisfactory in order to obtain an abstraction licence?	
Is the activity located in a groundwater vulnerable zone (for activities with direct releases to land only)?	

Proximity to Sensitive Receptors

Is public annoyance likely to be an issue for noise, odour or plume visibility ?	No.
Are there any wildlife habitats, eg Special Areas of Conservation,or Special Protection Areas, likely to be affected by releases from the activity? (Description of requirements of Habitats Directive is provided in EPR Technical Guidance Notes)	No.

Air Impacts

Calculate Process Contributions of Emissions to Air

This table estimates the Process Contribution (PC), calculated as the maximum ground level concentration for each emission listed in the inventory, according to the release point parameters input earlier. If you have more accurate data obtained through dispersion modelling, this may be entered as indicated and will be used instead of the estimated PC.

		Long Term			Short Term		
Number	Substance	EAL µg/m3	PC µg/m3	* Modelled PC µg/m3	EAL µg/m3	PC µg/m3	Modelled PC µg/m3
1	Sulphur Dioxide (15 Min Mean)		1.23	55	266	74.4	3.46
2	Sulphur Dioxide (1 Hour Mean)		0.0517	48.5	350	4.10	2.44
3	Sulphur Dioxide (24 Hour Mean)		0.0517	19.5	125	4.10	0.505
4	Nitrogen Dioxide	40	1.66		200	116	2.21
5	Nitrogen Dioxide (Ecological - Daily Mean)	30	0.108		75	23.6	0.728
6	Particulates (PM10) (Annual Mean)	40	0.802	0.0227		48.3	
7	Carbon monoxide		2.45		10000	171	83.9
8	Hydrogen chloride		0.00008093		750	0.00643	0.00843
9	Hydrogen fluoride (as F) (Ecological - Daily Mean)		0.00008093		4.9	0.00643	0.00843
10	Hydrogen fluoride (as F) (Ecological - Weekly Mean)		0.00008093		0.49	0.00643	0.00843
11	Hydrogen fluoride (as F) (Monthly Mean)	16	0.00009385		160	0.00643	
12	Arsenic and compounds (as As)	0.003	0.000675	0.000727		0.0536	
13	Cadmium and its compounds (as Cd)	0.005	0.00004047	0.0000364		0.00322	
14	Chromium, chromium (II) compounds and chromium (III) compounds as Cr	5	0.000216	0.000227	150	0.0172	0.0211
15	Chromium (VI) compounds (as Cr)	0.0002	0.00004316	0.0000123		0.00343	
16	Copper dusts and mists (as CU)	10	0.000311	0.000327	200	0.0247	0.0304
17	Lead	0.5	0.000378	0.000409		0.0300	
18	Mercury and compounds, except mercury alkyls, (as	0.25	0.00001349	0.0000136	7.5	0.00108	0.00126
19	Nickel (total Ni compounds in the PM10 fraction)	0.02	0.000756	0.0008		0.0600	
20	Selenium and compounds, except hydrogen selenide (as Se)	1	0.00699	0.00745	30	0.555	
21	Vanadium	5	0.000513	0.000545	1	0.0407	0.00803
22	Ammonia (human health receptor)	180	0.0119	0.0126	2500	0.940	1.17
23	Ammonia (ecological receptor - Sensitive Lichens)	1	0.0119	0.0126		0.940	1.17

Note that the Process Contribution shown for each substance is the sum of the individual process contributions of each point from which the substance is emitted. Process Contributions obtained from modelling data should incorporate all relevant release points and flow conditions.

* State the location of any detailed air dispersion modelling and also the main assumptions:	Comments

Air Impact Screening

Screen out Insignificant Emissions to Air

This page displays the Process Contribution as a proportion of the EAL or EQS. Emissions with PCs that are less than the criteria indicated may be screened from further assessment as they are likely to have an insignificant impact.

Number	Substance	Long Term EAL	Short Term EAL	Long Term			Short Term		
				PC	% PC of EAL	> 1% of EAL?	PC	% PC of EAL	> 10% of EAL?
		µg/m3	µg/m3	µg/m3	%		µg/m3	%	
1	Sulphur Dioxide (15 Min Mean)	-	266	55.0	-		3.47	1.31	No
2	Sulphur Dioxide (1 Hour Mean)	-	350	48.6	-		2.44	0.698	No
3	Sulphur Dioxide (24 Hour Mean)	-	125	19.6	-		0.506	0.405	No
4	Nitrogen Dioxide	40.0	200	1.66	4.15	Yes	2.21	1.11	No
5	Nitrogen Dioxide (Ecological - Daily Mean)	30.0	75.0	0.108	0.358	No	0.729	0.971	No
6	Particulates (PM10) (Annual Mean)	40.0	-	0.0228	0.0568	No	48.3	-	
7	Carbon monoxide	-	10,000	2.45	-		84.0	0.840	No
8	Hydrogen chloride	-	750	0.00008093	-		0.00844	0.00113	No
9	Hydrogen fluoride (as F) (Ecological - Daily Mean)	-	4.91	0.00008093	-		0.00844	0.173	No
10	Hydrogen fluoride (as F) (Ecological - Weekly Mean)	-	0.491	0.00008093	-		0.00844	1.73	No
11	Hydrogen fluoride (as F) (Monthly Mean)	16.0	160	0.00009385	0.000587	No	0.00643	0.00402	No
12	Arsenic and compounds (as As)	0.00301	-	0.000728	24.3	Yes	0.0536	-	
13	Cadmium and its compounds (as Cd)	0.00500	-	0.00003640	0.728	No	0.00322	-	
14	Chromium, chromium (II) compounds and chromium (III) compounds as Cr	5.00	150	0.000227	0.00454	No	0.0212	0.0141	No

15	Chromium (VI) compounds (as Cr)	0.000201	-	0.00001230	6.16	Yes	0.00343	-	
16	Copper dusts and mists (as CU)	10.00	200	0.000328	0.00328	No	0.0305	0.0153	No
17	Lead	0.501	-	0.000410	0.0819	No	0.0300	-	
18	Mercury and compounds, except mercury alkyls, (as	0.251	7.51	0.00001360	0.00545	No	0.00127	0.0168	No
19	Nickel (total Ni compounds in the PM10 fraction)	0.0201	-	0.000801	4.00	Yes	0.0600	-	
20	Selenium and compounds, except hydrogen selenide (as Se)	1.000	30.0	0.00746	0.746	No	0.555	1.85	No
21	Vanadium	5.00	1.000	0.000546	0.0110	No	0.00804	0.804	No
22	Ammonia (human health receptor)	180	2,500	0.0127	0.00701	No	1.18	0.0469	No
23	Ammonia (ecological receptor - Sensitive Lichens)	1.000	-	0.0127	1.27	Yes	1.18	-	

Air Impact Modelling

Identify need for Detailed Modelling of Emissions to Air

This page displays the Process Contributions in relation to the backgound pollutant levels and the EAL or EQS. You should use this information to decide whether to conduct detailed modelling. Note that releases that are insignificant are not shown as they are screened from further assessment. Also complete this page if you have already done detailed modelling.

			Long Term				Short Term	
Number	Substance	Air Bkgrnd Conc. µg/m3	PC µg/m3	% PC of headroom (EAL -	PEC mg/m3	% PEC of EAL %	PC µg/m3	% PC of headroom (EAL - Bkgrnd)
4	Nitrogen Dioxide	17.5	1.66	7.38	19.2	47.9	2.21	1.34
12	Arsenic and compounds (as As)	0.0006	0.000728	30.3	0.00133	44.3	0.0536	-
15	Chromium (VI) compounds (as Cr)	0.00015	0.00001230	24.6	0.000163	81.2	0.00343	-
19	Nickel (total Ni compounds in the PM10 fraction)	0.0006	0.000801	4.13	0.00141	7.00	0.0600	-
23	Ammonia (ecological receptor - Sensitive Lichens)	2.18	0.0127	-1.06	2.20	219	1.18	-

Air Impact Modelling Assessment

See guidelines in H1 Annex F section entitled "Decide if you need detailed air modelling.

Describe here the justification for whether detailed modelling is, or is not required for any of the releases. Refer to the quidelines in H1 Annex F	Detailed modelling was undertaken for both modes of operation, air and oxy modes.
Describe source of background information:	Baseline data is presented in table XXXXX
Document Reference of detailed modelling work:	Detailed modelling work has been presented as part of the projects DCO submission.

Deposition to Land from Air

With reference to H1 Guidance, describe assessment of deposition below:

Number	Substance	% PC of EAL %	Decision whether to screen as insignificant: Insignificant?	Reason (See section "Deposition of air emissions onto land/Screen out insignificant emissions" of Annex F in H1).
1	Sulphur Dioxide (15 Min Mean)	-	Yes	Review of the data demonstrates that for SO2 emissions at ecological receptors, all locations screen out as insignificant with the PC<1% of the EAL.
2	Sulphur Dioxide (1 Hour Mean)	-	Yes	Review of the data demonstrates that for SO2 emissions at ecological receptors, all locations screen out as insignificant with the PC<1% of the EAL.
3	Sulphur Dioxide (24 Hour Mean)	-	Yes	Review of the data demonstrates that for SO2 emissions at ecological receptors, all locations screen out as insignificant with the PC<1% of the EAL.
4	Nitrogen Dioxide	4.15	Yes	PC<1% of EAL and therefore insignificant.
5	Nitrogen Dioxide (Ecological - Daily Mean)	0.358	Yes	PC<1% of EAL and therefore insignificant.
6	Particulates (PM10) (Annual Mean)	0.0568	Yes	PC<1% of EAL and therefore insignificant.
7	Carbon monoxide	-	Yes	PC for Carbon Monoxide is <1% of the AQS.
8	Hydrogen chloride	-	Yes	PC and PEC both less than 1% of the AQS.

9	Hydrogen fluoride (as F) (Ecological - Daily Mean)	-	Yes	HF <1% of AQS at all receptors (Daily mean).
10	Hydrogen fluoride (as F) (Ecological - Weekly Mean)	-	No	HF PC <1% of AQS at all receptors (Daily mean).
11	Hydrogen fluoride (as F) (Monthly Mean)	0.000587	Yes	HF PC<1% of EAL and therefore insignificant (Weekly mean)
12	Arsenic and compounds (as As)	24.3	Yes	PEC < 70% of AQS and therefore insignificant.
13	Cadmium and its compounds (as Cd)	0.728	Yes	PC<1% of EAL and therefore insignificant.
14	Chromium, chromium (II) compounds and chromium (III) compounds as Cr	0.00454	Yes	
15	Chromium (VI) compounds (as Cr)	6.16	Yes	The approach taken with Cr (VI) has been to use a very conservative estimate based on 20% of the total Chromium concentration being hexavalent (This corresponds with EA guidance for municipal waste incinerators). Data appears to show that this estimate ge
16	Copper dusts and mists (as CU)	0.00328	Yes	PC<1% of EAL and therefore insignificant.
17	Lead	0.0819	Yes	PC<1% of EAL and therefore insignificant.
18	Mercury and compounds, except mercury alkyls, (as	0.00545	Yes	PC<1% of EAL and therefore insignificant.

19	Nickel (total Ni compounds in the PM10 fraction)	4.00	Yes	PEC<70% of AQS
20	Selenium and compounds, except hydrogen selenide (as Se)	0.746	Yes	PC <1% of AQS
21	Vanadium	0.0110	Yes	PC<1% of EAL and therefore insignificant.
22	Ammonia (human health receptor)	0.00701	Yes	PC<1% of EAL and therefore insignificant.
23	Ammonia (ecological receptor - Sensitive Lichens)	1.27	Yes	Review of the data demonstrates that for ammonia emissions at ecological receptors, all locations screen out as insignificant with the PC<1% of the EAL.

For those emissions not screened as insignificant, describe the location of any further assessment here:

Water Impacts - Fresh Water Releases

Apply Test 1 (See Guidance) and Calculate Process Contributions of Emissions to Water

This table applies Test 1 and also estimates the Process Contribution for Freshwater releases, this is calculated after dilution into the relevant surface water type for each emission to water listed in the inventory, according to the release point parameters input earlier. If you have more accurate data obtained through dilution modelling, this may be entered as indicated and will be used instead of the estimated PC. Any releases which 'Pass' Test 1 are screened out at this point.

Substance	Annual Avg EQS			MAC EQS		
	Release µg/l	EQS µg/l	Release conc < 10% EQS Test 1	Release µg/l	MAC µg/l	Release conc < 10% EQS Test 1
[Combined flow CW/Process effluents] Ammonia CaCO3 >50mg/l (90 %ile) (Discharge into Drax Purge System and thence to Ous)	438.0000	200.0000	Fail			N/A
[Combined flow CW/Process effluents] Arsenic (Discharge into Drax Purge System and thence to Ous)	7.0000	50.0000	Fail			N/A
[Combined flow CW/Process effluents] Boron (Discharge into Drax Purge System and thence to Ous)	33300.0000	2000.0000	Fail			N/A
[Combined flow CW/Process effluents] Cadmium and its compounds (100 - <200 mg/l CaCO3) (Discharge into Drax Purge System and thence to Ous)	11.0000	0.1500	Fail		0.9	Fail
[Combined flow CW/Process effluents] Chloride (Discharge into Drax Purge System and thence to Ous)	##########	##########	Fail			N/A
[Combined flow CW/Process effluents] Chlorine (95%ile) (Discharge into Drax Purge System and thence to Ous)	390.0000	2.0000	Fail		5	Fail
[Combined flow CW/Process effluents] Chromium III (95%ile) (dissolved) (Discharge into Drax Purge System and thence to Ous)	113.0000	4.7000	Fail		32	Fail
[Combined flow CW/Process effluents] Copper (100-250mg/l CaCO3) (dissolved) (Discharge into Drax Purge System and thence to Ous)	120.0000	10.0000	Fail			N/A
[Combined flow CW/Process effluents] Cyanide (Discharge into Drax Purge System and thence to Ous)	204.0000	1.0000	Fail		5	Fail
[Combined flow CW/Process effluents] Fluoride (> 50mg/l CaCO3) (dissolved) (Discharge into Drax Purge System and thence to Ous)	##########	5000.0000	Fail		15000	Fail
[Combined flow CW/Process effluents] Iron (Discharge into Drax Purge System and thence to Ous)	690.0000	1000.0000	Fail			N/A
[Combined flow CW/Process effluents] Lead and it's compounds (Discharge into Drax Purge System and thence to Ous)	25.0000	7.2000	Fail			N/A
[Combined flow CW/Process effluents] Mercury and its compounds (Discharge into Drax Purge System and thence to Ous)	1.0000	0.0500	Fail		0.07	Fail

[Combined flow CW/Process effluents] Nickel and its compounds (Discharge into Drax Purge System and thence to Ous)	337.0000	20.0000	Fail			N/A
[Combined flow CW/Process effluents] Silver (Discharge into Drax Purge System and thence to Ous)		0.0500	Fail		0.1	Fail
[Combined flow CW/Process effluents] Sulphate (Discharge into Drax Purge System and thence to Ous)	##########	##########	Fail			N/A
[Combined flow CW/Process effluents] Tin (inorganic) (Discharge into Drax Purge System and thence to Ous)	442.0000	25.0000	Fail			N/A
[Combined flow CW/Process effluents] Vanadium (0 - 200 mg/l CaCO3) (Discharge into Drax Purge System and thence to Ous)	8.0000	20.0000	Fail			N/A
[Combined flow CW/Process effluents] Zinc (Water Hardness 100-250mg/l) (Discharge into Drax Purge System and thence to Ous)	234.0000	75.0000	Fail			N/A

Note that the Process Contribution shown for each substance is the sum of the individual process contributions of each point from which the substance is emitted.
Process Contributions obtained from modelling data should incorporate all relevant release points and flow conditions.

* If you have valid dispersion modelling data available - please enter it here

Comments

Water Impact Screening - Fresh Water Releases

Apply Test 2

This page applies Test 2 and displays the Process Contribution as a proportion of the EQS. Emissions with PCs that are less than 4% of the EQS can be screened from further assessment as they are likely to have an insignificant impact.

Substance	Annual Avg EQS µg/l	PC µg/l	Modelled PC	% PC of EQS %	PC < 4% of EQS? Test 2	MAC EQS µg/l	PC µg/l	Modelled PC	% PC of MAC %	PC < 4% of MAC? Test 2
	Annual Avg EQS					MAC EQS				
Ammonia CaCO3 >50mg/l (90 %ile) (Discharge into Drax Purge System and thence to Ous)	200	0.6689		0.33	Pass				-	Pass
Arsenic (Discharge into Drax Purge System and thence to Ous)	50	0.0107		0.02	Pass				-	Pass
Boron (Discharge into Drax Purge System and thence to Ous)	2000	50.8516		2.54	Pass				-	Pass
Cadmium and its compounds (100 - <200 mg/l CaCO3) (Discharge into Drax Purge System and thence to Ous)	0.15	0.0168		11.20	Fail	0.9			-	Pass
Chloride (Discharge into Drax Purge System and thence to Ous)	250000	2,267.7082		0.91	Pass				-	Pass
Chlorine (95%ile) (Discharge into Drax Purge System and thence to Ous)	2	0.5956		29.78	Fail	5			-	Pass
Chromium III (95%ile) (dissolved) (Discharge into Drax Purge System and thence to Ous)	4.7	0.1726		3.67	Pass	32			-	Pass
Copper (100-250mg/l CaCO3) (dissolved) (Discharge into Drax Purge System and thence to Ous)	10	0.1832		1.83	Pass				-	Pass
Cyanide (Discharge into Drax Purge System and thence to Ous)	1	0.3115		31.15	Fail	5			-	Pass
Fluoride (> 50mg/l CaCO3) (dissolved) (Discharge into Drax Purge System and thence to Ous)	5000	169.5055		3.39	Pass	15000			-	Pass
Iron (Discharge into Drax Purge System and thence to Ous)	1000	1.0537		0.11	Pass				-	Pass
Lead and it's compounds (Discharge into Drax Purge System and thence to Ous)	7.2	0.0382		0.53	Pass				-	Pass
Mercury and its compounds (Discharge into Drax Purge System and thence to Ous)	0.05	0.0015		3.05	Pass	0.07			-	Pass
Nickel and its compounds (Discharge into Drax Purge System and thence to Ous)	20	0.5146		2.57	Pass				-	Pass
Sulphate (Discharge into Drax Purge System and thence to Ous)	400000	720.7800		0.18	Pass				-	Pass
Tin (inorganic) (Discharge into Drax Purge System and thence to Ous)	25	0.6750		2.70	Pass				-	Pass
Vanadium (0 - 200 mg/l CaCO3) (Discharge into Drax Purge System and thence to Ous)	20	0.0122		0.06	Pass				-	Pass
Zinc (Water Hardness 100-250mg/l) (Discharge into Drax Purge System and thence to Ous)	75	0.3573		0.48	Pass				-	Pass

Water Impact Screening (Predicted Environmental Concentration) - Fresh Water Releases

Apply Tests 3 and 4 and identify which releases may need more Detailed Modelling of Emissions/Discharges to Water

This page applies Tests 3, 4a and 4b and displays the Predicted Environmental Concentrations in relation to the backgound pollutant levels and the AA or MAC EQS. Any substances that pass all 3 of these tests can be screened out. Substances failing any of the tests must be modelled. Note that releases that have passed Tests1 and 2 are insignificant are not shown as they are already screened out.

			Annual Avg EQS						MAC* EQS			
Number	Substance	Bkgrnd Conc. µg/l	PC µg/l	PEC µg/l	(PEC - BC)/ EQS	PEC -BC >10% AA EQS **Test 3**	% PEC of EQS %	PEC >100% AA EQS **Test 4a**	PC µg/l	PEC µg/l	% PEC of MAC %	PEC >100% MAC **Test 4b**
9	Cadmium and its compounds (100 - <200 mg/l CaCO3) (Discharge into Drax Purge System and thence to Ous)		0.0168	0		No B	0	No B	-	0	0	No BC
4	Chlorine (95%ile) (Discharge into Drax Purge	0.05	0.596	0.646	29.8%	Fail	32.3	Pass	-	0	0	Pass
8	Cyanide (Discharge into Drax Purge System and thence to Ous)		0.312	0		No B	0	No B	-	0	0	No BC

* MAC = Maximum Allowable Concentration

Describe source of background information or reference to relevant documentation here:

Water Impact - Significant Loads

Identify any releases which constitute a Significant Load.

This page displays any priority substances and calculates whether or not the total annual release constitutes a Significant Load. The annual mass release is calculated by multiplying the mean flow by the mean release concentration. The calculation takes into account your 'Operating Mode' (percentage of the year that the substance/effluent is discharged), if not continuous and also includes your sewage treatment reduction factor for any discharges via sewer. To see the detail, look at the 'Annual Rate(s)' shown on the Water Inventory screen for each each Release Point but note that the figure(s) shown there is before any relevant Sewage Treatment Reduction factor has been applied

Discharge Proportion:	Substance:	Annual Load:	Significant Load for Substance:	Part B Significant Load Test:
		Kg	Kg	
Discharge into Drax Purge System and thence to Ous	Cadmium and its compounds (100 - <200 mg/l CaCO3)	45.09648	5	Fail
Discharge into Drax Purge System and thence to Ous	Mercury and its compounds	4.09968	1	Fail

Water Impact Modelling Assessment

See guidelines in H1 Annex D and respond to the following

Describe here the justification for whether detailed modelling is, or is not required for any of the releases. Refer to the quidelines in H1 Annex D.	

Describe source of background information:

Describe location of detailed modelling work:

Visual Impacts

Assess the visual impacts of plumes generated from the release points

Can ANY of the Options generate a visible plume	Yes
Can any of the release points generate a Visible Plume?	Yes
For what % of daylight hours per year does the Plume extend beyond the facility boundary?:	<5%
Refer to the guidance in Annex A and assign a level of significance:	Insignificant

Provide any supporting evidence below

Visual Impacts

Assess the visual impacts of plumes generated from the release points

Can ANY of the Options generate a visible plume	Yes
Can any of the release points generate a Visible Plume?	No

Photochemical Ozone Creation Impacts

Number	Substance	Annual Rate tonne/yr	POCP Value per tonne	POCP
1	Sulphur Dioxide (15 Min Mean)	19.12	4.8	91.79
2	Sulphur Dioxide (1 Hour Mean)	19.12	4.8	91.79
3	Sulphur Dioxide (24 Hour Mean)	19.12	4.8	91.79
4	Nitrogen Dioxide	39.74	2.8	111.28
5	Nitrogen Dioxide (Ecological - Daily Mean)	39.74	2.8	111.28
7	Carbon monoxide	473.04	2.7	1,277.21
1	Sulphur Dioxide (15 Min Mean)	71.43	4.8	342.86
2	Nitrogen Dioxide	94.13	2.8	263.58
4	Carbon monoxide	70.48	2.7	190.30
			Total:	2,571.86

Comments

Global Warming Potential Impacts

Substance	Source	Annual Rate MWh/yr	GWP Value per tonne	Annual GWP
C02 Energy: direct	direct emissions	3,924,480.00	1.00	1,177,344.00
			Total:	1,177,344.00

Comments

Waste Impact Score Calculation

Number	Waste Stream	Mass	Final treatment or disposal method	(Score)	Waste Type	(Score)	Impact Score
1	Activated Carbon - mercury re	90	Other Recycling (R3:R4:R5:R11 and R12)	3	stable non-reactive hazard	8	2160
4	Ash	230,000	Permanent Storage D10 or D3	17	other non-hazardous	2	7820000
2	Desiccant - flue gas driers	28	Other Recycling (R3:R4:R5:R11 and R12)	3	other non-hazardous	2	168
3	Sludge waste from water treat	6,000	Release into water and lagoons D4:D6 or	15	other non-hazardous	2	180000

Comments

Summary Tables

Print or Preview summary tables:

Choose which summary tables

- Air
- Deposition from Air to Land
- Water
- Waste
- Visual
- Ozone Creation
- Global Warming

Export to Excel

Export Releases to OPRA Profile

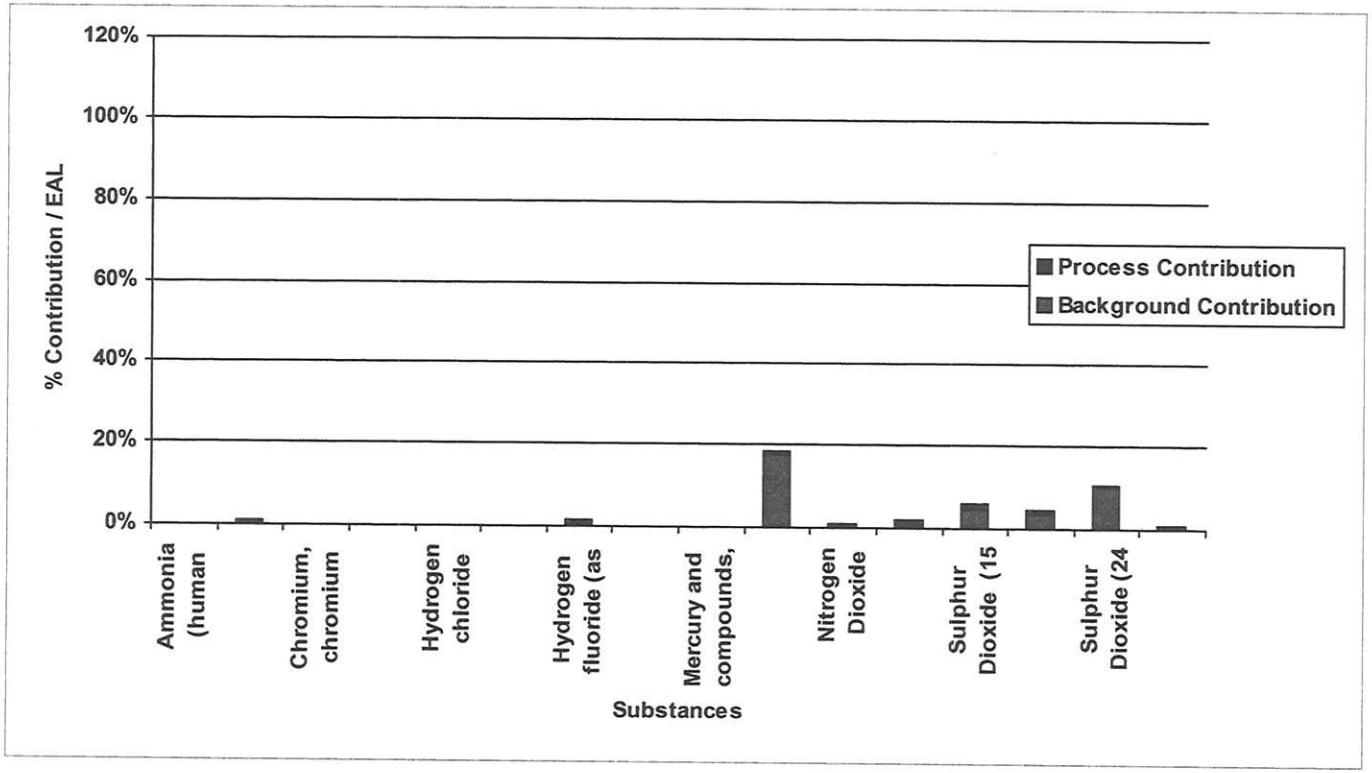
Preview

Print

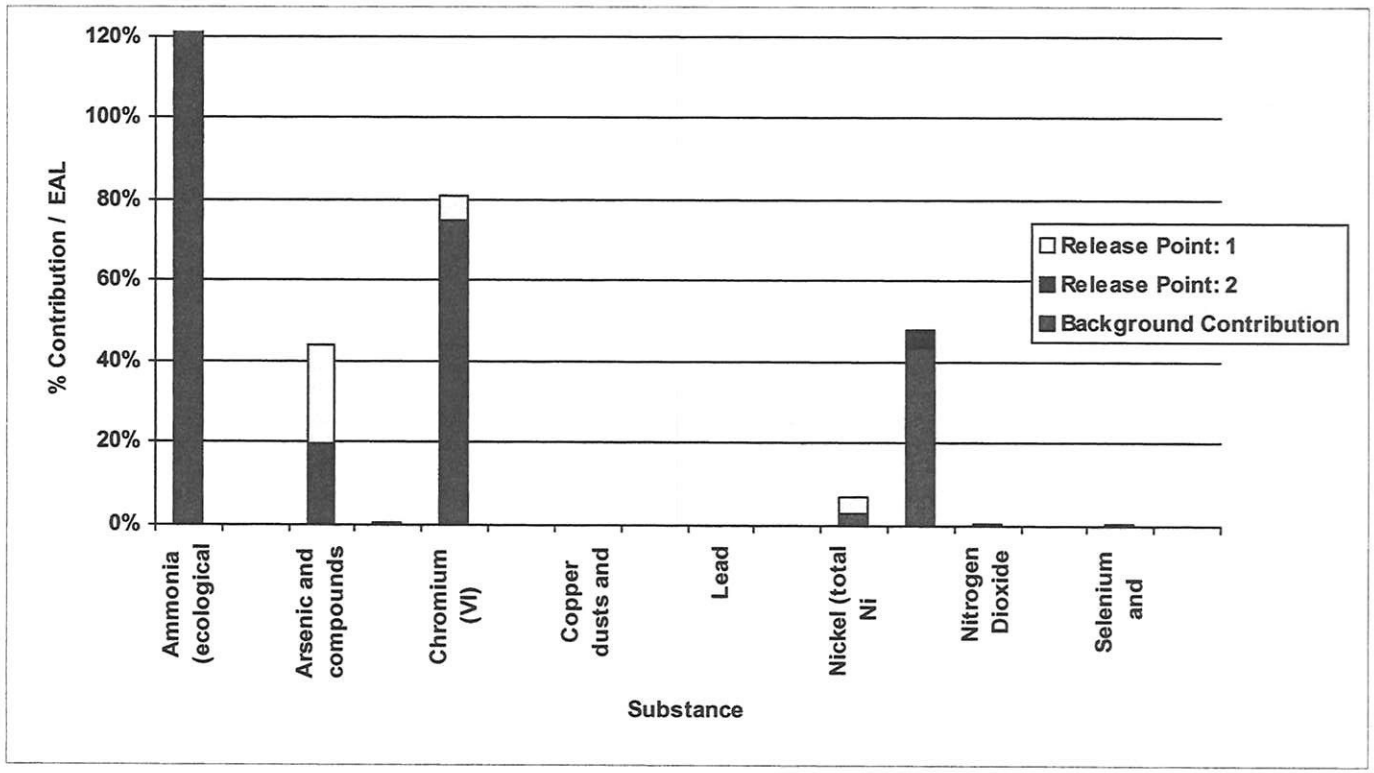
Include

- ○ All Air and Water Substances
- ◉ Air and Water Release Not Screend Out

Air Short Term Effects - Comparison by Substance



Air Long Term Effects - Comparison by Substance



Short Term (Incident) Odour - Option Comparison

No Data Available

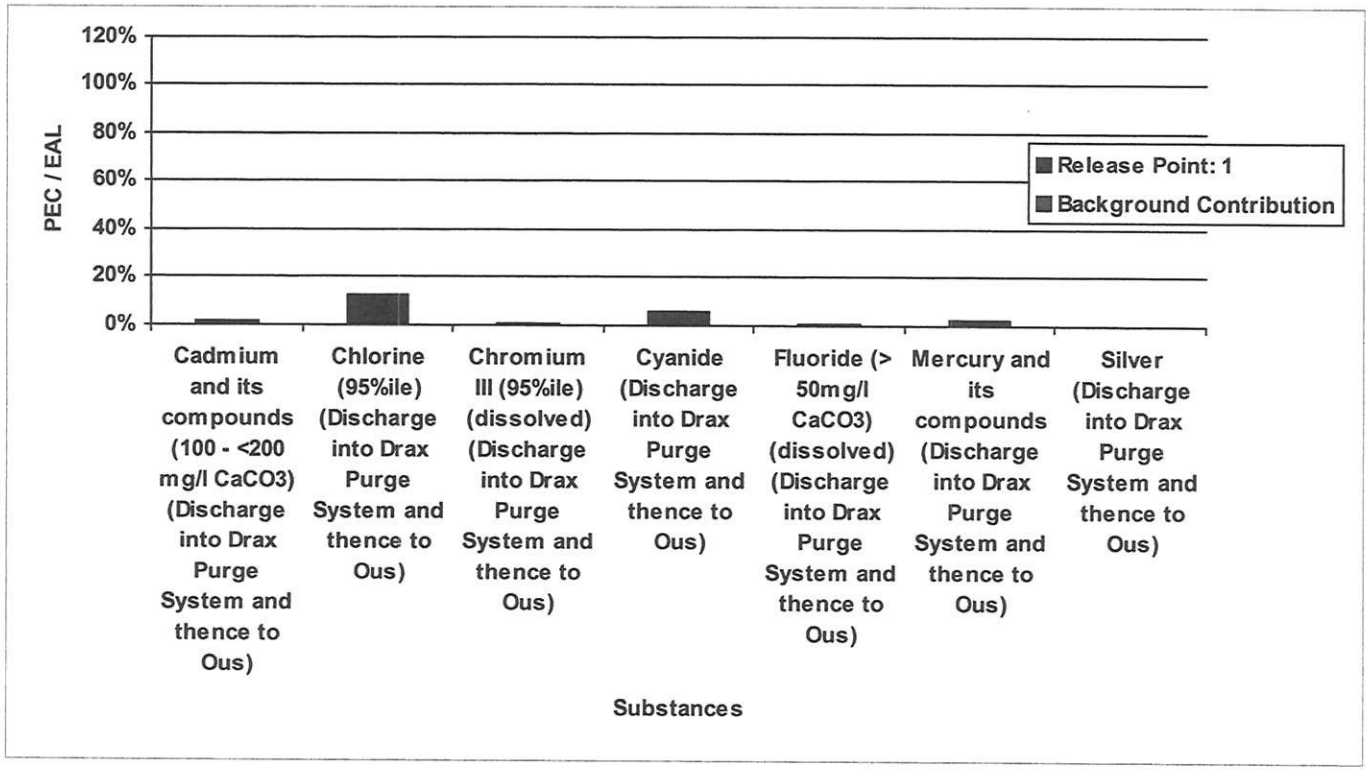
Long Term (Routine) Odour - Option Comparison

No Data Available

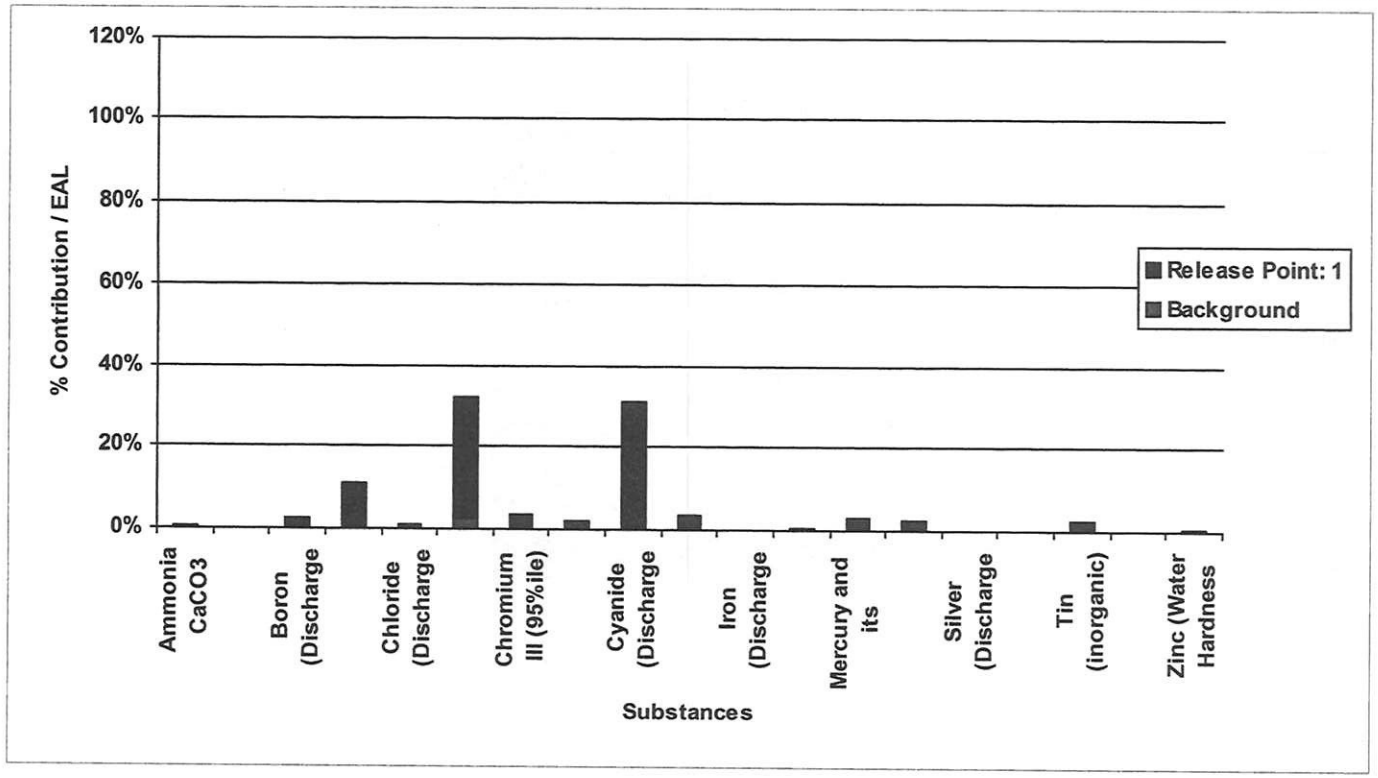
Odour Type - Option Comparison of total odour concentration by odour status

No Data Available

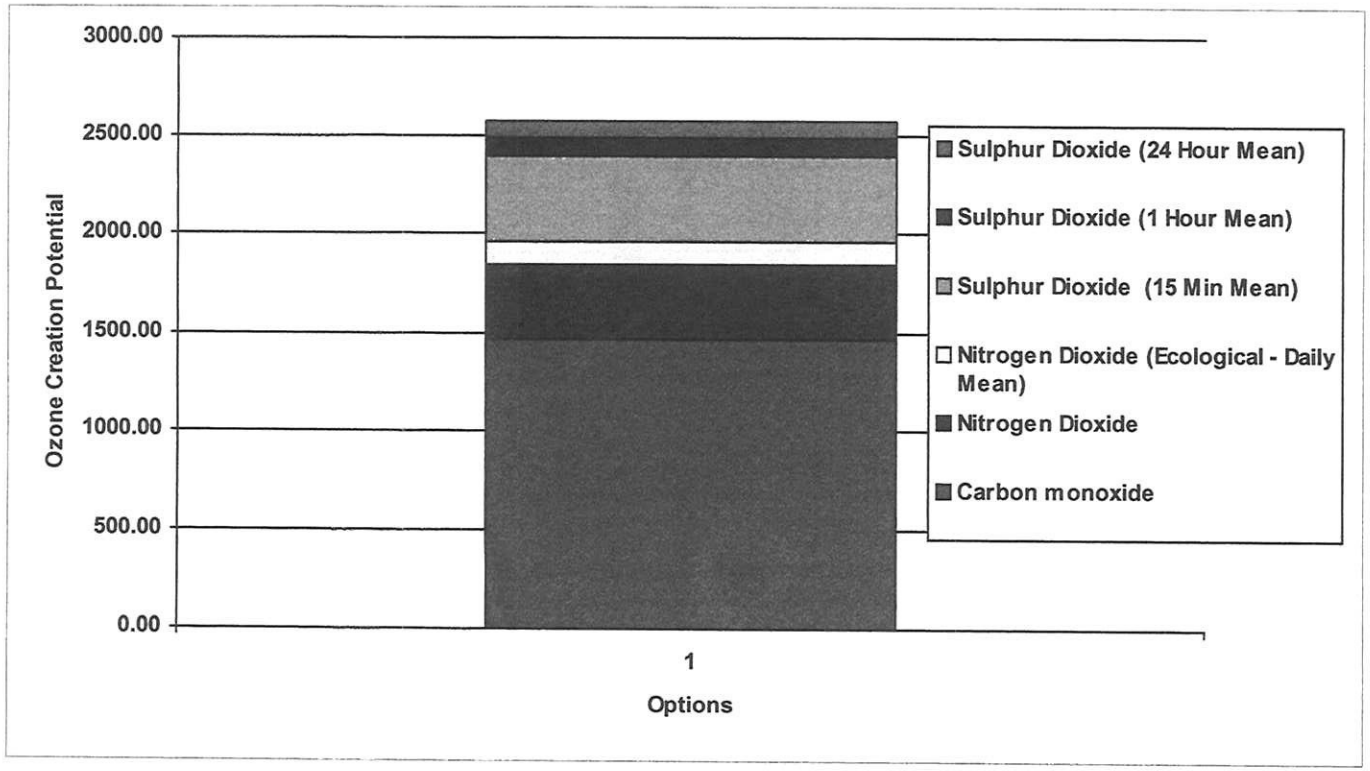
Short Term Water - Substance Comparison



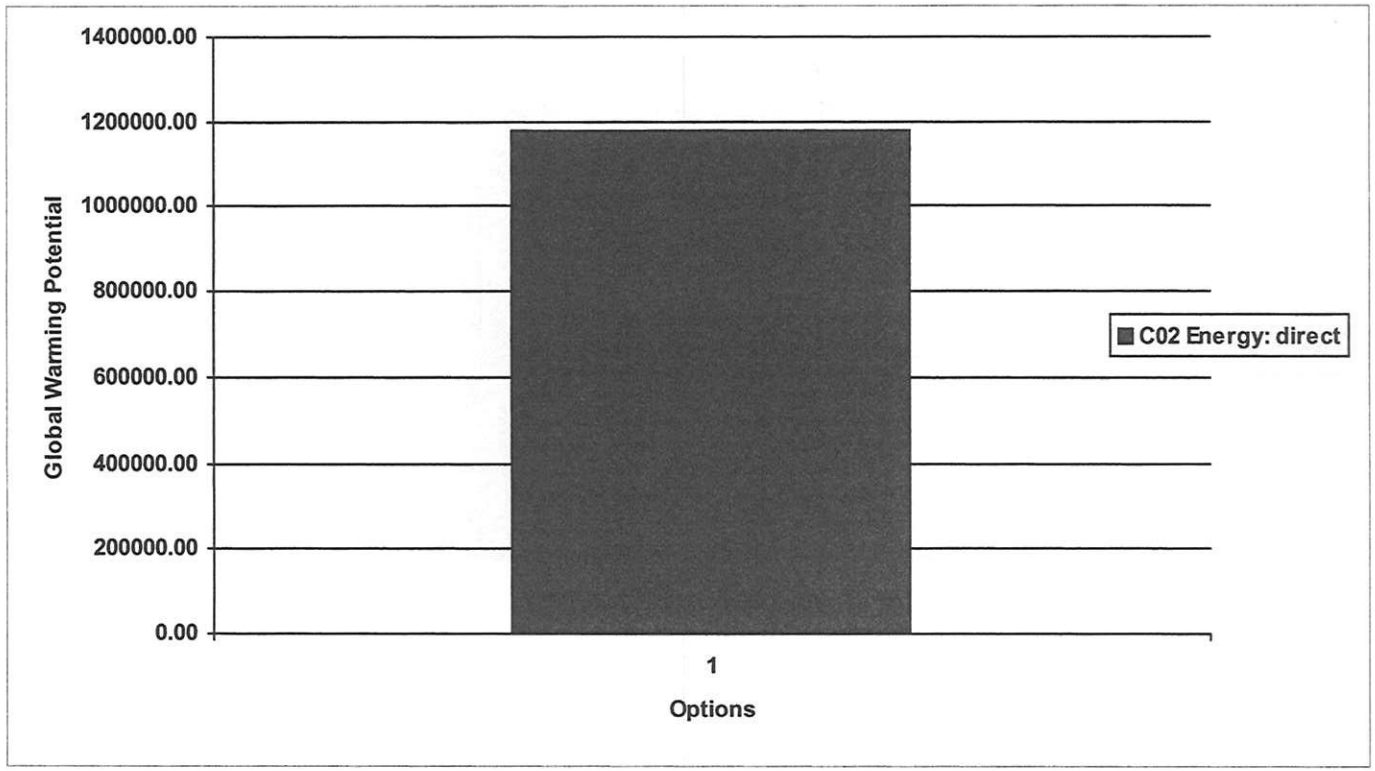
Water Long Term Effects - Comparison by Substance

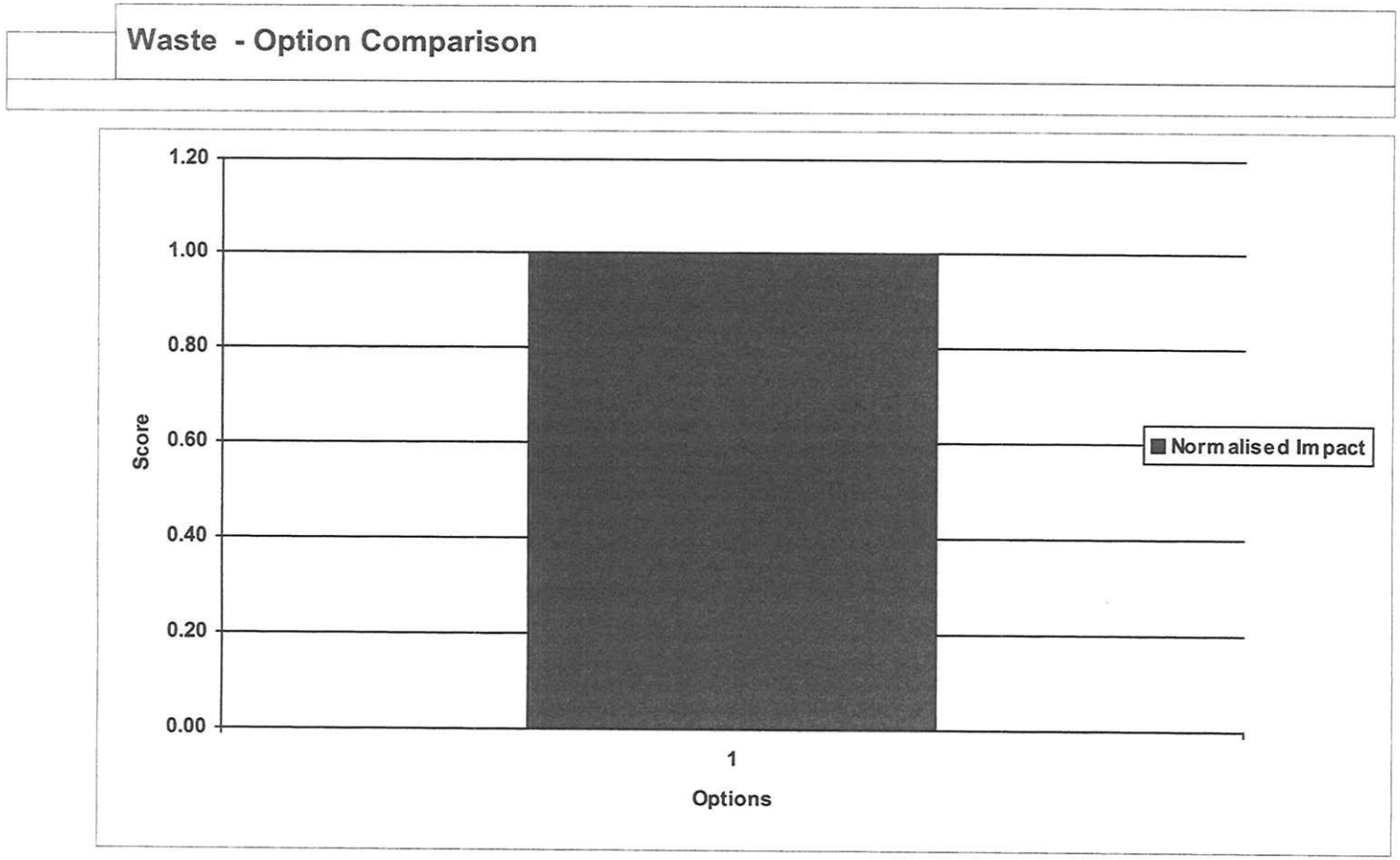


Ozone Creation - Substance Comparison



Global Warming - Substance Comparison




Waste - Option Comparison
1.20
1.00
0.80
0.60
0.40
0.20
0.00
Score
Normalised Impact
1
Options

Summary of Environmental Assessment

You have now completed all of the steps in this software for the environmental assessment. This will provide you with:

- an inventory of all emissions sources and substances emitted from your activities
- an information trail of how the impacts of these emissions have been assessed
- a summary of the impacts

You now need to use this information to confirm whether the emissions are acceptable, i.e. that they do not cause significant pollution to occur, by responding below:

Do any of the emissions exceed any of the folllowing

Statutory Emission limit values:	No	If yes, identify the substances concerned and improvements that are needed to at least meet the statutory requirement
Environmental Quality Standards (air and water):	No	If yes, identify the substances concerned, the contribution from the activities and investigate whether further detailed fate and effect modelling and/or pollution controls are needed. Ensure that the relevant EQS reference conditions are applied.
Environmental Assessment Levels:	No	If yes, identify the substances concerned, the contribution from the activities and investigate whether further detailed fate and effect modelling and/or pollution controls are needed.

Use the box below to provide further information on any of the above to which you have responded 'Yes':

Finally, print all of the information and submit with your application. Remember to include any supplementary information and reports that you have had made reference to during the assessment procedure.

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