

Aberthaw Cement Works

Waste Fuel Trial

July/August 2022

Introduction

Trial of a waste derived fuel (WDF) in the kiln preheater for the purpose of increasing the quantity of WDFs used in the kiln, thus reducing reliance on fossil fuels, in the form of coal, and CO₂ generation.

The material being trialled was described a mixed flammable sludge. The trial was to involve the use of no more than 100t of waste mixed flammable sludge as outlined in Environment Permit (section 2.3.8). The material to be trialled has EWC 19 02 08* as permitted in Table S2.2 of Permit.

The trial area was designed according to HAZOP and Environmental RA recommendations.

Operations were undertaken according to HAZOP and Environmental RA recommendations.

The permitted timescale was not to exceed 14 days as per permit condition 2.3.8.

Method

A risk assessment was carried out on 10th June 2021, and was reviewed and updated on 26th May 2022 prior to the trial beginning. Please see appendix 1.

A HAZOP was performed on 26th -27th June 2021, with report completed on 23rd December 2021. The scope of the HAZOP was to carry out a safety review of the proposed design of the new waste fuel process.

The trial used a Putzmeister pump, similar to that shown in fig.1. to pump the mixed flammable sludge into the kiln preheater where it was then combusted at temperatures of up to 1200 degC.



Figure1: Putzmeister piston pump

The material was loaded into the pump hopper from 205 litre drums and IBCs, which were stored on a bunded area next to the pump.

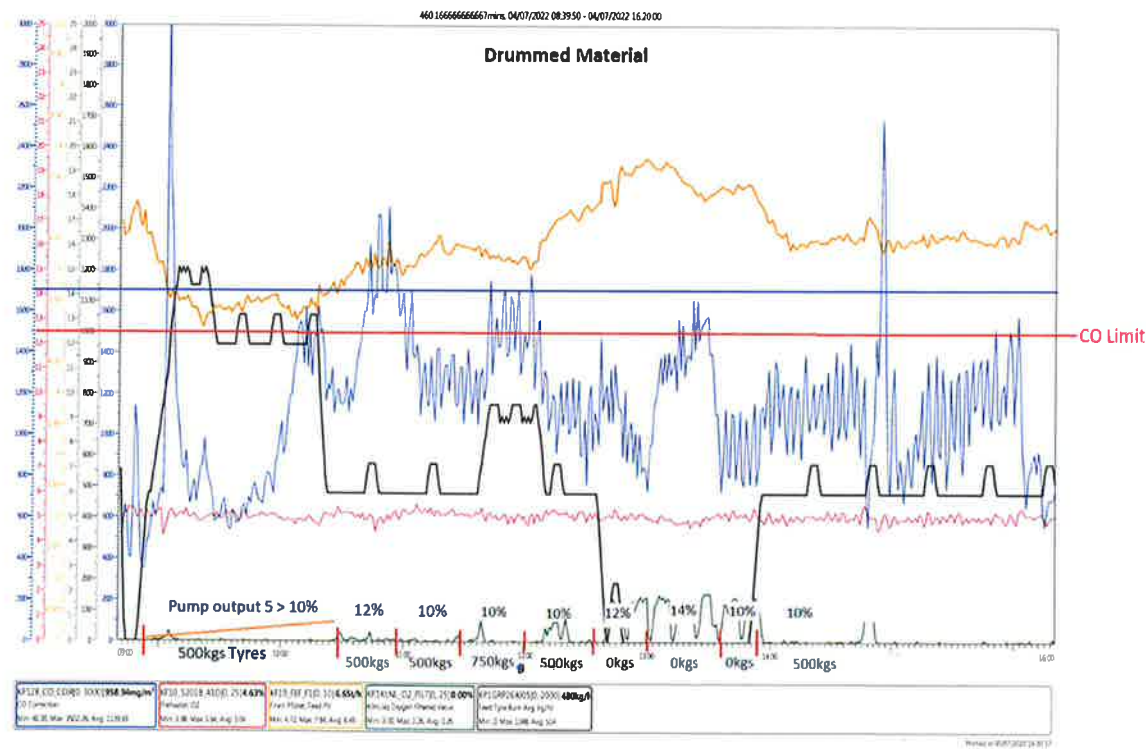
12.9 tonnes of the trial material were delivered to site on the 29th and 30th June.

Trial started on 4th July with the first of the material being introduced into the preheater.

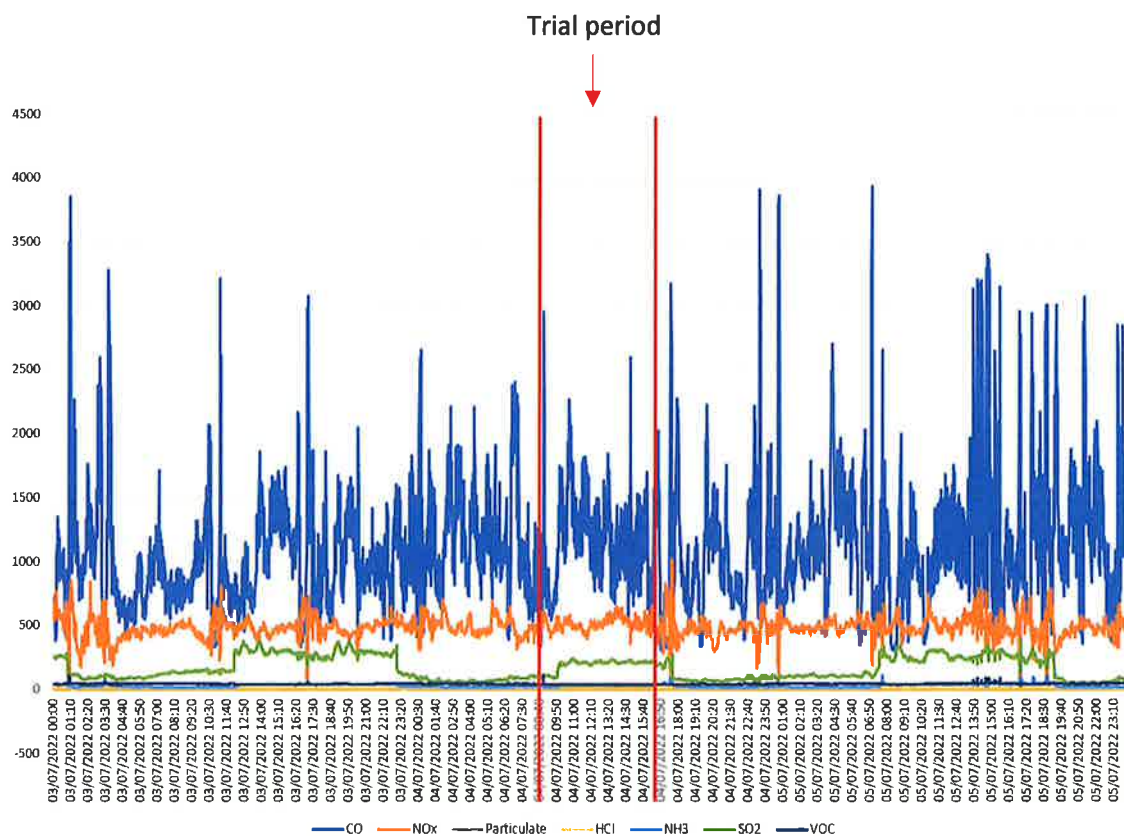
Emissions Monitoring

Internal Monitoring

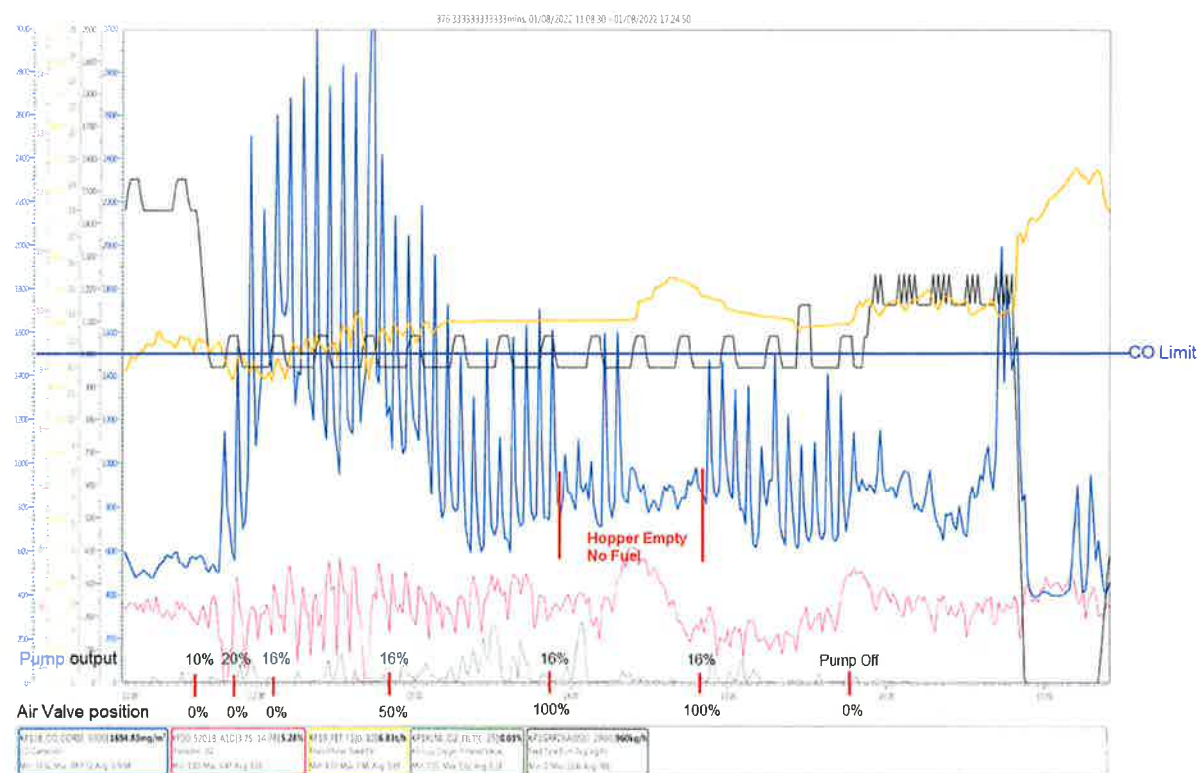
4th July 2022



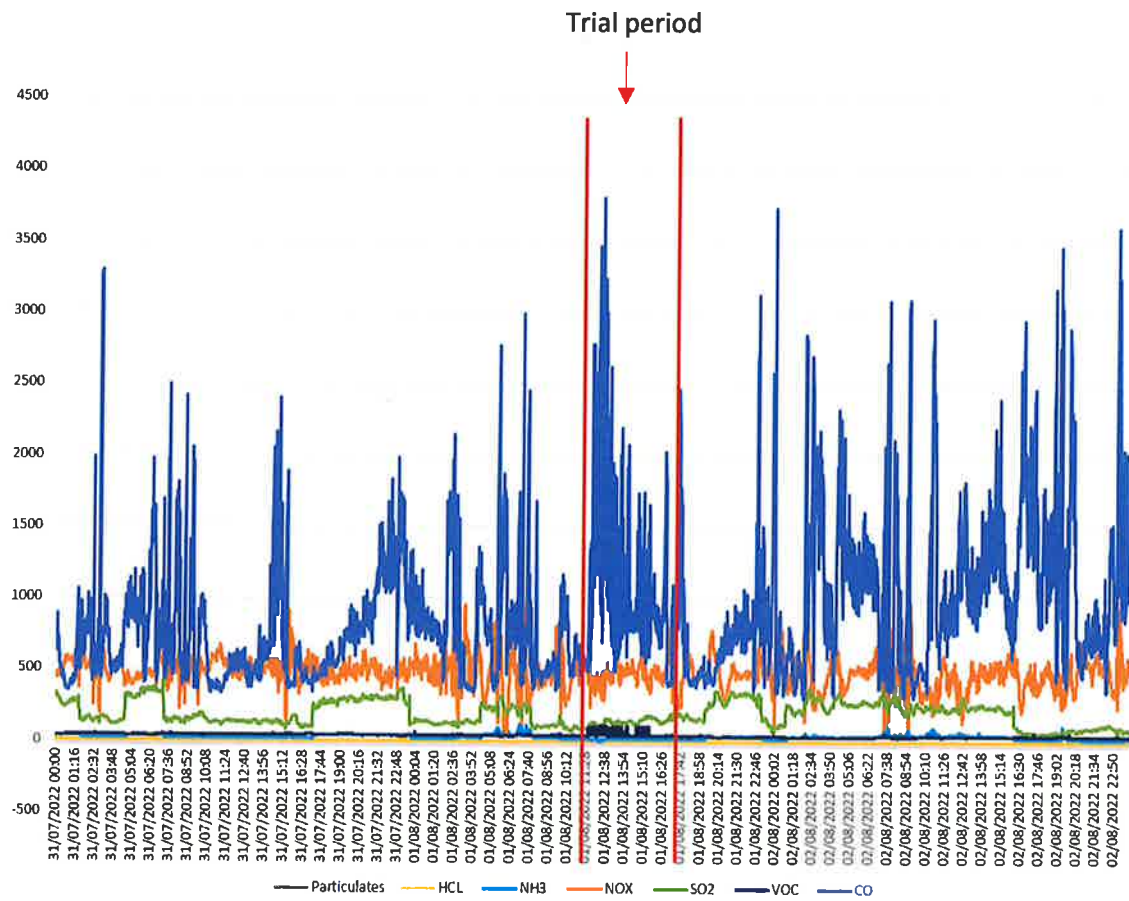
CEMs data 03/07/2022 – 05/07/2022



1st August 2022



CEMs data 31/7/2022 – 02/08/2022



External Element

MONITORING RESULTS

Tarmac Cement and Lime Ltd, Aberthaw
A1 - Main Stack
19th - 20th July 2022

where MU = Measurement Uncertainty associated with the Result

Parameter	Concentration				Mass Emission			
	Units	Result	MU +/-	Limit	Units	Result	MU +/-	Limit
Cadmium & Thallium	mg/m ³	0.0021	0.00036	0.05	g/hr	0.30	0.054	-
Heavy Metals	mg/m ³	0.010	0.0019	0.5	g/hr	1.3	0.29	-
Mercury	mg/m ³	0.0019	0.00046	0.05	g/hr	0.27	0.067	-
Dioxins & Furans Upper Limit (worst case where <LOD = LOD)								
Dioxins & Furans (NATO I-TEQ)	ng/m ³	0.0048	0.0010	0.1	µg/hr	0.67	0.15	-
Dioxins & Furans (WHO TEQ Humans / Mammals)	ng/m ³	0.0048	0.0010	-	µg/hr	0.68	0.15	-
Dioxins & Furans (WHO TEQ Fish)	ng/m ³	0.0044	0.00094	-	µg/hr	0.62	0.14	-
Dioxins & Furans (WHO TEQ Birds)	ng/m ³	0.022	0.0048	-	µg/hr	3.2	0.71	-
Dioxins & Furans Lower Limit (best case where <LOD = 0)								
Dioxins & Furans (NATO I-TEQ)	ng/m ³	0.0034	0.00072	-	µg/hr	0.48	0.11	-
Dioxins & Furans (WHO TEQ Humans / Mammals)	ng/m ³	0.0029	0.00063	-	µg/hr	0.42	0.093	-
Dioxins & Furans (WHO TEQ Fish)	ng/m ³	0.0023	0.00049	-	µg/hr	0.33	0.073	-
Dioxins & Furans (WHO TEQ Birds)	ng/m ³	0.021	0.0044	-	µg/hr	2.9	0.65	-
PCBs Upper Limit (worst case where <LOD = LOD)								
PCBs (WHO TEQ Humans / Mammals)	ng/m ³	0.00048	0.00010	-	µg/hr	0.068	0.015	-
PCBs (WHO TEQ Fish)	ng/m ³	0.000049	0.000010	-	µg/hr	0.0069	0.0015	-
PCBs (WHO TEQ Birds)	ng/m ³	0.012	0.00249	-	µg/hr	1.6	0.37	-
PCBs Lower Limit (best case where <LOD = 0)								
PCBs (WHO TEQ Humans / Mammals)	ng/m ³	0.00048	0.00010	-	µg/hr	0.068	0.015	-
PCBs (WHO TEQ Fish)	ng/m ³	0.000049	0.000010	-	µg/hr	0.0069	0.0015	-
PCBs (WHO TEQ Birds)	ng/m ³	0.012	0.0025	-	µg/hr	1.6	0.37	-
Oxygen	% v/v Dry	12.9	0.31					
Water Vapour	% v/v	9.0	0.48					
Stack Gas Temperature	°C	169						
Stack Gas Velocity	m/s	24.4	1.1					
Volumetric Flow Rate (ACTUAL)	m ³ /hr	338014	21701					
Volumetric Flow Rate (REF)	m ³ /hr	141476	9083					

NOTE: VOLUMETRIC FLOW RATE & VELOCITY DATA TAKEN FROM AN AVERAGE OF ALL OF THE ISOKINETIC RUNS.

¹ Reference Conditions (REF) are: 273K, 101.3kPa, dry gas, 10% oxygen.

* The Emissions Limit Values (ELVs) stated above in the 'Limit' column refer to the Daily ELV for continuous emission measurements.

Conclusion

The trial was considered unsuccessful and halted indefinitely before the planned end point of the trial. The lack of homogeneity of the material caused difficulties pumping it into the preheater, forcing the trial to be suspended at several points. It was therefore decided that the unsuitability of the material and problems with combustion, together with the unsuitability of the introduction point, meant that it would be unfeasible to continue the trial.

Appendix 1 – Risk Assessment Form

RISK ASSESSMENT FORM V9 Excel Version

TASK
Use of new fuel EWC 19 02 04
Used at 3 TPH maximum.

HA No.	
GW No.	N/A
Version No.	2.0

Written By	
Date	26/05/2022
Review Date	After initial trial

WO No.	
N/A	

1. Hazardous	2. Potential Effect of the Hazard	3. Standard CONTROL RISK Severity x Likelihood = Risk Rating	4. Revised CONTROL MEASURES	5. RESIDUAL RISK Severity x Likelihood = Risk Rating
New fuel storage internal transportation to the kiln.	Wind blown litter/fugitive dust.	1 x 1 = Very Low	Material is a non-hazardous waste and therefore not liable to fugitive releases. Material is stored in sealed containers prior to entry to the enclosed feed system as such material is not exposed to environment. Material is stored in sealed containers and the containers are very unlikely to spread vermin.	1 x 1 = Very Low
	Vermin	1 x 1 = Very Low	Material is stored in sealed containers right up until point of loading into system hopper. Implement a regime of daily inspections to identify any odour issues over and about usual conditions.	1 x 1 = Very Low
	Odour	2 x 4 = Medium	Material is stored in sealed drums, as to be contained within a dedicated area which is not visible from any boundary. Material is to be stored in sealed drums on concrete floor in new fuel trial area as it is self contained within a bund wall to prevent the escape of any liquids in the event of a spill. Material Pumping is to be located within a self contained bunded area as in the event of any leaks materials can not leave the area. Any spilled material will be collected straight away in integrated sump areas where it will be pumped back in to the process.	1 x 2 = Low
	Negative visual impact	1 x 2 = Low	Material is to be stored in sealed drums, as to be contained within a dedicated area which is not visible from any boundary.	1 x 1 = Very Low
	Leachate run-off from material storage	3 x 4 = Medium/High	Material is to be stored in sealed drums on concrete floor in new fuel trial area as it is self contained within a bund wall to prevent the escape of any liquids in the event of a spill. Material Pumping is to be located within a self contained bunded area as in the event of any leaks materials can not leave the area. Any spilled material will be collected straight away in integrated sump areas where it will be pumped back in to the process. Large scale spill to be located within fuel trial area. Regular inspections will ensure that any material spills are swiftly cleaned up down from made surfaces. Material is to be stored in sealed drums as it is self contained within a bund wall to prevent the escape of any liquids in the event of a spill. Signs to be erected for material identification and daily inspections will ensure materials are stored there. Material will be emptied from drums in to pump hopper which will feed in to sump direct.	1 x 2 = Low
	Material storage compatibility	2 x 2 = Medium/Low	Material is to be stored in sealed drums as it is self contained within a bund wall to prevent the escape of any liquids in the event of a spill. Signs to be erected for material identification and daily inspections will ensure materials are stored there. Material will be emptied from drums in to pump hopper which will feed in to sump direct.	2 x 1 = Low
	Material transportation to the kiln	2 x 2 = Medium/Low	Material is to be stored in sealed drums as it is self contained within a bund wall to prevent the escape of any liquids in the event of a spill. Signs to be erected for material identification and daily inspections will ensure materials are stored there. Material will be emptied from drums in to pump hopper which will feed in to sump direct.	2 x 1 = Low
	Noise from fuel feed pump	2 x 3 = Medium	Material is to be stored in sealed drums as it is self contained within a bund wall to prevent the escape of any liquids in the event of a spill. Signs to be erected for material identification and daily inspections will ensure materials are stored there. Material will be emptied from drums in to pump hopper which will feed in to sump direct.	2 x 2 = Low
	Introduction of contamination into the process resulting in exceedances of ELV	3 x 3 = Medium	Material is to be stored in sealed drums as it is self contained within a bund wall to prevent the escape of any liquids in the event of a spill. Signs to be erected for material identification and daily inspections will ensure materials are stored there. Material will be emptied from drums in to pump hopper which will feed in to sump direct.	2 x 1 = Low
	Waste generation	2 x 3 = Medium/Low	Material is to be stored in sealed drums as it is self contained within a bund wall to prevent the escape of any liquids in the event of a spill. Signs to be erected for material identification and daily inspections will ensure materials are stored there. Material will be emptied from drums in to pump hopper which will feed in to sump direct.	1 x 2 = Low
Use of new waste fuel oil	Unused material in case of extended plant shutdown or material no longer suitable.	2 x 2 = Medium/Low	Material is to be stored in sealed drums as it is self contained within a bund wall to prevent the escape of any liquids in the event of a spill. Signs to be erected for material identification and daily inspections will ensure materials are stored there. Material will be emptied from drums in to pump hopper which will feed in to sump direct.	2 x 1 = Low
	Kiln emission impacts TOC	2 x 3 = Medium	Material is to be stored in sealed drums as it is self contained within a bund wall to prevent the escape of any liquids in the event of a spill. Signs to be erected for material identification and daily inspections will ensure materials are stored there. Material will be emptied from drums in to pump hopper which will feed in to sump direct.	#N/A
	Kiln emissions Hg, Cd+Ti	2 x 3 = Medium	Material is to be stored in sealed drums as it is self contained within a bund wall to prevent the escape of any liquids in the event of a spill. Signs to be erected for material identification and daily inspections will ensure materials are stored there. Material will be emptied from drums in to pump hopper which will feed in to sump direct.	#N/A
	Kiln emission impacts other metals	2 x 3 = Medium	Material is to be stored in sealed drums as it is self contained within a bund wall to prevent the escape of any liquids in the event of a spill. Signs to be erected for material identification and daily inspections will ensure materials are stored there. Material will be emptied from drums in to pump hopper which will feed in to sump direct.	#N/A
	Fugitive VOC emissions	3 x 3 = Medium/High	Material is to be stored in sealed drums as it is self contained within a bund wall to prevent the escape of any liquids in the event of a spill. Signs to be erected for material identification and daily inspections will ensure materials are stored there. Material will be emptied from drums in to pump hopper which will feed in to sump direct.	3 x 1 = Low
	changes in material composition	4 x 4 = High	Material is to be stored in sealed drums as it is self contained within a bund wall to prevent the escape of any liquids in the event of a spill. Signs to be erected for material identification and daily inspections will ensure materials are stored there. Material will be emptied from drums in to pump hopper which will feed in to sump direct.	4 x 1 = Medium/Low
	Energy - equipment to handle	1 x 1 = Very Low	Material is to be stored in sealed drums as it is self contained within a bund wall to prevent the escape of any liquids in the event of a spill. Signs to be erected for material identification and daily inspections will ensure materials are stored there. Material will be emptied from drums in to pump hopper which will feed in to sump direct.	1 x 1 = Very Low
	Energy - impact on kiln and cement mill.	2 x 2 = Medium/Low	Material is to be stored in sealed drums as it is self contained within a bund wall to prevent the escape of any liquids in the event of a spill. Signs to be erected for material identification and daily inspections will ensure materials are stored there. Material will be emptied from drums in to pump hopper which will feed in to sump direct.	1 x 1 = Very Low
	Water quality		Material is to be stored in sealed drums as it is self contained within a bund wall to prevent the escape of any liquids in the event of a spill. Signs to be erected for material identification and daily inspections will ensure materials are stored there. Material will be emptied from drums in to pump hopper which will feed in to sump direct.	
	Pollution of controlled waters	4 x 3 = Medium/High	Material is to be stored in sealed drums as it is self contained within a bund wall to prevent the escape of any liquids in the event of a spill. Signs to be erected for material identification and daily inspections will ensure materials are stored there. Material will be emptied from drums in to pump hopper which will feed in to sump direct.	2 x 1 = Low
Legal impacts	Planning permission	1 x 1 = Very Low	Material is to be stored in sealed drums as it is self contained within a bund wall to prevent the escape of any liquids in the event of a spill. Signs to be erected for material identification and daily inspections will ensure materials are stored there. Material will be emptied from drums in to pump hopper which will feed in to sump direct.	1 x 1 = Very Low
	Non compliance with current legislation	3 x 3 = Medium	Material is to be stored in sealed drums as it is self contained within a bund wall to prevent the escape of any liquids in the event of a spill. Signs to be erected for material identification and daily inspections will ensure materials are stored there. Material will be emptied from drums in to pump hopper which will feed in to sump direct.	2 x 1 = Low
	waste acceptance	3 x 2 = Medium	Material is to be stored in sealed drums as it is self contained within a bund wall to prevent the escape of any liquids in the event of a spill. Signs to be erected for material identification and daily inspections will ensure materials are stored there. Material will be emptied from drums in to pump hopper which will feed in to sump direct.	2 x 1 = Low
	UK ETS emissions	1 x 1 = Very Low	Material is to be stored in sealed drums as it is self contained within a bund wall to prevent the escape of any liquids in the event of a spill. Signs to be erected for material identification and daily inspections will ensure materials are stored there. Material will be emptied from drums in to pump hopper which will feed in to sump direct.	1 x 1 = Very Low
	change to impact on habitats and biodiversity	1 x 1 = Very Low	Material is to be stored in sealed drums as it is self contained within a bund wall to prevent the escape of any liquids in the event of a spill. Signs to be erected for material identification and daily inspections will ensure materials are stored there. Material will be emptied from drums in to pump hopper which will feed in to sump direct.	1 x 1 = Very Low
Emergency	Fire	1 x 3 = Low	Material is to be stored in sealed drums as it is self contained within a bund wall to prevent the escape of any liquids in the event of a spill. Signs to be erected for material identification and daily inspections will ensure materials are stored there. Material will be emptied from drums in to pump hopper which will feed in to sump direct.	3 x 1 = Low
	Spillages	2 x 3 = Medium	Material is to be stored in sealed drums as it is self contained within a bund wall to prevent the escape of any liquids in the event of a spill. Signs to be erected for material identification and daily inspections will ensure materials are stored there. Material will be emptied from drums in to pump hopper which will feed in to sump direct.	1 x 2 = Low
	Nuisance complaint	1 x 2 = Low	Material is to be stored in sealed drums as it is self contained within a bund wall to prevent the escape of any liquids in the event of a spill. Signs to be erected for material identification and daily inspections will ensure materials are stored there. Material will be emptied from drums in to pump hopper which will feed in to sump direct.	1 x 1 = Very Low
	Responsible sourcing	3 x 2 = Medium	Material is to be stored in sealed drums as it is self contained within a bund wall to prevent the escape of any liquids in the event of a spill. Signs to be erected for material identification and daily inspections will ensure materials are stored there. Material will be emptied from drums in to pump hopper which will feed in to sump direct.	2 x 1 = Low
	Resource efficiency	3 x 2 = Medium	Material is to be stored in sealed drums as it is self contained within a bund wall to prevent the escape of any liquids in the event of a spill. Signs to be erected for material identification and daily inspections will ensure materials are stored there. Material will be emptied from drums in to pump hopper which will feed in to sump direct.	1 x 1 = Very Low
Sustainability	Climate change	2 x 2 = Medium/Low	Material is to be stored in sealed drums as it is self contained within a bund wall to prevent the escape of any liquids in the event of a spill. Signs to be erected for material identification and daily inspections will ensure materials are stored there. Material will be emptied from drums in to pump hopper which will feed in to sump direct.	2 x 2 = Medium/Low
	Public perception	3 x 2 = Medium	Material is to be stored in sealed drums as it is self contained within a bund wall to prevent the escape of any liquids in the event of a spill. Signs to be erected for material identification and daily inspections will ensure materials are stored there. Material will be emptied from drums in to pump hopper which will feed in to sump direct.	2 x 1 = Low
	Off site transport	2 x 1 = Low	Material is to be stored in sealed drums as it is self contained within a bund wall to prevent the escape of any liquids in the event of a spill. Signs to be erected for material identification and daily inspections will ensure materials are stored there. Material will be emptied from drums in to pump hopper which will feed in to sump direct.	1 x 1 = Very Low
	Water use	2 x 1 = Low	Material is to be stored in sealed drums as it is self contained within a bund wall to prevent the escape of any liquids in the event of a spill. Signs to be erected for material identification and daily inspections will ensure materials are stored there. Material will be emptied from drums in to pump hopper which will feed in to sump direct.	1 x 1 = Very Low

