Question 18: *In order to prevent fugitive emissions of dust, VOC and odour from the soil treatment facility, provide reasons, or propose an alternative approach, why the Agency should not require in a revised licence the full enclosure of the soil treatment facility, the application of negative pressure to the building and the treatment of extracted air to remove dust, VOC and odorous emissions, for example by means of a carbon filter.*

Response

Soil remediation activities at the existing Facility have not presented any significant dust, odour or VOC emission impact to date. A neighbouring premise's (Irish Rail) has raised concerns about potential dust emissions from the facility particularly due to their parking of plant and equipment adjacent to the soil remediation area in recent years. The Facility carries out routine dust monitoring as part of its existing licence and this monitoring has not shown there to be any exceedances in relation to dust emissions from the facility in the past 5 years. However due to the potential for lateral migration of dust from the soil remediation building (as it was open sided) and in response to the concerns from Irish Rail, the northern and eastern elevations of the soil remediation building were enclosed in March of this year.

Fugitive emissions monitoring carried out within the area has detected VOCs typically in the range of 0-5ppm. Current abatement measures available for the activity include the use of a portable Independent Rotary Atomiser. This is a self-contained mobile piece of equipment which can distribute an aerosol of water or water mixed with an 'encrusting agent' (e.g.Dustmac) to suppress and prevent dust generation. The unit can also be used to aerosol odour neutralising agents (e.g. Airborne 10 or Odalim) and control potential odours from soil processing activities. In addition the existing soil screening equipment is to be fitted with a spraybar to provide additional capability to supress dust and/or potential odours.

It is therefore not considered appropriate or necessary to provide any form of extraction system with abatement and it would be difficult to provide any additional useful form of abatement due to the size/volume of the building. It is worth noting that soil remediation facilities across Europe typically involve large open (and often unroofed areas) for both biological and chemical processing of contaminated soils. Extraction and abatement systems are more commonly associated with soil remediation technologies involving thermal treatment.

However it is proposed to further enclose the soil remediation area (i.e. on all sides) to further improve the control of fugitive emissions associated with soil handling/processing activities. Planning permission has been applied for to carry out the additional works and it is expected to have these works completed by 30th November 2016.

Question 19

a. In relation to the processed fuel oil produced at the installation there are two Quality Standards included in your existing Industrial emissions Licence. Provide information on:

- *The extent to which each of these quality standards are used (commentary);*
- *The appropriate quantity of processed fuel oil produced to each quality standard*
- *The destination (by activity) of each grade of processed fuel oil and the approximate quantity of processed fuel oil dispatched to each activity type.*

Response

A number of the requests are regarded as commercially sensitive and can be provided to the Agency as confidential information if required. All recovered fuel oils are processed to meet one of the two quality standards. As provided for under the licence the destinations for the recovered fuel oils are limited to use as a fuel in asphalt production plants (i.e. 11LS) and steam raising boilers (19LS), the recovered fuels are not sold for use in any other applications. The approximate volumes of recovered fuel oil produced in the past three years are as follows:

- 2015 – 12.5 million litres;
- 2014 – 12 million litres;
- 2013 – 15.6 million litres;

Question 19

b. Provide a report on the quality of the last 50 samples each (i.e. 100 samples in total) of:

- *Reprocessed oil with the use restricted according to condition 5.3.5 of the existing licence*
- *Reprocessed oil with the use restricted according to condition 5.3.6 of the existing licence*

The report should provide a table showing the complete analysis of each of the 100 batches tested. Highlight any exceedances of the quality standard and provide the reason or reasons identified for those individual exceedances of the quality standards.

Response

See below tables below 19.1 and 19.2 detailing the analysis on the previous 50 production batches, noting there are no exceedances as the process is either extended or part of the process repeated to ensure the batch meets the desired specification.

Question 19

c. State what virgin oils are displaced by your processed fuel oil

Response

The products displaced by both 11LS varies but are largely Light Fuel Oil, Heavy Fuel Oil or less often gas oil. In relation to 19LS based products these have to date only replaced the use of Heavy Fuel Oil and Light Fuel Oil in steam raising boilers.

Question 19

d. Describe any blending of processed fuel oil with virgin fuel oil.

Response

Blending of fuel oils is a commonly practiced process within the petroleum industry to produce fuels of varying viscosities to make them suitable for the various system set ups of oil handling and combustion equipment as well as for commercial reasons. For example Heavy Fuel Oil can be blended with Gas oil to produce Light or Medium Fuel Oil.

Blending of 11LS

Once 11LS has been tested to ensure it meets the End of Waste specification (as contained in condition 5.3.5 of the existing licence) and is no longer a waste may be blended with virgin gas oil to reduce the viscosity to the required level. Typically Enva can select the feedstock going into a production Batch to reduce the need for such blending. In general the maximum addition of gas oil to the 11LS would be 10% but is on averages less than 10%.

Once 19LS has been tested to ensure it meets the End of Waste specification (as contained in condition 5.3.6 of the existing licence) and is no longer a waste it may be blended with heavy fuel oil to increase the viscosity to the required level. In general the maximum addition of heavy fuel oil to the 19LS would be 20%.

Question 19

e. Demonstrate quantitatively that the quality standards in the licence remain appropriate to demonstrate that the processed fuel oil is not classified as waste when it leaves the installation. Alternatively propose new quality standards that enable this quantitative demonstration.

Response

Please see Appendix 19.1

Table 19.1 Laboratory analysis results on the past 50 batches of recovered oil (11LS) produced in accordance with condition 5.3.5 of the existing licence

SPECIFICATION LIMIT:	15000	10000	3000	10	25	100	50	100	800
UNITS:	mg/kg	mg/kg	mg/kg	mg/kg	ppm	ppm	ppm	ppm	ppm
Batch Ref	ASH	SULPHUR	CHLORINE	PCB's	CADMIUM	NICKEL	CHROMIUM	VANADIUM	LEAD
1	0.7196	5323	195	<2	<0.5	4.9	11.8	22.8	8.1
2	0.7580	4771	146	<2	<1.0	7.2	2.7	13.6	6.8
3	0.5408	4012	76	<2	<1.0	7.4	3.1	12.2	6.5
4	0.4736	3411	80	<2	<0.5	4.2	2.4	6.7	5.7
5	0.8120	5911	223	<2	<0.5	23.9	14.2	52.9	10.2
6	0.4411	3529	59	<2	<1.0	2.9	2.0	3.7	4.2
7	0.8911	5963	181	<2	<1.0	18.9	4.5	37.8	8.7
8	0.8909	5846	165	<2	<1.0	14.0	3.9	26.3	8.0
9	0.5550	4469	164	<2	<0.5	8.2	7.5	14.2	6.3
10	0.6917	4242	93	<2	<1	3.0	3.5	3.6	6.8
11	0.5668	3676	174	<2	<1.0	2.4	4.3	3.2	4.5
12	0.4700	4069	117	<2	<1.0	5.8	3.3	13.1	4.9
13	0.5917	3865	170	<2	0.6	5.5	2.7	8.7	7.1
14	0.5979	3733	119	<2	<0.5	6.9	3.4	11.3	6.8
15	0.8727	5118	230	<2	<0.5	12.4	9.4	18.8	9.3
16	0.7170	9340	104	<2	<0.5	5.7	3.5	10.1	8.0
17	0.6550	4293	169	<2	0.8	5.0	2.5	8.8	6.1
18	0.8971	6087	214	<2	<0.5	14.1	12.2	23.6	10.7
19	0.7790	5309	180	<2	<0.5	13.8	13.0	28.7	10.3
20	0.8071	5278	170	<2	<1.0	11.0	5.8	21.9	10.0
21	0.8131	5189	147	<2	<1.0	10.5	4.5	18.6	9.5
22	0.8439	5012	181	<2	<0.5	10.6	4.1	18.0	8.5
23	0.8529	4959	158	<2	<1.0	11.0	3.9	18.7	8.1

SPECIFICATION LIMIT:	15000	10000	3000	10	25	100	50	100	800
UNITS:	mg/kg	mg/kg	mg/kg	mg/kg	ppm	ppm	ppm	ppm	ppm
Batch Ref	ASH	SULPHUR	CHLORINE	PCB's	CADMIUM	NICKEL	CHROMIUM	VANADIUM	LEAD
24	0.8833	5112	187	<2	<1.0	11.5	3.7	20.3	7.8
25	0.5750	8804	121	<2	<0.5	6.1	5.4	8.0	6.3
26	0.8628	5930	136	<2	<0.5	17.9	4.5	31.7	11.3
27	0.7181	4996	190	<2	<1.0	12.1	3.5	19.9	8.0
28	0.6370	4149	180	<2	0.7	7.5	3.2	13.9	7.6
29	0.6930	4804	179	<2	<1.0	9.6	3.2	16.0	7.4
30	0.6091	4234	121	<2	0.7	4.8	3.3	6.6	6.7
31	0.4940	3657	107	<2	<1.0	4.2	2.5	6.3	5.6
32	0.7609	5068	205	<2	0.5	11.5	2.9	19.2	8.1
33	0.4864	3764	107	<2	<1	5.3	3.0	7.3	6.3
34	0.2782	6363	112	<2	0.6	8.8	3.0	12.2	7.1
35	0.4658	4068	41	<2.0	<1	4.3	2.9	4.8	5.9
36	0.6709	4788	154	<2	1.0	11.0	3.2	15.4	7.8
37	0.5539	4419	69	<2	1.4	8.2	3.0	11.8	6.9
38	0.7016	4960	139	<2	1.5	11.9	3.8	17.8	8.1
39	0.8024	6581	146	<2	<1	17.0	6.6	22.4	9.5
40	0.4770	3846	56	<2	<1.0	7.3	3.2	12.8	6.3
41	0.6588	4913	161	<2	<1.0	11.1	3.2	14.7	7.6
42	0.3812	2726	79	<2	1.5	7.0	2.8	11.3	4.8
43	0.5080	3743	69	<2	<1.0	2.0	2.8	1.7	4.0
44	0.6517	4963	178	<2	1.4	11.3	3.8	16.4	7.9
45	0.6980	4610	129	<2	0.9	4.5	4.1	9.2	6.7
46	0.6956	4571	141	<2.0	0.7	8.0	2.8	12.2	6.9
47	0.6185	3951	72	<2.0	1.0	3.2	2.6	3.9	6.7
48	0.5430	5655	57	<2	0.9	12.3	4.2	21.9	8.9

SPECIFICATION									
LIMIT:	15000	10000	3000	10	25	100	50	100	800
UNITS:	mg/kg	mg/kg	mg/kg	mg/kg	ppm	ppm	ppm	ppm	ppm
Batch Ref	ASH	SULPHUR	CHLORINE	PCB's	CADMIUM	NICKEL	CHROMIUM	VANADIUM	LEAD
49	0.7040	4654	105	<2	0.8	11.7	3.3	15.7	7.8
50	0.2285	4896	169	<2	1.2	11.8	3.7	16.5	7.9

Table 19.2 Analysis results on the past 50 batches of recovered oil (19LS) produced in accordance with condition 5.3.6 of the existing licence

LIMIT	0.20	1.0000	150	<5	5	5.0	5.0	5	25.0	5.0	40	300	5.0	5	5.0	5.0	5
Unit	%	%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Batch Ref	Sulphated Ash	Sulphur	Total Halogens as Chlorine	PCB's	Cadmium	Nickel	Chromium	Vanadium	Lead	Mercury	Copper	Zinc	Arsenic	Thallium	Antimony	Cobalt	Manganese
1	0.09	0.3910	68	<2	3.2	<0.5	1.1	0.8	3.0	1.0	25.4	69.6	0.9	<0.5	<0.5	<0.5	<0.5
2	0.06	0.5220	44	<2	0.6	<0.5	2.3	1.4	3.1	2.2	17.6	89	<0.5	<0.5	<0.5	<0.5	0.6
3	0.0840	0.4240	81	<2	2	1.7	2.1	1.1	2.0	1.4	20.4	53.7	1.0	<0.5	<0.5	<0.5	<0.5
4	0.0959	0.4600	28	<2	2.8	1.4	1.7	1.2	2.5	1.5	17.2	49.4	0.6	<0.5	0.8	<0.5	<0.5
5	0.0479	0.3600	54	<3	3.1	0.8	1.8	1.1	1.9	1.1	22.6	32.7	0.6	<0.5	<0.5	<0.5	<0.5
6	0.0889	0.3460	53	<2	3.3	0.9	1.6	1	1.8	1.1	21	35.5	0.6	<0.5	0.5	<0.5	0.5
7	0.1260	0.3990	49	<2	3.7	1.4	2.2	1.2	2.4	0.9	21	65.6	1.2	<0.5	<0.5	<0.5	<0.5
8	0.08	0.3880	58	<2	3.9	1.3	1.7	1.3	1.8	1.2	18.1	47.2	1.0	<0.5	0.6	<0.5	<0.5
9	0.06	0.5240	128	<2	<0.5	1.6	2.9	1	3.0	1.0	22.8	38.7	1.0	1	<0.5	<0.5	<0.5

LIMIT	0.20	1.0000	150	<5	5	5.0	5.0	5	25.0	5.0	40	300	5.0	5	5.0	5.0	5
Unit	%	%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Batch Ref	Sulphated Ash	Sulphur	Total Halogens as Chlorine	PCB's	Cadmium	Nickel	Chromium	Vanadium	Lead	Mercury	Copper	Zinc	Arsenic	Thallium	Antimony	Cobalt	Manganese
10	0.05	0.5250	53	<2	1	0.6	2.7	1.4	2.8	1.9	20.6	28.2	<0.5	<0.5	<0.5	<0.5	<0.5
11	0.11	0.4940	56	<2	<0.5	0.6	1.9	0.6	2.1	1.1	25.3	48.1	<0.5	1.9	<0.5	<0.5	0.6
12	0.08	0.3630	50	<2	<0.5	1.5	2.7	2.1	2.0	1.2	19.4	30.6	<0.5	2.3	0.8	<0.8	0.7
13	0.09	0.4350	24	<2	<0.5	0.7	1.9	1.4	2.5	1.5	15.5	39.3	<0.5	2.3	0.6	<0.5	0.6
14	0.10	0.5720	42	<2	<0.5	1.3	2.1	1.6	1.9	1.6	18	36.2	<0.5	2.1	0.7	<0.5	0.9
15	0.13	0.6290	44	<2	<0.5	1.1	2.1	1.1	4.7	1.2	18.8	71	<0.5	0.7	0.6	<0.5	0.7
16	0.16	0.4600	99	<2	0.6	1.8	2.5	0.9	3.3	0.5	27.7	80.3	<0.5	<0.5	<0.5	<0.5	0.6
17	0.0910	0.4350	77	<2	2.7	1.3	1.4	1.1	2.7	1.2	19.2	41.7	0.7	<0.5	<0.5	<0.5	<0.5
18	0.0420	0.3940	49	<2	3.1	0.9	1.9	1.2	1.8	0.8	21.9	36.4	0.5	<0.5	0.5	<0.5	<0.5
19	0.1490	0.3990	52	<2	2	2.0	1.7	2.3	2.3	1.0	22.2	49.7	0.9	<0.5	1.1	<0.5	<0.5
20	0.0870	0.2480	30	<2	3.7	1.1	1.5	1.3	2.2	1.2	12.6	22.4	0.6	<0.5	<0.5	<0.5	<0.5
21	0.1230	0.3505	42	<2	3.75	1.7	2.2	1.95	2.3	1.2	18.45	63.4	1.1	<0.5	0.7	<0.5	0.7
22	0.1180	0.3810	65	<2	4.2	0.7	1.5	0.5	1.8	0.9	19.2	65	1.2	<0.5	<0.5	<0.5	<0.5
23	0.0880	0.5580	69	<2	<0.5	1.7	1.6	1.9	3.1	0.6	22	38.4	2.1	1.1	<0.5	<0.5	<0.5
24	0.0968	0.3940	36	<2	0.7	<0.5	2.5	0.6	2.4	2.5	18.3	28.4	<0.5	0.5	<0.5	<0.5	<0.5
25	0.0980	0.4600	42	<2	<0.5	0.9	3.4	<0.5	3.1	1.4	26.5	55.2	<0.5	2.1	<0.5	<0.5	0.7

LIMIT	0.20	1.0000	150	<5	5	5.0	5.0	5	25.0	5.0	40	300	5.0	5	5.0	5.0	5
Unit	%	%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Batch Ref	Sulphated Ash	Sulphur	Total Halogens as Chlorine	PCB's	Cadmium	Nickel	Chromium	Vanadium	Lead	Mercury	Copper	Zinc	Arsenic	Thallium	Antimony	Cobalt	Manganese
26	0.1430	0.5300	41	<2	<0.5	4.3	2.5	3	2.7	1.3	21.6	46.6	<0.5	2.3	<0.7	<0.5	0.9
27	0.1030	0.5100	37	<2	<0.5	2.4	2.2	1.8	2.8	1.0	19.1	73.3	<0.5	2.2	0.8	<0.5	0.9
28	0.1438	0.5290	22	<2	<0.5	1.3	3.2	0.8	2.2	1.3	20.1	86.7	<0.5	2.1	0.6	0.6	0.9
29	0.0849	0.4450	23	<2	0.6	1.4	2.4	1.3	2.7	0.9	20.4	38.8	<0.5	0.6	<0.5	<0.5	0.8
30	0.1110	0.4240	54	<2	2.5	1.1	2.3	1.3	2.9	1.0	18.1	43	0.9	<0.5	<0.5	<0.5	<0.5
31	0.0160	0.3690	44	<2	2.9	1.0	1.0	1.1	2.1	1.3	22	37.9	<0.5	<0.5	0.9	<0.5	0.6
32	0.1180	0.3640	38	<2	3.4	0.8	1.9	1	2.0	1.0	20.1	30.5	0.9	<0.5	<0.5	<0.5	<0.5
33	0.1180	0.4045	37	<2	3.6	0.9	1.3	1.2	2.3	1.3	20.2	53.3	1.1	<0.5	0.7	<0.5	0.5
34	0.0415	0.3400	40	<2	3.8	1.3	1.4	1.7	1.9	1.2	19.2	58.9	1.0	<0.5	0.7	<0.5	0.5
35	0.8939	0.2270	33	<2	2.3	<0.5	1.8	1.6	3.0	2.4	11	62.7	<0.5	0.5	1.2	<0.5	0.6
36	0.0980	0.5170	59	<2	<0.5	5.9	2.0	5.7	3.4	1.3	18.1	71.6	<0.5	2.3	2.1	<0.5	1.4
37	0.0750	0.4100	36	<2	<0.5	0.9	2.0	1.2	1.4	1.6	14.9	30.9	<0.5	2.6	0.9	<0.5	1.0
38	0.0870	0.4240	13	<2	<0.5	<0.5	3.7	<0.5	2.0	1.2	0.5	38.2	<0.5	2.5	1.0	0.5	0.8
39	0.0440	0.4120	40	<2	<0.5	0.8	2.7	0.6	2.0	1.0	12.1	25	<0.5	2.5	0.6	<0.5	0.9
40	0.0979	0.4770	39	<2	<0.5	1.1	1.8	1.5	3.4	1.2	23	41.7	<0.5	2	<0.5	<0.5	0.8
41	0.1170	0.4570	73	<2	0.6	1.1	2.5	1.1	4.2	1.1	23.9	60.2	<0.5	0.6	<0.5	<0.5	0.7

LIMIT	0.20	1.0000	150	<5	5	5.0	5.0	5	25.0	5.0	40	300	5.0	5	5.0	5.0	5
Unit	%	%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Batch Ref	Sulphated Ash	Sulphur	Total Halogens as Chlorine	PCB's	Cadmium	Nickel	Chromium	Vanadium	Lead	Mercury	Copper	Zinc	Arsenic	Thallium	Antimony	Cobalt	Manganese
42	0.1230	0.3800	77	<2	0.7	1.7	3.4	0.9	3.1	1.1	27	61.3	<0.5	0.5	<0.5	<0.5	0.8
43	0.0960	0.4810	105	<2	<0.5	0.7	2.6	0.9	2.6	1.6	26.9	58.1	<0.5	2	0.9	<0.5	1.1
44	0.0689	0.4200	58	<2	<0.5	0.7	3.2	0.8	1.8	1.3	0.7	45.6	<0.5	0.9	<0.5	0.7	0.9
45	0.0749	0.3260	63	<2	0.7	1.1	1.8	2.4	2.0	0.9	17.9	43.5	<0.5	0.7	0.9	<0.5	1.1
46	0.09	0.3910	68	<2	3.2	<0.5	1.1	0.8	3.0	1.0	25.4	69.6	0.9	<0.5	<0.5	<0.5	<0.5
47	0.1200	0.5201	62	<2	<0.5	2.5	1.9	1.3	3.0	<0.5	22.3	54.3	<0.5	<0.5	0.5	<0.5	0.6
48	0.1050	0.5036	40	<2	<0.5	1.3	2.0	0.9	2.6	<0.5	18.3	99.4	<0.5	2.5	<0.5	<0.5	0.7
49	0.0510	0.4551	30	<2	<0.3	1.3	1.1	1.2	1.9	<0.5	17.8	35.3	<0.5	0.5	0.6	<0.5	<0.5
50	0.0390	0.3990	44	<2	<0.5	1.7	1.6	2.5	1.7	<0.5	20.7	22.1	<0.5	0.5	0.7	<0.5	<0.5

ATTACHMENT 19.1

INDUSTRIAL EMISSIONS LICENCE REVIEW

PRIVATE AND CONFIDENTIAL
LEGAL ADVICE – PRIVILEGED

OPINION

CLIENT: ENVA IRELAND LIMITED

STATUS OF 11LS AND 19LS

1. Introduction

1.1. ENVA Ireland Limited (**ENVA**) has operated a waste oil processing facility at Clonminam Industrial Estate, Portlaoise, Co Laois (the **Facility**) for over thirty years. The Facility is operated under Industrial Emissions Directive licence (the **Licence**) W0184/01, as amended. The Environmental Protection Agency (the **Agency**) granted the Licence, under the Waste Management Act 1996, on 16 January 2004. It was amended four times, on 11 October 2005, 10 February 2011, 14 January 2013 and 30 December 2013. As of the last amendment, the Licence is deemed to be a licence for the purposes of Part IV of the EPA Act 1992 and the Industrial Emissions Directive (Directive 2010/75/EU) (the **IE Directive**).

1.2. As part of its operations, ENVA processes waste oil to produce two oil products, 11LS and 19LS, which are then sold for use as fuel in asphalt plants and stream raising boilers respectively. 11LS has been manufactured at the facility for over thirty years and 19LS for approximately five years. In granting the Licence and amendment, the Agency satisfied itself that 11LS and 19LS were not waste within the meaning of the then applicable Waste Directives (Directive 75/442/EEC and Directive 2006/12/EC), a view consistent with legal opinions procured by ENVA on 5 December 2005, December 2006, 6 April 2007 and 1 October 2008.

1.3. Following a prosecution for odour nuisance at the Facility, the Agency decided to review the Licence. It notified ENVA of the review by letter dated 26 January 2016. That letter incorporates a detailed questionnaire, including, at paragraph 19, a number of questions that concern the processed fuel oils, 11LS and 19LS, manufactured at the Facility. (Paragraph 19 is reproduced for ease of reference in Appendix 1 to this letter).

1.4. ENVA has requested A&L Goodbody solicitors to provide a legal opinion that takes account of changes in legislation and case law since the time of the previous legal opinions. The purpose of this opinion is to provide advice on the relevant legal test that the Agency will use to determine whether it remains the case that 11LS and 19LS are not waste within the meaning of the current Directive 2008/98 (the **Waste Framework Directive**). For the reasons set out below, we are satisfied that the position remains that 11LS and 19LS may be regarded as outside the scope of the Waste Framework Directive.

2. Legal Analysis

2.1. Overview

2.1.1. Since the date of the last legal opinion provided to the Agency, significant new waste legislation has been introduced. The most important is the Waste Framework Directive which supersedes Directive 2006/12/EC, which in turn superseded Directive 75/442/EEC. The Waste Framework Directive was transposed into Irish law by the European Communities

(Waste Directive) Regulations 2011 (the **Regulations**). The Regulations are amendments to the Waste Management Act 1996 and contain some stand-alone provisions.

2.1.2. The Agency must decide whether 11LS and 19LS are waste in accordance with this legislation. For the reasons set out more fully below, we are of the opinion that the legal test that applied to 11LS and 19LS in making that decision has not fundamentally changed from that which used when the Licence was granted and amended.

2.1.3. Our analysis begins with a consideration of the express definition of waste in the Waste Framework Directive. It then considers what assistance, if any, the other provisions of the Waste Framework Directive provide in interpreting that definition, in particular, the provisions of Article 6 on End-of-Waste Criteria.

2.1.4. We then review the leading European case on the Waste Framework Directive, the *Lapland Centre for Economic Development Case*, which emphasises the need for the competent authorities of Member States to take a holistic and proportionate view of their powers and duties under European environmental law. In particular, it shows that, where environmental regulation can affect the free movement of goods, competent authorities must not use a regulatory power that restricts that free movement if there is available a less restrictive means to achieve the same level of environmental protection. 11LS and 19LS are *"goods"* whose free movement is protected to that extent under European law.

2.1.5. We understand that the decision of the English Court of Appeal judgment in *R(OSS Group Limited) v Environment Agency* was of assistance to the Agency in its previous consideration of the status of 11LS and 19LS, and we assess whether its conclusions remain valid in light of the new European legislation and case law.

2.1.6. We conclude by looking at the effect of the Irish transposing legislation, and how general principles of Irish and European law require it to be applied. The application of the law to 11LS and 19LS will be considered in Section 3 of this Opinion and will draw on the technical analysis carried out by RPS, on ENVA's behalf, and the conclusions reached which support this Opinion.

2.2. European Legislation

2.2.1. *Definitions*

The Waste Framework Directive develops and clarifies a wide range of EU waste law issues. The most important to the current analysis is the definition of waste. Under prior legislation, waste was defined as any substance or object that the holder discards or intends or is obliged to discard. That definition was adequate to identify when a formerly safe, useful non-waste object (or substance) became waste, but not when a waste became, through recovery, a safe, useful non-waste object. The rigid application of the definition to recovery processes can lead to absurd results. All recovered waste has at one point been discarded – the definition's literal meaning would make impossible the waste recovery that the Waste Framework Directive demands. On the other hand, a recovery process could be complete but inadequate, and its product could be a grave danger to human health and the environment. If, having undergone that deficient process, the product was thereby to fall outside the scope of the Waste Framework Directive, two of its key objectives, the protection of human health and the environment, could not be achieved. In particular, it would diminish

the effectiveness of Article 13, which requires Member States to take all necessary measures to ensure that waste management is carried out without endangering human health and the environment.[1]

2.2.2. *Article 6 – End-of-waste standards*

(1) The Waste Framework Directive did not seek to resolve that problem by amending the text of the definition. Waste is still defined as any substance or object which the holder discards or intends or is required to discard.[2] A systematic approach is instead proposed: under the new regime, the European Commission (the **Commission**) and Member States can create end-of-waste standards for specific waste types, such as , without limitation, aggregates, paper, glass, metal, tyres, textiles and, indeed, waste lubricating oils. Where those standards exist, they will determine whether the product of a recovery process is waste or not. Presumably it was intended that detailed, technical criteria for the entire EU would eventually determine when the most important waste streams ceased to be waste.

(2) The legal effect of the Commission's standards and the conditions they must accord with are set out in Article 6(1), as follows:

"Certain specified waste shall cease to be waste…when it has undergone a recovery, including recycling, operation and complies with specific criteria to be developed in accordance with the following conditions:

(a) the substance or object [i.e. the product of the recovery process] is commonly used for specific purposes;

(b) a market or demand exists for such a substance or object;

(c) the substance or object fulfils the technical requirements for the specific purposes and meets the existing legislation and standards applicable to products; and

(d) the use of the substance or object will not lead to overall adverse environmental or human health impacts.

The criteria shall include limit values for pollutants where necessary and shall take into account any possible adverse environmental effects of the substance or object."

(3) Those conditions (the **Article 6 Conditions**) have no legal effect other than to define the limits of the standards to be developed by the Commission. They do not affect the definition of waste or, where no standards exist, the manner in which a competent authority must apply that definition.

(4) The Commission has not prescribed end-of-waste criteria for waste lubricating oils. Article 6(4) sets out the entitlement of Member States in those circumstances:

---

[1] *The OSS case ([2007] EWCA Civ 611) deals in detail with this issue and is discussed below.*

[2] *An indicative list of wastes set out in prior legislation has been dispensed with, but this is not material. This is carried across into the Waste Management Act 1996 (as amended by the EC (Waste Directive) Regulations 2011).*

"Where criteria have not been set at Community level under the procedure set out in paragraphs 1 and 2, Member States may decide case by case whether certain waste has ceased to be waste taking into account the applicable case law. They shall notify the Commission of such decisions in accordance with Directive 98/34/EC of the European Parliament and of the Council of 22 June 1998 laying down a procedure for the provision of information in the field of technical standards and regulations and of rules on Information Society services (1) where so required by that Directive."

That means a Member State may, but is not obliged to, set end-of-waste standards.

(5) On its face, the Waste Framework Directive requires the Commission and Member States to go about making end-of-waste standards in separate and distinct ways. The Commission must take the Article 6 Conditions into account (some of which are not in the applicable case law, e.g. the existence of a market or demand). Member States are required to take into account only "*applicable case law*". This difference is deliberate – the issue Member States were required to take into account changed from the "*current legal situation*" to "*applicable case law*" as the draft Directive was negotiated by the Council of Ministers.[3] While *"the current legal situation"* might have allowed Member States to apply the Article 6 Conditions, the *"applicable case law"* does not. Nowhere in the drafts of the Directive is it contemplated that Member States would be at large to formulate their own end-of-waste criteria by reference to the expanded considerations that now guide the Commission's discretion, although we are aware that this may change in the future.[4]

(6) Ireland, as a Member State, could have but has not prescribed end-of-waste criteria for waste lubricating oils. As a result, Article 6 does not determine how to treat 11LS and 19LS. While end-of-waste standards for processed fuel oil exist in the UK, those standards have no legal effect in this jurisdiction. The Agency may have regard to them

---

[3] *European and domestic Courts have regard to drafting materials of this kind in interpreting European law (and the domestic measures that transpose it). See the Lapin Elinkeino case below and the comments of Nial Fennelly, (later Mr Justice Fennelly) in Legal Interpretation at the European Court of Justice (1996) 20 Fordham Int'l L.J. 656, 666*

[4] *The European Commission's Proposal for Directive amending Directive 2008/98/EC on waste* (COM/2015/0595 final) *would amend Article 6(1) so that it reads:*

"Member States shall ensure that waste which has undergone a recovery operation is considered to have ceased to be waste if it complies with the following conditions: :

(a) the substance or object can be used for specific purposes;

(b) a market or demand exists for such a substance or object;

(c) the substance or object fulfils the technical requirements for the specific purposes and meets the existing legislation and standards applicable to products; and

(d) the use of the substance or object will not lead to overall adverse environmental or human health impacts."

The Proposal was published on 2 December 2015 and may be amended by the Council and Parliament of the European Union before its enactment.

as one example of conditions under which another Member State authority[5] has decided that processed fuel oil will not harm human health or the environment, but they are not binding on the Agency and to regard them as determinative of the status of processed fuel oil in this jurisdiction would not be lawful. The Agency's task is, independently, to apply the definition of waste, as interpreted by the European Court of Justice, in accordance with the general principles of Irish and European law.

2.2.3. *General principles of European law - proportionality*

(1) The principle of proportionality is a general principle of European law that has a significant effect on how the Agency must determine the status of 11LS and 19LS. The principle of proportionality determines what restrictions can lawfully be imposed on the free movement of goods. In this context, proportionality requires that the objectives of the Waste Framework Directive must be achieved by the means least restrictive of the free movement of goods within the internal market. While this must not diminish the extent to which human health and the environment must be protected, it means that, where there is more than one way to achieve that level of protection, the way that least restricts the free movement of goods must be adopted.

(2) That wastes are goods is evident from the Waste Framework Directive itself. It obliges Member States to notify end-of-waste standards in accordance with Directive 98/34/EC (the **Technical Regulations Directive**). The Technical Regulations Directive, to protect the internal market, obliges Member States to notify the Commission and other Member States of *'technical regulations'*. Technical regulations include laws, regulations or administrative provisions prohibiting the marketing or use of goods. End-of-waste criteria would not require notification as technical regulations unless they could affect the internal market in goods, and the only goods whose market they can affect is waste.

(3) The European Court of Justice has considered the definition of waste and its interaction with the proportionality principle. Its key decisions in that regard are discussed in the next section.

2.3. Case law on the Waste Framework Directive – European

2.3.1. *Case 358-11 – Lapin elinkeino-, liikenne- ja ympäristökeskuksen liikenne ja infrastruktuuri – vastuualue* (Court of Justice of the European Union, 7 March 2013)

(1) The only decision to date that deals with the Waste Framework Directive is *Lapin elinkeino-, liikenne- ja ympäristökeskuksen liikenne ja infrastruktuuri -vastuualue* (Case C-358/11) (**Lapland Centre for Economic Development Case**). That case concerned decommissioned telephone poles that had originally been treated with wood preservatives regulated by Regulation (EC) No 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals) (**REACH**). The poles were used to repair a walking track in a European site. They provided support for "duckboards", i.e. raised tracks typically provided for hikers, ramblers and light vehicles to cross marshy terrain. That use was challenged before the Finnish courts by the Lapland Nature Protection Association and a number of issues were referred to the

[5] *The European Commission was notified of the standards before they were adopted, and they were circulated to the Member States had the opportunity to comment on them.*

Court of Justice of the European Union (**CJEU**). For the purposes of this advice, two of the referred issues are relevant:

(i) Does hazardous waste cease to be waste if it fulfils the Article 6 Conditions?

(ii) In determining whether an object is waste, in particular by reason of obligation to dispose of it, is it relevant that its re-use is authorised under certain conditions by the REACH Regulation?

(2) The Court agreed with its Advocate General[6] who found that the first question was misconceived. The Advocate General reasoned that Article 6(1) prescribed a *process for determining* when the specified waste ceases to be waste, but did not affect the *definition* of waste:

> *"That provision does not directly stipulate the conditions under which the waste ceases to be waste, but lays down the framework conditions within which that question can be regulated for certain types of waste."* [emphasis ours]

(3) As regards relevant considerations for Member States in developing end-of-waste criteria, the Advocate General reviewed the legislative history and concluded that (1) the reference to the making of end of waste criteria in accordance with "*applicable case law*" (as opposed to the Article 6 Conditions) was deliberate; (2) that there was no indication in the final version of the Directive that the Article 6 Conditions were to be taken account of by Member States in developing end of waste criteria; and (3) that Member States were bound to follow European Court decisions on the definition of waste for those purposes.

(4) Although not asked to, the European Court of Justice proceeded to rule on the application of the definition of waste:

> *"European Union law does not, as a matter of principle, exclude the possibility that waste regarded as hazardous may cease to be waste within the meaning of Directive 2008/98* [the Waste Framework Directive] *if a recovery operation enables it to be made usable without endangering human health or harming the environment and, also, if it is not found that the holder of the object at issue discards it or intends or is required to discard it, within the meaning of Article 3(1) of that Directive, this being a matter for the referring court to ascertain."*

(5) The judgment therefore confirms that the Agency may not have regard to the Article 6 conditions in determining whether 11LS or 19LS is waste. It is instead confined to applying the test set out above, i.e.

(i) Has the waste has undergone a recovery operation?

(ii) Has the holder of the object discarded it, does she intend to discard it, or is she required to discard it?

[6] *A lawyer and officer of the European Court of Justice whose opinion on the case is delivered some time prior to judgment and is frequently followed by the Court.*

(iii) Does the recovery operation enable the object to be made usable without endangering human health or harming the environment?

(6) Previous decisions of the CJEU had, in a somewhat contrived manner, tried to treat the risk of harm to the environment and human health as evidence that the holder had discarded or intended to discard the substance or object, rather than an as an independent element of the test.[7] In the *Lapland Centre for Economic Development Case*, the CJEU took a more direct approach. An object will not be waste unless it is both discarded (or intended or obliged to be discarded) and poses a danger to human health or the environment.

(7) Applying that test, firstly, 11LS and 19LS are the products of a recovery process and secondly, they are not being discarded, nor are they intended or obliged to be discarded. As a result, the Agency must only treat them as waste if they cannot to be used without endangering human health or harming in the environment.

2.3.2. *REACH and the holistic interpretation of environmental law*

(1) REACH is legislation with the same fundamental health and environmental objectives as the Waste Framework Directive. As a result, the CJEU held that it affects the definition of waste. Essentially, if REACH demands a particular environmental standard for a substance or object, the national competent authority need not go further:

> *"The REACH Regulation seeks, in particular, to ensure a high level of protection of human health and the environment. In the light of that objective, it must be acknowledged that the European Union legislature, by authorising the use of wood treated with CCA solutions under certain conditions, has taken the view that, although that treatment is carried out with a dangerous substance which is subject to restrictions under that regulation, that dangerous nature is not capable of compromising that high level of protection of human health and the environment in the case where such use is limited to certain applications.*
>
> *Waste management must be carried out with a comparable objective, in accordance with Article 13 of Directive 2008/98, without endangering human health and without harming the environment. In those circumstances, in order to assess that requirement, there is nothing to prevent account being taken of the fact that hazardous waste ceases to be waste because its recovery is carried out in the form of a use authorised under Annex XVII to the REACH Regulation and that its holder is therefore no longer required to discard it within the meaning of Article 3(1) of that directive."*

(2) The Advocate General also considered the application of REACH:

> *"It would be inconsistent to infer from Article 13 of the Waste Directive* [i.e. the obligation to manage waste in a manner that does not endanger the protection of human health or the environment] *requirements concerning the use of waste, which the holder does not discard or intend to discard, or no longer discards, or intends to discard, which are more stringent than those for*

[7] *See e.g. Arco Chemie Nederland (Joined Cases 418/97 and 419/97) and the discussion of its contradictions in R (OSS Group Limited) v Environment Agency* [2007] EWCA 611

identical substances which are not waste. An inconsistency of that kind must in any event be avoided if rules for such substances exist that are of similar objective to Article 13. In this regard, the purpose of the REACH Regulation…is likewise to ensure a high level of protection of human health and the environment.

In spite of that objective, not every use of substances, mixtures or products that would be permissible under that regulation is necessarily also to be regarded as permissible recovery of waste, particularly hazardous waste. The REACH Regulation covers a very large number of substances, mixtures and products, but specifically regulates their use in only very few cases, which are distinguished by particularly serious risks to human health and the environment. Correspondingly, Article 128(1) of the regulation frees the use of the materials covered but, under Article 128(2), the Member States may restrict their use to protect workers, human health and the environment unless it has been harmonised under the regulation.

As set out above, such harmonised rules for the use of CCA-treated wood already exist pursuant to the REACH Regulation.

That assessment by the legislature must [emphasis added] *therefore serve as guidance on how similar waste may be used."*

(3) In a similar way, the Industrial Emissions Directive offers guidance on the circumstances in which the EU legislature determined that 11LS and 19LS can be used without endangering human health or the environment. Under the IE Directive, the BAT Conclusions for waste treatment prescribe the techniques for the control of "*waste fuel*" emissions. "*Waste fuel*" is not necessarily waste; it is a defined term that encompasses all fuels that arise from waste treatment processes. Those fuels can a waste that will be disposed of by burning or a fully recovered non-waste fuel product.[8] In either case, the BAT Conclusions for emissions from waste fuel are:

(iv) Try to have a close relationship with the waste fuel user in order that a proper transfer of the knowledge of the waste fuel composition is carried out (Chapter 5.2, par. 117)

(v) Manufacture different type of waste fuels according to the type of user (e.g. cement kilns, different power plants), to the type of furnace (e.g. grate firing, blow feeding) and to the type of waste used to manufacture the waste (e.g. hazardous waste, municipal solid waste) (Chapter 5.2, par. 119)

(4) The BAT Conclusions therefore anticipate that a recovery process may yield a non-waste product whose use as fuel can be satisfactorily controlled through the best available techniques. IED Licence Conditions are required to be based on the BAT Conclusions (Article 14(3), Industrial Emissions Directive). Accordingly, 11LS and 19LS are, by default, subject to the controls described at (i) and (ii) above (see conditions 5.3.5 to 5.3.8), including the Agency's control and monitoring of the supply to ultimate users.

[8] *The full definition is* "any type of waste or prepared material from waste that is used as fuel in the combustion process." *[emphasis added]*

(5) The situation is therefore analogous to the *Lapland Centre for Economic Development Case*. In both instances, EU law has set a standard for the protection of human health and the environment (REACH in the Lapp case, IED in current case), and provided Member States with the legal powers to achieve that standard.

2.3.3. *Proportionality*

(1) If the Agency decides to treat 11LS and 19LS as waste, we consider that treatment exceeds the standard mandated by the BAT Conclusions. In doing so, a restriction on the free movement of goods will have been imposed. As a result, the Agency's decision must conform with the principle of proportionality.

(2) Proportionality does not entail a lesser level of environmental protection. The leading case in a waste context is *Commission v Denmark* (302/86) (the **Danish Bottle Case**). That concerned whether a Danish law was compatible with the free movement of goods. The Danish law required the marketing of drink bottles in quantities greater than 3,000 hectolitres a year to be subject to an authorisation. The authorisation was designed to maximise reuse and would not be granted if the bottle did not meet the requirements of a return system. The number of authorisations were capped at c. 30.

(3) These measures restricted the free movement in Denmark of bottles not having an authorisation. The Danish Government nonetheless submitted to the Court that the measures were justified by the need to protect the environment.

(4) The Court accepted that restrictions could be justified in the interests of environmental protection but, because the restriction was not proportionate, found Denmark in breach of EU law. Evidence was produced to show that satisfactory reuse rates had been achieved for bottles of wine, spirits and vinegar, which were subject to a less stringent regime. As those measures afforded equal protection for the environment, while being less restrictive of intra-Community trade, the restriction could not be maintained at the stricter level.

(5) In determining whether 11LS or 19LS should be treated as waste because of their potential impact on the environment and human health, the Agency must satisfy itself that that is the least restrictive way to address those potential impacts satisfactorily. If there is a less restrictive way in which the same level of environmental protection can be achieved (e.g. if it could impose an IE Directive licence condition on another ground that addresses the anticipated or suspected environmental effects) the Agency cannot lawfully treat 11LS and 19LS as waste.

2.4. Case law – UK

2.4.1. In *R (OSS) v Environment Agency*[9], the Court of Appeal of England and Wales was called on to determine whether processed fuel oil derived from waste oils was waste for the purposes of the Waste Framework Directive. As such it is of particular relevance to this case. In that case, the Court approved of a decision of the Administrative Law Division of the Dutch Council of State (*ICO Power BV v Secretary of State*). In ICO Power, the Council of State

[9] *[2007] EWCA Civ 611*

considered the status of fuel pellets for use in electricity and heating plants. The Council of State found that they were not waste on the basis that they were "*equivalent to regular fuels*" (without specifying what particular fuels they were equivalent to), that they contained no pollutants such as heavy metals, and that no special precautionary measures were needed to protect the environment in their use. Having summarised this decision, the Court of Appeal went on to state:

> *"Although we are not called upon to decide the correctness of the decision, I see no reason to doubt it. It seems to me a practical and common sense approach to the issue, which is consistent with the letter and spirit of the Directive and with the case law. It is also consistent with the objective of encouraging the recovery of waste materials for uses which replace raw materials. It should be enough that the holder has converted the waste material into a distinct, marketable product, which can be used in exactly the same way as an ordinary fuel, and with no worse environment effects. It cannot be said that such materials are being discarded in any ordinary sense of the term, and there is nothing in the objectives of the Directive which requires any fictitious assumption to that effect. The energy pellets would perhaps have failed DEFRA's test, because they were not hardly distinguishable from the alternative fuels. But, as I have said, I do not think such a general test can be extracted from Niselli* [another ECJ case that applied the traditional "discard" test]. *Nor do I see any reason for it. The objectives of the Directive do not include mimicry."*

2.4.2. The reference to DEFRA's test is a reference to the test that the UK Department of the Environment (**DEFRA**) had urged on the Court. The UK Environment Agency had also appeared and submitted a test of its own. The Court of Appeal judgment found that neither DEFRA nor the UK Environment Agency's test was appropriate. It therefore usefully demonstrates what the Agency is not required to do in determining whether 11LS or 19LS are waste. It is unnecessary to demonstrate that 11LS and 19LS:

(vi) Are chemically and physically identical to the original material and require no further processing such that they can replace virgin material which would otherwise be used; or

(vii) Have the same characteristics as a virgin material such that they can hardly be distinguished from virgin material.

2.4.3. *OSS* makes clear that the scope of waste law should be determined primarily by the objectives of the Directive rather than by seeking, in its words and syntax, a level of detailed guidance that is not there. That allows for the practical application of the law, whether by introducing end-of-waste standards (as the UK's Environment Agencies went on to do for waste oil after *OSS* had been decided) or by determining whether, on the facts of a particular case, a substance should be treated as waste. The latter is, of course, the Agency's task here.

2.4.4. We understand that the Agency had regard to, among other things, this judgment in its original decision not to treat 11LS and 19LS as waste. We believe that the judgment's authority has only been strengthened by European developments since the date of the Agency's decision and remains a valid basis for declining to treat 11LS and 19LS as waste.

2.5. Irish Legislation

2.5.1. The *European Communities (Waste Directive) Regulations 2011* is the primary instrument by which the Waste Framework Directive is transposed into Irish law. The Directive's definition of waste is inserted into the Waste Management Act 1996 verbatim. The Agency is obliged to

apply that definition to 11LS and 19LS and to have regard to the CJEU's case law in so doing.

2.5.2. As far as end-of-waste criteria are concerned, Article 6 has potentially been transposed inaccurately. Regulation 28(3) provides:

"(a) Where criteria have not been set at Community level as referred to in paragraphs 1 and 2 of Article 6 of the Waste Directive, the [Environmental Protection] Agency may decide on a case by case whether certain waste has ceased to be waste in accordance with the criteria set out in paragraph (1) taking into account the applicable case law."

2.5.3. The criteria set out in paragraph (1) are the Article 6 Conditions.

2.5.4. The natural meaning of the Regulation 28 is to give the Agency, within Ireland, the same power to develop end-of-waste criteria as the Commission. As discussed above, those conditions encompass matters not previously part of the definition of waste. Only the Commission is entitled to develop end-of-waste criteria in accordance with them. Member States are confined to considering the applicable case law. Accordingly, there appears to have been an error in the transposition of the Waste Framework Directive.

2.5.5. The transposition error between Regulation 28 and Article 6 could be addressed by construction. That construction would be achieved by reading it as allowing the Agency to develop end-of-waste criteria taking account of the applicable case law and, *only if the applicable case law allows*, taking into account the four conditions set out in Article 6(1). Consistent with European and Irish principles of interpretation, that construction gives proper effect to European law and confines the effect of the Regulation within the bounds of the authority delegated to Ireland by the Directive. (The Agency can have no greater entitlement than Ireland to apply the Article 6 Conditions). As we have seen, the applicable case law expressly prohibits the Member States and, therefore, the Agency from determining end-of-waste criteria by reference to the Article 6 Conditions.

2.5.6. In any case, the present case requires the Agency to apply the definition of waste directly to 11LS and 19LS, rather than to determine end-of-waste criteria.

2.6. Case law – Irish

General principles of Irish law also delimit the Agency's discretion. These are mostly matters of good public administration. The Agency must state the main reasons for its decisions. It must take into account all relevant considerations and no irrelevant considerations. Finally, its decision must be 'reasonable', which has a special meaning at law, i.e. not plainly at variance with fundamental reason and common sense.[10]

3. **Application of the law**

3.1. The above analysis yields three criteria that determine whether waste has ceased to be waste:

3.1.1. *Has the waste undergone a recovery operation?*

[10] *O'Keeffe v An Bord Pleanála* [1993] 1 IR 39

11LS and 19LS have undergone oil re-refining/other reuses of oil, a recovery operation listed at R9 of Annex II of the Waste Framework Directive. ENVA have advised us, and RPS have confirmed, that 11LS and 19LS are "*distinct, marketable product*[s], *which can be used in exactly the same way as an ordinary fuel*". It may or may not be the case that they are *"chemically and physically identical to"* or *"hardly distinguishable from"* the materials they replace, but it is clear from the *OSS* case that they do not need to be – that criterion is not prescribed by the Waste Framework Directive, and the *OSS* case accepted that adherence to it did not do anything to aid the Directive's objectives. Accordingly, for the purposes of the Directive, they have the same properties and characteristics as the virgin material that would otherwise be used in asphalt plants and steam raising boilers. All the legal tests for the completeness of the recovery operation are therefore satisfied.

3.1.2. *Has 11LS or 19LS been discarded or are they intended or obliged to be discarded?*

We are advised by ENVA that 11LS and 19LS are distinct products with a market value and economic use. They are not discarded, intended to be discarded or obliged to be discarded.

3.1.3. *Are 11LS and 19LS usable without endangering the environment or human health*

(1) Preliminary

Detailed evidence of the safety of 11LS and 19LS is provided in the written responses prepared by RPS by way of answer to the questions raised by the Agency in paragraph 19 of its 26 January letter (see Appendices 2 and 3 to this Opinion). As paragraph 19(e) of the Agency's letter acknowledges, there are at least two valid approaches to demonstrating the health and environmental impacts of the use of 11LS and 19LS. Because the Agency must have regard to all relevant information before it when assessing the human health and environmental impact of 11LS and 19LS, ENVA can choose to adopt any of those two valid approaches for each of 11LS and 19LS. In this case, it has chosen to do so – the environmental impact of 11LS has been demonstrated by reference to one approach and 19LS by reference to the other.

11LS' environmental and human health impact is demonstrated by the quantification of the emission of combustion gases produced upon its combustion in asphalt plants. 19LS' impact is demonstrated by way of a review of the standard to which it is produced and the comparative analysis underpinning that standard. That review shows that 19LS' combustion poses no danger to the environment or human health and, compared with the fuel oils it displaces, contains no more contaminants of environmental concern and has no greater environmental impact. The standard to which 19LS is produced is fundamentally based on the Quality Protocol for Processed Fuel Oil developed by the Environment Agency of England and Wales.

(2) 11LS

RPS' *11LS Oil Product – Emissions Study* dated 12 May 2016 (see Appendix 2) demonstrates that 11LS can be used in asphalt plants without endangering human health or the wider environment.

The Agency may take the view that 11LS poses a danger to the environment or human health because the safety of its use other than in asphalt plants has not been demonstrated. On that basis, it might conclude that it should be treated as waste. That approach appears to be contemplated by the second paragraph of 19(e) ("*The quantification of emission of combustion gases should be done…at a number of combustion plants of different types*"). We consider that would be disproportionate. The CJEU in the *Lapland Centre for Economic*

Development Case found that hazardous waste could cease to be waste if it were put to a use sanctioned by REACH, which sanctioned only a very limited set of uses. The use of 11LS is restricted to combustion in asphalt plants by Condition 5.3.5 of the IE Directive Licence. That (and other provisions aimed at controlling and monitoring its use) is consistent with the IE Directive's BAT Conclusions. To treat 11LS as waste would involve a much more serious restriction on its free movement within the EU. Without substantial evidence of potential harm to the environment or human health that could only be addressed by treating 11LS as waste, a decision by the Agency to so treat it would be at considerable risk of breaching EU law on the free movement of goods.

That 11LS is not produced to the Quality Protocol standard is not evidence that it poses a danger to human health or the environment. The Quality Protocol is a standard for processed fuel oils that can be manufactured in any waste facility (whether or not IED licenced) and can be sold or supplied for combustion in all of the same applications as residual and distillate fuel oils. The Agency, in this case, need only determine whether, on the evidence before it, 11LS is a waste, notwithstanding that its use (and potential for harm) is already controlled by licence terms imposed pursuant to the IE Directive.

(3) 19LS

We are advised that the standard to which 19LS is produced is fundamentally based on the Quality Protocol on end-of-waste criteria for the production and use of processed fuel oil from waste lubricating oils made by the Environment Agencies of England, Wales and Northern Ireland and notified to the European Commission. As discussed, while not binding in this jurisdiction, it is an example of a standard for end-of-waste that another Member State decided complies with the Waste Framework Directive, to which the Agency is required to give due weight in its determination.

To assist the Agency in that regard, RPS has produced *19LS Oil Product – Comparative Analysis* dated 12 May 2016 (see Appendix 3). That report confirms that the quality standards in the existing licence comply with the Quality Protocol in all respects necessary to achieve the mandated level of health and environmental protection. In particular, it confirms that the comparative analysis that supports that Quality Protocol shows that 19LS and other oils produced to that standard contain no more contaminants of environmental concern and will have no greater environmental impact that the fuel oils displaced by 19LS (in their words "*no net negative impact over the corresponding use of HFO* [the virgin oil for which 19LS is a substitute]".)

3.2. For the reasons detailed above, the product of a recovery process that meets these criteria is not waste, regardless of whether it complies with the Article 6 Conditions. In case the Agency's view of the law differs, we have also considered whether 11LS and 19LS comply with the Article 6 Conditions. On the analysis above, two of those conditions have already been satisfied, i.e the products are commonly used for specific purposes and their use will not lead to overall adverse environmental or human health impacts. We are advised by ENVA that the remaining two are also satisfied for the reasons set out below:

3.2.1. *A market or demand exists for such a substance or object*

We are advised that there has been a consistent demand for ENVA's recovered fuel products since the 1980s. The products have never had a negative value and compete as replacement fuels for virgin fuel oils.

3.2.2. *The substance or object fulfils the technical requirements for the specific purposes and meets the existing legislation and standards applicable to products*

We are advised that ENVA's customers have used 11LS and 19LS as a substitute for other virgin fuel oils without any additional processing or special precautions.

4. Conclusion

In arriving at the conclusion that 11LS and 19LS are not waste, this opinion had regard to the express definition of waste in the Waste Framework Directive. That definition was of limited assistance. It defines waste only as something discarded, intended to be discarded or obliged to be discarded, but the Directive clearly envisages that waste can be recovered to the extent it is no longer waste.

The Article 6 Conditions are also of limited assistance because, in the words of the CJEU in the Lapland Centre for Economic Development *"[t]hat provision does not directly stipulate the conditions under which the waste ceases to be waste, but lays down the framework conditions within which that question can be regulated for certain types of waste."*

The law, as interpreted by the CJEU, allows even hazardous waste, to cease to be such where a recovery operation enables it to be made usable without endangering human health or harming the environment and if the holder does not discard nor intends/is obliged to discard it. If the product's potential danger to human health or harm to the environment is already regulated (e.g. by REACH or the IE Directive) its treatment as waste will only be proportionate if the danger/harm is inadequately addressed by that regulation. These recent developments have validated the practical approach of the Court of Appeal of England and Wales in *OSS*.

Having regard to the above, ENVA's information on the marketing and use of 11LS and 19LS, and the conclusions of the appended RPS reports, we are of the opinion that 11LS and 19LS are not waste.

A&L GOODBODY

17 May 2016

Appendix 1

Paragraph 19 – Extract Agency letter of 26 January 2016

19.

(a) *In relation to the processed fuel oil produced at the installation, there are two quality standards included in your existing industrial emissions licence. Provide information on:*

- *the extent to which each of these quality standards are used (a commentary);*
- *the approximate quantity of processed fuel oil produced to each quality standard; and*
- *the destination (by activity) of each grade of processed fuel oil and the approximate quantity of processed fuel oil dispatched to each activity type.*

Do not submit any information that is deemed confidential for commercial reasons and cannot be published to the EPA's website.

(b) *Provide a report on the quality of the last 50 samples each (i.e. 100 samples in total) of:*

- *reprocessed oil with use restricted according to condition 5.3.5 of the existing licence; and*
- *residual oil equivalent with use restricted according to condition 5.3.6 of the existing licence.*

The report should provide a table showing the complete analysis of each of the 100 batches tested. Highlight any exceedances of the quality standard and provide the reason or reasons identified for those individual exceedances. State what actions in your procedures require where there is an exceedance of quality standards.

(c) *State what virgin fuel oils are displaced by your processed fuel oil.*

(d) *Describe any blending of processed fuel oil with virgin fuel oils.*

(e) *Demonstrate quantitatively that the quality standards in the existing licence remain appropriate to demonstrate that the processed fuel oil is not classified as waste when it leaves the installation. Alternatively, propose new quality standards that enable this quantitative demonstration.*

As part of this quantitative demonstration, carry out and report on a detailed comparative analysis or provide a relevant comparative analysis prepared by others that shows that processed fuel oil contains;

- *no more contaminants (of environmental concern); and*
- *will have no greater environmental impact.*

than the fuel oils displaced by processed fuel oils.

The effects of dilution, for example through mixing or blending with virgin fuel oils, should not be considered in your quantitative demonstration.

Alternatively, quantify the emission of combustion gases produced upon combustion of processed fuel oil and demonstrate quantitatively, through air dispersion modelling or other means, that the combustion gases do not and will not have an adverse impact on air quality in the vicinity of a combustion plant. The quantification of emissions of combustion gases should be done only as part of a comprehensive and representative sampling and analysis programme carried out in real world conditions at a number of combustion plants of different types. It will be appropriate to seek the Agency's opinion on the scope of any proposed sampling and analysis programme.

Appendix 2

11LS Oil Product – Emissions Study
RPS

Enva Ireland Limited

11LS Oil Product - Emissions Study

Document Control Sheet

Client:	Enva Ireland Limited
Project Title:	11LS Oil Product - Emissions Study
Document Title:	Emissions Study Report
Document No:	MDE0973Rp0101

Text Pages:	43	Appendices:	-

Rev.	Status	Date	Author(s)		Reviewed By		Approved By	
F01	Final	12th May 2016	PC		CR		CR	

QUALITY ISO 9001:2008 NSAI Certified | ENVIRONMENT ISO 14001:2004 NSAI Certified | HEALTH & SAFETY OHSAS 18001:2007 NSAI Certified

CERTIFIED IQNet MANAGEMENT SYSTEM

ENGINEERS IRELAND cpd ACCREDITED EMPLOYER

rpsgroup.com/ireland

TABLE OF CONTENTS

1 INTRODUCTION 1
2 METHODOLOGY 3
2.1 General 3
2.2 Fuel Specification Testing 3
2.3 Emissions Monitoring 4
2.4 Air Dispersion Modelling 4
3 ASSESSMENT CRITERIA 6
3.1 Waste Licence Oil Quality Standards 6
3.2 Emissions to Atmosphere 6
3.3 Ambient Air Quality 8
4 FUEL ANALYSIS 12
5 MONITORING OF EMISSIONS TO ATMOSPHERE 14
6 AIR DISPERSION MODELLING 27
7 DISCUSSION 36
7.1 Emissions to Atmosphere 36
7.2 Emissions to Atmosphere 36
7.3 Link between Fuel Specification and Emissions to Atmosphere 37
7.4 Impact on Human Health 38
7.5 Impact on the Wider Environment 39
7.5.1 Sensitive Ecosystems 39
7.5.2 Acidifying Gases 39
7.6 Impact Summary 40
7.7 Link between Fuel Specification and Environmental Impact 40
8 CONCLUSIONS 42

1 INTRODUCTION

Enva Ireland Limited operates under an Industrial Emissions Licence (Register No. W0184-01) from the EPA for the facility in Clonminam Industrial Estate, Portlaoise, County Laois. One of the processes carried out under the licence involves the recovery of waste oil to produce a commercial processed fuel oil product known as 11LS. Condition 5.3.5 of the licence restricts the use of 11LS to asphalt plants subject to the fuel meeting the quality standards presented in Schedule G.2.

On the 26th January 2016, the EPA gave notice to Enva Ireland Limited that the EPA was initiating a review of the licence in accordance with the provisions of Sections 90(4) and 98A of the EPA Act 1992 as amended. The EPA notification contains a detailed list of information that is sought as part of the review and, in particular, Requirement 19(e) requires Enva to submit the following:

Demonstrate quantitatively that the quality standards in the existing licence remain appropriate to demonstrate that the processed fuel oil is not classified as waste when it leaves the installation. Alternatively, propose new quality standards that enable his quantitative demonstration.

As part of this quantitative demonstration, carry out and report on a detailed comparative analysis, or provide a relevant comparative analysis prepared by others, that shows processed fuel oil contains:

- *no more contaminants (of environmental concern), and*
- *will have no greater environmental impact,*

than the virgin fuel oils displaced by processed fuel oil.

The effects of dilution, for example through mixing or blending with virgin fuel oils, should not be considered in your quantitative demonstration.

Alternatively, quantify the emission of combustion gases produced upon combustion of processed fuel oil and demonstrate quantitatively, through air dispersion modelling or other means, that the combustion gases do not and will not have an adverse impact on air quality in the vicinity of a combustion plant. The quantification of emissions of combustion gases should be done only as part of a comprehensive and representative sampling and analysis programme carried out in real-world conditions at a number of combustion plants of different types. It would be appropriate to seek the Agency's opinion on the scope of any proposed sampling and analysis programme.

This report presents the details sought in the final paragraph of Requirement 19(e) in the form of quantitative evidence of the impact of the fuel oil product (11LS) against a virgin fuel. This detailed study involved comprehensive emissions monitoring of the real-world fuel combustion at two asphalt plants followed by air dispersion modelling to determine the environmental impact, if any, of using 11LS over virgin fuels.

In 2008, RPS carried out monitoring of emissions to atmosphere at two real-world sites to allow for variation in site conditions and raw material mix. These sites are two asphalt manufacturing sites located within the Republic of Ireland.

This monitoring was carried out by an MCERT accredited air sampling team for all parameters in duplicate for both the 11LS product and virgin oil (gas oil) and results are compared against a relevant set of assessment criteria. It should be noted that typically asphalt plants utilise Light Fuel Oil (LFO) as opposed to gas oil and the use of LFO and other residual fuel types would generate higher emissions (in particular higher sulphur dioxide emissions) than the relatively cleaner gas oil. However, for the purposes of a robust and conservative assessment, gas oil was used as the comparator for this study.

RPS included the results of this monitoring survey in a US EPA approved AERMOD Prime dispersion model for each site to determine the air quality impacts on the environment at the site boundary. The results of the modelling surveys are assessed against the relevant statutory limits and ambient air quality guidelines for both the protection of human health and the wider environment (natural ecosystems).

This report provides robust and comprehensive evidence that the use of the 11LS product in asphalt plants *"does not and will not have an adverse on air quality in the vicinity of a combustion plant"*. Furthermore, the report will demonstrate that this product can be used without endangering human health or the wider environment.

2 METHODOLOGY

2.1 GENERAL

Enva Ireland Ltd. currently produce an oil product known as 11LS from waste oils at the Enva facility in Portlaoise in Co. Laois. This oil product is suitable for use as a combustion fuel in asphalt plants and is currently used at a number of facilities around the country. This report has been prepared by RPS at the request of Enva to assess the environmental impact of using 11LS over virgin fuel at these facilities to determine the net impact of using this fuel.

RPS commissioned City Analysts MCERT accredited air sampling team to carry out emissions monitoring under test conditions at the following facilities during 2008:

- Asphalt Plant A
- Asphalt Plant B

Further details of the monitoring surveys, pollutants targeted and methods employed are presented in **Section 2.3**.

Subsequent to this monitoring, an air dispersion model was prepared for each site to simulate the actual emissions from the site and determine the resultant impact on the environment. The modelling was undertaken by the Air Quality team in RPS using the USEPA approved AERMOD Prime model and the results are compared against the relevant statutory limits and air quality guidelines. Further details of the modelling methodology employed is presented in **Section 2.4**.

2.2 FUEL SPECIFICATION TESTING

In advance of any monitoring carried out at the two asphalt plants, samples of the 11LS product to be used at each plant were dispatched for quantitative analysis at SGS laboratories in the UK (UKAS Accredited). Analysis was carried out using a range of analytical techniques as outlined in **Table 2.1**.

Parameter	Method/Technique
Halogen Content (as Chlorine)	IP510/BSEN14077
Sulphur Content	ASTM D5453
Ash Content	ASTM D482
Metals	ASTM D5185
PCB Content	ASTM D4059

Table 2.1: List of parameters and analytical methods employed in the fuel specification testing

The results of the monitoring survey are presented in **Section 4** of this report and are compared against the limits presented in the Waste Licence (as outlined in **Section 3.1**).

2.3 EMISSIONS MONITORING

The monitoring programme was carried out by technical staff, with suitable MCERT Accreditation at the time of the surveys, from City Analysts Air Monitoring Department. The team leader on site held MCERTS Level 2. Sampling for a series of targeted pollutants was carried out in strict accordance with recognised standard procedures as detailed in **Table 2.2**.

Parameter	Method/Technique	Analysis
Volume Flow	CEN 13284/Pitot tube and thermocouple	n/a
Combustion Gases CO, NO_x, SO_2 etc.	ISO 12039/Flue Gas Analyser	n/a
Particulate Matter	CEN 13284/isokinetic	Gravimetric
Heavy Metals	BS EN 14385	ICP-MS
VOCs	CEN 13649/SKC 226-01 tubes	GC-MS
Inorganic Acids (HCl, HF)	US EPA Method 26 BS EN 1911	IC
Dioxins/Furans	BS EN 1948	GC-MS

Table 2.2: List of parameters and standard monitoring methods employed in the monitoring assessment

Sampling was carried out on the week beginning Monday 31st March 2008 at Asphalt Plant A. Sampling was carried out on the week beginning Monday 21st of July 2008 at Asphalt Plant B.

For each site, two separate (4 hr) sampling sessions were carried out for both the 11LS product and gas oil resulting in 4 separate sample runs per plant. For all sample runs production details such as product, material moisture content, operating temperatures, etc. were identical and the fuel used was the only significant variable in the process.

All samples and field blanks were transported to SAL Laboratories (UKAS Accredited) in Manchester using strict chain of custody procedures. Analysis has been carried out as per the techniques presented in **Table 2.2**.

The results of the monitoring survey are presented in **Section 5** of this report and are compared against the relevant assessment criteria.

2.4 AIR DISPERSION MODELLING

The model used for Air Dispersion Modelling was the US EPA approved AERMOD Prime model, which is the regulatory model in the US and a recommended model under the EPA guidance note Air Dispersion Modelling from Industrial Installations Guidance Note (AG4).

AERMOD is run with a sequence of hourly meteorological conditions to predict concentrations at receptors for averaging times of one hour up to a year. It is necessary to use many years of hourly data to develop a better understanding of the statistics of calculated short-term hourly peaks or of longer time averages. Utilities associated with the dispersion model allow computation of ground

level concentrations of pollutants over defined statistical averaging periods, consideration of building wake/downwash effects and the effects of elevated terrain in the vicinity of the site.

Site-specific emission source data has been derived for each site from the results determined in the monitoring assessment (**Section 2.3**). Results have been modelled for the average emissions using both fuels at the site. Site specific data such as stack height, cross sectional areas, volume flows, emission temperatures etc. have also been derived from the monitoring report and site drawings.

Model receptors were placed at the nearest sensitive receptors to each of the sites to determine the levels of pollution that will occur off site from operations.

The most important parameters governing dispersion in the atmosphere are wind speed, wind-direction and the stability or turbulence of the atmosphere. These parameters along with the ambient temperature and inferred mixing heights for each hour were included in the modelling using data from and appropriate met station with validated met data.

The results of the modelling are presented in **Section 6** of this report.

3 ASSESSMENT CRITERIA

3.1 WASTE LICENCE OIL QUALITY STANDARDS

Schedule G.2 of the Waste Licence (Technical Amendment B of February 2011) presents the limitations for reprocessed oil with use restricted according to Condition 5.3.5 of the licence. Condition 5.3.5 limits the use of this fuel to hot-mix asphalt plants and this is the 11LS product supplied by Enva. The fuel specification maximum contents (as mg/kg) are presented in **Table 3.1**.

Parameter	Limit (mg/kg)
Cadmium	25
Nickel	100
Chromium	50
Vanadium	100
Lead	800
Chlorine	3,000
Sulphur	10,000
Ash	15,000
PCBs	10

Table 3.1: Schedule G.2 of the Waste Licence – Reprocessed Oil Quality Standard - Limitations

3.2 EMISSIONS TO ATMOSPHERE

It should be noted that the EPA request of the 26th January 2016 specifically makes reference to the quantification of "combustion gases". Combustion gases are strictly limited to oxides of nitrogen (NO_x), oxides of sulphur (SO_x typically expressed as SO_2) and Carbon Monoxide (CO). Other parameters such as particulates, metals, halides or organic pollutants have not been requested by the EPA but these have been monitored and modelled in this assessment for completeness.

There are no statutory limits applicable for general emissions to atmosphere from asphalt plants. For facilities licensed by the EPA (IPC, IED or Waste licence) or a local authority (Air Pollution Licence), facility specific emission limit values for some parameters may be set. A set of typical emission limit values specified in Air Pollution Licences for Asphalt Plants are presented in **Table 3.2**:

Pollutant	Emission Concentration
Carbon Monoxide (CO)	850 mg/m^3
Sulphur Dioxide (SO_2)	500 mg/m^3
Nitrogen Oxides (as NO_2)	450 mg/m^3
Particulate Matter	50 mg/m^3

Table 3.2: Typical Emission Limit Values Specified in Air Pollution Licences for Asphalt Plants

Typically these emission limit values are derived from the emission guidelines presented in the German Government "Technical Instructions on Air Quality" (TA Luft 1986, revised in 2002). **Table 3.3** presents the emission concentration and mass flow guidelines applicable to the other target parameters monitored in this survey (metals, halides, etc.).

Pollutant	Emission Concentration	Mass Flow	TA Luft Reference
Dioxins/Furans	0.1 ng/m^3	0.25µg/hr	5.2.7.2 Slowly Degradable, Accumulative and Highly Toxic Organic Substances
Cadmium (Cd)	0.05 mg/m^3	0.15 g/hr	5.2.7.1.1 Class I Carcinogenic Substance
Thallium (Tl)	0.05 mg/m^3	0.25 g/hr	5.2.2 Class I Inorganic Particulate Matter
Mercury (Hg)	0.05 mg/m^3	0.25 g/hr	5.2.2 Class I Inorganic Particulate Matter
Antimony (Sb)	1 mg/m^3	5 g/hr	5.2.2 Class III Inorganic Particulate Matter
Arsenic (As)	0.05 mg/m^3	0.15 g/hr	5.2.7.1.1 Class I Carcinogenic Substance
Lead (Pb)	0.5 mg/m^3	2.5 g/hr	5.2.2 Class II Inorganic Particulate Matter
Chromium (Cr)	1 mg/m^3	5 g/hr	5.2.2 Class III Inorganic Particulate Matter
Cobalt (Co)	0.5 mg/m^3	2.5 g/hr	5.2.2 Class II Inorganic Particulate Matter
Copper (Cu)	1 mg/m^3	5 g/hr	5.2.2 Class III Inorganic Particulate Matter
Manganese (Mn)	1 mg/m^3	5 g/hr	5.2.2 Class III Inorganic Particulate Matter
Nickel (Ni)	0.5 mg/m^3	2.5 g/hr	5.2.2 Class II Inorganic Particulate Matter
Vanadium (V)	1 mg/m^3	5 g/hr	5.2.2 Class III Inorganic Particulate Matter
Zinc (Zn)	n/a	n/a	Not Classified
Hydrogen Fluoride (HF)	3 mg/m^3	15 g/hr	5.2.4 Class II Inorganic Gaseous Substance
Hydrogen Chloride (HCl)	30 mg/m^3	0.15 kg/hr	5.2.4 Class II Inorganic Gaseous Substance
Particulate Matter	20 mg/m^3	0.20 kg/hr	5.2 Total Dust
Volatile Organic Compounds (VOCs)	50 mg/m^3	0.5 kg/hr	5.4.2.15 Asphalt Mixing Plants

Table 3.3: Emission Guidelines as specified by TA Luft 2002

For completeness, the emission limit values as specified in Part 3 of Annex VI (Technical provisions relating to waste incineration plants and waste co-incineration plants) as listed in Directive 2010/75/EU on industrial emissions (integrated pollution prevention and control) have also been referenced. These limits replace the former Waste Incineration Directive (WID) limits for waste combustion but the actual limits remain unchanged between the two directives.

While these asphalt plants are not subject to these incineration requirements, the IED Annex VI limits have been used as reference as they provide a comprehensive and stringent set of limits for emissions comparison. In reality, if the emissions from these plants comply with the IED Annex VI limits, they will demonstrate the highest levels of emission compliance available in the EU. These emission limit values are presented in **Table 3.4**.

Pollutant	Emission Concentration
Carbon Monoxide (CO)	n/a
Sulphur Dioxide (SO_2)	50 mg/m^3
Nitrogen Oxides (NO_x)	400 mg/m^3
Dioxins/Furans	0.1 ng/m^3
Cadmium (Cd)	0.05 mg/m^3
Thallium (Tl)	0.05 mg/m^3
Mercury (Hg)	0.05 mg/m^3
Antimony (Sb)	0.5 mg/m^3
Arsenic (As)	0.5 mg/m^3
Lead (Pb)	0.5 mg/m^3
Chromium (Cr)	0.5 mg/m^3
Cobalt (Co)	0.5 mg/m^3
Copper (Cu)	0.5 mg/m^3
Manganese (Mn)	0.5 mg/m^3
Nickel (Ni)	0.5 mg/m^3
Vanadium (V)	0.5 mg/m^3
Zinc (Zn)	n/a
Hydrogen Fluoride (HF)	1 mg/m^3
Hydrogen Chloride (HCl)	10 mg/m^3
Particulate Matter (Total Dust)	10 mg/m^3
Volatile Organic Compounds (VOCs expressed as TOC)	10 mg/m^3

Table 3.4: Emission Limit Values as specified by Annex VI of the Industrial Emissions Directive (IED)

The results determined in this study are compared against both the appropriate TA Luft Guideline and the emission limit value from Annex VI of the IED in the tables presented in **Section 5** of this report.

3.3 AMBIENT AIR QUALITY

In May 2008, the European Commission introduced a Directive on ambient air quality and cleaner air for Europe (2008/50/EC), which has been transposed into Irish Legislation through the Air Quality Standards Regulations (S.I. 180 of 2011). These regulations are presented in **Table 3.5**.

This legislation specifies limit values in ambient air for sulphur dioxide (SO_2), lead (Pb), benzene (C_6H_6), particulate matter (PM_{10} and $PM_{2.5}$), carbon monoxide (CO), nitrogen dioxide (NO_2) and oxides of nitrogen (NO_x). These limits are mainly for the protection of human health and are largely based on review of epidemiological studies on the health impacts of these pollutants.

Pollutant	Limit Type	Margin of Tolerance	Value
Nitrogen Dioxide	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	50% until 2001 reducing linearly to 0% by 2010	200 µg/m^3 NO_2
	Annual limit for protection of human health	50% until 2001 reducing linearly to 0% by 2010	40 µg/m^3 NO_2
	Annual limit for protection of vegetation	None	30 µg/m^3 $NO + NO_2$
Sulphur Dioxide	Hourly limit for protection of human health - not to be exceeded more than 24 times/year	43% until 2001 reducing linearly until 0% by 2005	350 µg/m^3
	Daily limit for protection of human health - not to be exceeded more than 3 times/year	None	125 µg/m^3
	Annual & Winter limit for the protection of ecosystems	None	20 µg/m^3
Particulate Matter (PM_{10})	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50% until 2001 reducing linearly to 0% by 2005	50 µg/m^3 PM_{10}
	Annual limit for protection of human health	20% until 2001 reducing linearly to 0% by 2005	40 µg/m^3 PM_{10}
Particulate Matter ($PM_{2.5}$)	Annual target value for the protection of human health	None	25 µg/m^3 $PM_{2.5}$
Lead	Annual limit for protection of human health	60% until 2003 and every 12 months thereafter	0.5 µg/m^3
Benzene	Annual limit for protection of human health	100% until 2003 reducing linearly to 0% by 2010	5 µg/m^3
Carbon Monoxide	8-hour limit (on a rolling basis) for protection of human health	50% until 2003 reducing linearly to 0% by 2005	10 mg/m^3

Table 3.5: Ambient Air Quality Limits as specified in S.I. 180 of 2011

In addition to the main ambient air pollutants presented in **Table 3.5**, there are also ambient air quality target values for certain metal compounds as defined in the "*Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations 2009*" (S.I. 58 of 2009). These target values are presented in **Table 3.6**.

Pollutant	Limit Type	Target Value[(1)] (ng/m^3)
Arsenic	Annual target value	6
Cadmium	Annual target value	5
Nickel	Annual target value	20

Table 3.6: Ambient Air Quality Target Values as specified in S.I. 58 of 2009

Note: (1) For the total content in the PM_{10} fraction averaged over a calendar year to be met by 31 Dec 2012.

There are no legislative ambient limits for dioxins and furans, general particulates, metals and VOCs (not listed in **Tables 3.5 and 3.6**), hydrogen chloride and hydrogen fluoride in ambient air. As such, best practice is to reference air quality standards from other EU countries or international guidance

as stated in Appendix K of the EPA guidance note on dispersion modelling (AG4). For the purposes of this assessment the following EU standards are referenced:

- The World Health Organisation's "Air Quality Guidelines for Europe" (2nd Edition, 2000) have listed a number of potentially hazardous air pollutants and the potential health impacts to humans as a result of both long and short term exposure. In addition to the European Guidelines published in 2000, a global update for certain pollutants was published in 2005. Where applicable, the global update guidelines are presented in **Table 3.7**.

- TA Luft from the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, 2002, "*Technical Instructions on Air Quality Control*".

- Environmental Assessment Levels (EAL) which are ambient air quality guidelines based on the Health & Safety Authority occupational exposure limits for the workplace. The EAL have been derived using the approach outlined in Appendix D of UK Environment Agency "*IPPC H1 - IPPC Environmental Assessment for BAT*". The occupational exposure limits employed to generate EALs are those listed by the Health and Safety Authority (HSA) in the 2011 "*Code of Practice for the Safety, Health and Welfare at Work (Chemical Agents) Regulations 2001 (S.I. No. 619 of 2001)*".

Table 3.7 presents the air quality guidelines associated with the above guidance for use in this impact assessment. Where pollutants have statutory limits (as listed in **Tables 3.5 and 3.6**), the guidelines are listed in **Table 3.7** but for the purposes of this assessment the limit supersedes the guidelines. Where no guideline exists the table is blank.

Pollutant	Annual Exposure			Short Term Exposure		
	WHO	TA Luft	EAL	WHO	TA Luft	EAL
Nitrogen Dioxide (µg/m^3)	40	40	50	200	200	300
Sulphur Dioxide (µg/m^3)	-	50	-	20	350	-
Carbon Monoxide (CO) (mg/m^3)	7	-	-	35	-	30
Particulate Matter PM_{10} (µg/m^3)	20	40	-	50	50	-
Particulate Matter $PM_{2.5}$ (µg/m^3)	10	-	-	25	-	-
Antimony (µg/m^3)	-	-	5	-	-	150
Arsenic (µg/m^3)	-	-	0.003	-	-	-
Cadmium (µg/m^3)	0.005	-	0.005	-	-	-
Chromium (µg/m^3)	-	-	5	-	-	150
Cobalt (µg/m^3)	-	-	-	-	-	-
Copper (µg/m^3)	-	-	10	-	-	200
Lead (µg/m^3)	0.5	0.5	-	-	-	-
Manganese (µg/m^3)	0.15	-	0.15	-	-	1,500
Mercury (µg/m^3)	1	-	0.25	-	-	7.5
Nickel (µg/m^3)	-	-	0.02	-	-	-
Thallium (µg/m^3)						
Vanadium (µg/m^3)	1	-	5	-	-	1
Zinc (µg/m^3)	-	-	-	-	-	-
Hydrogen Fluoride (µg/m^3)	-	-	16	-		160
Hydrogen Chloride (µg/m^3)	-	-		-		750
Dioxins/Furans (µg/m^3)	-	-	-	-	-	-

Table 3.7: European air quality guidelines for key pollutants

Notes: (a) TA Luft guideline from 1986 guidance as no limit specified in 2002 guidance.

For the purposes of this report the resultant ground level concentrations of pollutants at the site boundary will be compared against any statutory limit in the first instance. Where no statutory limit is applicable, the lowest appropriate guideline value will be used as a reference to determine impacts.

4 FUEL ANALYSIS

The results of the 11LS fuel analysis undertaken for the samples extracted at Asphalt Plants A and B are presented in **Table 4.1**. Also presented is the relative fraction (as a %) of the level detected versus the limit presented in schedule G.2 of the licence (refer **Section 3.1**).

Parameter	Plant A		Plant B	
	Concentration mg/kg	% Limit	Concentration mg/kg	% Limit
Cadmium	ND	ND	ND	ND
Nickel	<5	<5%	<5	<5%
Chromium	<5	<10%	<5	<10%
Vanadium	7	7%	7	7%
Lead	13	2%	12	2%
Chlorine	131	4%	186	6%
Sulphur	5,979	60%	6,070	61%
Ash	8,020	53%	7,810	52%
PCBs	<1	<10%	<1	<10%

Table 4.1: Results of the 11LS Fuel Analysis at Plant A and Plant B relative to the Waste Licence

The results of the analysis show a consistent trend between the two samples employed at each of the plants with the fractions of the limit similar in both cases. The levels of Nickel, Chromium and PCBs are undetected in both samples, while levels of Vanadium and Lead are very low in both samples (less than 7% of the limit). Cadmium was not analysed in this sample round.

Total halogen content (expressed as Chlorine) was determined to be 4% and 6% of the limit specified between the two samples sowing very low levels. Chlorine content in the fuel may lead to discharges of hydrogen chloride or dioxins and furans from the combustion process depending on the level of chlorine and the combustion conditions.

Sulphur content is the highest relative to the Waste Licence limit at 60-61%. The sulphur content of 11LS is circa 0.6% by mass which is lower than the 1% limit in the licence. This 1% limit is in line with the limit on sulphur content for heavy fuel oil listed in S.I. No. 119/2008. Sulphur content is a key characteristic in the volume of sulphur dioxide emitted by a fuel on combustion.

Ash content is approximately half the limit expressed in the licence and is a measure of the solid content of the fuel. The ash content is a key characteristic in the volume of particulate matter emitted by a fuel on combustion, however, other factors such as the feedstock and combustion temperature are also key factors.

In short, the levels of the parameters analysed in the two fuel samples indicate full compliance with the limits expressed in Schedule G.2 and indicate a low pollutant loading in the 11LS product combusted in the trial.

In addition to the licenced parameters analysis was also undertaken for additional parameters not listed in the licence or those listed in Schedule G.1 but with no limit specified in Schedule G.2 (Copper only). These results are presented in **Table 4.2**.

Parameter	Plant A Concentration (mg/kg)	Plant B Concentration (mg/kg)
Arsenic	<5	<5
Cobalt	9	7
Copper	26	21
Manganese	<5	<5
Mercury	<5	<5
Zinc	850	737

Table 4.2: Results of the 11LS Fuel Analysis at Plant A and Plant B (other parameters)

As with the results in **Table 4.1**, the more toxic elements such as Arsenic, Manganese and Mercury were undetected in both samples. Other metals such as Copper and Cobalt were detected in low levels and similar levels across both samples. Zinc was detected at higher concentrations in both fuels.

The analysis presented above is referenced against the emission concentrations detected post combustion to determine and trends in **Section 7** of this report. In addition, this trend analysis is used to determine the potential significance of any emission in the event that higher concentrations of these parameters were detected in the samples.

5 MONITORING OF EMISSIONS TO ATMOSPHERE

The results of the monitoring assessment at both plants are presented in **Tables 5.1 to 5.21** in this section of the report. Results are presented by parameter in comparison to the Annex VI IED limits and other guideline values as presented in **Section 3.2**. The parameters included in the monitoring study were derived from those with the potential for emissions from combustion following the analysis presented in **Section 4** of this report. For example, given the chlorine content, monitoring for HCl and dioxins/furans has been undertaken but given that PCBs were undetected in the fuel analysis monitoring was not undertaken.

Sample	Plant A		Plant B	
	Concentration[2] ng/Nm^3	Mass Emission Rate µg/hr	Concentration[2] ng/Nm^3	Mass Emission Rate µg/hr
Gas Oil Run 1	0.001	0.024	0.0004	0.013
Gas Oil Run 2	0.001	0.018	0.0011	0.039
11LS Run 1	0.001	0.022	0.0005	0.017
11LS Run 2	0.001	0.019	0.0012	0.045
TA Luft	0.1	0.25	0.1	0.25
Industrial Emissions Directive	0.1	n/a	0.1	n/a

Table 5.1: Results of Dioxin and Furan[1] Monitoring

Notes: (1) Refers to the total concentration of dioxins and furans calculated using the concept of toxic equivalence in accordance with Annex I of EU Directive 2000/76/EC.
(2) All concentrations are referenced to 273k, 101.3 kPa with no correction for water content.

Dioxin and Furan emission concentrations show no significant difference between the two fuel types at both Plant A and Plant B. The emission concentrations determined at Plant A and Plant B show no significant variation. Emission concentrations are approximately 1% of the limit specified in the Annex VI of the Industrial Emissions Directive and are not considered significant.

The potential sources of dioxins and furans in the combustion are the chlorine content of the fuel and the low combustion temperature. However, the results indicate that purely on a simple mass balance approach, if the chlorine content was to increase by 20 times the input (up to the limit expressed in the Waste Licence, **Table 3.1**), the resultant increase in dioxin emissions would not breach the limit specified in the Annex VI of the Industrial Emissions Directive.

Sample	Plant A		Plant B	
	Concentration[1,2] mg/Nm^3	Mass Emission Rate g/hr	Concentration[1,2] mg/Nm^3	Mass Emission Rate g/hr
Gas Oil Run 1	<0.13	<3	<0.76	<27
Gas Oil Run 2	<0.10	<3	<0.83	<30
11LS Run 1	<0.15	<4	<0.50	<18
11LS Run 2	<0.15	<4	<0.71	<25
TA Luft	3	15	3	15
Industrial Emissions Directive	1	n/a	1	n/a

Table 5.2: Results of Hydrogen Fluoride Monitoring

Notes: (1) The symbol "<" denotes levels less than limit of detection
(2) All concentrations are referenced to 273k, 101.3 kPa with no correction for water content.

Hydrogen Fluoride emission concentrations show no significant difference between the two fuel types at both plants. Emissions of hydrogen fluoride at both plants were undetected for all eight test scenarios.

Sample	Plant A		Plant B	
	Concentration[1,2] mg/Nm^3	Mass Emission Rate kg/hr	Concentration[1,2] mg/Nm^3	Mass Emission Rate kg/hr
Gas Oil Run 1	<0.13	<0.003	<0.76	<0.027
Gas Oil Run 2	<0.10	<0.003	<0.83	<0.030
11LS Run 1	0.25	0.006	<0.50	<0.018
11LS Run 2	0.20	0.005	<0.79	<0.028
TA Luft	30	0.15	30	0.15
Industrial Emissions Directive	10	n/a	10	n/a

Table 5.3: Results of Hydrogen Chloride Monitoring

Notes: (1) The symbol "<" denotes levels less than limit of detection
(2) All concentrations are referenced to 273k, 101.3 kPa with no correction for water content.

Hydrogen Chloride emission concentrations show only a slight difference with no HCl detected with Gas Oil and only trace levels detected with 11LS at Plant A. At Plant B no HCl was detected in the emissions from either fuel. Emission concentrations from all eight tests are less than 2.5% of the limit specified in Annex VI of the Industrial Emissions Directive.

As with dioxins and furans, the key driver in HCl emissions is the chlorine content of the fuel. The results indicate that on a simple mass balance, even if the chlorine levels in 11LS were to increase 20 fold to meet the Waste licence limit, the resultant emissions of HCl would still be in compliance with the limit specified in the Annex VI of the Industrial Emissions Directive.

Sample	VOC	TA Luft Class	Plant A		Plant B	
			Conc.[1, 2] mg/Nm^3	Mass Emission Rate kg/hr	Conc.[1, 2] mg/Nm^3	Mass Emission Rate kg/hr
Gas Oil Run 1	Benzene	III (Carcinogens)	-	-	**1.8**	0.065
	Toluene	II	-	-	2.3	0.084
	Total	-	<0.57	<0.01	4.1	0.150
Gas Oil Run 2	Toluene	II	-	-	1.6	0.057
	Total	-	<0.57	<0.01	1.6	0.057
11LS Run 1	Hexene	No Class	-	-	0.3	0.014
	Benzene	III (Carcinogens)	-	-	1.0	0.038
	Toluene	II	-	-	0.8	0.031
	Total	-	<0.58	<0.01	4.2	0.150
11LS Run 2	Hexene	No Class	-	-	0.5	0.021
	Benzene	III (Carcinogens)	-	-	**1.4**	0.052
	Toluene	II	-	-	1.3	0.047
	Pentene	No Class	-	-	0.3	0.014
	Total	-	<0.58	<0.01	6.4	0.230
TA Luft	General Organic Substances	I	20	0.1	20	0.1
		II	100	0.5	100	0.5
		No Class	50	0.5	50	0.5
	Carcinogenic Substances	III	1	0.0025	1	0.0025
	Asphalt Plants	Organic Substances	50	0.5	50	0.5
Industrial Emissions Directive	Total Organic Carbon	NA	10	n/a	10	n/a

Table 5.4: Results of Volatile Organic Carbon Monitoring

Notes: (1) The symbol "<" denotes levels less than limit of detection.
(2) All concentrations are referenced to 273k, 101.3 kPa with no correction for water content.

Volatile Organic Compound (VOC) emission concentrations show no significant difference between the two fuel types and were undetected for both fuels at Plant A. However, a mixture of alkenes and aromatics were detected at low levels using both fuels at Plant B. The detection of VOCs at this site using both fuels is due to site conditions at the time whereby, moisture in the stone reduces the efficiency of the burn increasing the VOC emissions to atmosphere. The emissions of these VOCs are consistent with the fuel sources as they are constituents of various fuel types. Levels of all VOCs detected are below the guidelines specified in the TA Luft Guidelines with the exception of benzene

(exceedances noted in bold). Benzene was detected using both fuels at levels above the Class III carcinogen guideline in the TA Luft. Total VOCs detected from the 11LS product are higher than the corresponding Gas Oil runs on Plant B but the levels from both are lower (less than 64%) than the limit specified in Annex VI of the Industrial Emissions Directive.

Sample	Plant A		Plant B	
	Concentration[(1)] mg/Nm^3	Mass Emission Rate kg/hr	Concentration[(1)] mg/Nm^3	Mass Emission Rate kg/hr
Gas Oil Run 1	9.1	**0.22**	1.3	0.05
Gas Oil Run 2	6.3	0.15	1.4	0.05
11LS Run 1	8.3	**0.21**	7.8	**0.28**
11LS Run 2	6.2	0.15	0.8	0.03
Air Pollution Licence	50	n/a	50	n/a
TA Luft	20	0.20	20	0.20
Industrial Emissions Directive	10	n/a	10	n/a

Table 5.5: Results of Particulate Monitoring

Notes: (1) All concentrations are referenced to 273k, 101.3 kPa with no correction for water content.

Particulate emission concentrations show a slight reduction in emissions using 11LS at Plant A but emissions using both fuels are below the limit specified in Annex VI of the Industrial Emissions Directive and approximately 15% of a typical Air Pollution Licence Limit. Mass emissions using both fuels show levels marginally above the TA Luft mass emission guideline at Plant A (in bold). At Plant B the trend is reversed with slightly higher particulate emissions with 11LS over Gas Oil. On average, the levels are lower than at Plant A and represent approximately 9% of a typical Air Pollution Licence Limit and 43% of the limit specified in Annex VI of the Industrial Emissions Directive.

Particulate emissions from these asphalt plants are dictated by the grade and particle size of the feed stock (gravel), the efficiency of the combustion and to some extent the ash content of the fuel. In this regard it is not possible to carry out a simple mass balance to assess the implications of changing the ash content of 11LS and the resultant impact on the emissions.

As an illustration of this point, gas oil has a relatively low ash content (0.1-0.2%) compared to the limit for 11LS in the Waste Licence (1.5%) but there is no significant difference in the emissions measured from each of the trials run in this study. In reality the particulate emissions are dictated by the feedstock and combustion efficiency in these plants.

Sample	Plant A		Plant B	
	Concentration[1, 2] mg/Nm^3	Mass Emission Rate g/hr	Concentration[1, 2] mg/Nm^3	Mass Emission Rate g/hr
Gas Oil Run 1	<0.004	<0.09	<0.002	<0.07
Gas Oil Run 2	<0.003	<0.08	<0.002	<0.07
11LS Run 1	<0.004	<0.10	<0.002	<0.07
11LS Run 2	<0.003	<0.10	<0.002	<0.08
TA Luft	0.05	0.15	0.05	0.15
Industrial Emissions Directive	0.05	n/a	0.05	n/a

Table 5.6: Results of Cadmium Monitoring

Notes: (1) The symbol "<" denotes levels less than limit of detection
(2) All concentrations are referenced to 273k, 101.3 kPa with no correction for water content.

No Cadmium was detected in the emissions using either fuel at both plants. While Cadmium was not included in the fuel analysis (refer **Section 4**), based on simple mass balance and trends observed for other metals, it may be assumed that there is no Cadmium input to the combustion and hence no Cadmium output.

Sample	Plant A		Plant B	
	Concentration[1, 2] mg/Nm^3	Mass Emission Rate g/hr	Concentration[1, 2] mg/Nm^3	Mass Emission Rate g/hr
Gas Oil Run 1	<0.008	<0.2	<0.004	<0.1
Gas Oil Run 2	<0.008	<0.2	<0.004	<0.1
11LS Run 1	<0.008	<0.2	<0.004	<0.1
11LS Run 2	<0.007	<0.2	<0.004	<0.1
TA Luft	0.05	0.25	0.05	0.25
Industrial Emissions Directive	0.05	n/a	0.05	n/a

Table 5.7: Results of Thallium Monitoring

Notes: (1) The symbol "<" denotes levels less than limit of detection
(2) All concentrations are referenced to 273k, 101.3 kPa with no correction for water content.

No Thallium was detected in the emissions using either fuel at both plants. Thallium was not included in the fuel analysis (refer **Section 4**) but based on simple mass balance it is assumed that there is no Thallium input to the combustion process.

Sample	Plant A		Plant B	
	Concentration[1, 2] mg/Nm^3	Mass Emission Rate g/hr	Concentration[1, 2] mg/Nm^3	Mass Emission Rate g/hr
Gas Oil Run 1	<0.004	<0.09	<0.002	<0.07
Gas Oil Run 2	<0.003	<0.08	<0.002	<0.08
11LS Run 1	<0.004	<0.10	<0.002	<0.07
11LS Run 2	<0.003	<0.10	<0.002	<0.07
TA Luft	0.05	0.25	0.05	0.25
Industrial Emissions Directive	0.05	n/a	0.05	n/a

Table 5.8: Results of Mercury Monitoring

Notes: (1) The symbol "<" denotes levels less than limit of detection
(2) All concentrations are referenced to 273k, 101.3 kPa with no correction for water content.

No Mercury was detected in the emissions using either fuel at both plants. This is as expected given that Mercury was undetected in the fuel analysis presented in **Section 4** of this report.

Sample	Plant A		Plant B	
	Concentration[1, 2] mg/Nm^3	Mass Emission Rate g/hr	Concentration[1, 2] mg/Nm^3	Mass Emission Rate g/hr
Gas Oil Run 1	<0.004	<0.09	<0.002	<0.07
Gas Oil Run 2	<0.003	<0.08	<0.002	<0.08
11LS Run 1	<0.004	<0.10	<0.002	<0.07
11LS Run 2	<0.003	<0.10	<0.002	<0.07
TA Luft	1	5	1	5
Industrial Emissions Directive	0.5	n/a	0.5	n/a

Table 5.9: Results of Antimony Monitoring

Notes: (1) The symbol "<" denotes levels less than limit of detection
(2) All concentrations are referenced to 273k, 101.3 kPa with no correction for water content.

No Antimony was detected in the emissions using either fuel at both plants. Antimony was not included in the fuel analysis (refer **Section 4**) but based on simple mass balance it is assumed that there is no Antimony input to the combustion process.

Sample	Plant A		Plant B	
	Concentration[1, 2] mg/Nm^3	Mass Emission Rate g/hr	Concentration[1, 2] mg/Nm^3	Mass Emission Rate g/hr
Gas Oil Run 1	<0.004	<0.09	<0.002	<0.07
Gas Oil Run 2	<0.003	<0.08	<0.002	<0.08
11LS Run 1	<0.004	<0.10	<0.002	<0.07
11LS Run 2	<0.003	<0.10	<0.002	<0.07
TA Luft	0.05	0.15	0.05	0.15
Industrial Emissions Directive	0.5	n/a	0.5	n/a

Table 5.10: Results of Arsenic Monitoring

Notes: (1) The symbol "<" denotes levels less than limit of detection
(2) All concentrations are referenced to 273k, 101.3 kPa with no correction for water content.

No Arsenic was detected in the emissions using either fuel at both plants. This is as expected given that Arsenic was undetected in the fuel analysis presented in **Section 4** of this report.

Sample	Plant A		Plant B	
	Concentration[1, 2] mg/Nm^3	Mass Emission Rate g/hr	Concentration[1, 2] mg/Nm^3	Mass Emission Rate g/hr
Gas Oil Run 1	<0.004	<0.09	<0.002	<0.07
Gas Oil Run 2	<0.003	<0.09	<0.002	<0.08
11LS Run 1	<0.004	<0.09	<0.002	<0.07
11LS Run 2	<0.003	<0.09	<0.002	<0.07
TA Luft	0.5	2.5	0.5	2.5
Industrial Emissions Directive	0.5	n/a	0.5	n/a

Table 5.11: Results of Lead Monitoring

Notes: (1) The symbol "<" denotes levels less than limit of detection
(2) All concentrations are referenced to 273k, 101.3 kPa with no correction for water content.

No Lead was detected in the emissions using either fuel at both plants. The fuel analysis presented in **Section 4** of this report identifies Lead at levels circa 2% of the Waste Licence limit. Based on a simple mass balance, if the Lead levels were to increase 50 fold to meet the limit in the Waste Licence (800mg/kg), the resultant emissions would still be well below the limits specified in Annex VI of the IED.

Sample	Plant A		Plant B	
	Concentration[1, 2] mg/Nm^3	Mass Emission Rate g/hr	Concentration[1, 2] mg/Nm^3	Mass Emission Rate g/hr
Gas Oil Run 1	<0.004	<0.09	<0.002	<0.07
Gas Oil Run 2	<0.003	<0.09	0.002	0.06
11LS Run 1	<0.004	<0.09	0.04	1.4
11LS Run 2	<0.003	<0.09	0.002	0.08
TA Luft	1	5	1	5
Industrial Emissions Directive	0.5	n/a	0.5	n/a

Table 5.12: Results of Chromium Monitoring

Notes: (1) The symbol "<" denotes levels less than limit of detection
(2) All concentrations are referenced to 273k, 101.3 kPa with no correction for water content.

No Chromium was detected in the emissions using either fuel at Plant A. Trace levels were detected using both fuels at Plant B but these levels are less than 8% of the Annex VI IED limit. Chromium was undetected in the fuel analysis presented in **Section 4** so the trace levels of Chromium are unlikely a result of the fuel constituents. This is supported by the fact that Chromium was detected using both fuels at Plant B only and in this regard, it is concluded that the Chromium input is likely from the feedstock employed at this plant.

Sample	Plant A		Plant B	
	Concentration[1, 2] mg/Nm^3	Mass Emission Rate g/hr	Concentration[1, 2] mg/Nm^3	Mass Emission Rate g/hr
Gas Oil Run 1	<0.004	<0.09	<0.002	<0.07
Gas Oil Run 2	<0.003	<0.09	<0.002	<0.08
11LS Run 1	<0.004	<0.09	<0.002	<0.07
11LS Run 2	<0.003	<0.09	<0.002	<0.07
TA Luft	0.5	2.5	0.5	2.5
Industrial Emissions Directive	0.5	n/a	0.5	n/a

Table 5.13: Results of Cobalt Monitoring

Notes: (1) The symbol "<" denotes levels less than limit of detection
(2) All concentrations are referenced to 273k, 101.3 kPa with no correction for water content.

No Cobalt was detected in the emissions using either fuel at both plants. Very low levels of Cobalt (7 and 9mg/kg) were detected in the fuel analysis presented in **Section 4** but these are not detected in the emissions. It is likely that any Cobalt input to the combustion process is lost to ash or the asphalt product.

Sample	Plant A		Plant B	
	Concentration[1, 2] mg/Nm^3	Mass Emission Rate g/hr	Concentration[1, 2] mg/Nm^3	Mass Emission Rate g/hr
Gas Oil Run 1	<0.004	<0.09	<0.002	<0.07
Gas Oil Run 2	0.003	0.08	<0.002	<0.07
11LS Run 1	<0.004	<0.09	0.006	0.21
11LS Run 2	0.003	0.09	0.002	0.08
TA Luft	1	5	1	5
Industrial Emissions Directive	0.5	n/a	0.5	n/a

Table 5.14: Results of Copper Monitoring

Notes: (1) The symbol "<" denotes levels less than limit of detection
(2) All concentrations are referenced to 273k, 101.3 kPa with no correction for water content.

Trace levels of Copper were detected using both fuels at Plant A and using 11LS at Plant B. These emission levels are less than 2% of the Annex VI IED limit. Low levels of Copper were detected in the fuel analysis (21 and 26mg/kg) presented in **Section 4**. Based on a simple mass balance the above analysis suggest that these levels would need to increase at least 20 fold before the resultant emissions would breach the TA Luft mass emission limit.

Sample	Plant A		Plant B	
	Concentration[1, 2] mg/Nm^3	Mass Emission Rate g/hr	Concentration[1, 2] mg/Nm^3	Mass Emission Rate g/hr
Gas Oil Run 1	<0.004	<0.09	0.002	0.07
Gas Oil Run 2	<0.003	<0.09	0.003	0.10
11LS Run 1	<0.004	<0.09	0.01	0.35
11LS Run 2	<0.003	<0.09	0.004	0.16
TA Luft	1	5	1	5
Industrial Emissions Directive	0.5	n/a	0.5	n/a

Table 5.15: Results of Manganese Monitoring

Notes: (1) The symbol "<" denotes levels less than limit of detection
(2) All concentrations are referenced to 273k, 101.3 kPa with no correction for water content.

No Manganese was detected in the emissions using either fuel at Plant A. Trace levels of Manganese were detected using both fuels at Plant B. These emission levels are less than 1% of the IED Annex VI limit. Manganese was undetected in the fuel analysis presented in **Section 4** so the trace levels of are unlikely a result of the fuel constituents. This is supported by the fact that Manganese was detected using both fuels at Plant B only and in this regard, it is concluded that the Manganese input is likely from the feedstock employed at this plant.

Sample	Plant A		Plant B	
	Concentration[1, 2] mg/Nm^3	Mass Emission Rate g/hr	Concentration[1, 2] mg/Nm^3	Mass Emission Rate g/hr
Gas Oil Run 1	<0.004	<0.09	<0.002	<0.07
Gas Oil Run 2	0.007	0.2	<0.002	<0.07
11LS Run 1	<0.004	<0.09	0.02	0.70
11LS Run 2	<0.003	<0.09	<0.002	<0.08
TA Luft	0.5	2.5	0.5	2.5
Industrial Emissions Directive	0.5	n/a	0.5	n/a

Table 5.16: Results of Nickel Monitoring

Notes: (1) The symbol "<" denotes levels less than limit of detection
(2) All concentrations are referenced to 273k, 101.3 kPa with no correction for water content.

Trace levels of Nickel were detected using Gas Oil at Plant A and 11LS at Plant B but levels are less than 4% of the IED Annex VI limit. Nickel was undetected in the fuel analysis presented in **Section 4**. The trace levels detected for gas oil and Plant A and 11LS at Plant B are likely derived from the feedstocks rather than the fuels.

Sample	Plant A		Plant B	
	Concentration[1, 2] mg/Nm^3	Mass Emission Rate g/hr	Concentration[1, 2] mg/Nm^3	Mass Emission Rate g/hr
Gas Oil Run 1	<0.004	<0.09	<0.002	<0.07
Gas Oil Run 2	<0.003	<0.09	<0.002	<0.08
11LS Run 1	<0.004	<0.09	<0.002	<0.07
11LS Run 2	<0.003	<0.09	<0.002	<0.07
TA Luft	1	5	1	5
Industrial Emissions Directive	0.5	n/a	0.5	n/a

Table 5.17: Results of Vanadium Monitoring

Notes: (1) The symbol "<" denotes levels less than limit of detection
(2) All concentrations are referenced to 273k, 101.3 kPa with no correction for water content.

No Vanadium was detected in the emissions using either fuel at both plants. Very low levels of Vanadium (7mg/kg) were detected in the fuel analysis presented in **Section 4** but these are not detected in the emissions. It is likely that any Vanadium input to the combustion process is lost to ash or the asphalt product.

Sample	Plant A		Plant B	
	Concentration[1] mg/Nm^3	Mass Emission Rate g/hr	Concentration[1] mg/Nm^3	Mass Emission Rate g/hr
Gas Oil Run 1	2.6	64	4.3	161
Gas Oil Run 2	2.2	54	3.7	138
11LS Run 1	1.1	27	6.7	251
11LS Run 2	1.8	44	4.6	172
TA Luft	n/a	n/a	n/a	n/a
Industrial Emissions Directive	n/a	n/a	n/a	n/a

Table 5.18: Results of Zinc Monitoring

Notes: (1) All concentrations are referenced to 273k, 101.3 kPa with no correction for water content.

Emissions of zinc are approximately 66% higher using Gas Oil at Plant A and approximately 44% higher using 11LS at Plant B. The results are largely similar and given the geological variation between the two plants, it is considered that the emissions from both fuels show no significant difference. There is no limit specified for zinc in the IED and it is unclassified under TA Luft.

Zinc was detected at levels of 850 and 737mg/kg in the fuel samples of Plant A and Plant B respectively (refer **Section 4**), however, there is no corresponding limit for zinc in the Waste Licence. Given the relatively higher levels of zinc over other metals in the fuels, it is unsurprising that the measured emissions are noticably higher. These higher levels are also noted for the gas oil and hence a similar level of zinc is presented in the gas oil or the common feedstock is a contributory factor.

Sample	Plant A		Plant B	
	Concentration[1] mg/Nm^3	Mass Emission Rate kg/hr	Concentration[1] mg/Nm^3	Mass Emission Rate kg/hr
Gas Oil Run 1	75	1.83	33	1.17
Gas Oil Run 2	82	1.98	36	1.29
11LS Run 1	39	0.98	48	1.73
11LS Run 2	34	0.84	46	1.67
Air Pollution Licence	450	n/a	450	n/a
Industrial Emissions Directive	400	n/a	400	n/a

Table 5.19: Results of Oxides of Nitrogen Monitoring

Notes: (1) All concentrations are referenced to 273k, 101.3 kPa, 17% O_2 with no correction for water content.

Emissions of oxides of nitrogen from the 11LS are approximately half those using gas oil at Plant A. At Plant B, the trend is reversed slightly with emissions of NO_x from 11LS marginally higher than the Gas Oil. The reason for this trend is due to a variance in combustion dynamics and temperatures

between the two fuels both plants. Emissions using 11LS are less than 12% of the limit specified in the Annex VI of the IED at both plants.

Oxides of nitrogen are derived from the need for oxygen to support combustion resulting in the combustion of air (containing nitrogen as N_2) in the process. As such, the generation of NO and NO_2 (NO_x) are not dependent on the constituents of the fuel as determined in **Section 4** of this report. The generation of NO_x is linked to the efficiency of combustion so while the fuel plays a role (as does the feedstock and temperature) the fuel constituents do not.

Sample	Plant A		Plant B	
	Concentration[1] mg/Nm^3	Mass Emission Rate kg/hr	Concentration[1] mg/Nm^3	Mass Emission Rate kg/hr
Gas Oil Run 1	201	4.87	566	20.46
Gas Oil Run 2	221	5.36	649	23.44
11LS Run 1	533	13.11	705	25.51
11LS Run 2	402	9.87	**873**	31.57
Air Pollution Licence	850	n/a	850	n/a
Industrial Emissions Directive	n/a	n/a	n/a	n/a

Table 5.20: Results of Carbon Monoxide Monitoring

Notes: (1) All concentrations are referenced to 273k, 101.3 kPa, 17% O_2 with no correction for water content.

Carbon monoxide emissions from the 11LS emissions are higher those using gas oil (twice as high at Plant A and 30% higher at Plant B). Emission concentrations with 11LS were slightly above the standard emission limit in an air pollution licence on one sample at Plant B (in bold) but are in compliance on all other samples. These variances are principally due to the variation in combustion dynamics and temperatures associated with the two fuel types. The variation between the plants would be from the differences in age, efficiency, type and model of combustion equipment on each plant. In addition, the monitoring of emissions from 11LS and gas oil at Plant B was following heavy rainfall and the high moisture content in the stone would lead to a decrease in combustion efficiency increasing the CO emissions. This decrease in combustion efficiency was common to both fuels. There is no limit specified in Annex VI of the IED for carbon monoxide.

As with NO_x, the volume of CO generated is not dependent on the fuel constituents determined in **Section 4**. CO is derived as a result of incomplete combustion of the organic fuel and hence is linked to the feedstock, temperatures, etc.

Sample	Plant A		Plant B	
	Concentration[1] mg/Nm^3	Mass Emission Rate kg/hr	Concentration[1] mg/Nm^3	Mass Emission Rate kg/hr
Gas Oil Run 1	8.52	0.21	45	1.64
Gas Oil Run 2	8.57	0.21	**63**	2.30
11LS Run 1	24.41	0.61	**70**	2.52
11LS Run 2	22.77	0.56	**92**	3.36
Air Pollution Licence	500	n/a	500	n/a
Industrial Emissions Directive	50	n/a	50	n/a

Table 5.21: Results of Sulphur Dioxide Monitoring

Notes: (1) All concentrations are referenced to 273k, 101.3 kPa, 17% O_2 with no correction for water content.

Sulphur Dioxide emissions from 11LS are higher than those using the Gas Oil as with carbon monoxide at both plants (175% higher at Plant A and 50% higher at Plant B). All emissions at Plant A are less than 50% of the limit specified in Annex VI of the Industrial Emissions Directive and less than 5% of the typical limit specified in an Air Pollution Licence. However, at Plant B, the emissions of SO_2 would be above the limit specified in Annex VI of IED using both fuels (in bold).

The fuel analysis presented in **Section 4** of this report indicates that the sulphur content of the 11LS is 0.6% compared to the limit in the Waste Licence of 1%. Low sulphur gas oil (0.2% sulphur content) was deliberately chosen as the comparator fuel at both plants to ensure a robust and conservative assessment. It should be noted that other readily available virgin fuels (e.g. Light Fuel Oil) would have a sulphur content similar to 11LS (i.e. <1%). Typically, Light Fuel Oil is the fuel that is substituted out for 11LS in asphalt plants and hence the actual SO_2 emissions would be similar.

As the sulphur content of 11LS is greater than the gas oil comparator, this is what has resulted in the variation in emissions presented in **Table 5.21**. The emissions of SO_2 are directly linked to the sulphur content of the fuel.

As with carbon, monoxide, the variation in emissions between the two plants is as a result of variations in the type, efficiency and age of the asphalt plants. In addition, the lower efficiency due to the high moisture in the stone material would also lead to higher emissions at Plant B.

The results doe indicate that at Plant A, even if the sulphur content of 11LS was to increase to the limit in the Waste Licence (1% or 10,000mg/kg), the resultant increase in emissions (based in simple mass balance) would still result in emission levels below the typical Air Pollution Licence and Annex VI emission limit values.

This is not the case in Plant B as emission concentrations are already above the Annex V IED levels (that do not apply to these plants). However, as the levels of emission from the gas oil also show elevated SO_2 emissions, despite the low sulphur fuel used, these tests are not considered representative of the actual sulphur emissions from the fuel content. As with carbon, monoxide, the lower efficiency due to the high moisture in the stone material has likely lead to higher emissions for both fuels at Plant B.

6 AIR DISPERSION MODELLING

The results of the modelling of emissions from both plants are presented in **Tables 6.1 to 6.21**. The maximum predicted ground level concentrations at the nearest sensitive receptor are presented. For pollutants undetected in the monitoring survey the limit of detection has been employed to determine a modelling emission factor. All results are compared with the statutory limits for air quality, where applicable, and the Environment Agency EAL and WHO guidelines where no limits exist.

Averaging Period	Plant A		Plant B	
	Gas Oil	11LS	Gas Oil	11LS
Annual Average (pg/m^3)	0.004	0.004	0.001	0.001

Table 6.1: Results of Dioxin/Furan Modelling

Note: There is no statutory limit or guideline for Dioxins and Furans applicable.

There is no statutory limit or guideline available for dioxins and furans in ambient air. However, there is no variance observed between the predicted ground level concentrations from emissions of gas oil and from the 11LS product at both plants. As such there is no net difference in the impact of dioxin emissions to atmosphere.

Averaging Period	Plant A		Plant B	
	Gas Oil	11LS	Gas Oil	11LS
1-hour Average ($\mu g/m^3$)	<0.022	<0.022	<0.102	<0.102
EA Guideline [1]	160			
Annual Average ($\mu g/m^3$)	<0.0006	<0.0006	<0.006	<0.006
EA Guideline [2]	16			

Table 6.2: Results of Hydrogen Fluoride Modelling

Notes: (1) Guidelines expressed by UK Environment Agency as short term EAL
(2) Guidelines expressed by UK Environment Agency as long term EAL

Ground level concentrations of HF show no variation between the two fuels at both plants and the levels predicted are less than 1% of the EA guidelines.

Averaging Period	Plant A		Plant B	
	Gas Oil	11LS	Gas Oil	11LS
1-hour Average ($\mu g/m^3$)	<0.019	0.033	<0.102	<0.102
EA Guideline [1]	750			
Annual Average ($\mu g/m^3$)	<0.0005	0.0009	<0.006	<0.006

Table 6.3: Results of Hydrogen Chloride Modelling

Notes: (1) Guidelines expressed by UK Environment Agency as short term EAL

Ground level concentrations of HCl at Plant A are higher (albeit at trace levels compared to undetected levels) as a result of emissions from the 11LS combustion over gas oil showing a net increase in emissions. However, the emissions from 11LS at the nearest receptor are less than 1% of the EA guideline. There is no variation in resultant ground level concentrations of HCl at Plant B as this was undetected in the emissions tests using both fuels.

Pollutant	Averaging Period	Plant A		Plant B	
		Gas Oil	11LS	Gas Oil	11LS
Benzene	1-hour Average ($\mu g/m^3$)		-	0.131	0.174
	Annual Average ($\mu g/m^3$)		-	0.007	0.010
	Statutory Limit [2]	5			
Toluene	1-hour Average ($\mu g/m^3$)	-	-	0.284	0.153
	Guideline [1]	8,000			
	Annual Average ($\mu g/m^3$)	-	-	0.016	0.009
	WHO Guideline [4]	260			
	EA Guideline [3]	1,910			
Hexene	1-hour Average ($\mu g/m^3$)	-	-	0	0.058
	Annual Average ($\mu g/m^3$)	-	-	0	0.003
Pentene	1-hour Average ($\mu g/m^3$)	-	-	0	0.044
	Annual Average ($\mu g/m^3$)	-	-	0	0.002
Total VOCs	1-hour Average ($\mu g/m^3$)			0.41	0.77
	Annual Average ($\mu g/m^3$)	<0.002	<0.002	0.02	0.04
	Statutory Limit [6]	5			

Table 6.4: Results of Volatile Organic Carbon Modelling

Notes: (1) Guidelines expressed by UK Environment Agency as short term EAL
(2) Statutory limit for benzene for protection of human health (S.I. 180 of 2011)
(3) Guidelines expressed by UK Environment Agency as long term EAL
(4) World Health Organisation as a weekly average
(5) No specific long term guideline or limit applicable so results compared to statutory limit (S.I. 180 of 2011) for benzene, a known carcinogen.

No VOCs were detected in the monitoring assessment at Plant A and the limit of detection has been modelled. Some VOCs (benzene, toluene, hexane and pentene) were detected using both fuels in

Plant B and these emission concentrations have been modelled for this plant. The resultant ground level concentrations are compared to the statutory limit for benzene (a known carcinogen). At both plants, the predicted ground level concentrations show only slight variation and ground level concentrations of Total VOCs are less than 1% of the annual limit for benzene.

Averaging Period	Plant A		Plant B	
	Gas Oil	11LS	Gas Oil	11LS
24-hour Average (µg/m^3)	1.11	1.05	0.20	0.62
Statutory PM_{10} Limit [1]	50			
WHO PM_{10} Guideline [2]	50			
WHO $PM_{2.5}$ Guideline [2]	25			
Annual Average(µg/m^3)	0.030	0.028	0.011	0.036
Statutory PM_{10} Limit [1]	40			
Statutory $PM_{2.5}$ Target Value [1]	25			
WHO PM_{10} Guideline [2]	20			
WHO $PM_{2.5}$ Guideline [2]	10			

Table 6.5: Results of Particulate Modelling

Notes: (1) Limits as expressed in S.I. 180 of 2011. Modelled parameter is total suspended particulates which includes fraction above and below 10 and 2.5µm.
(2) Guidelines expressed by World Health Organisation (Global Update 2005).

Ground level concentrations of particulates at the nearest receptor are predicted to be lower using the 11LS product at Plant A and higher at Plant B. Ground level concentrations from both fuels at both plants are less than 3% of the statutory limit for PM_{10}, which is used a worst case reference limit given that modelled parameter includes for total particulates.

Averaging Period	Plant A		Plant B	
	Gas Oil	11LS	Gas Oil	11LS
1-hour Average (ng/m^3)	<0.61	<0.61	<0.24	<0.24
Annual Average (ng/m^3)	<0.02	<0.02	<0.01	<0.01
Statutory Limit [1]	5			
Guideline [2]	5			

Table 6.6: Results of Cadmium Modelling

Notes: (1) Target Value as expressed in S.I. 58 of 2009
(2) Guidelines expressed by UK Environment Agency and World Health Organisation

Averaging Period	Plant A		Plant B	
	Gas Oil	11LS	Gas Oil	11LS
1-hour Average ($\mu g/m^3$)	<0.001	<0.001	<0.0002	<0.0002
Annual Average ($\mu g/m^3$)	<0.0001	<0.0001	<0.00001	<0.00001
Statutory Limit [1]	0.006			

Table 6.7: Results of Arsenic Modelling

Notes: (1) Target Value as expressed in S.I. 58 of 2009

Averaging Period	Plant A		Plant B	
	Gas Oil	11LS	Gas Oil	11LS
1-hour Average ($\mu g/m^3$)	0.001	<0.001	<0.0002	0.0017
Annual Average ($\mu g/m^3$)	0.0001	<0.0001	<0.00001	0.00010
Statutory Limit [1]	0.02			

Table 6.8: Results of Nickel Modelling

Notes: (1) Target Value as expressed in S.I. 58 of 2009

For the three metals with specified targets in S.I. 58 of 2009 (cadmium, arsenic, nickel), the ground level concentrations indicate no significant variance between the two fuels at both plants. No emissions of cadmium or arsenic were detected in either monitoring assessment. Trace levels of Nickel were detected at Plant A using Gas Oil and Plant B using 11LS. Individually, the levels of metals at the nearest sensitive receptor are less than 1% (cadmium), less than 2% (arsenic) and less than 1% (nickel) of the target value.

Averaging Period	Plant A		Plant B	
	Gas Oil	11LS	Gas Oil	11LS
Annual Average ($\mu g/m^3$)	<0.0001	<0.0001	<0.00001	<0.00001
Statutory Limit [1]	0.5			
Guideline[2]	0.5			

Table 6.9: Results of Lead Modelling

Notes: (1) Annual limit for the protection of human health (S.I. 180 of 2011)
(2) Guideline from World Health Organisation

The predicted levels of lead show no variance and indicate ground level concentrations at the nearest receptors to both plants less than 1% of the statutory limit for the protection of human health (S.I. 180 of 2011).

Averaging Period	Plant A		Plant B	
	Gas Oil	11LS	Gas Oil	11LS
1-hour Average ($\mu g/m^3$)	<0.001	<0.001	<0.0004	<0.0004
Annual Average ($\mu g/m^3$)	<0.0001	<0.0001	<0.00002	<0.00002

Table 6.10: Results of Thallium Modelling

Averaging Period	Plant A		Plant B	
	Gas Oil	11LS	Gas Oil	11LS
1-hour Average ($\mu g/m^3$)	<0.001	<0.001	<0.0002	<0.0002
Guideline[1]	7.5			
Annual Average ($\mu g/m^3$)	<0.0001	<0.0001	<0.00001	<0.00001
Guideline [2]	0.25			
Guideline [3]	1			

Table 6.11: Results of Mercury Modelling

Notes: (1) Guidelines expressed by UK Environment Agency as short term EAL
(2) Guidelines expressed by UK Environment Agency as long term EAL
(3) Guideline expressed by World Health Organisation

Averaging Period	Plant A		Plant B	
	Gas Oil	11LS	Gas Oil	11LS
1-hour Average ($\mu g/m^3$)	<0.001	<0.001	<0.0002	<0.0002
Guideline[1]	150			
Annual Average ($\mu g/m^3$)	<0.0001	<0.0001	<0.00001	<0.00001
Guideline [2]	5			

Table 6.12: Results of Antimony Modelling

Notes: (1) Guidelines expressed by UK Environment Agency as short term EAL
(2) Guidelines expressed by UK Environment Agency as long term EAL

Averaging Period	Plant A		Plant B	
	Gas Oil	11LS	Gas Oil	11LS
1-hour Average ($\mu g/m^3$)	<0.001	<0.001	<0.0002	0.0035
Guideline[1]	150			
Annual Average ($\mu g/m^3$)	<0.0001	<0.0001	<0.00001	0.00020
EA Guideline [3]	5			

Table 6.13: Results of Chromium Modelling

Notes: (1) Guidelines expressed by UK Environment Agency as short term EAL
(2) Guidelines expressed by UK Environment Agency as long term EAL

Averaging Period	Plant A		Plant B	
	Gas Oil	11LS	Gas Oil	11LS
1-hour Average ($\mu g/m^3$)	<0.001	<0.001	<0.0002	<0.0002
Annual Average ($\mu g/m^3$)	<0.0001	<0.0001	<0.00001	<0.00001

Table 6.14: Results of Cobalt Modelling

Averaging Period	Plant A		Plant B	
	Gas Oil	11LS	Gas Oil	11LS
1-hour Average ($\mu g/m^3$)	0.001	0.001	<0.0002	0.0006
Guideline[1]	200			
Annual Average ($\mu g/m^3$)	0.0001	0.0001	<0.00001	0.00003
EA Guideline [2]	10			

Table 6.15: Results of Copper Modelling

Notes: (1) Guidelines expressed by UK Environment Agency as short term EAL
(2) Guidelines expressed by UK Environment Agency as long term EAL

Averaging Period	Plant A		Plant B	
	Gas Oil	11LS	Gas Oil	11LS
1-hour Average ($\mu g/m^3$)	<0.001	<0.001	0.0003	0.0011
Guideline[1]	1500			
Annual Average ($\mu g/m^3$)	<0.0001	<0.0001	0.00002	0.00006
EA Guideline [2]	0.15			
WHO Guideline [3]	0.15			

Table 6.16: Results of Manganese Modelling

Notes: (1) Guidelines expressed by UK Environment Agency as short term EAL
(2) Guidelines expressed by UK Environment Agency as long term EAL
(3) Guidelines expressed by World Health Organisation

Averaging Period	Plant A		Plant B	
	Gas Oil	11LS	Gas Oil	11LS
1-hour Average ($\mu g/m^3$)	<0.001	<0.001	<0.0002	<0.0002
EA Guideline[1]	1			
24-hour Average ($\mu g/m^3$)	<0.001	<0.001	<0.0001	<0.0001
WHO Guideline [2]	1			
Annual Average ($\mu g/m^3$)	<0.0001	<0.0001	<0.00001	<0.00001
EA Guideline [3]	5			

Table 6.17: Results of Vanadium Modelling

Notes: (1) Guidelines expressed by UK Environment Agency as short term EAL
(2) Guidelines expressed by World Health Organisation as a 24-hour average
(3) Guidelines expressed by UK Environment Agency as long term EAL

Averaging Period	Plant A		Plant B	
	Gas Oil	11LS	Gas Oil	11LS
1-hour Average ($\mu g/m^3$)	0.34	0.21	0.59	0.84
Annual Average ($\mu g/m^3$)	0.009	0.006	0.032	0.046

Table 6.18: Results of Zinc Modelling

For all metals that do not have statutory limits for the protection of human health (thallium, mercury, antimony, chromium, cobalt, copper, manganese, vanadium and zinc) the predicted levels show no significant variation between the two fuels. Predicted concentrations at the nearest receptor to each plant indicate that levels are less than 1% of the relevant EA and WHO guidelines where available.

Averaging Period	Plant A		Plant B	
	Gas Oil	11LS	Gas Oil	11LS
1-hour Average ($\mu g/m^3$)	11.36	5.28	5.02	6.83
Statutory Limit[1]	200			
Guideline[2]	200			
Annual Average ($\mu g/m^3$)	0.305	0.142	0.289	0.392
Statutory Limit [3]	40			
Guideline [4]	40			
Guideline [5]	30			

Table 6.19: Results of Oxides of Nitrogen Modelling

Notes:
(1) 1-hour NO_2 limit for the protection of human health (S.I. 180 of 2011)
(2) Guidelines expressed by World Health Organisation and Environment Agency (1-hour NO_2)
(3) Annual NO_2 limit for the protection of human health NO_2
(4) Guidelines expressed by World Health Organisation and Environment Agency
(5) Annual NO_x limit for the protection of vegetation (S.I. 180 of 2011)

The predicted ground level concentrations of oxides of nitrogen are lower (approx. 54%) at the nearest receptor to Plant A using the 11LS product when compared to gas oil. However, at Plant B, this trend is reversed indicating ground level concentrations 36% higher using 11LS. The predicted concentrations with 11LS are less than 4% of the hourly limit for NO_2, less than 1% of the annual limit for NO_2.

Averaging Period	Plant A		Plant B	
	Gas Oil	11LS	Gas Oil	11LS
1-hour Average (mg/m^3)	0.030	0.067	0.088	0.115
Guideline[1]	30			
Guideline[2]	35			
8-hour Average (mg/m^3)	0.020	0.044	0.059	0.076
Statutory Limit [3]	10			
Guideline [4]	10			

Table 6.20: Results of Carbon Monoxide Modelling

Notes:
(1) Guidelines expressed by UK Environment Agency as short term EAL
(2) Guidelines expressed by World Health Organisation for 1-hour average
(3) 8-hour limit for the protection of human health (S.I. 180 of 2011)
(4) Guidelines expressed by World Health Organisation for 8-hour average

Result ground level concentrations of carbon monoxide are higher (approx. 122% at Plant A and approx. 30% at Plant B) at the nearest receptor using the 11LS product when compared to gas oil. However, the predicted levels at both sites are less than 1% of the statutory limit for the protection of human health.

Averaging Period	Plant A		Plant B	
	Gas Oil	11LS	Gas Oil	11LS
1-hour Average ($\mu g/m^3$)	1.24	3.41	7.85	11.78
Statutory Limit[1]	350			
24-hour Average ($\mu g/m^3$)	0.49	1.35	3.59	5.38
Statutory Limit [2]	125			
WHO Guideline [3]	20			
Annual Average ($\mu g/m^3$)	0.03	0.09	0.45	0.68
Statutory Limit [4]	20			

Table 6.21: Results of Sulphur Dioxide Modelling

Notes: (1) 1-hour SO_2 limit for the protection of human health (S.I. 180 of 2011)
(2) 24-hour SO_2 limit for the protection of human health (S.I. 180 of 2011)
(3) Guidelines expressed by World Health Organisation (24-hour SO_2) Global Update 2005
(4) Annual SO_2 limit for the protection of ecosystems (S.I. 180 of 2011)

Predicted ground level concentrations of sulphur dioxide are higher (approx. 175% at Plant A and approx. 50% at Plant B) at the nearest receptor using the 11LS product when compared to gas oil. However, levels are predicted to be less than 5% of the limits for the protection of human health and less than and approximately 4% of the annual limit for the protection of ecosystems.

7 DISCUSSION

7.1 EMISSIONS TO ATMOSPHERE

Schedule G.2 of the Waste Licence outlines specification limits for fuel contents for 11LS for use in asphalt plants. For the two real-world trials undertaken in this study the 11LS samples employed were sent for analysis in the UK to determine the levels of constituents relative to the limit and these results are presented in **Section 4** of this report.

The results of the analysis indicate that the two samples were free from Nickel, Chromium and PCBs with trace levels of other metals – Vanadium and Lead and chlorine content. Levels of ash and sulphur in the 11LS were higher, but compliant, and in a similar range to other fuel oils. A series of other metals were also tested as part of the analytical regimes with low levels of other metals also detected as well as higher levels of Zinc.

In short, the levels showed full compliance with the Schedule G.2 limits for 11LS.

7.2 EMISSIONS TO ATMOSPHERE

A summary table of the variance in results is presented in **Table 7.1**. The results are presented as a % of the Annex VI IED limit. As noted, these plants are not covered by this incineration legislation but the IED limits are used as a conservative parameter. The analysis presented is based on the averages of the two sample runs undertaken for each fuel.

Parameter	Plant A Significance (% of IED Limit)		Plant B Significance (% of IED Limit)	
	Gas Oil	11LS	Gas Oil	11LS
Nitrogen Oxides (NO_x)	20%	9%	9%	12%
Carbon Monoxide (CO)	n/a			
Sulphur Dioxide (SO_2)	17%	47%	108%	162%
Particulate Matter (Total Dust)	77%	72%	14%	43%
Hydrogen Fluoride (HF)	Undetected	Undetected	Undetected	Undetected
Hydrogen Chloride (HCl)	Undetected	2%	Undetected	Undetected
Dioxins/Furans	1%	1%	1%	1%
Cadmium (Cd)	Undetected	Undetected	Undetected	Undetected
Thallium (Tl)	Undetected	Undetected	Undetected	Undetected
Mercury (Hg)	Undetected	Undetected	Undetected	Undetected
Antimony (Sb)	Undetected	Undetected	Undetected	Undetected
Arsenic (As)	Undetected	Undetected	Undetected	Undetected
Lead (Pb)	Undetected	Undetected	Undetected	Undetected
Chromium (Cr)	Undetected	Undetected	1%	4%
Cobalt (Co)	Undetected	Undetected	Undetected	Undetected
Copper (Cu)	1%	1%	Undetected	1%

Manganese (Mn)	Undetected	Undetected	1%	1%
Nickel (Ni)	1%	Undetected	Undetected	4%
Vanadium (V)	Undetected	Undetected	Undetected	Undetected
Zinc (Zn)	n/a			
Volatile Organic Compounds	Undetected	Undetected	19%	53%

Table 7.1: Summary of emission significance of 11LS to WID Limits

In summary, all emissions from both plants using 11LS indicate compliance with the specified limits of a typical air pollution licence. With the exception of Sulphur Dioxide emissions at Plant B, all monitored emissions to atmosphere from both fuels at both plants indicate compliance with the very stringent emission concentrations presented in Annex VI of the Industrial Emissions Directive. It would also be expected that other virgin fuels employed in asphalt plants would show similar levels of compliance with the limits specified in the IED (noting that the IED emission limits are not legally applicable to asphalt plants). Levels of the majority of pollutants are less than 12% of the relevant emission limit value with sulphur dioxide, particulates and VOCs (at Plant B only) demonstrating levels more than 12% of the emission limit values.

The elevated levels of SO_2 at Plant B is considered to be a result of the plant set up and resultant combustion efficiency as opposed to the fuel type as these elevated levels were determined with both fuels. As such, it is concluded that there is no significant variation in utilising the two fuels at such plants.

7.3 LINK BETWEEN FUEL SPECIFICATION AND EMISSIONS TO ATMOSPHERE

As part of the analysis presented in **Section 5** of this report, the potential links between the fuel quality data presented in **Section 4** and the resultant emissions presented in **Section 5** are discussed. It should be noted that the analysis is presented as a simple mass balance (contents in fuel in equivalent to emissions out) and does not factor in more complex processes such as contents of the stone, bitumen or other inputs as well as materials lost in ash or product.

Notwithstanding this point, the analysis shows a largely uniform trend with few exceptions. For all metals, except Zinc, the low levels (or undetected levels) in the fuel samples largely translate to very low or undetected levels in the emissions. Furthermore, by extrapolating these levels in the fuel sample up to the Schedule G.2 limits, the emission levels would still not exceed the limits expressed in Annex VI of IED which are used as a comparator. As such, it is concluded that the continued use of these metal specification limits will not pose a risk of elevated emissions to atmosphere.

Chlorine content is similar in that these levels detected in the fuel samples are very low (4 and 6% of the limit). Extrapolation shows that if the chlorine content was to increase up to the limit expressed in the Waste Licence, the resultant increase in dioxin/furan and HCl emissions would not breach the limit specified in the Annex VI of IED. In this regard, like metals the continued use of the chlorine specification limit will not pose a risk of elevated emissions to atmosphere.

The sulphur limit of 1% by mass was not breached in either fuel sample but as **Table 7.1** shows, the emissions generated were above the IED limits in one of the two plants. However, a similar trend was noted for gas oil which has a lower sulphur content (0.2%) and it is concluded that the emissions were as a direct result of the poor combustion efficiency at Plant B as opposed to fuel specification.

At Plant A, the extrapolated results indicate that at the specification limit in Schedule G.2, the emissions would still comply with the IED limit and these limits should be retained.

The ash limit shows a similar trend in that the measures levels are approximately half of the limit in the fuel analysis. The comparator virgin fuel (gas oil) has a relatively low ash content (0.1-0.2%) compared to the ash limit for 11LS in the Waste Licence (1.5%) but there is no significant difference in the emissions measured from each of the trials run in this study. In reality the particulate emissions are dictated by the feedstock and combustion efficiency in these plants. As such, there is no environmental justification to alter this limit.

7.4 IMPACT ON HUMAN HEALTH

The results of the air dispersion modelling at both sites are summarised in **Table 7.2**. All resultant ground level concentrations are compared to the relevant statutory limits for the protection of human health as well as the EA and WHO Guidelines for the protection of human health.

Parameter	Plant A Significance (% of Limit for protection of human health)		Plant B Significance (% of Limit for protection of human health)	
	Gas Oil	11LS	Gas Oil	11LS
Nitrogen Oxides (NO_x)	1%	1%	1%	1%
Carbon Monoxide (CO)	1%	1%	1%	1%
Sulphur Dioxide (SO_2)	1%	1%	2%	3%
Particulate Matter (Total Dust)	1%	1%	1%	1%
Hydrogen Fluoride (HF)	1%	1%	1%	1%
Hydrogen Chloride (HCl)	1%	1%	1%	1%
Dioxins/Furans	No Limit			
Cadmium (Cd)	1%	1%	1%	1%
Thallium (Tl)	1%	1%	1%	1%
Mercury (Hg)	1%	1%	1%	1%
Antimony (Sb)	1%	1%	1%	1%
Arsenic (As)	2%	2%	1%	1%
Lead (Pb)	1%	1%	1%	1%
Chromium (Cr)	1%	1%	1%	1%
Cobalt (Co)	1%	1%	1%	1%
Copper (Cu)	1%	1%	1%	1%
Manganese (Mn)	1%	1%	1%	1%
Nickel (Ni)	1%	1%	1%	1%
Vanadium (V)	1%	1%	1%	1%
Zinc (Zn)	1%	1%	1%	1%
Volatile Organic Compounds	1%	1%	1%	1%

Table 7.2: Summary Table of Impact of use of 11LS compared to limits or guidelines for the protection of human health

The results of the modelling at both plants indicates that the use of 11LS results in negligible impact on the human environment when compared to the relevant limit or guideline for the protection of human health. The results using Gas Oil show similar results and the results indicate that while there is variation in the emissions between the two fuels, the environmental impact shows no significant difference.

7.5 IMPACT ON THE WIDER ENVIRONMENT

The potential emissions from the operations of asphalt plants may have an impact on the environment other than that discussed above for human health. These impacts include those to vegetation and sensitive ecosystems and the production of acidifying gases.

7.5.1 Sensitive Ecosystems

Emissions from any combustion process may have an impact on vegetation and sensitive ecosystems as well as residential receptors. In particular, concentrations of NO_x and SO_2 may have such impacts and there are limits for the exposure of sensitive ecosystems to these pollutants (S.I. 180 of 2011, **Table 3.5**). There is an annual and winter SO_2 limit of 20µg/m^3 for the protection of ecosystems and an annual limit of NO_x of 30µg/m^3 for the protection of vegetation.

The results of the modelling at Plant A indicate that the use of 11LS leads to a significant reduction in the ground level concentrations of NO_x from levels of 1% (with gas oil) to only 0.5% (with 11LS) of the limit for protection of vegetation. At Plant B there is a marginal decrease in the opposite direction, with 11LS generating levels 1.3% of the limit for the protection of vegetation compared to 1% using gas oil.

While levels of SO_2 at the nearest receptor show an increase with 11LS at Plant A this is not significant as both fuels generate levels less than 0.5% of the limit for protection of ecosystems. At Plant B, emissions using both fuels are higher and the resultant ground levels concentrations are more relevant at 2.3% (gas oil) and 3.4% (11LS) of the limit for the protection of ecosystems. Again, it should be pointed out that gas oil has a much lower sulphur content than light fuel oil or other virgin alternatives which would generate levels similar to 11LS.

Carbon monoxide has no significant impact on vegetation or ecosystems and does not have any limit specified.

7.5.2 Acidifying Gases

Directive 2001/81/EC of the European Parliament and of the Council on National Emission Ceilings for certain pollutants (NECs) sets upper limits for each Member State for the total emissions in 2010 of the four pollutants responsible for acidification, eutrophication and ground-level ozone pollution (SO_2, NO_x, VOCs and ammonia), but leaves it largely to the Member States to decide which measures to take in order to comply. In Ireland this Directive was transposed into Irish law through S.I. No. 10 of 2004.

The latest EPA reporting for 2013 (published April 2015) indicates that Ireland is on schedule to achieve the targets for SO_2 with projected levels at 25 ktonnes compared to a target of 42 ktonnes.

However, Ireland is well behind the target for NO_x and not predicted to achieve the target with a projected level of 76 ktonnes in 2013 compared to the target of 65 ktonnes.

Given the nature of emissions from the 11LS product and the associated significant reduction in NO_x emissions, the use of this product would have a positive impact in terms of playing its part in reducing Irelands annual NO_x emissions. While the emissions of SO_2 have been shown to increase with 11LS compared to gas oil (but not with light fuel oils or similar), the sensitivity of the environment is less pronounced as Ireland is on course to meet its target for this pollutant.

7.6 IMPACT SUMMARY

In summary, the modelling results parallel the monitoring results in that for the majority of parameters the predicted ground level concentrations show no significant variation between the use of the two fuels at both plants. Some parameters (particulates and oxides of nitrogen) indicate variations dependant on the site with net reductions in ground concentrations with 11LS while others (carbon monoxide and sulphur dioxide) indicate an increase in ground level concentrations at both plants.

Furthermore, the results of the modelling indicate that all pollutants are less than 5% of the limit or guideline for the protection of human health at the nearest sensitive receptor to both sites. This is true regardless of the fuel indicating that the negligible impact to atmosphere from the use of Gas Oil will not be significantly altered with the use of 11LS.

The use of the 11LS product may also have a net positive impact on the impact to sensitive ecosystems and levels of acidifying gases though the net reductions in NO_x emissions on average between the two plants.

Taking the range of pollutants as a whole the modelling would indicate that there is little or no net variation between the impacts to atmosphere from emissions of 11LS when compared to the gas oil.

7.7 LINK BETWEEN FUEL SPECIFICATION AND ENVIRONMENTAL IMPACT

Section 7.3 provides the summary of the link between the fuel specification data presented in **Section 4** of the report and the emissions to atmosphere data presented in **Section 5**. In summary this assessment concluded that extrapolation of the levels of metals and other constituents in the fuel to the limits expressed in Schedule G.2 of the Waste Licence, would not result in any emissions to atmosphere in excess of the Annex VI IED emission limits. These waste incineration limits do not apply to the asphalt plants included in this assessment but are used as a robust set of comparator data.

By extension, if the constituents of the fuel were present at the levels specified in the Waste Licence and the resultant discharges to atmosphere were within the limits specified in Annex VI of IED, the modelled air quality impacts would also increase.

Table 7.3 provides a theoretical extrapolation of the real-world data collated in this study. For each of the parameters listed in Schedule G.2 the following hard data is presented:

- Column 1 - The level identified in the 11LS fuel specification testing as a % of the Schedule G.2 limit (**Section 4**).
- Column 2 – The average level of emission for 11LS as monitoring as a fraction of the Annex VI IED Limit (**Section 5**).
- Column 3 – The predicted impact of this average emission at the nearest sensitive receptor as a % of the relevant statutory limit or guideline for the protection of human health (**Section 6**)

The first line of each parameter (unshaded) notes the actual trend from fuel data to emissions to impact and notes the low level of impact identified for all parameters in this study. It is noted that the Sulphur content may lead to a breach of the IED Annex VI sulphur dioxide limit and the ash limit may lead to a breach of the Annex VI particulate limit. However, as noted earlier this is as a result of the feedstock and not the 11LS and these limits do not apply to these plants.

Presented in the second line for each parameter (shaded) are the extrapolated results assuming 100% of the fuel specification (i.e. fuel at the limit in Schedule G.2) and the resultant impact on emissions and ultimately impact on the environment. The emissions show and increased emission level for all parameters and in increased level of breach for particulates and sulphur dioxide compared to the actual data. However, the resultant impact on the environment at these theoretical levels for all parameters is low (Column 3) and it is concluded that the real world combustion of 11LS at the specification listed in Schedule G.2 will not result in any significant impact to air quality at these asphalt plants.

Parameter	Fuel Specification (as % limit)	Emissions (as % Annex IV IED)	Impact (as % limit/guideline)
Cadmium	ND (assumed 5%)	1%	1%
	100%	**40%**	**40%**
Nickel	10%	4%	1%
	100%	**20%**	**5%**
Chromium	5%	1%	1%
	100%	**20%**	**20%**
Vanadium	7%	1%	1%
	100%	**14%**	**14%**
Lead	2%	1%	1%
	100%	**50%**	**50%**
Chlorine	5%	1%	1%
	100%	**20%**	**20%**
Sulphur	60%	104%	2%
	100%	**173%**	**3%**
Ash	53%	58%	1%
	100%	**109%**	**2%**

Table 7.3: Analysis of Fuel Specification to Emissions to Impact

It should be noted that these mass balance assumptions are simplified and do not account for other sources (such as stone, asphalt, etc.) or pathways (e.g. ash, product, etc.) in these plants. However, they do point to a trend of compliance both at the real-world measured levels and the extrapolated Schedule G.2 limits.

8 CONCLUSIONS

The main objective of this assessment was to determine the significance of any variation in the impact to the environment from the use of the Enva 11LS product over standard virgin gas oil and to provide robust and comprehensive evidence that the use of the 11LS product in asphalt plants *"do not and will not have an adverse on air quality in the vicinity of a combustion plant"*.

Assessment of the 11LS fuel samples used in the study was undertaken for comparison with the limits expressed in Schedule G.2 of the licence was undertaken. The fuel samples showed very low or undetected levels of the main metals and also chlorine. Higher levels of sulphur and ash were detected at similar levels to other virgin oils.

A series of real-world monitoring surveys were undertaken two asphalt plants by an MCERT Accredited monitoring team. Monitoring was undertaken using standard techniques for a range of key parameters including all pollutants listed in Part 2 of Annex VI of the IED (formerly the WID monitoring requirements). All process inputs remained constant throughout the monitoring period with the exception of the process fuel which was controlled between both 11LS and gas oil.

The results of the real-world monitoring indicate that for the majority of parameters (dioxins, metals, VOCs, inorganic acids) there is no significant variation between the emission concentrations between the two fuels at both sites. Emission concentrations of the flue gases show some variation between the fuels with some parameters (carbon monoxide and sulphur dioxide) on average higher using 11LS and others (oxides of nitrogen) higher on average using gas oil.

While these plants are not subject to the requirements of Annex VI of the IED, all emission concentrations are compared to the limits specified in this Annex in order to benchmark the emissions against the highest emissions standard. For all parameters monitored, except sulphur dioxide, the levels are well below the emissions limits specified and typically levels are less than 12% of the limit. Where no limits exist the levels are well below the TA Luft Guidelines. Sulphur dioxide indicated levels in excess of the limit specified in Annex VI of the IED using both Gas Oil and 11LS at Plant B. No such breaches were identified in Plant A suggesting that the issue relates to the plant at Plant B rather than the fuel content. This may in fact have been due to higher moisture within the stone being dried in Plant B, thereby decreasing the combustion efficiency.

The average emission concentrations derived in the monitoring for both fuels have been used to simulate the impact to the environment using the US EPA approved AERMOD Prime dispersion model. Emissions are presented as the maximum concentration at the nearest sensitive receptor for all parameters and the results are compared against any relevant statutory limit (existing or pending) and the relevant guidelines from the World Health Organisation and the UK Environment Agency. As emission concentrations showed no significant variation, the resultant ground level concentrations showed no significant variation for the majority of pollutants. For the flue gases, where variation was observed in the monitoring, a similar trend was observed in the modelling. However, for all parameters modelled both the short term and long term ground level concentrations are predicted to be less than 5% of the statutory limits or relevant guidelines for the protection of human health.

In summary, the assessment indicates that the use of the 11LS product at this site represents only a minor variation in the emissions associated with gas oil. In addition, all pollutants are less than 5% of the relevant statutory limit for the protection of human health. As such, it can be concluded that

the use of 11LS at asphalt plants has no significant net negative impact on the environment over the use of gas oil and this product can be used for these applications without endangering human health or the wider environment.

Furthermore, a simplified mass balance assessment was carried out to extrapolate the real-world data to simulate the impact of using the 11LS at the limits expressed in Schedule G.2. This extrapolation indicates that the use of 11LS at the limits specified will not lead to any levels breaching the statutory limits or guidelines for the protection of human health or the environment. As such, it is not proposed to alter this specification as part of the current licence review.

Appendix 3

19LS Oil Product – Comparative Analysis
RPS

Enva Ireland Limited

19LS Oil Product – Comparative Analysis

Document Control Sheet

Client:	Enva Ireland Limited
Project Title:	19LS Oil Product – Comparative Analysis
Document Title:	Technical Report on Recovered Oil Quality
Document No:	MDE0973Rp0102

Text Pages:	14	Appendices:	-

Rev.	Status	Date	Author(s)		Reviewed By		Approved By	
F01	Final	12th May 2016	PC		CR		CR	

QUALITY ISO 9001:2008 NSAI Certified | ENVIRONMENT ISO 14001:2004 NSAI Certified | HEALTH & SAFETY OHSAS 18001:2007 NSAI Certified

CERTIFIED IQNet MANAGEMENT SYSTEM

ENGINEERS IRELAND cpd ACCREDITED EMPLOYER

rpsgroup.com/ireland

TABLE OF CONTENTS

1 INTRODUCTION 1
2 QUALITY STANDARDS FOR 19LS 3
2.1 WASTE LICENCE 3
2.2 UK QUALITY PROTOCOL 4
3 QUALITY STANDARDS FOR VIRGIN FUELS 6
3.1 BRITISH STANDARD BS2869 6
3.2 HFO COMPOSITIONAL DATA 6
4 COMPARATIVE ANALYSIS 8
4.1 HALOGENS 8
4.2 PCBS 9
4.3 VANADIUM 9
4.4 ZINC 10
4.5 OTHER METALS 10
5 CONCLUSIONS 13

1 INTRODUCTION

Enva Ireland Limited operates under an Industrial Emissions Licence (Register No. W0184-01) from the EPA for the facility in Clonminam Industrial Estate, Portlaoise, County Laois. One of the processes carried out under the licence involves the recovery of waste oil to produce a commercial fuel oil product known as 19LS. Condition 5.3.6 of the licence restricts the use of 19LS to steam raising boilers subject to the fuel meeting the quality standards presented in Schedule G.2 of the licence.

On the 26th January 2016, the EPA gave notice to Enva Ireland Limited that the EPA was initiating a review of the licence in accordance with the provisions of Sections 90(4) and 98A of the EPA Act 1992 as amended. The EPA notification contains a detailed list of information that is sought as part of the review and, in particular, Requirement 19(e) requires Enva to submit the following:

Demonstrate quantitatively that the quality standards in the existing licence remain appropriate to demonstrate that the processed fuel oil is not classified as waste when it leaves the installation. Alternatively, propose new quality standards that enable his quantitative demonstration.

As part of this quantitative demonstration, carry out and report on a detailed comparative analysis, or provide a relevant comparative analysis prepared by others, that shows processed fuel oil contains:

- *no more contaminants (of environmental concern), and*
- *will have no greater environmental impact*

than the virgin fuel oils displaced by processed fuel oil.

The effects of dilution, for example through mixing or blending with virgin fuel oils, should not be considered in your quantitative demonstration.

This report presents the details sought by the EPA as a comparative quantitative analysis of the constituents of the 19LS product relative to virgin fuels. In the case of 19LS, the primary virgin fuel that is replaced by this product is heavy fuel oil (HFO) and this fuel is employed in the comparative analysis.

This assessment does make reference the UK Quality Protocol for "Processed Fuel Oil" (PFO) and the supporting study that has been used to determine acceptable end of waste criteria in the UK. This UK study has completed a detailed comparative analysis of PFO relative to virgin fuels for a range of parameters with input from industry groups and regulators to ensure a robust end of waste specification. This analysis is directly relevant to the EPA request to Enva and is referenced throughout this report.

Furthermore, it should be noted that once PFO meets the quality protocol, the use of PFO in the UK is unrestricted. Once 19LS meets the specification in the licence, it is further restricted by Condition 5.3.6 to steam raising boiler applications only AND where the combustion residues do not form part of the final product. In this regard, the current licence conditions for 19LS are more onerous and restrictive than the UK approach.

This report will demonstrate that the 19LS product contains no more contaminants and will have no greater environmental impact, than the virgin HFO that has been displaced by the 19LS.

2 QUALITY STANDARDS FOR 19LS

2.1 WASTE LICENCE

Use of the 19LS product by Enva is subject to Condition 5.3.6 of the Waste Licence (Register No. W0184-01). Use is restricted to steam raising boilers and the product may not be used in direct contact heating/drying applications where the combustion residues become part of any product being produced (e.g. in the food industry).

Enva also need to implement formal agreements with 19LS customers to ensure buy back clauses are implemented and no 19LS is unaccounted for.

Schedule G.2 of the licence sets out the quality limits for 19LS and these limits specify the maximum levels that may be present in the product prior to use under Condition 5.3.6. The analytical methods for testing these quality specifications are restricted to those listed in Schedule G.1 of the licence. These schedules are summarised in **Table 2.1**.

Parameter	Limit (mg/kg unless stated otherwise) Schedule G.2	Analysis Method Schedule G.1
Cadmium	5	Atomic Absorption
Nickel	5	Atomic Absorption
Chromium	5	Atomic Absorption
Copper	40	Atomic Absorption
Vanadium	5	Atomic Absorption
Lead	25	IP PM EB
PCBs	5	IP 462
Sulphated Ash Content	0.2% (m/m)	IP 550
Total halogens, as chlorine	150	IP 503
Mercury	5	IP PM DZ
Zinc	300	To be agreed
Arsenic	5	To be agreed
Thallium	5	To be agreed
Antimony	5	To be agreed
Cobalt	5	To be agreed
Manganese	5	To be agreed

Table 2.1: Summary of Schedules G.1 and G.2 of the Waste Licence

Schedule G.3 of the licence lists the waste streams that may be employed by Enva for generation of the 19LS product. These are not reproduced in this document but include 29 individual EWC hazardous waste streams that may be recovered to generate the 19LS product.

The details presented in **Table 2.1** are the subject of the EPA request and this report will present technical analysis to illustrate that the use of 19LS at these specifications has no net negative impact over the use of virgin fuels.

2.2 UK QUALITY PROTOCOL

In the UK, a significant body of work has been undertaken to assist operators in identifying when a waste has been fully recovered and ceases to be a waste within the meaning of Article 3(1) of the EU Waste Framework Directive (2008/98/EC). To this end, the Environment Agency of England and Wales (EA) and the Northern Ireland Environment Agency (NIEA) commenced publication of a series of Quality Protocols for guidance to operators. Quality protocols explain when a waste derived material can be regarded as a non-waste product and is no longer subject to waste controls by defining quality standards for the waste derived material.

In February 2011, the quality protocol for "Processed Fuel Oil" (PFO) was published by the EA and NIEA which sets out the end-of-waste criteria for the production and use of PFO from waste lubricating oils. The document is available at:

https://www.gov.uk/government/publications/quality-protocol-processed-fuel-oil-pfo

The protocol states that once the PFO complies with the specification listed in Appendix C it is regarded as having been fully recovered and ceased to be a waste because:

- It has been converted into a distinct, marketable product;
- It can be used in exactly the same way as the relevant virgin equivalent fuel oil described in BS2869; and
- It can be used with no worse environmental effects than that equivalent.

Given its remit, the UK quality protocol is an appropriate benchmark by which to demonstrate that, per the EPA's request, 19LS has no more contaminants (of environmental concern) and will have no greater impact than the virgin fuels it displaces. The research used to develop the quality protocol for PFO is also used as reference material and in particular the "*Waste Oil Technical Advisory Group, Final Report*" (February 2008) as published by ERM.

Table 2.2 presents the specification for residual oil equivalent from the protocol and includes both the limits and the approved monitoring method. Specifications that are not directly related to the environmental impact (flash point, kinematic viscosity, etc.) are not presented, only the parameters with a potential for impact to human health or the environment.

Table 2.2 indicates that all of the limits specified in the Waste Licence for 19LS (**Table 2.1**) are identical to those in the quality protocol. In this regard, the current specification in Schedule G.2 of the licence is in full compliance with the UK regulatory specification. The only variation is that sulphur content is not currently listed in Schedule G.2 for 19LS. However the sulphur content of fuels used within Ireland is controlled by SI 273 of 2015.

The quality protocol is more specific than Schedule G.2 of the licence in relation to the accepted International Petroleum (IP) analysis methods that are required to be employed by an operator to demonstrate compliance with the limits.

Finally the 29 individual EWC hazardous waste streams that may be recovered to generate the 19LS product as specified in Schedule G.3, are identical to the acceptable inputs for PFO as listed in Appendix B of the protocol.

Parameter	Limit (mg/kg unless stated otherwise)	International Petroleum (IP) Analysis Methods
Cadmium	5	IP 592
Nickel	5	IP 592
Chromium	5	IP 592
Copper	40	IP 592
Vanadium	5	IP 592
Lead	25	IP 592
PCBs	5	IP 462
Sulphated Ash Content	0.2% (m/m)	IP 550
Total halogens, as chlorine	150	IP 503
Mercury	5	IP 594
Zinc	300	IP 592
Arsenic	5	IP 592
Thallium	5	IP 592
Antimony	5	IP 592
Cobalt	5	IP 592
Manganese	5	IP 592
Sulphur	1% (m/m)	BS2000-336

Table 2.2: Summary of Specifications and required test methods from the Quality Protocol

3 QUALITY STANDARDS FOR VIRGIN FUELS

3.1 BRITISH STANDARD BS2869

British Standard BS 2869 is the UK standard specification for virgin fuels and specified the properties and material composition limits for several classes of fuel oils. BS 2869:2010 of September 2010 is the current standard and the standard presents limits for virgin fuels for use in any agricultural, domestic and industrial engines and boilers.

While BS2869:2010 presents standard for eight virgin fuels, the fuels of most relevance to this analysis are the Heavy Fuel Oil Classes (Class E, F and G) as these are the fuels most likely displaced by the 19LS product. The key property specifications for Class E, F and G virgin fuels as specified in BS 2869:2010 are however not primarily related to environmental impact and relate largely to the physical characteristics of a fuel to facilitate its use in a wide range of boilers.

As the primary requirement for PFO in the quality protocol is for recovered fuel to meet the requirements of BS2869:2010, it is unsurprising that there is very little variation between the two specifications. Only the ash content varies between BS2869:2010 and the quality protocol.

The remaining performance and environmental properties are identical and indicate that on meeting the quality protocol specifications that performance of PFO will be that same as that for virgin oils.

3.2 HFO COMPOSITIONAL DATA

As noted BS2869:2010 is not focused on environmental impact and therefore does not include specifications for metals, halogens or PCBs which are relevant to this assessment and referenced in the quality protocol. In the absence of binding specifications, ERM collated a database off compositional data on HFO and published same in the *Waste Oil Technical Advisory Group, Final Report*" (February 2008) which as used to inform the quality protocol for PFO. One particular dataset (from the OSS Group) covered the majority of parameters relevant to this analysis and this information is presented in **Table 3.1**. Also presented for comparison are the analogous limits specified in the PFO quality protocol.

Material	Typical levels detected in Class G (HFO)	Quality Protocol PFO
Chlorine (mg/kg)	200	150
Fluorine (mg/kg)	33	
PCBs (mg/kg)	<1	5
Zinc (mg/kg)	50	300
Vanadium (mg/kg)	300	5
Arsenic (mg/kg)	1	5
Antimony (mg/kg)	1	5
Lead (mg/kg)	28	25
Cadmium (mg/kg)	3	5
Chromium (mg/kg)	11	5
Cobalt (mg/kg)	1	5
Copper (mg/kg)	6	40
Nickel (mg/kg)	20	5
Manganese (mg/kg)	1	5
Magnesium (mg/kg)	1	No limit
Mercury (mg/kg)	No data	5
Thallium(mg/kg)	No data	5

Table 3.1: Comparative Levels of other constituents in HFO.

The analysis shows that the levels detected for halogens in the HFO are higher than that in in the quality protocol. The ERM report notes considerable discussion between the technical advisory group members on the potential for dioxin formation and as such the quality protocol limit for total halogens (as chlorine) is lower than the corresponding level detected in HFO.

PCB levels are equally low in the quality protocol as that detected for HFO in the ERM study.

Zinc and Vanadium show significant variance between the level detected in HFO and the subsequent quality protocol limit. Both are noted as present in relatively high concentrations (relative to other metals) in HFO, however, vanadium is considerably more toxic to human health than zinc and hence the working group sought a much stricter limit than that for zinc. As a result, the quality protocol limit for vanadium is considerably stricter than detected levels in virgin HFO and the use of recovered fuel would represent a net positive impact for this parameter.

The working group found that as vanadium is 60 times more toxic than zinc, a limit 60 times higher was applied at that point. While zinc is less toxic than vanadium it is not without environmental significance. Based on the data in **Table 3.1**, the zinc limit for 19LS would represent a net negative in terms of emissions relative to the use of HFO levels. However taking into account the much lower levels of vanadium allowable in 19LS the overall impact is considered to be net positive.

For the remaining metals, the limits in the protocol are largely in line with the levels detected in the virgin fuel. In some cases the limits in the protocol are set at the minimum (5mg/kg) relative to more elevated HFO levels but this appears to be as a direct result of the toxicity of the metals – note for Nickel and Chromium. Less toxic/environmentally sensitive metals such as Copper are assigned a more lenient limit in the quality protocol relative to HFO.

4 COMPARATIVE ANALYSIS

Section 2 of this report identifies the current 19LS specification in the Waste Licence and identifies that the environmentally significant specification parameters are identical to the specifications listed in the UK quality protocol for PFO. **Section 3** of the report identifies the quality standards for virgin fuel as well as details of typical constituent levels for parameters where no standard exists. To a large extent the levels of the parameters in the 19LS and the virgin fuel (HFO) are identical and this section of the report outlines the key constituents, the environmental implications and a comparative analysis of using either fuel type.

Details relating to impacts to human health and the wider environment are derived from the WHO "Air Quality Guidelines for Europe" (2nd Edition, 2000) and from other regulatory and industry sources.

This analysis is also cognisant of the documented review undertaken by ERM to inform the quality protocol for PFO. This study has invited comments from industry groups and regulators (Defra, Environment Agency) who sat on the Waste Oil Technical Advisory Group who were consulted ion the plan. In this regard, the ERM study has considered views from all parties in devising a set of recommendations that EA and NIEA have considered in developing the quality protocol.

This analysis considers the environmental and human health implications of both the input fuel constituent as well as the subsequent products post combustion (acids, oxides, etc.).

4.1 HALOGENS

Combustion of substances containing chloride and fluorine produce hydrogen chloride (HCl) and hydrogen fluoride (HF) which are gases that cause acidification. Both HCl and HF can produce irritation of the eyes, skin, gastrointestinal system and respiratory system. Long-term exposure to low levels can cause respiratory problems, eye and skin irritation, and discoloration of the teeth. There is no evidence to suggest that these substances are carcinogenic, teratogenic or mutagenic.

In the environment hydrogen fluoride is directly phytotoxic at relatively low levels. In addition bioaccumulation in plant tissues occurs and may be associated with subsequent impacts on animals eating the plants. Hydrogen chloride can cause acidification effects but does not accumulate in the environment.

Halogen content in a combustion system at temperatures between 200-800^{0}C may also lead to the generation of dioxins and furans (polychlorinated dibenzo-para-dioxins and polychlorinated dibenzofurans). Dioxins and furans are associated with a large number of toxicological properties including carcinogenic, teratoganic and mutagenic properties. Dioxin and furan deposition to the wider environment can result in uptake of soils, plants and animals of these compounds which may then enter the food chain and indirectly affect human health.

In the case of both the acid and dioxin/furan formation, the generation rate is related to the content in the fuel along with other key factors such as combustion temperature and efficiency. There is no chlorine or halogen limit for HFO in BS2869:2010. The industry recorded levels of halogen content in virgin HFO was reported as 233mg/kg in one field study reported by ERM. A further theoretical calculation provided by the Environment Agency in the ERM report estimated a chlorine content of

158mg/kg. Based on this data set it is a valid assumption that chlorine/halogen levels in virgin HFO are of the order of 150-200mg/kg.

In this regard, the 19LS limit and quality protocol limit of 150mg/kg limit for total halogens (as chlorine) mas be considered as a more conservative specification that typically found in virgin HFO. As such, it is concluded that the anticipated levels of halogen emissions (as acid or dioxin/furan formation) from the combustion of 19LS would be of a similar order or lower than the corresponding combustion of virgin HFO in a corresponding system. As a result it is not proposed to alter the existing Schedule G.2 limit for 19LS in the Waste Licence.

4.2 PCBS

Polychlorinated biphenyls (PCBs) are a group of man-made compounds that were widely used in electrical equipment but which were banned at the end of the 1970s because of environmental concerns. In terms of human health, PCBs are bio-accumulative, carcinogens and may also display mutagenic effects. At higher concentrations many of these species may cause eye, skin and respiratory irritation, and exposure to some PCBs may also result in damage to the nervous system. In terms of environmental effects, many species of PCBs are environmentally persistent and bio-accumulative. PCBs have been linked to endocrine disruption in animals.

The ERM study identified undetected (<1mg/kg) levels of PCBs in virgin HFO indicating that virgin fuel is largely free from these compounds.

Given the significant human health impacts and persistence in the environment, it is not surprising that the quality protocol specified the strictest limits for these compounds in PFO (5mg/kg max). This limit is also applied in the Schedule G.2 limit for 19LS ensuring the strictest control on emissions of these substances. In this regard, the emissions from 19LS will be largely identical to the emissions from virgin HFO and there is no greater environmental impact in using 19LS.

As such, it is not proposed to alter the Schedule G.2 limit for PCBs to ensure that the emissions of 19LS have no net negative impact over the use of virgin HFO.

4.3 VANADIUM

The WHO has reported both acute and chronic irritative effects of vanadium on the respiratory tract as the key human health concern. However, it is the oxides of vanadium that pose a greater risk and vanadium oxides are potentially released during combustion. Exposure to high levels of vanadium pentoxide in air can result in lung damage. The International Agency for Research on Cancer (IARC) has classified vanadium pentoxide as possibly carcinogenic to humans based on evidence of lung cancer in exposed mice.

The ERM study identified levels of vanadium in virgin HFO at levels ranging from 22 mg/kg in one study (Federation of Petroleum Suppliers) up to 600mg/kg in another (OSS Group). These levels indicate a high level and high variance in vanadium levels of virgin HFO. Vanadium content in virgin fuels is a direct result of the mineral content in the crude oil which contains vanadium and other trace metals.

Given the significant health implications of vanadium and its oxides, the quality protocol has derived the minimum limit for this substance in PFO (5mg/kg). This is the limit that also applies to 19LS under Schedule G.2.

In this regard, the potential for emissions of vanadium and vanadium oxides from 19LS is considerably lower than the analogous combustion of virgin HFO given the stricter controls on 19LS. While there is a net positive impact for 19LS over virgin HFO, it is not considered appropriate to alter the Schedule G.2 specification given the health concerns.

4.4 ZINC

Zinc is one of the essential elements for human growth and development. Zinc deficiency in a diet during growth periods results in growth failure. Epidermal, gastrointestinal, central nervous, immune, skeletal, and reproductive systems are the organs most affected clinically by zinc deficiency. In very high doses, elevated levels of zinc can interfere with a body's ability to absorb copper so the principle health implication of zinc exposure relates to copper deficiency.

In the environment, like other metals, zinc may bio-accumulate in fish and other species and zinc deposition can have a detrimental impact on soil quality in large concentrations. However, zinc oxide is classed as very toxic to aquatic organisms and may cause long term adverse effects in the aquatic environment.

A range of studies in the ERM report identify zinc at very low levels (less than 2mg/kg) in virgin HFO with one study reporting a level of 50mg/kg (OSS Study). This is in contrast with the limit specified in the quality protocol and Schedule G.2 at 300mg/kg for zinc.

A complicating factor is the fact that zinc-based additives are integral to the function of lubricating oils and hence these zinc levels will be retained through the lifetime of the oil and are prevalent in the recovered oil. In this regard, zinc levels in oil recovered from lubricating oil (such as 19LS) are not comparable to virgin HFO.

This issue is recognised in the quality protocol and hence the limit specified for zinc in PFO is noticeably higher that the levels observed in virgin HFO. As such, the combustion of 19LS will result in higher concentrations of zinc and zinc oxides being released to the environment when compared to virgin fuel. However, as noted above, the human health impacts of zinc are less significant than for other metals which have toxic impacts (e.g. vanadium).

Given the moderate significance of the impact from the zinc emissions coupled with the constraints with recovering lubricating oils with high zinc content, it is proposed that the 300mg/kg specification limit for 19LS can be retained without any significant environmental impact.

4.5 OTHER METALS

A number of the metals listed in Schedule G.2 are carcinogens or have other known toxic effects on human health. Each of the metals is summarised below along with a note on the net environmental impact.

Antimony: Antimony oxides are classed as possibly carcinogenic to humans by the IARC. Low levels of antimony (1mg/kg) were detected in virgin HFO in the ERM study and, as with other metals, given the significant health concerns, it is not considered valid to amend the strict limit imposed in the licence of 5mg/kg to ensure no net negative impact over using HFO.

Arsenic: Lung cancer is considered to be the critical effect following inhalation of arsenic compounds. An increased incidence of lung cancer has been seen in several occupational groups exposed to inorganic arsenic compounds. Low levels (<1mg/kg) were noted in virgin HFO in the ERM study and given the significant health concerns, it is not considered valid to amend the strict limit imposed in the licence of 5mg/kg to ensure no net negative impact over using HFO.

Cadmium: IARC has classified cadmium and cadmium compounds as Group 1 human carcinogens. Low levels of cadmium (3mg/kg) were detected in virgin HFO in the ERM study and, as with arsenic, given the significant health concerns with cadmium emissions, it is not considered valid to amend the strict limit imposed in the licence of 5mg/kg to ensure no net negative impact over using HFO.

Chromium: Chromium(III) is recognized as a trace element that is essential to both humans and animals. Chromium(VI) compounds are toxic and carcinogenic. IARC has stated that for chromium and certain chromium compounds there is sufficient evidence of carcinogenicity in humans. Low levels of chromium (11mg/kg) were detected in virgin HFO in the ERM study and, as with arsenic and cadmium, given the significant health concerns with chromium, it is not considered valid to amend the strict limit imposed in the licence of 5mg/kg to ensure no net negative impact over using HFO. At this limit the levels of chromium emissions would be approximately half of those from virgin HFO.

Cobalt: Cobalt and it's compounds are classed as possibly carcinogenic to humans by the IARC. Cobalt also has beneficial effects because it is part of vitamin B12 which is essential to maintain human health. Low levels of cobalt (1mg/kg) were detected in virgin HFO in the ERM study and given the possible carcinogenicity, it is not considered valid to amend the strict limit imposed in the licence of 5mg/kg to ensure no net negative impact over using HFO.

Copper: Copper is one of the few metals in this assessment that is not classified as possibly or probably carcinogenic. Copper, like zinc, is also one of the elements that are essential for human metabolism. Low levels of copper (6mg/kg) were detected in virgin HFO in the ERM study and a higher level is specified in the quality protocol and in Schedule G.2 (40mg/kg). This level acknowledges the potential for elevated copper in waste oils (from engine wear) that are not relevant to virgin fuels. As a result, the level of copper emissions from 19LS are likely to be higher than the corresponding use of HFO but this impact is not considered significant given the low risk to human health and the environment.

Nickel: Nickel compounds are categorised by human carcinogens by inhalation exposure by the IARC. Moderate levels of nickel (20mg/kg) were detected in virgin HFO in the ERM study and, as with the metals above, given the significant health concerns with nickel, it is not considered valid to amend the strict limit imposed in the licence of 5mg/kg to ensure no net negative impact over using HFO. Based in the levels presented, the use of 19LS would actually lead to a net reduction in nickel emissions when compared to virgin HFO.

Lead: Lead is a cumulative toxicant that affects multiple body systems and is particularly harmful to young children with impacts including cognitive deficit, hearing impairment and disturbed vitamin D metabolism. Inorganic lead compounds are classes as probably carcinogenic by the IARC. Lead was

detected at moderate levels in HFO (28mg/kg) in the ERM study and the quality protocol has specified a similar level for PFO (25mg/kg). This level is also specified for 19LS in Schedule G.2 of the waste licence. At this limit, the emissions from 19LS will be similar to those from virgin HFO and there will be no net negative environmental impact.

Manganese: By inhalation manganese is known to be toxic and effects are characterised by various psychiatric and movement disorders, with some general resemblance to Parkinson's disease. Low levels of manganese (1mg/kg) were detected in virgin HFO in the ERM study and, as with other metals, given the significant health concerns with manganese, it is not considered valid to amend the strict limit imposed in the licence of 5mg/kg to ensure no net negative impact over using HFO.

Mercury: The predominant species of mercury present in air is mercury vapour which is neither mutagenic nor carcinogenic. An increase in ambient air levels of mercury will result in an increase in deposition in natural bodies of water, possibly leading to elevated concentrations of methylmercury in freshwater fish. No data was available for mercury from the ERM study but given the environmental implications and persistence in the environment, the minimum limit of 5mg/kg is set in the quality protocol and in Schedule G.2 for 19LS. It is not proposed to alter this limit under this licence review.

Thallium: Thallium and its compounds are toxic but are not classed as carcinogenic. No data exists from the ERM study on HFO but the quality protocol and Schedule G.2 set the minimum limit of 5mg/kg and it is not proposed to alter this limit.

In summary, the metals covered are typically toxic in some fashion and for these metals, the limits in Schedule G.2 of the licence ensure the strictest control and the lowest limits (5mg/kg) are applied. The only variations are lead and copper. In the case of lead a level similar to that for virgin HFO is specified (25mg/kg) to ensure no net negative impact. For copper a higher limit is applied (40mg/kg) to account for copper levels from engine wear in waste oils that are not present in virgin fuels. However, it should be noted that copper is not toxic and poses the lowest impact on human health and the environment when compared to the other metals in the Schedule.

5 CONCLUSIONS

The main objective of this assessment was to determine the comparative quantitative analysis of the constituents of the 19LS product relative to virgin fuels. This report set out to demonstrate that the 19LS product contains no more environmentally significant contaminants and therefore will have no greater environmental impact, than the virgin fuel oils that have been displaced by the 19LS (in this case HFO).

A summary of the findings of this report are presented in **Table 5.1**. The results illustrate that only copper, zinc and sulphated ash content are higher in 19LS compared to virgin HFO but these are not contaminants of environmental concern given the low environmental impact. Conversely, the use of 19LS will lead to a net reduction in the emissions of vanadium and nickel as levels in 19LS are more strictly regulated than those in virgin HFO.

Parameter	Is the 19LS parameter present in greater quantity than HFO	Will this level have any greater environmental impact
Cadmium	No	No
Nickel	No – 19LS level slightly lower	No
Chromium	No	No
Copper	Yes – to account for engine wear in the waste oil	No – Copper has a low impact on the environment and human health
Vanadium	No – 19LS level considerably lower	No – 19LS use is a net positive impact over virgin fuel
Lead	No	No
PCBs	No	No
Sulphated Ash Content	Yes – marginally higher than BS2869:2010 level for HFO	No
Total halogens, as chlorine	No – slightly lower	No
Mercury	No	No
Zinc	Yes – however it is counteracted by the relatively lower levels of Vanadium which is more environmentally significant	No –zinc is not toxic to human health.
Arsenic	No	No
Thallium	No	No
Antimony	No	No
Cobalt	No	No
Manganese	No	No

Table 5.1: Summary findings of this assessment

In summary, this analysis has illustrated the following:

- The recovered 19LS product contains *no more contaminants (of environmental concern)* as **Table 5.1** illustrates that the only parameters that are greater in the 19LS product are not of concern relating to the environment or human health.
- Emissions from the use of 19LS will have no greater environmental impact when compared to virgin HFO. As noted above all contaminants of environmental concern are at similar

levels with higher levels of Zinc counteracted by vanadium being present at much lower levels in 19LS and representing a net reduction in impact.

This assessment concludes that the limits expressed in Schedule G.2 of the Waste Licence for the 19LS product are in full agreement with the specifications for a residual fuel oil equivalent in the UK quality protocol. The comparative analysis with the virgin fuel (HFO) indicates that there are no contaminants of concern to the environment at higher levels in the 19LS product and the environmental impact of the use of this product will have no net negative impact over the corresponding use of HFO. As such, it is not proposed to amend Schedule G.2 as part of this licence review.

It is concluded that compliance of the 19LS product with the UK Quality Protocol is sufficient to demonstrate that the human health impact of using 19LS is not greater than the use of virgin fuels for the applications listed in the licence.

Question 20: *Provide a baseline report in accordance with section 86 B of the EPA Act 1992 as amended. Follow the guidance provided in the following document: European Commission Guidance concerning baseline reports under Article 22 (2) of Directive 2010/75/EU on industrial emissions (2014/C 136/03) which is available on the EPA website.*

Response

Please see attached Baseline report

Enva Ireland Limited

IE Licence Review
Baseline Report

Document Control Sheet

Client:	Enva Ireland Limited
Project Title:	IE Licence Review
Document Title:	Baseline Environmental Report
Document No:	MDE0973Rp0104

Text Pages:	28	Appendices:	1

Rev.	Status	Date	Author(s)		Reviewed By		Approved By	
F01	Final	16th May 2016	DC		AOT		PC	

TABLE OF CONTENTS

1 INTRODUCTION 1

2 STAGE 1: IDENTIFYING THE HAZARDOUS SUBSTANCES 3

2.1 GUIDANCE REQUIREMENTS 3

2.2 APPLICANT DETAILS 3

2.2.1 Substances Used 3

2.2.2 Substances Produced 6

2.2.3 Substances Released 6

3 STAGE 2: IDENTIFYING THE RELEVANT HAZARDOUS SUBSTANCES 7

3.1 GUIDANCE REQUIREMENTS 7

3.2 APPLICANT DETAILS 7

4 STAGE 3: ASSESSMENT OF THE SITE-SPECIFIC POLLUTION POSSIBILITY 11

4.1 GUIDANCE REQUIREMENTS 11

4.2 APPLICANT DETAILS 11

4.2.1 Stage 3 Summary 18

5 STAGE 4: SITE HISTORY 20

5.1 GUIDANCE REQUIREMENTS 20

5.2 INCIDENT HISTORY 20

5.3 SITE HISTORY 20

5.4 SITE INVESTIGATION 21

6 STAGE 5: ENVIRONMENTAL SETTING 23

6.1 GUIDANCE REQUIREMENTS 23

6.2 APPLICANT DETAILS 23

6.2.1 Topography 23

6.2.2 Geology 23

6.2.3 Direction of Groundwater Flow 23

6.2.4 Other Potential Migration Pathways 23

6.2.5 Environmental Aspects 24

6.2.6 Surrounding Land Use 24

7 STAGE 6: SITE CHARACTERISATION 25

7.1 GUIDANCE REQUIREMENTS 25

7.2 APPLICANT DETAILS 25

7.2.1 Source Details 25

7.2.2 Pathway Details 26
7.2.3 Receptor Details 26
7.2.4 Conclusion 26
8 STAGE 7: SITE INVESTIGATION 27
8.1 GUIDANCE REQUIREMENTS 27
8.2 APPLICANT DETAILS 27
9 STAGE 8: BASELINE REPORT CONCLUSIONS 28
9.1 GUIDANCE DOCUMENTS 28
9.2 APPLICANT DETAILS 28

APPENDICES

Appendix A Hazard Classes for Hazardous Substances

LIST OF FIGURES

Figure 5.1 – Phenol Concentrations in all Monitoring Wells 22
Figure 5.2 - PAH (Total) Concentrations in all Monitoring Wells 22

LIST OF TABLES

Table 2.1 – List of "Hazardous Substances" used at the Enva facility 4
Table 2.2 – List of "Hazardous Substances" produced at the Enva facility 6
Table 3.1 – Assessment of "Hazardous Substances" at the Enva facility 8
Table 4.1 – Sodium Hydroxide 12
Table 4.2 – Nitric Acid 12
Table 4.3 – Sodium Hypochlorite 13
Table 4.4 – Hydrogen Peroxide 13
Table 4.5 – Waste Oil (Shipping oil and garage oil) 14
Table 5.1 – Incident History at the Enva Facility 20
Table 5.2 – Ground Conditions 21

1 INTRODUCTION

Enva Ireland Limited operates under an Industrial Emissions Licence (Register No. W0184-01) from the EPA for the facility in Clonminam Industrial Estate, Portlaoise, County Laois. Enva is currently licensed for the following class of activities:

11.2(j): Disposal or recovery of hazardous waste with a capacity exceeding 10 tonnes per day involving oil re-defining or other reuses of oil

11.1: The recovery or disposal of waste in a facility, within the meaning of the Act of 1996, which facility is connected or associated with another activity specified in this Schedule in respect of which a licence or revised licence under Part IV is in force or in respect of which a licence under the said Part is or will be required.

11.2(a): Disposal or recovery of hazardous waste with a capacity exceeding 10 tonnes per day involving biological treatment

11.2(b): Disposal or recovery of hazardous waste with a capacity exceeding 10 tonnes per day involving physico-chemical treatment

11.2(c): Disposal or recovery of hazardous waste with a capacity exceeding 10 tonnes per day involving blending or mixing prior to submission to any of the other activities listed in 11.2 or 11.3

11.2(d): Disposal or recovery of hazardous waste with a capacity exceeding 10 tonnes per day involving repackaging prior to submission to any of the other activities listed in paragraph 11.2 or 11.3

11.2(g): Disposal or recovery of hazardous waste with a capacity exceeding 10 tonnes per day involving regeneration of acids or bases

11.4(a) (ii): Disposal of non-hazardous waste with a capacity exceeding 50 tonnes per day involving one or more of the following activities: physico-chemical treatment;

11.6: Temporary storage of hazardous waste, (other than waste referred to in paragraph 11.5) pending any of the activities referred to in paragraph 11.2, 11.3, 11.5 or 11.7 with a total capacity exceeding 50 tonnes, other than temporary storage, pending collection, on the site where the waste is generated.

On the 26th January 2016, the EPA gave notice to Enva Ireland Limited that the EPA was initiating a review of the licence in accordance with the provisions of Sections 90(4) and 98A of the EPA Act 1992 as amended. The EPA notification contains a detailed list of information that is sought as part of the review and, in particular, Requirement 20 requires Enva to prepare a baseline report in accordance with Regulation 9(2)(n) of the EPA (Industrial Emissions) Regulations 2013.

This report has been prepared in line with the guidance presented in the "European Commission Guidance concerning baseline reports under Article 22(2) of Directive 2010/75/EU on industrial

emissions" (reference 2014/C 136/03). This guidance sets out a standard eight stage process that includes highly prescriptive requirements to complete the report and this report is set out on a stage by stage process as per the guidance below:

- Stage 1: Identifying the hazardous substances that are currently used, produced or released at the installation
- Stage 2: Identifying the relevant hazardous substances
- Stage 3: Assessment of the site-specific pollution possibility
- Stage 4: Site history
- Stage 5: Environmental setting
- Stage 6: Site characterisation
- Stage 7: Site investigation
- Stage 8: Production of the baseline report

2 STAGE 1: IDENTIFYING THE HAZARDOUS SUBSTANCES

2.1 GUIDANCE REQUIREMENTS

The draft guidelines from the Commission require the following details for Stage 1:

Identify which hazardous substances are used, produced or released at the installation and produce a list of these hazardous substances.

"Hazardous substance" is defined in the Guidance as substances or mixtures as defined in Article 3 of Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures.

Article 3 of Regulation (EC) No 1272/2008 defines hazardous substances and mixtures and specification of hazard classes as follows:

*A substance or a mixture fulfilling the criteria relating to physical hazards, health hazards or environmental hazards, laid down in **Parts 2 to 5 of Annex I** is hazardous and shall be classified in relation to the respective hazard classes provided for in that Annex.*

Where, in Annex I, hazard classes are differentiated on the basis of the route of exposure or the nature of the effects, the substance or mixture shall be classified in accordance with such differentiation.

A full list of the relevant hazard classes applicable are presented in **Appendix A** for reference.

2.2 APPLICANT DETAILS

A full list of all substances and mixtures used, produced or released at the Enva facility has been compiled and are presented in the following sections along with details of the nature of the hazardous substances identified. The Commission Guidance state that substances must include raw materials, products, intermediaries, by-products, emissions or wastes at the facility.

2.2.1 Substances Used

The main substances used at the Enva facility include waste oils and process chemicals. Table G.1(i) of the response to Item 9 of the EPA request lists details of materials used on the site and identifies the following "hazardous substances" listed in **Table 2.1**. Laboratory chemicals have been excluded from the list but all relevant materials, water treatment chemicals and boiler chemicals are included in the list.

Table 2.1 – List of "Hazardous Substances" used at the Enva facility

Substance	Hazardous Category	Use
Sodium Hydroxide	H290: May be corrosive to metals H314: Causes severe skin burns and eye damage	Wastewater Treatment
Nitric Acid	H314: Causes severe skin burns and eye damage	Water Treatment (pH Adjustment)
Sodium Hypochlorite	H290: May be corrosive to metals H314: Causes severe skin burns and eye damage	Wastewater Treatment
Hydrogen Peroxide	H272: May intensify fire; oxidiser. H302: Harmful if swallowed. H315: Causes skin irritation. H318: Causes serious eye damage. H335: May cause respiratory irritation	Wastewater Treatment (Hodgefield Dosing)
Waste Oil (Garage & Shipping)	H226: Flammable liquid and vapour H304: May be fatal if swallowed and enters airways H315: Causes skin irritation H332: Harmful if inhaled H351: Suspected of causing cancer (state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard) H373: May cause damage to organs (state all organs affected, if known) through prolonged or repeated exposure (state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard) H411: Toxic to aquatic life with long lasting effects	Raw Material for Remediation
Aquatreat	H302: Harmful if swallowed H315: Causes skin irritation H335: May cause respiratory irritation H411: Toxic to aquatic life with long lasting effects	Boiler
Fuel Additive A	H226: Flammable liquid and vapour H302: Harmful if swallowed	Oil Processing (Enhance Combustion & Reduce Emissions)

	H315: Causes skin irritation H411: Toxic to aquatic life with long lasting effects	
Fuel Additive B	H302: Harmful if swallowed	Oil Processing (Inhibitor)
Oil De-Emulsifier	H302: Harmful if swallowed H315: Causes skin irritation H318: Causes serious eye damage H410: Very toxic to aquatic life with long lasting effects	Oil Processing (Demulsifier)
De-ashing chemical	H302: Harmful if swallowed H314: Causes severe skin burns and eye damage H318: Causes serious eye damage H412: Harmful to aquatic life with long lasting effects	Oil Processing
Fuel Additive C	H302: Harmful if swallowed H315: Causes skin irritation H318: Causes serious eye damage H373: May cause damage to organs (state all organs affected, if known) through prolonged or repeated exposure (state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard)	Oil Processing

2.2.2 Substances Produced

The products processed at the Enva facility are listed below in **Table 2.2**.

Table 2.2 – List of "Hazardous Substances" produced at the Enva facility

Substance	Hazardous Category
Reclaimed Fuels (11LS & 19LS)	H304: May be fatal if swallowed and enters airways H332: Harmful if inhaled H350: May cause cancer (state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard) H361: Suspected of damaging fertility or the unborn child (state specific effect if known) (state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard) H372 Causes damage to organs through prolonged or repeated exposure by skin H410: Very toxic to aquatic life with long lasting effects
Marked Kerosene	H226: Flammable liquid and vapour H304: May be fatal if swallowed and enters airways H315: Causes skin irritation H336: May cause drowsiness or dizziness H411: Toxic to aquatic life with long lasting effects
Marked Gas Oil	H304: May be fatal if swallowed and enters airways H315: Causes skin irritation H332: Harmful if inhaled H351: Suspected of causing cancer H373: May cause damage to organs through prolonged or repeated exposure H411: Toxic to aquatic life with long lasting effects

2.2.3 Substances Released

The only releases from the Enva facility are as follows:

- Discharges to air which are restricted by Schedule C.2 of the current licence to ensure that there shall be no emissions to air of environmental significance.
- Discharges of surface water which are restricted by Schedule C.3 of the current licence to ensure that there shall be no emissions to water of environmental significance.
- Discharges to the municipal foul sewer, which are controlled by Schedule C.4 of the current licence to ensure that the discharged water is of a quality that can be adequately assimilated into the main outfall.

Given the nature of the above discharges there are no substances released from the Enva facility that may be considered as hazardous substances and substances released are not considered further in this assessment.

3 STAGE 2: IDENTIFYING THE RELEVANT HAZARDOUS SUBSTANCES

3.1 GUIDANCE REQUIREMENTS

The draft guidelines from the Commission require the following details for Stage 2:

Identify which of the hazardous substances from Stage 1 are 'relevant hazardous substances' (see Section 4.2).

Discard those hazardous substances that are incapable of contaminating soil or groundwater. Justify and record the decisions taken to exclude certain hazardous substances.

'Relevant hazardous substances' (are defined in the guidance as those substances or mixtures defined within Article 3 of Regulation (EC) No 1272/2008 (Identified in Stage 1) which, as a result of their hazardousness, mobility, persistence and biodegradability (as well as other characteristics), are capable of contaminating soil or groundwater and are used, produced and/or released by the installation.

3.2 APPLICANT DETAILS

For each of the hazardous substances identified in Stage 1, a review of the following parameters derived from the MSDS has been completed to determine which, if any of the substances are considered "relevant hazardous substances". Where an MSDS was not available for a substance due to its nature (e.g. recovered fuel oil is a mixture of one or more substances), the MSDS for the most hazardous component of this substance was used:

- Physical state
- Solubility
- Toxicity
- Mobility
- Persistence
- Biodegradability
- Environmental Hazard (Part 4 of Regulation (EC) No 1272/2008)

Each of the above is identified and used to determine what substances are included as "relevant hazardous substances" along with a rationale for the decision making. This element is presented in **Table 3.1.** Details of the chemical characteristics and environmental fate of these substances has been derived from the following websites:

- European Chemicals Agency (ECHA http://echa.europa.eu/information-on-chemicals) as prescribed by the Commission Guidance.
- The US National Center for Biotechnology Information (NCBI) PubChem website (http://pubchem.ncbi.nlm.nih.gov).

Table 3.1 – Assessment of "Hazardous Substances" at the Enva facility

Substance	Physical State	Soluble in Water	Toxicity	Mobility	Persistence	Biodegradability	Environmental Hazard	Relevant Hazardous Substance	Rationale
Sodium Hydroxide	Viscous Liquid	Completely soluble	Acute dermal toxicity	Soluble in water	No data	No data	Acute aquatic toxicity	Yes	Capable of contaminating groundwater
Nitric Acid	Liquid	Miscible	Acute toxicity	Highly water soluble	Readily biodegradable	Readily biodegradable	Low toxicity to water organisms	Yes	Capable of contaminating groundwater
Sodium Hypochlorite	Liquid	Completely soluble	Toxic	Soluble in water	Quickly decomposes in water and soil	Quickly decomposes in water and soil	Very toxic to all aquatic organisms	Yes	Capable of contaminating groundwater
Hydrogen Peroxide	Liquid	No data	Acute toxicity	No data	No data	No data	Harmful to aquatic life	Yes	Capable of contaminating groundwater
Waste Oil (Garage & Shipping)*	Semi solid	N/A	Acute toxicity	Residue fuel oil will absorb to soil particles	Residue fuel oil components may persist in the aquatic environment.	Residue fuel oil components may persist in the aquatic environment.	Some short term toxicity to aquatic and marine organisms.	Yes	Capable of contaminating soil and groundwater
Aquatreat	Aqueous solution	Completely miscible	Toxic by inhalation, skin contact and ingestion	No data	No data	Moderate to fully biodegradable	Will contribute to BOD and COD of receiving waters	Yes	Capable of contaminating groundwater
Fuel Additive A	Liquid	Negligible	Toxic by inhalation, skin contact and ingestion	No data	No data	No data	May be harmful to aquatic life and waterfowl	Yes	Capable of contaminating groundwater

Fuel Additive B	Liquid	N/A	Acute toxicity	No data	Persistent	No data	Toxic to aquatic life	Yes	Capable of contaminating groundwater
Oil De-Emulsifier	Liquid	Completely miscible	Acute toxicity Category 4	No data	Not readily biodegradable	Not readily biodegradable	Very toxic to aquatic life with long lasting effects	Yes	Capable of contaminating groundwater
De-ashing chemical	Liquid	Soluble	Acute toxicity Category 4	Readily absorbed into soil	Biodegradable	Biodegradable	Harmful to aquatic organisms. Harmful to soil organisms.	Yes	Capable of contaminating soil and groundwater.
Fuel Additive C	Liquid	Soluble	Acute toxicity	No data	Readily biodegradable	Readily biodegradable	Toxic to aquatic life	Yes	Capable of contaminating groundwater.
Marked Kerosene	Liquid	Negligible	May be fatal if swallowed and enters airways	On release to water, hydrocarbons will float on the surface and since they are sparingly soluble, the only significant loss is volatilization to air. It is possible that some of the higher molecular weight hydrocarbons will be adsorbed on sediment.	Non-persistent	Not readily biodegradable but inherently biodegradable since their hydrocarbon components can be degraded by microorganisms.	Toxic to aquatic organisms, with the potential to cause long term adverse effects in the aquatic environment	Yes	Capable of contaminating soil and groundwater
Marked Gas Oil	Liquid	Negligible	Acute toxicity Category 4	On release to water, hydrocarbons will float on the surface and since they are sparingly soluble, the only significant	Non-persistent	Not readily biodegradable but inherently biodegradable since their hydrocarbon	Toxic to aquatic life with long lasting effects	Yes	Capable of contaminating soil and groundwater

				loss is volatilization to air. It is possible that some of the higher molecular weight hydrocarbons will be adsorbed on sediment.		components can be degraded by microorganisms.			
Reclaimed Fuel Oil*	Semi solid	N/A	Acute toxicity	Residue fuel oil will absorb to soil particles	Residue fuel oil components may persist in the aquatic environment.	Residue fuel oil components may persist in the aquatic environment.	Some short term toxicity to aquatic and marine organisms.	Yes	Capable of contaminating soil and groundwater

*MSDS for Heavy Fuel Oil used as this is the most hazardous component of this substance (used for Waste Oil (shipping and garage oil) and for Reclaimed Fuel Oil)

4 STAGE 3: ASSESSMENT OF THE SITE-SPECIFIC POLLUTION POSSIBILITY

4.1 GUIDANCE REQUIREMENTS

The draft guidelines from the Commission require the following details for Stage 3:

For each relevant hazardous substance brought forward from Stage 2, identify the actual possibility for soil or groundwater contamination at the site of the installation, including the probability of releases and their consequences, and taking particular account of:

- *the quantities of each hazardous substance or groups of similar hazardous substances concerned;*
- *how and where hazardous substances are stored, used and to be transported around the installation;*
- *where they pose a risk to be released;*
- *In case of existing installations also the measures that have been adopted to ensure that it is impossible in practice that contamination of soil or groundwater takes place.*

4.2 APPLICANT DETAILS

For each of the relevant hazardous substances identified in Stage 2, a risk assessment of the potential for ground contamination is provided in the following sections. The assessment includes a review of potential breaches caused by:

- Accidents/Incidents
- Routine Operations
- Planned Emissions

Table 4.1 – Sodium Hydroxide

Criteria	Description
Substance	Sodium Hydroxide
Annual Usage	26,000Ltrs (1000Ltr IBC's)
Storage Location	Stores & dosing area
Description of Use	Effluent/ Waste Water treatment
Mode of Transport	Forklift
Potential Pathways to Ground	Spill caused by handling or storage.
Existing Mitigation	• Stored in bunded area. • IBC's in use are stored on a spill tray/bund which is also located in a concrete bund. • Bunds are tested regularly
Probability of Release to Ground	**Low**
Consequence of Incident	**Moderate**
Risk of Soil or Groundwater Contamination	**Low**

Table 4.2 – Nitric Acid

Criteria	Description
Substance	Nitric Acid
Annual Usage	4,000Ltrs (1000Ltr ASP's)
Storage Location	Stores & dosing area
Description of Use	Effluent/ Waste water Treatment
Mode of Transport	Forklift
Potential Pathways to Ground	Spill caused by handling or storage.
Existing Mitigation	• Stored in bunded area. • IBC's in use are stored on a spill tray/bund which is also located in a concrete bund. • Bunds are tested regularly
Probability of Release to Ground	**Low**
Consequence of Incident	**Moderate**
Risk of Soil or Groundwater Contamination	**Low**

Table 4.3 – Sodium Hypochlorite

Criteria	Description
Substance	Sodium Hypochlorite
Annual Usage	4,000Ltrs (1000Ltr ASP's)
Storage Location	Stores & dosing area
Description of Use	Effluent/ Waste Water treatment.
Mode of Transport	Forklift
Potential Pathways to Ground	Spill caused by handling or storage.
Existing Mitigation	• Stored in bunded area. • IBC's in use are stored on a spill tray/bund which is also located in a concrete bund. • Bunds are tested regularly
Probability of Release to Ground	**Low**
Consequence of Incident	**Moderate**
Risk of Soil or Groundwater Contamination	**Low**

Table 4.4 – Hydrogen Peroxide

Criteria	Description
Substance	Hydrogen Peroxide
Annual Usage	30,000Ltrs (1000Ltr ASP's)
Storage Location	Stores & dosing area
Description of Use	Treatment of Hydrogen sulphide /odour/ contaminated soil
Mode of Transport	Forklift
Potential Pathways to Ground	Spill caused by handling or storage.
Existing Mitigation	• Stored in bunded area. • IBC's in use are stored on a spill tray/bund which is also located in a concrete bund. • Bunds are tested regularly
Probability of Release to Ground	**Low**
Consequence of Incident	**Moderate**
Risk of Soil or Groundwater Contamination	**Low**

Table 4.5 – Waste Oil (Shipping oil and garage oil)

Criteria	Description
Substance	Waste Oil
Annual Usage	13,000,000 Ltrs
Storage Location	Tank farm
Description of Use	Raw material
Mode of Transport	Hard piped on site. Delivered to site on road tankers.
Potential Pathways to Ground	Spill caused by handling or storage.
Existing Mitigation	• Stored in Steel Tanks (primary containment). • Stored in bunded area (secondary containment). • All tanks fitted with level sensors and controlled centrally using a SCADA system. • Tanks in use are stored on a spill tray/bund which is also located in a concrete bund. • Bunds are tested regularly
Probability of Release to Ground	**Low – double containment**
Consequence of Incident	**Moderate to High depending on the extent of any spill**
Risk of Soil or Groundwater Contamination	**Moderate**

Table 4.6 - Aquatreat

Criteria	Description
Substance	Aquatreat
Annual Usage	< 1000Ltrs (25ltr Drums)
Storage Location	Boiler House
Description of Use	Boiler water treatment
Mode of Transport	Forklift
Potential Pathways to Ground	Spill caused by handling or storage.
Existing Mitigation	• Drums are stored on a spill tray/Bunds are tested regularly
Probability of Release to Ground	**Low**
Consequence of Incident	**Moderate**
Risk of Soil or Groundwater Contamination	**Low**

Table 4.7 - Fuel Additive A

Criteria	Description
Substance	Fuel Additive A
Annual Usage	<1000Ltrs (25Ltr drums)
Storage Location	Stores & dosing area
Description of Use	Fuel additive
Mode of Transport	Forklift
Potential Pathways to Ground	Spill caused by handling or storage.
Existing Mitigation	• Stored in bunded area. • Drums in use are stored on a spill tray/bund which is also located in a concrete bund. • Bunds are tested regularly
Probability of Release to Ground	**Low**
Consequence of Incident	**Moderate**
Risk of Soil or Groundwater Contamination	**Low**

Table 4.8 – Fuel Additive B

Criteria	Description
Substance	Fuel Additive B
Annual Usage	10,000Ltrs (200Ltr Drums)
Storage Location	Stores & dosing area
Description of Use	Fuel additive
Mode of Transport	Forklift
Potential Pathways to Ground	Spill caused by handling or storage.
Existing Mitigation	• Stored in bunded area. • Drums in use are stored on a spill tray/bund which is also located in a concrete bund. • Bunds are tested regularly
Probability of Release to Ground	**Low**
Consequence of Incident	**Moderate**
Risk of Soil or Groundwater Contamination	**Low**

Table 4.9 – Oil De-Emulsifier

Criteria	Description
Substance	Oil De-Emulsifier
Annual Usage	15,000Ltrs (1,000Ltr IBC's)
Storage Location	Stores & dosing area
Description of Use	Water removal in oil process
Mode of Transport	Forklift
Potential Pathways to Ground	Spill caused by handling or storage.
Existing Mitigation	• Stored in bunded area. • IBC's in use are stored on a spill tray/bund which is also located in a concrete bund. • Bunds are tested regularly
Probability of Release to Ground	**Low**
Consequence of Incident	**Moderate**
Risk of Soil or Groundwater Contamination	**Low**

Table 4.10 – De-ashing chemical

Criteria	Description
Substance	De-ashing chemical
Annual Usage	50,000Ltrs (1,000Ltr IBC's)
Storage Location	Stores & dosing area
Description of Use	De-Ashing of oil
Mode of Transport	Forklift
Potential Pathways to Ground	Spill caused by handling or storage.
Existing Mitigation	• Stored in bunded area. • IBC's in use are stored on a spill tray/bund which is also located in a concrete bund. • Bunds are tested regularly
Probability of Release to Ground	**Low**
Consequence of Incident	**Moderate**
Risk of Soil or Groundwater Contamination	**Low**

Table 4.11 – Fuel Additive C

Criteria	Description
Substance	Fuel Additive C
Annual Usage	10,000Ltrs (200Ltr Drums)
Storage Location	Stores & dosing area
Description of Use	Fuel additive
Mode of Transport	Forklift
Potential Pathways to Ground	Spill caused by handling or storage.
Existing Mitigation	• Stored in bunded area. • Drums in use are stored on a spill tray/bund which is also located in a concrete bund. • Bunds are tested regularly
Probability of Release to Ground	**Low**
Consequence of Incident	**Moderate**
Risk of Soil or Groundwater Contamination	**Low**

Table 4.12 – Marked Kerosene

Criteria	Description
Substance	Marked Kerosene
Annual Usage	3,400,000Ltrs
Storage Location	Tank Farm
Description of Use	Resale
Mode of Transport	Road tanker
Potential Pathways to Ground	Spill caused by handling or storage
Existing Mitigation	• Storage tanks are tested • Storage tanks are located in a concrete bunds are tested regularly
Probability of Release to Ground	**Low – double containment**
Consequence of Incident	**Moderate to High depending on the extent of any spill**
Risk of Soil or Groundwater Contamination	**Moderate**

Table 4.13 – Marked Gas Oil

Criteria	Description
Substance	Marked Gas Oil
Annual Usage	3,730,000Ltrs.
Storage Location	Tank Farm
Description of Use	Resale
Mode of Transport	Road tanker
Potential Pathways to Ground	Spill caused by handling or storage
Existing Mitigation	• Storage tanks are tested • Storage tanks are located in a concrete bunds are tested regularly
Probability of Release to Ground	**Low – double containment**
Consequence of Incident	**Moderate to High depending on the extent of any spill**
Risk of Soil or Groundwater Contamination	**Moderate**

Table 4.14 – Recovered Fuel Oil

Criteria	Description
Substance	Recovered Fuel Oil
Annual Usage	12,850,000Ltrs.
Storage Location	Tank Farm
Description of Use	Resale as fuel
Mode of Transport	Road tanker
Potential Pathways to Ground	Spill caused by handling or storage
Existing Mitigation	• Storage tanks are tested • Storage tanks are located in a concrete bunds are tested regularly
Probability of Release to Ground	**Low – double containment**
Consequence of Incident	**Moderate to High depending on the extent of any spill**
Risk of Soil or Groundwater Contamination	**Moderate**

4.2.1 Stage 3 Summary

The risk assessment for each of the "relevant hazardous substances" presented in this stage of the report indicates that the volumes of the substance employed, the nature of the containment system and the consequences of the events are varied but in all cases the risk assessment indicates that the risk of ground or groundwater contamination by a relevant hazardous substance is **low to medium.**

As such, RPS contends that a baseline report is not required for the Enva facility as per Section 5.3 of the Commission Guidance.

However, for completeness and to present a robust case, RPS has presented the additional requirements for Stages 4 to 6 of the Guidance in the following sections of this report. This includes details on the site as well as results of groundwater monitoring events. Stage 8 presents a summary of these findings to confirm that the baseline condition of the site is free of contamination from any relevant hazardous substance.

5 STAGE 4: SITE HISTORY

5.1 GUIDANCE REQUIREMENTS

The draft guidelines from the Commission require the following details for Stage 4:

Provide a site history. Consider available data and information:

- *In relation to the present use of the site, and on emissions of hazardous substances which have occurred and which may give rise to pollution. In particular, consider accidents or incidents, drips or spills from routine operations, changes in operational practice, site surfacing, changes in the hazardous substances used.*
- *Previous uses of the site that may have resulted in the release of hazardous substances, be they the same as those used, produced or released by the existing installation, or different ones.*

Review of previous investigation reports may assist in compiling this data.

5.2 INCIDENT HISTORY

A history of the reported incidents from 2008 to 2015 is presented in **Table 5.1**. There have been no known incidents at the Enva facility that pose a risk to groundwater or soil contamination in this period.

Table 5.1 – Incident History at the Enva Facility

Year	No. Of Incidents	Incidents with Potential for Ground Contamination	Details
2015	2	0	n/a
2014	2	0	n/a
2013	2	0	n/a
2012	2	0	n/a
2011	6	0	n/a
2010	3	0	n/a
2009	6	0	n/a
2008	27	0	n/a

5.3 SITE HISTORY

Waste oil processing and storage activities have been carried out at the Enva Ireland Ltd. facility since the late 1970s. From 2004, Atlas Environmental Ireland Ltd. expanded activities on-site to include the processing of additional wastes including the treatment of contaminated soil, repacking of oily contaminated wastes, and recovering paint wastes. The facility also stores waste in containers prior to transfer offsite for recovery or disposal.

From the commencement of activities until 2000, activities were carried out under the environmental enforcement remit of Laois County Council.

In 2000, Atlas Oil Laboratories Ltd. was granted an Integrated Pollution Control (IPC) licence (IPC Reg. No. 472) by the EPA to carry on the activity of the use of heat for the manufacture of fuel from waste, the refining and reuse of waste oils, recovery of waste oil filters, treatment of oily solid wastes and treatment/bioremediation of contaminated soils.

IPC Licence Reg. No. 472 was reviewed and in early 2004, Waste Licence Reg. No. W0184-01 was granted in substitution to Atlas Environmental Ireland Ltd.

Since 2004, the licence has been amended by the EPA on four occasions by way of technical amendment.

Technical Amendments:

- Technical Amendment A (2005) inserted additional conditions relating to Resource Use and Energy Efficiency, Accident Prevention and Decommissioning & Residuals Management.
- Technical Amendment B (2011) replaced and inserted conditions and schedules relating to Reprocessed Oil Quality, Monitoring and Input Restrictions.
- Technical Amendment C (2013) as required by the provisions of the European Communities Environmental Objectives (Groundwater) Regulations 2010, as amended.
- Technical Amendment D (2014) IED amendment to achieve conformity of the licence with the Industrial Emissions Directive.

5.4 SITE INVESTIGATION

No site investigations have been carried out at the facility, however, routine groundwater monitoring is carried out on a quarterly basis that can provide some relevant information.

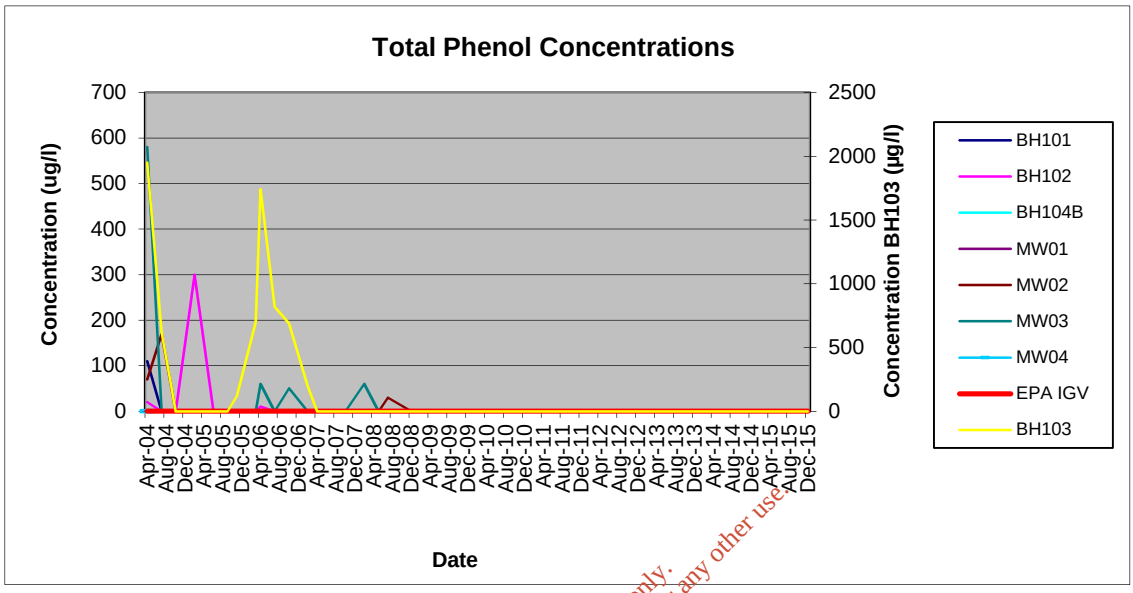
A total of eight boreholes have been drilled at the site and the general sequence of ground conditions is presented in **Table 5.2.**

Table 5.2 – Ground Conditions

Strata	Extent	Thickness	Description
Made Ground	BH104	0-3.5 m	Predominantly concrete, with hardcore fill, and clay.
Boulder Clay	All boreholes	<8.5 m	Includes fine to medium, well rounded gravels.
Sand and Gravel	Confined to south east corner of site (BH101, BH104 and MW03)	0-2 m	In general the transition from boulder clay to sand is gradual with changes from gravel, to sandy gravel, to sand.
Limestone Bedrock	Encountered in MW01, MW02 and MW03	Top of limestone ranges from 7.7m to 9m below ground level.	Pale grey, fine-grained bedrock, differentiated from boulders by its un-weathered nature.

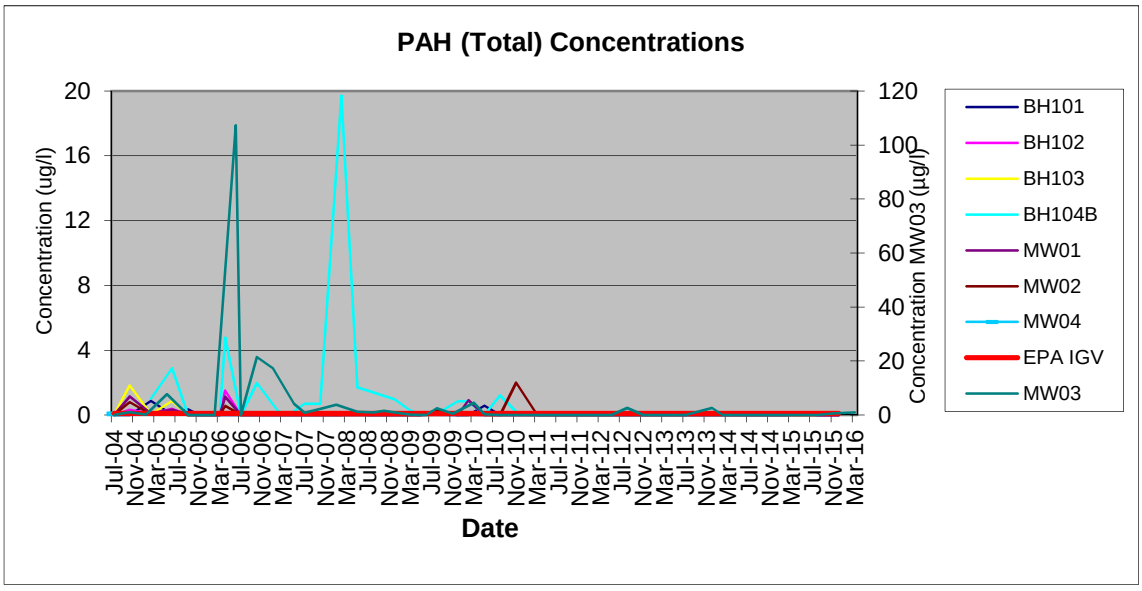
In terms of "relevant hazardous substances", **Figure 5.1** and **5.2** show the concentrations of phenols and PAH (polycyclic aromatic hydrocarbons), respectively, in each well over time. Subsequent to the Quarter 1 2010 monitoring event no detections of phenols have been noted at any monitoring location.

Figure 5.1 – Phenol Concentrations in all Monitoring Wells



Similarly to phenol concentrations, concentrations of PAH have decreased significantly since 2010 and continue to decrease. And while the general trend over time continues to be somewhat variable, compounds are not being continually detected in the same borehole on two or three consecutive monitoring rounds. PAHs are significant constituents of heavy fuel oil, diesel and gas oil – typically 5% or more of these fuels. PAHs are an environmental concern because they are persistent and they can stay in the environment for long periods of time.

Figure 5.2 - PAH (Total) Concentrations in all Monitoring Wells



6 STAGE 5: ENVIRONMENTAL SETTING

6.1 GUIDANCE REQUIREMENTS

The draft guidelines from the Commission require the following details for Stage 5:

Identify the site's environmental setting including:

- *Topography;*
- *Geology;*
- *Direction of groundwater flow;*
- *Other potential migration pathways such as drains and service channels;*
- *Environmental aspects (e.g. particular habitats, species, protected areas etc.); and*
- *Surrounding land use.*

6.2 APPLICANT DETAILS

6.2.1 Topography

The site slopes very gently upward from the south of the site (circa 101 mOD) to the north-east of the site (103 mOD). Much of the surrounding area is relatively flat and of a similar elevation.

6.2.2 Geology

The Geological Survey of Ireland indicates that the regional geology of Portlaoise is typified by Carboniferous Limestone. In the vicinity of the site itself the solid geology comprises the Ballysteen Formation, a micaceous-bioclastic limestone. This well-bedded limestone, with interbeds of shale, is extensively folded, with axes trending north-east to south-west, and becomes increasingly muddy towards the top of the formation. North-east to south-west trending faults are found in the region, with one located approximately 500m to the east of the site. The subsoils in the region comprise mainly Made Ground, around the industrial area, and Limestone Till in the surrounding regions.

6.2.3 Direction of Groundwater Flow

Groundwater flow across the site is from south-west to north-east.

6.2.4 Other Potential Migration Pathways

There are two drainage networks at the Enva facility as follows:

- A storm water discharge system that takes unpolluted rainwater from the buildings and paved areas and discharges at a discharge point, SW1 (formerly SW01) along the western boundary of the site.

- There is one emission to sewer, SE1 (formerly FS1), which diverts all process water which is collected and discharged to Laois County Council's foul sewer.

These networks are used to transfer aqueous based liquids to the treatment or discharge options. No "relevant hazardous substances" are transported in these networks and there is no potential pathway for such substances to enter these networks and form a pathway to ground.

6.2.5 Environmental Aspects

There are no designated EU (Natura 200, SAC or SPA) or national (NHA) designed sites in close proximity to the Enva site. The nearest designed ecological site is the Slieve Bloom Mountains (site code 004160) which is located approximately 7.7km to the west of the site. This SPA is a protected area for the Hen Harrier (*Circus cyaneus*) [A082].

An AA Screening report is included in the IE licence application which demonstrates that the Enva operation will not impact on this or any site in the Natura 2000 network.

6.2.6 Surrounding Land Use

The site is located on the outskirts of Portlaoise in an area of agricultural and light industrial development. The site is bounded to the north and east by land belonging to Irish Rail, comprising sidings and general storage areas. To the south is a vehicle repair garage, which is elevated above the level of the site by approximately 1.5 m. To the west the site is adjoined by further industrial land, as well as residential land.

7 STAGE 6: SITE CHARACTERISATION

7.1 GUIDANCE REQUIREMENTS

The draft guidelines from the Commission require the following details for Stage 6:

Use the results of Stages 3 to 5 to describe the site, in particular demonstrating the location, type, extent and quantity of historic pollution and potential future emissions sources noting the strata and groundwater likely to be affected by those emissions – making links between sources of emissions, the pathways by which pollution may move and the receptors likely to be affected.

7.2 APPLICANT DETAILS

The results of Stages 3 to 5 have been collated and are presented in a standard Source-Pathway-Receptor model to establish the potential pollutant linkages, if any, for the relevant hazardous substances identified to cause or have caused ground contamination.

7.2.1 Source Details

Based on the Stage 2 analysis, Table 7.1 lists the "relevant hazardous substances" at the Enva facility:

Table 7.1 – Location of Hazardous Substances

Substance	Source
Sodium Hydroxide	Stores and dosing area
Nitric Acid	Stores and dosing area
Sodium Hypochlorite	Stores and dosing area
Hydrogen Peroxide	Stores and dosing area
Waste Oil (Garage & Shipping)	Tank Farm
Aquatreat	Stores and dosing area
Fuel Additive A	Stores and dosing area
Fuel Additive B	Stores and dosing area
Fuel Additive C	Stores and dosing area
Oil De-emulsifier	Stores and dosing area
Deashing Chemical	Stores and dosing area
Marked Kerosene	Tank Farm
Marked Gas Oil	Tank Farm
Reclaimed Fuel Oil	Tank Farm

7.2.2 Pathway Details

Groundwater flow across the site is from south-west to north-east.

The regional geology of Portlaoise is typified by Carboniferous Limestone. The limestone is classified by the Geological Survey of Ireland (GSI) as a Locally Important Karstified Aquifer (Ll). Porosity is predominantly in the form of fractures, in this aquifer, however the muddy nature of this formation greatly reduces permeability.

The underlying groundwater body is the South Eastern groundwater body which is classed as poorly productive but with moderate to high vulnerability. This vulnerability is as a result of the shallow made ground soil/subsoil layer.

Given the location of the site however, and the distance to any surface water bodies, any contaminant plume would be short lived.

7.2.3 Receptor Details

The public water supply for Portlaoise is derived from groundwater, utilising three groundwater abstraction well fields comprising of two abstraction wells in each well field. This supply currently comes from the Straboe area, approximately 5.5 km to the north-east of the site. The source protection zone for this water supply extends to within 3.2 km of the Enva site but does not encompass the Enva site.

The GSI record a number of other dug wells and boreholes within the Portlaoise area, including the boreholes installed on the site. The accuracy of the locations of these wells varies. One well, which was drilled in 1899 is recorded as being located immediately to the south of the Enva site. The use of this well is not known and its location is only accurate to 1 km. A second borehole, drilled in 1973 is recorded 1.5 km to the north of the site at Clonroosk; the accuracy of this location is also 1 km so it could be closer or further from the site. The use of this well is not known but its yield is recorded as being poor. There are no other wells recorded within 1 km of the site.

Enva is not aware of any abstraction boreholes within the immediate vicinity of their site.

7.2.4 Conclusion

Assessment of the potential Source-Pathway-Receptor pollutant linkages described above concludes that as no source to receptor pathway is present at the Enva facility, there are no pollutant linkages to ground or groundwater associated with the site's activities. While there is a pathway to receptor linkage, the nature of the strata underlying the facility is such that any contaminant plume would be short lived.

The risk of current activities at the Enva facility having caused or causing pollution to ground or groundwater is low to medium. In the event that pollution in the area has been caused in the past, this has attenuated fully from the site and there is no residual ground contamination at the site. This is confirmed by the groundwater monitoring data presented in Stage 4 of this report.

8 STAGE 7: SITE INVESTIGATION

8.1 GUIDANCE REQUIREMENTS

The draft guidelines from the Commission require the following details for Stage 7:

If there is sufficient information to quantify the state of soil and groundwater pollution by relevant hazardous substances on the basis of Stages (1) to (6) then go directly to Stage 8. If insufficient information exists then intrusive investigation of the site will be required in order to gather such information. The details of such investigation should be clarified with the competent authority.

8.2 APPLICANT DETAILS

There is sufficient information to quantify the state of soil and groundwater pollution by relevant hazardous substances on the basis of Stages 1 to 6.

9 STAGE 8: BASELINE REPORT CONCLUSIONS

9.1 GUIDANCE DOCUMENTS

The draft guidelines from the Commission require the following details for Stage 8:

Produce a baseline report for the installation that quantifies the state of soil and groundwater pollution by relevant hazardous substances.

9.2 APPLICANT DETAILS

This document presents the baseline report which has been prepared in accordance with the "*European Commission Guidance concerning baseline reports under Article 22(2) of Directive 2010/75/EU on industrial emissions*" (reference 2014/C 136/03).

Assessment of the potential Source-Pathway-Receptor pollutant linkages described above concludes that as no source to receptor pathway is present at the Enva facility, there are no pollutant linkages to ground or groundwater associated with the site's activities. While there is a pathway to receptor linkage, the nature of the strata underlying the facility is such that any contaminant plume would be short lived.

The risk of current activities at the Enva facility having caused or causing pollution to ground or groundwater is low to medium. In the event that pollution in the area has been caused in the past, this has attenuated fully from the site and there is no residual ground contamination at the site. This is confirmed by the groundwater monitoring data presented in Stage 4 of this report.

APPENDIX A

HAZARD CLASSES FOR HAZARDOUS SUBSTANCES

Article 3 of Regulation (EC) No 1272/2008 (Parts 2 to 5 of Annex I)

Part 2: Physical Hazards	
2.1 Explosives	H200: Unstable Explosive H201: Explosive; mass explosion hazard H202: Explosive; severe projection hazard H203: Explosive; fire, blast or projection hazard H204: Fire or projection hazard H205: May mass explode in fire
2.2. Flammable gases	H220: Extremely flammable gas H221: Flammable gas
2.3. Flammable aerosols	H222: Extremely flammable aerosol H223: Flammable aerosol
2.4. Oxidising gases	H270: May cause or intensify fire; oxidiser
2.5. Gases under pressure	H280: Contains gas under pressure; may explode if heated H280: Contains gas under pressure; may explode if heated H281: Contains refrigerated gas; may cause cryogenic burns or injury H280: Contains gas under pressure; may explode if heated
2.6. Flammable liquids	H224: Extremely flammable liquid and vapour H225: Highly flammable liquid and vapour H226: Flammable liquid and vapour
2.7. Flammable solids	H228: Flammable solid
2.8. Self-reactive substances and mixtures	H240: Heating may cause an explosion H241: Heating may cause a fire or explosion H242: Heating may cause a fire
2.9. Pyrophoric liquids	H250: Catches fire spontaneously if exposed to air
2.10. Pyrophoric solids	H250: Catches fire spontaneously if exposed to air
2.11. Self-heating substances and mixtures	H251: Self-heating; may catch fire H252: Self-heating in large quantities; may catch fire
2.12. Substances and mixtures which in contact with water emit flammable gases	H260: In contact with water releases flammable gases which may ignite spontaneously H261: In contact with water releases flammable gases
2.13. Oxidising liquids	H271:May cause fire or explosion; strong oxidiser H272: May intensify fire; oxidiser
2.14. Oxidising solids	H271: May cause fire or explosion; strong oxidiser H272: May intensify fire; oxidiser
2.15. Organic peroxides	H240: Heating may cause an explosion H241: Heating may cause a fire or explosion H242: Heating may cause a fire
2.16. Corrosive to metals	H290: May be corrosive to metals
Part 3: Health Hazards	
3.1. Acute toxicity	H300: Fatal if swallowed H301: Toxic if swallowed H302: Harmful if swallowed H310:Fatal in contact with skin

	H311: Toxic in contact with skin H312: Harmful in contact with skin H330: Fatal if inhaled H331: Toxic if inhaled H332: Harmful if inhaled
3.2. Skin corrosion/irritation	H314: Causes severe skin burns and eye damage H315: Causes skin irritation
3.3. Serious eye damage/eye irritation	H318: Causes serious eye damage H319: Causes serious eye irritation
3.4. Respiratory or skin sensitisation	H334: May cause allergy or asthma symptoms or breathing difficulties if inhaled H317: May cause an allergic skin reaction
3.5. Germ cell mutagenicity	H340: May cause genetic defects (state route of exposure if it is conclusively proven that No other routes of exposure cause the hazard) H341: Suspected of causing genetic defects (state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard)
3.6. Carcinogenicity	H350: May cause cancer (state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard) H351: Suspected of causing cancer (state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard)
3.7. Reproductive toxicity	H360: May damage fertility or the unborn child (state specific effect if known)(state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard) H361: Suspected of damaging fertility or the unborn child (state specific effect if known) (state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard) H362: May cause harm to breast-fed children.
3.8. Specific target organ toxicity — single exposure	H370: Causes damage to organs (or state all organs affected, if known) (state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard) H371: May cause damage to organs (or state all organs affected, if known) (state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard) H335: May cause respiratory irritation; H336: May cause drowsiness or dizziness
3.9. Specific target organ toxicity — repeated exposure	H372: Causes damage to organs (state all organs affected, if known) through prolonged or repeated exposure (state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard) H373: May cause damage to organs (state all organs affected, if known) through prolonged or repeated exposure (state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard)
3.10. Aspiration hazard	H304: May be fatal if swallowed and enters airways
Part 4: Environmental Hazards	
4.1. Hazardous to the aquatic environment	H400: Very toxic to aquatic life H410: Very toxic to aquatic life with long lasting effects H411: Toxic to aquatic life with long lasting effects

	H412: Harmful to aquatic life with long lasting effects H413: May cause long lasting harmful effects to aquatic life
Part 5: Additional EU Hazard Class	
5.1. Hazardous to the ozone layer	EUH059: Hazardous to the Ozone Layer

Question 21: *Undertake a screening for appropriate assessment and state whether the activity the subject of the licence (that is the entire licenced activity including any new processes sought as part of this licence review), individually or in combination with other plans or projects, is likely to have a significant effect on a European site or European sites, in view of best scientific knowledge and the conservation objectives of the site or sites. Where it cannot be excluded on the basis of objective scientific information, following screening for appropriate assessment that an activity either individually or in combination with other plans or projects, is likely to have a significant effect on a European site or European sites provide a Natura Impact Statement, as defined in Regulation 2(1) of the European Communities (Birds and natural Habitats) Regulations (S.I. 477 of 2011). Where, based on screening, it is considered that an appropriate assessment is not required, provide a reasoned response.*

Response

Please see attached Screening Report

Enva Ireland Ltd. Portlaoise

Screening for Appropriate Assessment

Document Control Sheet

Client:	Enva Ireland Ltd.
Project Title:	EPA Licence Review for Enva, Clonminam Industrial Estate, Portlaoise, Co. Laois
Document Title:	Screening for Appropriate Assessment, Enva, Portlaoise, Co. Laois
Document No:	MDE0973Rp0026F01

Text Pages:	18	Appendices:	2

Rev.	Status	Date	Author(s)		Reviewed By		Approved By	
D02	Draft	13th May 2016	DC		ACr		TR	dig sig
F01	Final	17th May 2016	DC					

TABLE OF CONTENTS

1 INTRODUCTION 1

1.1 BACKGROUND 1

1.2 LEGISLATIVE CONTEXT FOR APPROPRIATE ASSESSMENT 1

1.3 STAGES OF APPROPRIATE ASSESSMENT 2

2 METHODOLOGY 4

2.1 GUIDANCE DOCUMENTS ON APPOPRIATE ASSESSMENT 4

2.2 GUIDING PRINCIPLES AND CASE LAW 4

2.3 INFORMATION CONSULTED 4

2.4 SCREENING PROTOCOL 5

3 SCREENING OF EUROPEAN SITES 6

3.1 DESCRIPTION OF THE ENVA SITE ACTIVITIES 6

3.2 BRIEF DESCRIPTION OF THE EUROPEAN SITES WITHIN THE ZONE OF INFLUENCE 7

4 ASSESSMENT CRITERIA 13

4.1 IS THE PROJECT NECESSARY TO THE MANAGEMENT OF EUROPEAN SITES? 13

4.2 DIRECT, INDIRECT OR SECONDARY IMPACTS 13

4.3 CUMULATIVE AND IN-COMBINATION IMPACTS 14

4.4 LIKELY CHANGES TO THE EUROPEAN SITE(S) 14

5 SCREENING CONCLUSIONS AND STATEMENT 16

6 REFERENCES 17

APPENDICES

Appendix A SAC Conservation Objectives

Appendix B SPA Special Conservation Interests

LIST OF FIGURES

Figure 3.1 – European Sites within 15 km of the Enva Site 12

LIST OF TABLES

Table 3.1 – European Sites within 15km Zone of Influence of the Enva Site 9
Table 4.1 – Likely Changes to European Sites 14

1 INTRODUCTION

This report contains information in support of screening for Appropriate Assessment (AA) in line with the requirements of Article 6(3) of the EU Habitats Directive (EC 92/43/EEC) on the Conservation of Natural Habitats and Wild Fauna and Flora; the Planning and Development (Amendment) Act 2010; and the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended) for the licenced operation of the Enva facility, Clonminam Industrial Estate, Portlaoise, Co. Laois.

1.1 BACKGROUND

The Enva site in Portlaoise currently operates as a hazardous waste facility under an Industrial Emissions licence granted by the Environmental Protection Agency (EPA) (Licence No. W0184-01). This EPA licence is now subject to review. To aid the EPA as the Competent Authority, in making a screening determination, Enva have provided information to support the screening for appropriate assessment.

1.2 LEGISLATIVE CONTEXT FOR APPROPRIATE ASSESSMENT

The Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora, better known as the "Habitats Directive" provides legal protection for habitats and species of European importance. Articles 3 to 9 provide the legislative means to protect habitats and species of Community interest through the establishment and conservation of an EU-wide network of sites known as the Natura 2000 network. These are Special Areas of Conservation (SACs) designated under the Habitats Directive and Special Protection Areas (SPAs) designated under the Conservation of Wild Birds Directive (79/409/ECC) as codified by Directive 2009/147/EC.

Articles 6(3) and 6(4) of the Habitats Directive set out the decision-making tests for plans and projects likely to affect European Sites (Annex 1.1). Article 6(3) establishes the requirement for AA:

> *Any plan or project not directly connected with or necessary to the management of the [European] site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subjected to appropriate assessment of its implications for the site in view of the site's conservation objectives. In light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public.*

Article 6(4) states:

> *If, in spite of a negative assessment of the implications for the [European] site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of a social or economic nature, Member States shall take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected. It shall inform the Commission of the compensatory measures adopted.*

The Habitats Directive has been transposed into Irish law by the Planning and Development Act 2000 (as amended) and the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended).

1.2.1 Role of the Competent Authority

The EPA in its role as the Competent Authority for the licencing the site is obliged to examine the likely significant effects, individually or in combination, of the site activities on European Sites in light of their specific qualifying interests/special conservation interests and conservation objectives. If screening determines that there is likely to be a significant effect on a European Site, then Appropriate Assessment must be carried out for the site activities, including the compilation of a Natura Impact Statement to inform the decision making.

1.3 STAGES OF APPROPRIATE ASSESSMENT

The AA process progresses through four stages. If at any stage in the process it is determined that there will be no significant effect on the integrity of a European Site in view of the sites conservation objectives, the process is effectively completed. The four stages are as follows:

- Stage 1 – Screening of the proposed plan or project for AA;
- Stage 2 – An AA of the proposed plan or project;
- Stage 3 – Assessment of alternative solutions; and
- Stage 4 – Imperative Reasons of Overriding Public Interest (IROPI)/ Derogation.

Stages 1 and 2 relate to Article 6(3) of the Habitats Directive; and Stages 3 and 4 to Article 6(4).

Stage 1: Screening for Appropriate Assessment

The aim of screening is to assess firstly if the plan or project is directly connected with or necessary to the management of European Site(s); or in view of best scientific knowledge, if the plan or project, individually or in combination with other plans or projects, is likely to have a significant effect on a European site. This is done by examining the proposed plan or project and the conservation objectives of any European Sites that might potentially be affected. If screening determines that there is potential for significant effects or there is uncertainty regarding the significance of effects then it will be recommended that the plan is brought forward to full AA.

Stage 2: Appropriate Assessment

The aim of stage 2 of the AA process is to identify any adverse impacts that the plan or project might have on the integrity of relevant European Sites. As part of the assessment, a key consideration is 'in combination' effects with other plans or projects. Where adverse impacts are identified, mitigation measures can be proposed that would avoid, reduce or remedy any such negative impacts and the plan or project should then be amended accordingly, thereby avoiding the need to progress to Stage 3.

Stage 3: Assessment of Alternative Solutions

If it is not possible during the stage 2 to reduce impacts to acceptable, non-significant levels by avoidance and/or mitigation, stage 3 of the process must be undertaken which is to objectively assess whether alternative solutions exist by which the objectives of the plan or project can be achieved. Explicitly, this means alternative solutions that do not have negative impacts on the integrity of a European Site. It should also be noted that EU guidance on this stage of the process states that, '*other assessment criteria, such as economic criteria, cannot be seen as overruling ecological criteria'* (EC, 2007). In other words, if alternative solutions exist that do not have negative impacts on European Sites; they should be adopted regardless of economic considerations.

Stage 4: Imperative Reasons of Overriding Public Interest (IROPI)/Derogation

This stage of the AA process is undertaken when it has been determined that negative impacts on the integrity of a European Site will result from a plan or project, but that no alternatives exist. At this stage of the AA process, it is the characteristics of the plan or project itself that will determine whether or not the competent authority can allow it to progress. This is the determination of 'over-riding public interest'.

It is important to note that in the case of European Sites that include in their qualifying features 'priority' habitats or species, as defined in Annex I and II of the Directive, the demonstration of 'over-riding public interest' is not sufficient and it must be demonstrated that the plan or project is necessary for 'human health or safety considerations'. Where plans or projects meet these criteria, they can be allowed, provided adequate compensatory measures are proposed. Stage 4 of the process defines and describes these compensation measures.

2 METHODOLOGY

2.1 GUIDANCE DOCUMENTS ON APPOPRIATE ASSESSMENT

The AA requirements of Article 6(3) of the Habitats Directive 92/43/EEC (European Communities 2001) follow a sequential approach as outlined in the following guidance documents and memoranda, namely:

- *Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning Authorities.* Department of Environment, Heritage and Local Government, 2010 revision.
- *Appropriate Assessment under Article 6 of the Habitats Directive: Guidance for Planning Authorities.* Circular NPWS 1/10 and PSSP 2/10.
- *Assessment of Plans and Projects Significantly Affecting Natura 2000 Sites: Methodological Guidance on the provisions of Article 6(3) and 6(4) of the Habitats Directive 92/43/EEE* (European Commission Environment Directorate-General, 2001).
- *Managing Natura 2000 Sites: The provisions of Article 6 of the Habitat's Directive 92/43/EEC* (European Commission Environment Directorate-General, 2000).
- *Guidance Document on Article 6(4) of the 'Habitat's Directive 92/43/EEC. Clarification of the Concepts of Alternative Solutions, Imperative Reasons of Overriding Public Interest, Compensatory Measures, Overall Coherence.* Opinion of the European Commission (European Commission January 2007).
- *Guidelines for Good Practice Appropriate Assessment of Plans Under Article 6(3) Habitats Directive* (International Workshop on Assessment of Plans under the Habitats Directive, 2011).
- *Communication from the Commission on the precautionary principle.* European Commission (2000).

2.2 GUIDING PRINCIPLES AND CASE LAW

The screening process is concerned with determining the likelihood of a plan or project giving rise to significant effects on a European Site(s) either alone or in combination with other plans and projects. Over time legal interpretation has been sought on the practical application of the legislation as some terminology was found to be unclear. This gave rise to doubt and uncertainty, particularly for those statutorily obligated to act as the Competent Authority, and applying the various instructions/memoranda were found in certain circumstances to be unclear with regards to some definitions leading to possible misinterpretations. European and National case law has clarified a number of issues and some aspects of the published guidance documents have been superseded by case law. Case law has informed the preparation of this document.

2.3 INFORMATION CONSULTED

The screening exercise is based on a desktop study which utilised the following sources of information:

- Information on the location and nature of site operations supplied by the client;
- *Interim status report on the Assessment of Emissions to Air at ENVA Ireland Limited, Waste Management Facility, Portlaoise, Co. Laois EPA Licence Reg. No. W0184-01.* (EPA, 2015);

- *Annual Environmental Report 2015. Agglomeration Name: Portlaoise. Licence Register No.: D0001-01.*(Irish Water, 2015);
- Portlaoise Local Area Plan 2012-2018 (Laois County Council, 2012);
- Department of Environment, Community and Local Government – online land use mapping www.myplan.ie/en/index.html;
- Environmental Protection Agency – Water Quality www.epa.ie;
- ESRI Ireland - Mapping Themes www.esri-ireland.ie;
- Geological Survey of Ireland – Geology, soils and hydrogeology www.gsi.ie;
- Information on the conservation status of birds in Ireland (Colhoun & Cummins 2013);
- Information on the South Eastern River Basin District www.serbd.com; Water Framework Directive website – www.wfdireland.ie;
- National Parks and Wildlife Service – online Natura 2000 site network information, including site conservation objectives www.npws.ie;
- National Parks and Wildlife Service – Information on the status of EU protected habitats and species in Ireland (NPWS 2013a & 2013b);
- National Biodiversity Data Centre – www.biodiversityireland.ie; and
- Ordnance Survey of Ireland – Mapping and Aerial photography www.osi.ie.

2.4 SCREENING PROTOCOL

2.4.1 Screening Sequence

- Determining whether a project or plan is directly connected with or necessary to the conservation management of any European sites;
- Describing the project or plan;
- Identifying the European sites potentially affected by the project or plan;
- Identifying and describing any potential effects of the project or plan on European sites, alone, in-combination and cumulatively with other plans/projects;
- Assessing the likelihood of significant effects on European sites.

3 SCREENING OF EUROPEAN SITES

3.1 DESCRIPTION OF THE ENVA SITE ACTIVITIES

The Enva Ireland Ltd. facility is located on a 2 hectare site at Clonminam Industrial Estate, Portlaoise, Co. Laois (Irish National Grid Reference: S 45915 97492). The industrial estate is surrounded by a railway yard, vehicle repair and panel beaters, commercial units and oil storage. The nearest residential area is situated approximately 30m north of the facility boundary.

The Enva site has been an EPA-licensed hazardous waste facility since 1999 (License No. W0184-01) where it has carried out waste oil reprocessing (approximately 20,000 tonnes in 2014) and storage activities since the late 1970's. From 2004 activities were expanded on-site to include the processing of additional wastes including the treatment of contaminated soil, repacking of oily contaminated wastes and recovering paint wastes. The facility also stores waste in containers prior to transfer offsite for recovery or disposal. The infrastructure consists of a tank farm (45 tanks, both heated and unheated) for the processing and storage of waste and virgin hydrocarbon fuels, waste processing and storage buildings, a roofed concrete soil remediation area and associated office buildings. A number of storage tanks belong to and are used by EMO oil and are not associated with the licensed activity. One dual fuel process boiler is operated on-site that is fuelled on natural gas or kerosene gas oil, typically natural gas, to provide heat for waste oil processing tanks.

Reprocessing of waste oil is undertaken on a batch basis as part of a multi–stage process. The stages of this reprocessing activity are briefly summarised below:

- Pre-acceptance – prior to waste oil being accepted for recovery processing it is subjected to a number of waste acceptance controls and testing.
- Preliminary dewatering – this stage involves the separation of oil and water. The waste oil is typically heated to temperatures between 50-80 °C to improve the viscosity of the oil. Heating the waste oil also improves the rate of separation of oil from water.
- Pre-processing – waste oils suitable for processing are filtered and demulsifying chemicals are added. High specification fuels are also de-metallised, heated up to 80°C and filtered/centrifuged prior to the drying stage.
- Drying – waste oils that still have a high water content are heated to temperatures between 90-102°C (max). Water content is typically reduced from 5% to less than 2% in the drying tanks – this occurs in one of three process tanks at the site. Part of the drying process includes 'air sparging' where air is passed through the waste oil from the base of the tank to improve mixing and speed up the drying process.
- Blending/Finishing – reprocessed oils are tested to ensure they meet limits specified in the EPA licence conditions. Then reprocessed oils are blended with virgin oil and additives (as necessary), which have been approved for use and stored on site appropriately to meet customer specification requirements.

The frequency of waste oil reprocessing activity occurring is dependent on the quantity of waste oil collected and the level of water content in the oil. The water content in the oil can vary - from circa 45% in ship oils to circa 15% in garage and interceptor oils.

The EPA (2015) states the following in relation to emissions to air from the Enva site:

- *Air quality in the vicinity of the ENVA Ireland Ltd. Portlaoise facility and in Portlaoise Town is within ambient air quality guideline values;*
- *There has been no significant change in the magnitude of emissions from the drying tanks when comparing recent emissions data and the data submitted as part of the original licence application;*
- *Dispersion modelling of emissions from the drying tanks indicate that ground level concentrations are within ambient air quality guideline values;*
- *Odour nuisance was not identified during independent odour agent or EPA odour surveys in 2014 and 2015.*

Final wastes to leave the site is disposed of at licenced hazardous waste facilities both within and outside of the State.

Process effluent consists of water removed from the waste oil processing system and that collected from the soil remediation area. The aqueous effluent from the separation of oil is treated twice on a batch basis to remove as much oil as possible, before settling and then passing through oil separators before being pumped under controlled conditions through a monitoring station to a final process effluent drain. This drains to the existing Industrial Estate foul sewer system to the west of the site and is pumped to the Portlaoise Wastewater Treatment Works (WWTW) for treatment prior to discharge to the River Triogue downstream of Portlaoise.

Surface water on site is generated from yards and roofs. There are two surface water collection systems on site:

- Yard gullies draining to a four chamber oil interceptor and pumped to a second oil interceptor on the west of the site;
- Surface water from the north end of the site is collected and passed through the second oil separator as mentioned in the point above.

Following treatment via oil separator the water is discharged to the municipal surface water system which ultimately discharges to the River Triogue. The River Triogue discharges to the River Barrow north east of Mountmellick *ca*. 13.5km downstream of the Enva site. The River Barrow forms part of the River Barrow and River Nore SAC.

3.2 BRIEF DESCRIPTION OF THE EUROPEAN SITES WITHIN THE ZONE OF INFLUENCE

A buffer of 15km is typically taken as the initial zone of influence (ZoI) extending beyond the reach of the footprint of a plan or project, as per Ministerial guidance (DoEHLG 2010), although there may be scientifically appropriate reasons for extending this ZoI further afield depending on the pathway of potential impacts. For example in the case of sites with water dependent habitats or species, and a plan or project that could affect water quality or quantity, for example, it may be necessary to consider the full extent of the upstream and/or downstream catchment . With regard to the Enva site, the 15km distance is considered acceptable to screen all likely significant effects that might impact upon European Sites.

The European Sites are shown in **Table 3.1,** while **Figure 3.1** is a cartographic representation of the same data. The spatial boundary data for the European Sites shown in **Figure 3.1** was the most recent available at the time of writing (March 2016).

The integrity of European Sites is determined on the conservation status of the Qualifying Interests/Special Conservation Interests of the SAC or SPA. These have been obtained through a review of the Conservation Objectives available from the National Parks and Wildlife Service (NPWS)[1]. Qualifying Interest/Special Conservation Interest habitats/species are summarised in **Table 3.1.**

[1] www.npws.ie accessed 13th May 2016

Table 3.1 – European Sites within 15km Zone of Influence of the Enva Site

Site Name and Code	Distance from the Enva Site (approximate) [2]	Qualifying Interest Habitats and Species (* = Priority Habitat)[3]	Connectivity
River Barrow and River Nore SAC [002162]	*ca.* 8km	**Annex I Habitats** ▪ Estuaries [1130] ▪ Mudflats and sandflats not covered by seawater at low tide [1140] ▪ Salicornia and other annuals colonizing mud and sand [1310] ▪ Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] ▪ Mediterranean salt meadows (*Juncetalia maritimi*) [1410] ▪ Water courses of plain to montane levels with the *Ranunculion fluitantis and Callitricho-Batrachion* vegetation [3260] ▪ European dry heaths [4030] ▪ Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] ▪ Petrifying springs with tufa formation (*Cratoneurion*) [7220]* ▪ Old sessile oak woods with Ilex and *Blechnum* in British Isles [91A0] ▪ Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)	Potential for hydrological linkages to the SAC via the wastewater and surface water discharges to the River Triogue which ultimately discharges to the European Sites. No direct linkage exists due to the distance and presence of an extensive buffer area (both urban and rural) between the Enva site and the European Site.

[2] Measured "as the crow flies"

[3] Sourced from NPWS online Conservation Objectives Generic Version 4.0 (dated 13/02/2015) unless otherwise stated. Downloaded from www.npws.ie 13/05/2016

Site Name and Code	Distance from the Enva Site (approximate) [2]	Qualifying Interest Habitats and Species (* = Priority Habitat)[3]	Connectivity
		[91E0]* **Annex II Species** ▪ Desmoulin's Whorl Snail (*Vertigo moulinsiana)* [1016] ▪ Freshwater pearl mussel (*Margaritifera margaritifera*) [1029] ▪ White-clawed crayfish (*Austropotamobius pallipes*) [1092] ▪ Sea lamprey (*Petromyzon marinus*) [1095] ▪ Brook lamprey (*Lampetra planeri*) [1096] ▪ River lamprey (*Lampetra fluviatilis*) [1099] ▪ Allis shad (*Alosa alosa*) [1102] ▪ Twaite shad (*Alosa fallax fallax*) [1103] ▪ Salmon (*Salmo salar*) [1106] ▪ Otter (*Lutra lutra*) [1355] ▪ Nore Freshwater Pearl mussel (*Margaritifera durrovensis*) [1990] ▪ Killarney fern (*Trichomanes speciosum*) [1421] **Sourced from detailed Conservation Objectives Version 1.0 (dated 19/07/11)**	
Ballyprior Grassland SAC [002256]	*ca.* 12.5km	**Annex I Habitats** ▪ Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco Brometalia*)	No connectivity between the Enva site and the European Site due to the distance between them and lack of hydrological connection between the two areas.

Site Name and Code	Distance from the Enva Site (approximate)[2]	Qualifying Interest Habitats and Species (* = Priority Habitat)[3]	Connectivity
		(*important orchid sites) [6210]*	
Slieve Bloom Mountains SAC [000412]	*ca.* 10km	▪ Northern Atlantic wet heaths with Erica tetralix [4010] ▪ Blanket bogs (* if active bog) [7130] ▪ Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0]*	No connectivity between the Enva site and the European Site due to the distance between them and lack of hydrological connection between the two areas.
Mountmellick SAC [002141]	*ca.* 11km	**Annex II Species** ▪ Desmoulin's Whorl Snail (*Vertigo moulinsiana*) [1016]	No connectivity between the Enva site and the European Site due to the distance between them and lack of hydrological connection between the two areas.
River Nore SPA [004233]	*ca.* 11.5km	▪ Kingfisher (*Alcedo atthis*) [A229]	No connectivity between the Enva site and the European Site due to the distance between them and lack of hydrological connection between the two areas.
Slieve Bloom Mountains SPA [004160]	*ca.* 8km	▪ Hen Harrier (*Circus cyaneus*) [A082]	No connectivity between the Enva site and the European Site due to the distance between them, lack of hydrological connection between the two areas and given the location of the Enva site in a highly urban/industrial area, the habitat is not favoured for nesting by Hen Harrier as they typically nest in moorland and young forestry plantations.

Figure 3.1 – European Sites within 15 km of the Enva Site

4 ASSESSMENT CRITERIA

4.1 IS THE PROJECT NECESSARY TO THE MANAGEMENT OF EUROPEAN SITES?

The site activities are not directly connected with or necessary to the management of any European Site.

4.2 DIRECT, INDIRECT OR SECONDARY IMPACTS

Table 3.1 lists the European Sites within 15km of the Enva site. There are six sites in all, four SACs and two SPAs. The Enva site is not situated within or adjacent to the boundaries of any SACs or SPAs, therefore no direct impacts are likely to occur.

A source – pathway – receptor approach has been used as part of this assessment process. The pathway identified is the River Triogue which discharges to the River Barrow and River Nore SAC at Mountmellick *ca.* 13.5km north east of the Enva site. The Enva site is linked to the River Triogue by virtue of the fact that treated foul effluent from Portlaoise WWTW and surface water run-off from the site is ultimately discharged to the Triogue River.

Process effluent from the site is treated twice on a batch basis to remove oil, thereafter undergoing a settling process before it is passed through oil separators before the resultant cleaned water is released under controlled conditions to a monitoring station and discharged to the local foul sewer. It is then treated at Portlaoise WWTW before being discharged to the Triogue River. The Enva site incorporates the necessary treatment methods to process effluent prior to discharge to the foul sewer, as per EPA guidance.

The Portlaoise WWTW (which itself operates under EPA licence D0001-01) has a design Population Equivalent of 39,000 and provides preliminary, primary, secondary and tertiary treatment as well as chemical dosing for nitrogen and phosphorus removal. The plants final effluent was compliant with the Emission Limit Values in 2015 and the plant is currently operating under the hydraulic and organic loading capacity. The discharge from the WWTW does not have a negative impact on water quality or WFD status (Irish Water, 2015). Owing to this, the process effluent from the Enva plant is currently treated prior to discharge to the foul sewer, and that there will be no change to the nature of the process effluent as a result of site operations, no impacts to water quality in the Triogue River are envisaged, and hence there will be no resultant impacts to downstream European Site.

Surface water run-off draining from the site is passed through oil separators prior to being discharged to the local surface water network. Due to the treatment of the surface water run-off, the distance between the Enva site and the European Site and potential for dilution in the surface water network before entering the River Barrow, there will be no impacts on the European Sites

In addition, it is not anticipated that the proposed works will impact on groundwater in the area and therefore, will not impact, directly or indirectly, on groundwater dependent qualifying interests of the River Barrow and River Nore SAC e.g. petrifying springs.

There is no other hydrological connectivity between the Enva site and any of the other SACs or SPAs. These sites are situated at distance from the Enva site and will not be impacted either directly or indirectly as a result of operations at the Enva site.

Carbon Monoxide, Nitrogen and Sulphur Oxides emissions, and Combustion Efficiency from the on-site boilers are monitored on an annual basis. However, there are no specified limits for any of these parameters in the current licence and air quality in the vicinity of the Enva site in Portlaoise and in Portlaoise town has been shown to be within ambient air quality guideline values (EPA, 2015).

4.3 CUMULATIVE AND IN-COMBINATION IMPACTS

There is a potential linkage for in-combination impacts with other plans or projects in the area that could result in impacts to water quality in the Triogue River either via foul water or surface water discharges. However, no changes in the nature of the process effluent or surface water run-off from the Enva site are anticipated and there is available capacity in the Portlaoise WWTW. Therefore it can cater for additional industrial, commercial or residential developments in the area and is subject to its own EPA licence review periodically. It is a policy of the Portlaoise Local Area Plan 2012-2018 to "**INF04** *encourage only as much development, both in terms of quantity and type of development as can be provided for, based on the utility services available. To promote Sustainable Drainage to reduce flood risks and maintain and enhance water quality, in accordance with the Laois County Council Storm Water Management Policy*". This will ensure protection of water quality in the area, and via sustainable drainage systems will also contribute to enhancing the quality of surface water run-off in the area.

Give the low concentrations of air emissions from the site (as per the AER for 2015), the recorded ambient air quality measurements for Portlaoise (EPA, 2015) and the fact that there are no other licenced facilities in the vicinity (which would be subject to licencing requirements), it is therefore envisaged that were will be no combination impacts on air quality.

No other pathways have been identified by which any plan or project could have a significant in-combination effect on any of the European Sites. There is therefore no potential for cumulative or in-combination impacts.

4.4 LIKELY CHANGES TO THE EUROPEAN SITE(S)

The likely changes that could arise from the Enva site activities have been examined in the context of a number of factors that could have likely significant effects on the relevant European Sites (**Table 4.1**)

Table 4.1 – Likely Changes to European Sites

Site Name	Site Code	Reduction of Habitat Area	Disturbance to Key Species	Habitat or Species fragmentation	Reduction in Species Density	Changes in Key Indicators of Conservation Value (Water Quality, etc.)	Climate Change
River Barrow and River Nore SAC	002162	None	None	None	None	None	None

Site Name	Site Code	Reduction of Habitat Area	Disturbance to Key Species	Habitat or Species fragmentation	Reduction in Species Density	Changes in Key Indicators of Conservation Value (Water Quality, etc.)	Climate Change
Ballyprior Grassland SAC	002256	None	None	None	None	None	None
Slieve Bloom Mountains SAC	000869	None	None	None	None	None	None
Mountmellick SAC	002141	None	None	None	None	None	None
River Nore SPA	004233	None	None	None	None	None	None
Slieve Bloom Mountains SPA	000412	None	None	None	None	None	None

5 SCREENING CONCLUSIONS AND STATEMENT

The operations at the Enva site in Portlaoise have been examined to identify potential likely significant effects on European Sites.

It is concluded that the site operations at Enva, Clonminam Industrial Estate, Portlaoise, Co. Laois will have no likely significant effects on any European Sites either alone or in combination with other plans or projects, and that an Appropriate Assessment is not required.

6 REFERENCES

Colhoun, K. & Cummins, S. (2013). *Birds of Conservation Concern in Ireland 2014-2019*. Birdwatch Ireland

Council of the European Communities (1992) *Council Directive of 21 May 1992 on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC).* OJL 206/35, 1992

DoEHLG (2010). *Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning Authorities* (Department of Environment, Heritage and Local Government, Rev. Feb 2010).

DEHLG (2010b) Department of the Environment, Heritage and Local Government Circular NPW1/10 and PSSP 2/10 on Appropriate Assessment under Article 6 of the Habitats Directive – Guidance for Planning Authorities. Department of the Environment, Heritage and Local Government, Dublin.

Environmental Protection Agency (2011). EPA ENVision Service (online environmental information portal). http://gis.epa.ie/Envision

Environmental Protection Agency (2015). *Interim status report on the Assessment of Emissions to Air at ENVA Ireland Limited, Waste Management Facility, Portlaoise, Co. Laois EPA Licence Reg. No. W0184-01.*

European Commission (2007). *Guidance Document on Article 6(4) of the Habitats Directive 92/43/EEC. Clarification of the Concepts of Alternative Solutions, Imperative Reasons of Overriding Public Interest, Compensatory Measures, Overall Coherence*. Opinion of the European Commission.

European Commission (2000a). *Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC.* Office for Official Publications of the European Communities, Luxembourg.

European Commission (2000b) Communication from the Commission on the Precautionary Principle. Office for Official Publications of the European Communities, Luxembourg.

European Commission (2001). *Assessment of Plans and Projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Article 6(3) and 6(4) of the Habitats Directive 92/43/EEC* (European Commission Environment Directorate-General)

European Parliament and European Council (2009). Directive 2009/147/EC of 30th November 2009 on the Conservation of Wild Birds (2009/147/EC). Official Journal L20/7, 2010.

EU Habitats Directive (92/43/EEC)

Geological Survey of Ireland (2011). *GIS datasets Public Viewer*. Online at http://spatial.dcenr.gov.ie/imf/imf.jsp?site=GSI_Simple

Irish Water (2015). *Annual Environmental Report 2015. Agglomeration Name: Portlaoise. Licence Register No.: D0001-01.*

Laois County Council (2012). *Portlaoise Local Area Plan 2012-2018*;

NPWS (2010). *Circular NPW 1/10 & PSSP 2/10 Appropriate Assessment under Article 6 of the Habitats Directive: Guidance for Planning Authorities.* (Department of Environment, Heritage and Local Government, 2010).

NPWS (2013a). *The Status of EU Protected Habitats and Species in Ireland. Species Assessments Volume 2, Version 1.0.* Unpublished Report, National Parks and Wildlife Service. Department of Arts, Heritage and the Gaeltacht, Dublin.

NPWS (2013b). *The Status of EU Protected Habitats and Species in Ireland. Species Assessments Volume 3, Version 1.0.* Unpublished Report, National Parks and Wildlife Service. Department of Arts, Heritage and the Gaeltacht, Dublin.

APPENDIX A

SAC Conservation Objectives

Date of SAC Conservation Objectives consulted in preparation of the AA Screening for the Enva Site

Site Name	Site Code	Specific or Generic Conservation Objectives	Version No.	Date of Issue
River Barrow and River Nore SAC	002162	Site Specific	1.0	19th July 2011
Ballyprior Grassland SAC	002256	Generic	4.0	13th February 2015
Slieve Bloom Mountains SAC	000412	Generic	4.0	13th February 2015
Mountmellick SAC	002141	Generic	4.0	13th February 2015

Full Details of the Conservation Objectives (COs) are available on the NPWS website at www.npws.ie/sites/default/files/protected-sites

APPENDIX B

SPA Special Conservation Interests

Date of SPA Special Conservation Interests consulted in preparation of the AA Screening for the Enva Site

Site Name	Site Code	Specific or Generic Conservation Objectives	Version No.	Date of Issue
River Nore SPA	004233	Generic	4.0	13th February 2015
Slieve Bloom Mountains SPA	004160	Generic	4.0	13th February 2015

Full details of the Conservation Objectives (COs) are available on the NPWS website at www.npws.ie/sites/default/files/protected-sites