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TECHNICAL NOTE

Project **Nestle Askeaton**

Subject **Response To RFI**

Author **Dr. Edward Porter**

Date **11/01/18**

Ref. **17_9407AT02a**

Attached is a response to the Request For Additional Information from the EPA dated 07 December 2017 in relation to Information Request 1 (Air Dispersion Modelling).

AWN Consulting were responsible for carrying out the air modelling assessment that was submitted as part of the Technical Amendment Request.

Kind regards

Dr. Edward Porter C CHEM MRSC MIAQM

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EPA Request For Additional Information Letter Dated 07/12/17

1. In relation to the Air Dispersion Modelling report dated 09 March 2017:

a. Provide further information by way of historical data to confirm the current emission details having reference to the emission rates referred to in the report (i.e. 20 kg/hr and 17.02 kg/hr).

Response:

The results of emission monitoring of stacks A2-1, A2-3, A2-4 and A2-6 are shown in Table 1 covering each quarter from 2012 – 2017.

The average total emission rate for these four emission points over the period is 7.75 kg/hr. The licence emission rate, based on maximum emission concentrations and maximum volume flows, sums to 16.92 kg/hr and thus these four emission points are typically operating at less than 50% of the licence limits. The licensed emission rate of 17.02 kg/hr referred to above includes A2-1, A2-3, A2-4, A2-6 and additionally A2-8 which has a mass emission of 0.1 kg/hr.

Drier 1b, A2-1				
	Dust mg/Nm³			
Year	Q1	Q2	Q3	Q4
2012	32.9	46.59	Not OP.	Not OP.
2013	Not OP.	27.63	34.11	11.53
2014	34.26	26.65	Not OP.	Not OP.
2015	16.02	24.19	Not OP.	Not OP.
2016	33.9	Not OP.	26.19	Not Op.
2017	20.1	1.5	29.61	

Drier 1b, A2-1				
	Flow Rate Nm³/h			
Year	Q1	Q2	Q3	Q4
2012	34693	29983	Not OP.	Not OP.
2013	Not OP.	35365	36494	32756
2014	33812	37205	Not OP.	Not OP.
2015	34824	30783	Not OP.	Not OP.
2016	36193	Not Op.	39637	Not Op.
2017	30810	28155	33362	

Drier 1b, A2-1						
	Flow Rate kg/hr					
Year	Q1	Q2	Q3	Q4	Average	
2012	1.14	1.40				
2013		0.98	1.24	0.38		
2014	1.16	0.99				
2015	0.56	0.74				
2016	1.23		1.04			
2017	0.62	0.04	0.99		0.89	kg/hr

Drier 3, A2-3				
	Dust mg/Nm³			
Year	Q1	Q2	Q3	Q4
2012	40.9	23.13	25.62	37.33
2013	Not OP.	26.33	28.34	13.05
2014	26.04	40.5	39.02	36.9
2015	3.86	27.87	27.59	38.59
2016	46.46	29.44	Not Op.	10.86
2017	26	39.4	45.08	

Drier 3, A2-3				
	Flow Rate Nm³/h			
Year	Q1	Q2	Q3	Q4
2012	84031	77607	74765	77802
2013	Not OP.	76569	79174	73731
2014	80656	48657	44314	72085
2015	66163	78748	70822	71869
2016	59622	73649	Not Op.	77686
2017	75007	76899	81742	

Drier 3, A2-3						
	Flow Rate Nm³/h					
Year	Q1	Q2	Q3	Q4	Average	
2012	3.44	1.80	1.92	2.90		
2013		2.02	2.24	0.96		
2014	2.10	1.97	1.73	2.66		
2015	0.26	2.19	1.95	2.77		
2016	2.77	2.17		0.84		
2017	1.95	3.03	3.68	0.00	2.06	kg/hr

Drier 4, A2-4				
	Dust mg/Nm³			
Year	Q1	Q2	Q3	Q4
2012	13.63	27.14	20.03	22.19
2013	9.66	12.03	41.13	11.59
2014	16.68	15.74	26.93	24.23
2015	16.96	33.24	14.63	25.72
2016	25.37	47.6	16.39	29.81
2017	26.52	29.08	Not Op.	

Drier 4, A2-4				
	Flow Rate Nm³/h			
Year	Q1	Q2	Q3	Q4
2012	114573	105319	99851	95320
2013	92329	93609	99293	88814
2014	98923	98395	95852	93135
2015	88193	91530	99609	96192
2016	73399	94761	78380	101548
2017	106173	101632	Not Op.	

Drier 4, A2-4						
	Flow Rate Nm³/h					
Year	Q1	Q2	Q3	Q4	Average	
2012	1.56	2.86	2.00	2.12		
2013	0.89	1.13	4.08	1.03		
2014	1.65	1.55	2.58	2.26		
2015	1.50	3.04	1.46	2.47		
2016	1.86	4.51	1.28	3.03		
2017	2.82	2.96			2.21	kg/hr

Drier 5, A2-6				
	Dust mg/Nm³			
Year	Q1	Q2	Q3	Q4
2012	16.78	29.59	14.73	26.9
2013	22.83	24.84	23.57	12.8
2014	10.74	22.76	21.3	42.86
2015	19.8	30.89	23.02	20.39
2016	33.11	41.84	27.17	52.23
2017	34.26	49.94	32.21	

Drier 5, A2-6				
	Flow Rate Nm³/h			
Year	Q1	Q2	Q3	Q4
2012	95444	102758	97251	98182
2013	104003	97200	101693	93009
2014	89393	92760	100220	90629
2015	88317	88056	91302	92053
2016	94796	98953	96188	103299
2017	98845	106793	103552	

Drier 5, A2-6						
	Flow Rate Nm³/h					
Year	Q1	Q2	Q3	Q4	Average	
2012	1.60	3.04	1.43	2.64		
2013	2.37	2.41	2.40	1.19		
2014	0.96	2.11	2.13	3.88		
2015	1.75	2.72	2.10	1.88		
2016	3.14	4.14	2.61	5.40		
2017	3.39	5.33	3.34	0.00	2.58	kg/hr
					Sum	
					7.75	kg/hr

Table 1 Dust emission monitoring concentrations and volume flows – 2012 – 2017.

b. In Section 2.0 it is stated that worst-case operations for PM_{10}/$PM_{2.5}$ emissions assume all emission points to be running continuously for a full year, while Table 5 refers to the hours and days/week actually modelled. Please clarify which is correct.

Response:

The model was run based on the operational scenario outlined in Table 5 of the Air Dispersion Modelling Report. The comment that emissions were running continuously is incorrect.

c. Clarify the source of the volumetric flows set out in Table 5 and confirm that these are maximum values.

Response:

The model was based on the volume flows outlined in Table 5 of the Air Dispersion Modelling Report. The volume flows were based on the maximum volume flows reported by Nestle Askeaton and are outlined in Table 2 below.

As shown in Table 1 and 2, average volume flows over the period 2012 – 2017 are between 72% and 93% of the maximum volume flows. Thus, the volume flows used in the air dispersion modelling report were conservative and thus will also over-estimate the mass emission of dust from the facility.

Emission Point	Maximum Volume Flow (Nm^3/hr)	Average Volume Flow (Nm^3/hr)	Average Flow As % Of Maximum Flow
A2-1	46992	33862	72%
A2-3	83267	72457	87%
A2-4	104084	95765	92%
A2-6	104084	96726	93%
A2-8	6600	Not Applicable	Not Applicable

Table 2 Comparison of Actual And Maximum Volume Flows (Nm^3/hr) For A2-1, A2-3, A2-4 and A2-6

d. Provide predicted environmental concentrations for (i) beyond the installation boundary and (ii) at the nearest sensitive receptors. Also, identify the locations of these receptors.

Response:

The model was run based on a three-tiered grid and including boundary receptors (amounting to 14,368 receptors) with the worst-case result at any location reported in Tables 7 - 10 of the air dispersion modelling report. These have been reproduced below with the location of the maximum sensitive receptor for each scenario outlined in Tables 7 – 10 of this note and shown in Figure 1.

(i) Worst-Case Beyond Installation Boundary - Existing Scenario

Ambient Ground Level Concentrations (GLCs) of PM_{10} / $PM_{2.5}$ have been predicted below in Tables 3 – 4 for the existing scenario.

PM_{10} / $PM_{2.5}$ Emissions

The PM_{10} / $PM_{2.5}$ modelling results are detailed in Table 3 and Table 4. The results indicate that the ambient ground level concentration is below the relevant air quality standard for PM_{10} / $PM_{2.5}$. Emissions from the facility lead to an ambient PM_{10} concentration (including background) which is 86% of the maximum ambient 24-hour limit value at the worst-case receptor (see Table 3). In relation to the annual mean concentration, ambient PM_{10} / $PM_{2.5}$ concentration (including background) are at most 58% of the annual mean limit values at the worst-case receptor (Tables 3 and 4).

Pollutant / Scenario / Maximum Receptor	Background (µg/m³)	Averaging Period	Process Contribution (µg/m³)	Predicted Environmental Concentration (µg/Nm³)	Standard (µg/Nm³) Note 1
PM_{10} / 2012	18.0	Maximum 24-hr mean (as a 90thO%ile) Note 2	19.4	37.6	50
PM_{10} / 2012	9.2	Annual mean	8.5	17.7	40
PM_{10} / 2013	18.0	Maximum 24-hr mean (as a 90thO%ile) Note 2	33.9	43.1	50
PM_{10} / 2013	9.2	Annual mean	8.4	17.6	40
PM_{10} / 2014	18.0	Maximum 24-hr mean (as a 90thO%ile) Note 2	28.5	37.7	50
PM_{10} / 2014	9.2	Annual mean	8.2	17.4	40
PM_{10} / 2015	18.0	Maximum 24-hr mean (as a 90thO%ile) Note 2	24.7	33.9	50
PM_{10} / 2015	9.2	Annual mean	8.2	17.4	40
PM_{10} / 2016	18.0	Maximum 24-hr mean (as a 90thO%ile) Note 2	26.4	35.6	50
PM_{10} / 2016	9.2	Annual mean	8.2	17.5	40

Note 1 Air Quality Standards 2011 (from EU Directive 2008/50/EC)

Note 2 Short-term Environmental Concentrations calculated according to UK DEFRA guidance(1) based on the maximum background 24-hr mean (as a 90thO%ile) of 18.0 µg/m³ (based on Kilkitt)

Table 3 Dispersion Model Results – PM_{10} (Existing Scenario)

[1] EPA (2010) Air Dispersion Modelling From Industrial Installations Guidance Note

Pollutant / Scenario	Annual Mean Background ($\mu g/m^3$)	Averaging Period	Process Contribution ($\mu g/m^3$)	Predicted Environmental Concentration ($\mu g/Nm^3$)	Standard ($\mu g/Nm^3$)[Note 1]
$PM_{2.5}$ / 2012	6.0	Annual mean	8.5	14.5	25
$PM_{2.5}$ / 2013	6.0	Annual mean	8.4	14.4	25
$PM_{2.5}$ / 2014	6.0	Annual mean	8.2	14.2	25
$PM_{2.5}$ / 2015	6.0	Annual mean	8.2	14.2	25
$PM_{2.5}$ / 2016	6.0	Annual mean	8.3	14.3	25

Note 1 Air Quality Standards 2011 (from EU Directive 2008/50/EC)

Table 4 Dispersion Model Results – $PM_{2.5}$ (Existing Scenario)

Worst-Case Beyond Installation Boundary - Proposed Scenario

Ambient Ground Level Concentrations (GLCs) of PM_{10} / $PM_{2.5}$ have been predicted below in Tables 5 – 6 for the proposed scenario.

PM_{10} / $PM_{2.5}$ Emissions

The PM_{10} / $PM_{2.5}$ modelling results are detailed in Table 5 and Table 6. The results indicate that the ambient ground level concentration is below the relevant air quality standard for PM_{10} / $PM_{2.5}$. Emissions from the facility lead to an ambient PM_{10} concentration (including background) which is 73% of the maximum ambient 24-hour limit value at the worst-case receptor (see Table 3). In relation to the annual mean concentration, ambient PM_{10} / $PM_{2.5}$ concentration (including background) are at most 50% of the annual mean limit values at the worst-case receptor (Tables 5 and 6).

Pollutant / Scenario	Background ($\mu g/m^3$)	Averaging Period	Process Contribution ($\mu g/m^3$)	Predicted Environmental Concentration ($\mu g/Nm^3$)	Standard ($\mu g/Nm^3$) Note 1
PM_{10} / 2012	18.0	Maximum 24-hr mean (as a 90thO%ile)Note 2	22.2	31.4	50
PM_{10} / 2012	9.2	Annual mean	6.0	15.2	40
PM_{10} / 2013	18.0	Maximum 24-hr mean (as a 90thO%ile)Note 2	27.2	36.4	50
PM_{10} / 2013	9.2	Annual mean	6.6	15.8	40
PM_{10} / 2014	18.0	Maximum 24-hr mean (as a 90thO%ile)Note 2	22.6	31.8	50
PM_{10} / 2014	9.2	Annual mean	6.0	15.2	40
PM_{10} / 2015	18.0	Maximum 24-hr mean (as a 90thO%ile)Note 2	19.8	29.0	50
PM_{10} / 2015	9.2	Annual mean	6.0	15.2	40
PM_{10} / 2016	18.0	Maximum 24-hr mean (as a 90thO%ile)Note 2	19.9	29.1	50
PM_{10} / 2016	9.2	Annual mean	6.0	15.2	40

Note 1 Air Quality Standards 2011 (from EU Directive 2008/50/EC)

Note 2 Short-term Environmental Concentrations calculated according to UK DEFRA guidance(1) based on the maximum background 24-hr mean (as a 90thO%ile) of 18.0 $\mu g/m^3$ (based on Kilkitt)

Table 5 Dispersion Model Results – PM_{10} (Proposed Scenario)

Pollutant / Scenario	Annual Mean Background ($\mu g/m^3$)	Averaging Period	Process Contribution ($\mu g/m^3$)	Predicted Environmental Concentration ($\mu g/Nm^3$)	Standard ($\mu g/Nm^3$)Note 1
$PM_{2.5}$ / 2012	6.0	Annual mean	6.0	12.0	25
$PM_{2.5}$ / 2013	6.0	Annual mean	6.6	12.6	25
$PM_{2.5}$ / 2014	6.0	Annual mean	6.0	12.0	25
$PM_{2.5}$ / 2015	6.0	Annual mean	6.0	12.0	25
$PM_{2.5}$ / 2016	6.0	Annual mean	6.0	12.0	25

Note 1 Air Quality Standards 2011 (from EU Directive 2008/50/EC)

Table 6 Dispersion Model Results – $PM_{2.5}$ (Proposed Scenario)

(ii) Worst-Case Sensitive Receptor - Existing Scenario

Ambient Ground Level Concentrations (GLCs) of PM_{10} / $PM_{2.5}$ have been predicted below in Tables 7 – 8 for the existing scenario. These have been reproduced below with the location of the maximum sensitive receptor (R) for each scenario outlined in each Table and shown in Figure 1.

PM_{10} / $PM_{2.5}$ Emissions

The PM_{10} / $PM_{2.5}$ modelling results are detailed in Table 7 and Table 8. The results indicate that the ambient ground level concentration is below the relevant air quality standard for PM_{10} / $PM_{2.5}$. Emissions from the facility lead to an ambient PM_{10} concentration (including background) which is 39% of the maximum ambient 24-hour limit value at the worst-case sensitive receptor (see Table 7). In relation to the annual mean concentration, ambient PM_{10} / $PM_{2.5}$ concentration (including background) are at most 30% of the annual mean limit values at the worst-case sensitive receptor (Tables 7 and 8).

Pollutant / Scenario	Background ($\mu g/m^3$)	Averaging Period	Process Contribution ($\mu g/m^3$)	Predicted Environmental Concentration ($\mu g/Nm^3$)	Standard ($\mu g/Nm^3$) Note 1
PM_{10} / 2012 / R10	18.0	Maximum 24-hr mean (as a 90thO%ile) Note 2	5.6	19.5	50
PM_{10} / 2012 / R10	9.2	Annual mean	1.5	10.7	40
PM_{10} / 2013 / R10	18.0	Maximum 24-hr mean (as a 90thO%ile) Note 2	5.3	19.5	50
PM_{10} / 2013 / R10	9.2	Annual mean	1.5	10.7	40
PM_{10} / 2014 / R10	18.0	Maximum 24-hr mean (as a 90thO%ile) Note 2	5.4	19.4	50
PM_{10} / 2014 / R6	9.2	Annual mean	1.4	10.6	40
PM_{10} / 2015 / R10	18.0	Maximum 24-hr mean (as a 90thO%ile) Note 2	5.1	19.4	50
PM_{10} / 2015 / R10	9.2	Annual mean	1.4	10.6	40
PM_{10} / 2016 / R6	18.0	Maximum 24-hr mean (as a 90thO%ile) Note 2	4.7	19.4	50
PM_{10} / 2016 / R6	9.2	Annual mean	1.4	10.6	40

Note 1 Air Quality Standards 2011 (from EU Directive 2008/50/EC)

Note 2 Short-term Environmental Concentrations calculated according to UK DEFRA guidance(1) based on the maximum background 24-hr mean (as a 90thO%ile) of 18.0 $\mu g/m^3$ (based on Kilkitt)

Table 7 Dispersion Model Results – PM_{10} (Existing Scenario)

Pollutant / Scenario	Annual Mean Background (µg/m³)	Averaging Period	Process Contribution (µg/m³)	Predicted Environmental Concentration (µg/Nm³)	Standard (µg/Nm³)[Note 1]
$PM_{2.5}$ / 2012 / R10	6.0	Annual mean	1.5	7.5	25
$PM_{2.5}$ / 2013 / R10	6.0	Annual mean	1.5	7.5	25
$PM_{2.5}$ / 2014 / R16	6.0	Annual mean	1.4	7.4	25
$PM_{2.5}$ / 2015 / R10	6.0	Annual mean	1.4	7.4	25
$PM_{2.5}$ / 2016 / R6	6.0	Annual mean	1.4	7.4	25

Note 1 Air Quality Standards 2011 (from EU Directive 2008/50/EC)

Table 8 Dispersion Model Results – $PM_{2.5}$ (Existing Scenario)

Worst-Case Sensitive Receptor - Proposed Scenario

Ambient Ground Level Concentrations (GLCs) of PM_{10} / $PM_{2.5}$ have been predicted below in Tables 9 – 10 for the proposed scenario.

PM_{10} / $PM_{2.5}$ Emissions

The PM_{10} / $PM_{2.5}$ modelling results are detailed in Table 9 and Table 10. The results indicate that the ambient ground level concentration is below the relevant air quality standard for PM_{10} / $PM_{2.5}$. Emissions from the facility lead to an ambient PM_{10} concentration (including background) which is 39% of the maximum ambient 24-hour limit value at the worst-case receptor (see Table 9). In relation to the annual mean concentration, ambient PM_{10} / $PM_{2.5}$ concentration (including background) are at most 29% of the annual mean limit values at the worst-case receptor (Tables 9 and 10).

Pollutant / Scenario	Background ($\mu g/m^3$)	Averaging Period	Process Contribution ($\mu g/m^3$)	Predicted Environmental Concentration ($\mu g/Nm^3$)	Standard ($\mu g/Nm^3$) Note 1
PM_{10} / 2012 / R10	18.0	Maximum 24-hr mean (as a 90thO%ile)Note 2	4.7	19.3	50
PM_{10} / 2012 / R10	9.2	Annual mean	1.3	10.5	40
PM_{10} / 2013 / R10	18.0	Maximum 24-hr mean (as a 90thO%ile)Note 2	4.6	19.3	50
PM_{10} / 2013 / R10	9.2	Annual mean	1.3	10.5	40
PM_{10} / 2014 / R10	18.0	Maximum 24-hr mean (as a 90thO%ile)Note 2	4.4	19.2	50
PM_{10} / 2014 / R16	9.2	Annual mean	1.2	10.4	40
PM_{10} / 2015 / R10	18.0	Maximum 24-hr mean (as a 90thO%ile)Note 2	4.4	19.2	50
PM_{10} / 2015 / R10	9.2	Annual mean	1.2	10.4	40
PM_{10} / 2016 / R1	18.0	Maximum 24-hr mean (as a 90thO%ile)Note 2	4.1	19.2	50
PM_{10} / 2016 / R16	9.2	Annual mean	1.2	10.4	40

Note 1 Air Quality Standards 2011 (from EU Directive 2008/50/EC)

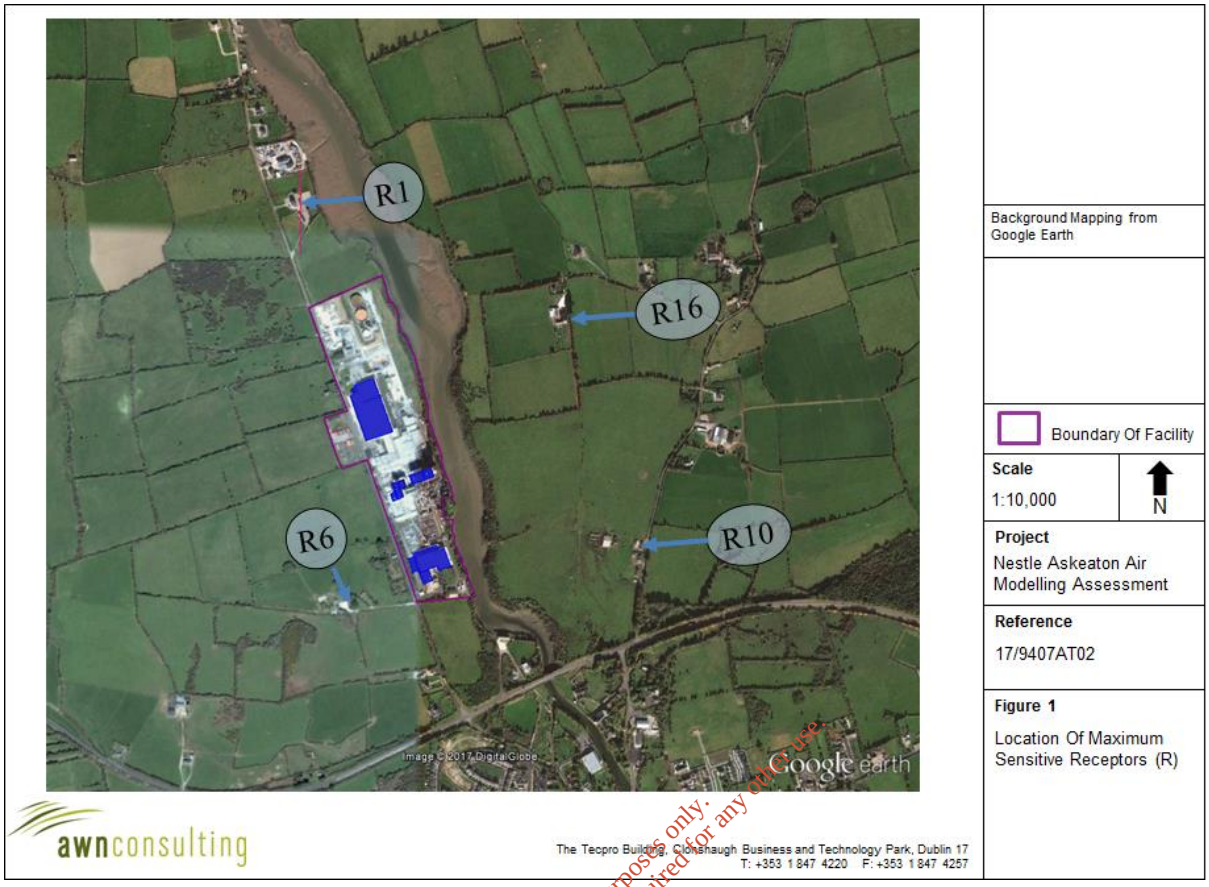
Note 2 Short-term Environmental Concentrations calculated according to UK DEFRA guidance(1) based on the maximum background 24-hr mean (as a 90thO%ile) of 18.0 $\mu g/m^3$ (based on Kilkitt)

Table 9 Dispersion Model Results – PM_{10} (Proposed Scenario)

Pollutant / Scenario	Annual Mean Background ($\mu g/m^3$)	Averaging Period	Process Contribution ($\mu g/m^3$)	Predicted Environmental Concentration ($\mu g/Nm^3$)	Standard ($\mu g/Nm^3$)Note 1
$PM_{2.5}$ / 2012 / R10	6.0	Annual mean	1.3	7.3	25
$PM_{2.5}$ / 2013 / R10	6.0	Annual mean	1.3	7.3	25
$PM_{2.5}$ / 2014 / R16	6.0	Annual mean	1.2	7.2	25
$PM_{2.5}$ / 2015 / R10	6.0	Annual mean	1.2	7.2	25
$PM_{2.5}$ / 2016 / R16	6.0	Annual mean	1.2	7.2	25

Note 1 Air Quality Standards 2011 (from EU Directive 2008/50/EC)

Table 10 Dispersion Model Results – $PM_{2.5}$ (Proposed Scenario)



e. The contour plots are unclear and the legend appears to be incorrect for some of the figures (e.g. Figure 6), please review and resubmit these plots accordingly.

Response:

The figures are based on the process contribution from the facility only (i.e. the contour plots do not show the existing background concentration). The colour-coded legend varies from purple / blue through shades of green to yellow and finally orange and red. The purple / blue represents lower concentrations whilst the red / orange are the "hot-spots" i.e. the absolute maximum concentration at the site boundary and beyond. In each case, the maximum location is at the boundary of the site with a sharp fall-off in concentration away from this point. As the gradient is very steep at this point, the area covered by red and orange is too confined to show up on the contour plot but will be a sub-section of the yellow / green contour plot in each case.