APPENDIX E

EMISSIONS – SUPPORTING INFORMATION

- Appendix E.1 Emission Points

- Appendix E.2 Details of Emissions to Air
  - Table E.1(i) [Not applicable]
  - Tables E.1(ii) (A2-1, A2-2. A2-3, A2-4, A2-5, A2-6)
  - Tables E.1(iii) (A2-1, A2-2. A2-3, A2-4, A2-5, A2-6)
  - Table E.1(iv) (A2-7)

- Appendix E.3 Details of Emissions to Surface Waters
  - Table E.2(i) (SW1)
  - Table E.3(i) [Not applicable]
  - Table E.3(ii) [Not applicable]

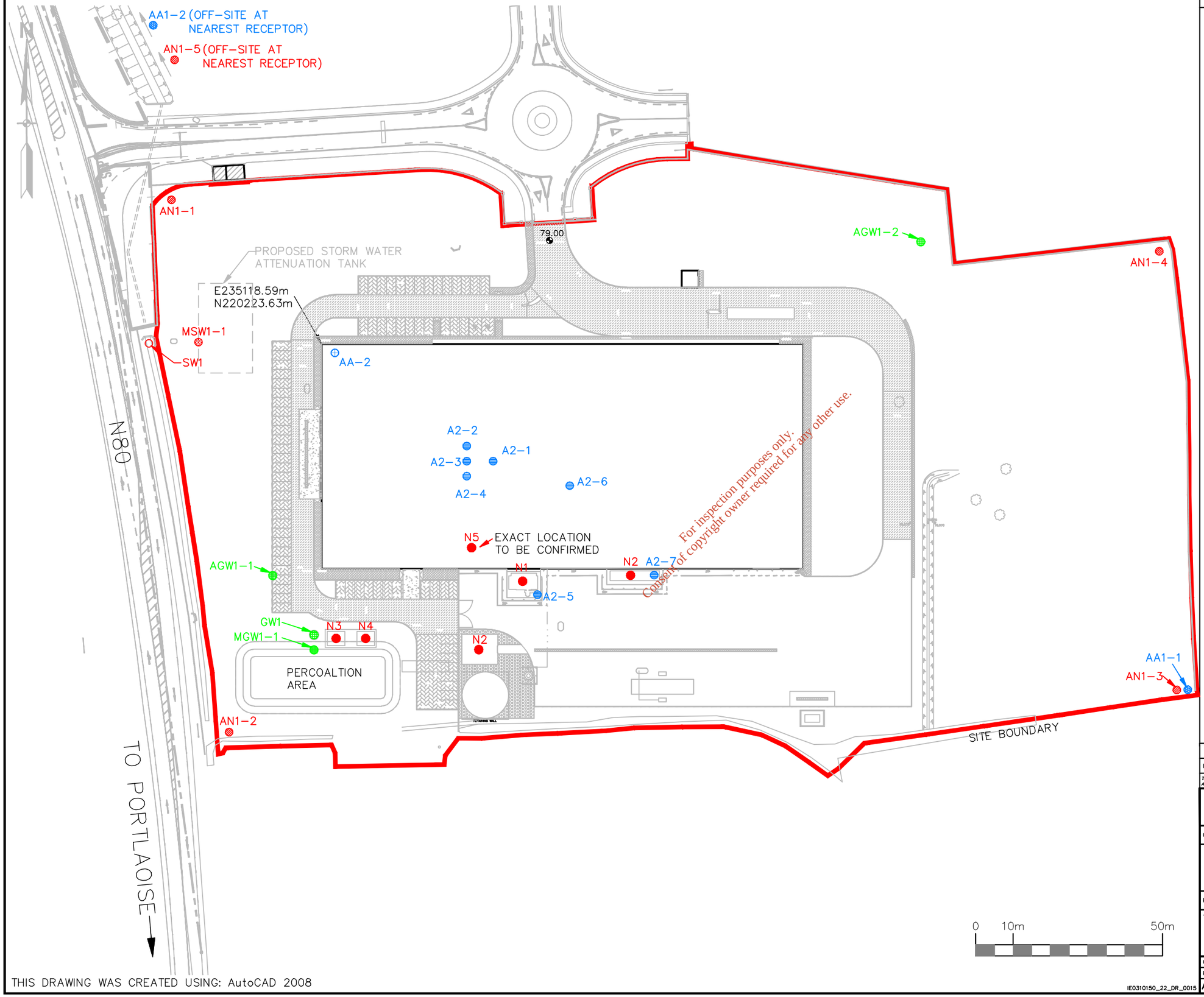
- Appendix E.4 Details of Emissions to Groundwater
  - Table E.4(i) (GW1)

- Appendix E.5 Details of Noise Emissions
  - Table E.5(i)

APPENDIX E.1

EMISSION POINTS

(1 no. drawing)



LEGEND

- A2–1 PRIMARY STACK AIR EMISSION/ MONITORING POINT
- A2–2 GAS ENGINE STACK 1
- A2–3 GAS ENGINE STACK 2
- A2–4 GAS ENGINE STACK 3
- A2–5 REGENERATIVE THERMAL OXIDISER STACK
- A2–6 AIR VENT FROM ODOUR ABATEMENT UNIT
- A2–7 EMERGENCY GENERATOR
- AA1–1 AMBIENT ODOUR MONITORING
- AA1–2 AMBIENT ODOUR MONITORING
- SW1 SURFACE WATER DRAINAGE OUTFALL EMISSION
- MSW1–1 SURFACE WATER MONITORING
- GW1 GROUND WATER PERLOCATION AREA EMISSION
- MGW1–1 WWTP MONITORING CHAMBER
- AGW1–1 GROUND WATER MONITORING WELL
- AGW1–2 GROUND WATER MONITORING WELL
- N1 RTO NOISE EMISSION
- N2 PUMP HOUSE NOISE EMISSION
- N3 TRANSFORMER UNIT
- N4 TRANSFORMER UNIT
- N5 STEAM CONDENSING UNITS
- AN1–1 AMBIENT NOISE MONITORING
- AN1–2 AMBIENT NOISE MONITORING
- AN1–3 AMBIENT NOISE MONITORING
- AN1–4 AMBIENT NOISE MONITORING
- AN1–5 AMBIENT NOISE MONITORING
- AA2 WEATHER STATION

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ISSUE	DESCRIPTION	DRN	ORIG	AUTH CHK	APP	DATE
A	ISSUED FOR WASTE LICENCE	LS	TOS	MD	MD	02/05/12

CLIENT: GLANPOWER LTD

PM GROUP

PROJECT: DERRYCLURE ENERGY CENTRE

TITLE: PROPOSED EMISSION POINTS & MONITORING LOCATIONS

CLIENT REF.	CLIENT DRG No.
PROJECT No. IE0310150	
A3 SCALE 1:1000	PM DRG No. IE0310150-22-DR-0015

APPENDIX E.2

DETAILS OF EMISSIONS TO AIR

TABLE E.1(i) LANDFILL GAS FLARE EMISSIONS TO ATMOSPHERE
Emission Point:

Emission Point Ref. Nº:	Not applicable
Location :	
Grid Ref. (12 digit, 6E,6N):	
Vent Details Diameter: Height above Ground(m):	
Date of commencement of emission:	

Characteristics of Emission :

CO	Not applicable		mg/m^3
Total organic carbon (TOC)	Not applicable		mg/m^3
NOx	Not applicable 0^oC. 3% O_2(Liquid or Gas), 6% O_2(Solid Fuel)		mg/Nm^3
Maximum volume of emission	Not applicable		m^3/hr
Temperature	Not applicable ^oC(max)	^oC(min)	^oC(avg)

(i) Period or periods during which emissions are made, or are to be made, including daily or seasonal variations (*start-up/shutdown to be included):*

Periods of Emission (avg)	Not applicable min/hr Not applicable hr/day Not applicable day/yr

TABLE E.1(ii) MAIN EMISSIONS TO ATMOSPHERE (1 Page for each emission point)

Emission Point Ref. N^{o}:	A2-1
Source of Emission:	Primary Stack (Pyrolysis System Stack)
Location :	Main building – see drawing no. IE0310150-22-DR-0015 (Appendix E.1)
Grid Ref. (12 digit, 6E,6N):	235 161E, 220 194N
Vent Details Diameter: Height above Ground(m):	 0.9m 30m
Date of commencement:	Commissioning / start-up approx. 12 months post commencement construction

Characteristics of Emission :

(i) Volume to be emitted:			
Average/day[1]	610,312 Nm^3/d	Maximum/day[2]	668,291 Nm^3/d
Maximum rate/hour	27,845 Nm^3/h	Min efflux velocity	34.5 m.sec^{-1}
(ii) Other factors			
Temperature	284^{o}C(max)	260^{o}C(min)	272^{o}C(avg)
For Combustion Sources: Volume terms expressed as :	☐ wet.	✓ dry.	11%O_2

(iii) Period or periods during which emissions are made, or are to be made, including daily or seasonal variations (*start-up /shutdown to be included):*

Periods of Emission (avg)[3]	60 min/hr 24 hr/day 333 day/yr

[1] Based on an annual average flowrate of 25,430Nm^3/h and 8,000 hours operation per year.
[2] Based on a maximum 24 hour average flowrate of 27,845Nm^3/h (emissions at this flowrate are representative of maximum daily emissions only and not annual emissions).
[3] Based on average 8,000 hours operation per year.

TABLE E.1(ii) MAIN EMISSIONS TO ATMOSPHERE (1 Page for each emission point)

Emission Point Ref. N^{o}:	A2-2
Source of Emission:	Exhaust Stack 2 – Gas Engine 1
Location :	Main building – see drawing no. IE0310150-22-DR-0015 (Appendix E.1)
Grid Ref. (12 digit, 6E,6N):	235 158E, 220 194N
Vent Details Diameter: Height above Ground(m):	 0.55m 30m
Date of commencement:	Commissioning / start-up approx. 12 months post commencement construction

Characteristics of Emission :

(i) Volume to be emitted:			
Average/day[4]	228,428 Nm^3/d	Maximum/day[5]	250,129 Nm^3/d
Maximum rate/hour	10,422 Nm^3/h	Min efflux velocity	27.6 m.sec^{-1}
(ii) Other factors			
Temperature	150^{o}C(max)	130^{o}C(min)	140^{o}C(avg)
For Combustion Sources: Volume terms expressed as :	☐ wet.	✓ dry.	5%O_2

(iii) Period or periods during which emissions are made, or are to be made, including daily or seasonal variations (*start-up /shutdown to be included):*

Periods of Emission (avg)[6]	60 min/hr	24 hr/day	333 day/yr

[4] Based on an annual average flowrate of 9,518Nm^3/h and 8,000 hours operation per year.
[5] Based on a maximum 24 hour average flowrate of 10,422Nm^3/h (emissions at this flowrate are representative of maximum daily emissions only and not annual emissions).
[6] Based on average 8,000 hours operation per year.

TABLE E.1(ii) MAIN EMISSIONS TO ATMOSPHERE (1 Page for each emission point)

Emission Point Ref. N^{o}:	A2-3
Source of Emission:	Exhaust Stack 3 – Gas Engine 2
Location :	Main building – see drawing no. IE0310150-22-DR-0015 (Appendix E.1)
Grid Ref. (12 digit, 6E,6N):	235 158E, 220 194N
Vent Details Diameter: Height above Ground(m):	 0.55m 30m
Date of commencement:	Commissioning / start-up approx. 12 months post commencement construction

Characteristics of Emission :

(i) Volume to be emitted:			
Average/day[7]	228,428 Nm^3/d	Maximum/day[8]	250,129 Nm^3/d
Maximum rate/hour	10,422 Nm^3/h	Min efflux velocity	27.6 m.sec^{-1}
(ii) Other factors			
Temperature	150^{o}C(max)	130^{o}C(min)	140^{o}C(avg)
For Combustion Sources: Volume terms expressed as :	☐ wet.	✓ dry.	5%O_2

(iii) Period or periods during which emissions are made, or are to be made, including daily or seasonal variations (*start-up /shutdown to be included):*

Periods of Emission (avg)[9]	60 min/hr	24 hr/day	333 day/yr

[7] Based on an annual average flowrate of 9,518Nm^3/h and 8,000 hours operation per year.
[8] Based on a maximum 24 hour average flowrate of 10,422Nm^3/h (emissions at this flowrate are representative of maximum daily emissions only and not annual emissions).
[9] Based on average 8,000 hours operation per year.

TABLE E.1(ii) MAIN EMISSIONS TO ATMOSPHERE (1 Page for each emission point)

Emission Point Ref. N^{o}:	A2-4
Source of Emission:	Exhaust Stack 4 – Gas Engine 3
Location :	Main building – see drawing no. IE0310150-22-DR-0015 (Appendix E.1)
Grid Ref. (12 digit, 6E,6N):	235 158E, 220 193N
Vent Details Diameter: Height above Ground(m):	 0.55m 30m
Date of commencement:	Commissioning / start-up approx. 12 months post commencement construction

Characteristics of Emission :

(i) Volume to be emitted:			
Average/day[10]	228,428 Nm^3/d	Maximum/day[11]	250,129 Nm^3/d
Maximum rate/hour	10,422 Nm^3/h	Min efflux velocity	27.6 m.sec^{-1}
(ii) Other factors			
Temperature	150^{o}C(max)	130^{o}C(min)	140^{o}C(avg)
For Combustion Sources: Volume terms expressed as :	☐ wet.	✓ dry.	5%O_2

(iii) Period or periods during which emissions are made, or are to be made, including daily or seasonal variations (*start-up /shutdown to be included):*

Periods of Emission (avg)[12]	60 min/hr 24 hr/day 333 day/yr

[10] Based on an annual average flowrate of 9,518Nm^3/h and 8,000 hours operation per year.
[11] Based on a maximum 24 hour average flowrate of 10,422Nm^3/h (emissions at this flowrate are representative of maximum daily emissions only and not annual emissions).
[12] Based on average 8,000 hours operation per year.

TABLE E.1(ii) MAIN EMISSIONS TO ATMOSPHERE (1 Page for each emission point)

Emission Point Ref. N^{o}:	A2-5
Source of Emission:	Exhaust Stack 5 – Regenerative Thermal Oxidiser
Location :	Main building – see drawing no. IE0310150-22-DR-0015 (Appendix E.1)
Grid Ref. (12 digit, 6E,6N):	235 176E, 220 164N
Vent Details Diameter: Height above Ground(m):	 0.7m 18.9m
Date of commencement:	Commissioning / start-up approx. 12 months post commencement construction

Characteristics of Emission :

(i) Volume to be emitted:			
Average/day[13]	271,233 Nm^3/d	Maximum/day[14]	297,000 Nm^3/d
Maximum rate/hour	12,375 Nm^3/h	Min efflux velocity	13.2 m.sec^{-1}
(ii) Other factors			
Temperature	140 ^{o}C(max)	120 ^{o}C(min)	130 ^{o}C(avg)
For Combustion Sources: Volume terms expressed as :	☐ wet.	✓ dry.	%O_2[15]

(iii) Period or periods during which emissions are made, or are to be made, including daily or seasonal variations (*start-up /shutdown to be included):*

Periods of Emission (avg)[16]	60 min/hr	24 hr/day	333 day/yr

[13] Based on an annual average flowrate of 11,301Nm^3/h and 8,000 hours operation per year.
[14] Based on a maximum 24 hour average flowrate of 12,375Nm^3/h (emissions at this flowrate are representative of maximum daily emissions only and not annual emissions).
[15] No correction for oxygen or moisture content. Emission at ambient stack conditions.
[16] Based on average 8,000 hours operation per year.

TABLE E.1(ii) MAIN EMISSIONS TO ATMOSPHERE (1 Page for each emission point)

Emission Point Ref. N^{o}:	A2-6
Source of Emission:	Air Vent from Odour Abatement Unit
Location :	Main building – see drawing no. IE0310150-22-DR-0015 (Appendix E.1)
Grid Ref. (12 digit, 6E,6N):	235 210E, 220 164N
Vent Details Diameter: Height above Ground(m):	 1.78m 19m
Date of commencement:	Commissioning / start-up approx. 12 months post commencement construction

Characteristics of Emission :

(i) Volume to be emitted:			
Average/day[17]	1,722,126 Nm^3/d	Maximum/day[18]	1,885,728 Nm^3/d
Maximum rate/hour	78,572 Nm^3/h	Min efflux velocity	8.77 m.sec^{-1}
(ii) Other factors			
Temperature	25 ^{o}C(max)	15 ^{o}C(min)	20 ^{o}C(avg)
For Combustion Sources: Volume terms expressed as :	☐ wet.	✓ dry.	%O_2[19]

(iii) Period or periods during which emissions are made, or are to be made, including daily or seasonal variations (*start-up /shutdown to be included):*

Periods of Emission (avg) [20]	60 min/hr	24 hr/day	365 day/yr

[17] Based on an annual average flowrate of 71,755Nm^3/h and 8,760 hours operation per year.
[18] Based on a maximum 24 hour average flowrate of 78,572Nm^3/h (emissions at this flowrate are representative of maximum daily emissions only and not annual emissions).
[19] No correction for oxygen or moisture content. Emission at ambient stack conditions.
[20] Based on continuous operation (8,760 hours per year).

TABLE E.1(iii): MAIN EMISSIONS TO ATMOSPHERE- Chemical characteristics of the emission (1 table per emission point)

Emission Point Reference Number: A2-1

Parameter[21]	Prior to treatment[(1)]				Brief description of treatment	As discharged[(1)]					
	mg/Nm^3		kg/h			mg/Nm^3		kg/h.		kg/year[22]	
	Avg	Max	Avg	Max		Avg	Max	Avg[23]	Max[24]	Avg	Max
NO_X	260	300	6.61	8.35	Hydraulic loading system excludes nitrogen and oxygen from feed prior to pyrolysis in chamber. Packed bed scrubber. SNCR	170	200	4.32	5.57	34,585	44,552
SO_2	80	100	2.03	2.78	Pyrolysis, packed bed scrubber	40	50	1.02	1.39	8,138	11,138
CO	40	50	1.02	1.39	Combustion control	40	50	1.02	1.39	8,138	11,138
Particulates	2,000	3,000	50.86	83.54	Heavy particles in the gas exiting the pyrolysis chamber are separated via impingement baffle. Fine dust content is then removed by conventional single stage cyclone separator. Remaining entrained particles are removed by pressure drop and impingement during the wet cleaning process (quench tower, packed bed scrubber). Ceramic filters capture	6	10	0.15	0.28	1,221	2,228

[21] Reference conditions are 273K, 101.3kPa, dry gas, 11% oxygen
[22] Based on 8,000 hours per year operation
[23] Based on average daily flowrate of 25,430Nm^3/h
[24] Based on maximum daily flowrate of 27,845Nm^3/h

Parameter[21]	Prior to treatment[(1)]				Brief description of treatment	As discharged[(1)]					
	mg/Nm^3		kg/h			mg/Nm^3		kg/h.		kg/year[22]	
	Avg	Max	Avg	Max		Avg	Max	Avg[23]	Max[24]	Avg	Max
					particulates resulting from char combustion.						
Volatile Organic Compounds (VOCs)	5	10	0.13	0.28	Combustion control	5	10	0.13	0.28	1,017	2,228
Cadmium (Cd) + Thalium (Tl) – Total	0.05	0.1	0.0013	0.0028	Reduction to metallic form by pyrolysis and entrapment in the gas scrubber.	0.01	0.05	0.0003	0.0014	2.03	11.14
Mercury (Hg)	0.02	0.08	0.0005	0.0022	Reduction to metallic form by pyrolysis and entrapment in the gas scrubber.	0.004	0.05	0.0001	0.0014	0.8	11.14
Sb, As, PB, Cr, Co, Cu, Mn, Ni, Va – Total	1.9	2.5	0.0483	0.0696	Reduction to metallic form by pyrolysis and entrapment in the gas scrubber.	0.4	0.5	0.0102	0.0139	81.4	111.4
Dioxins	0.000001	0.000001	2.54^E-8	2.78^E-8	Pyrolysis of feedstock prevents formation of dioxins and the pass through of pre-existing dioxin and related compounds.	8^E-8	1^E-7	2.03^E-9	2.78^E-9	1.63^E-5	2.23^E-5
HCl	0.08	10	0.002	0.2785	Removed and neutralised by wet scrubbing (packed bed scrubber	0.08	10	0.002	0.2785	16.3	2228
HF	0.08	1	0.002	0.0278	Gas scrubbing	0.08	1	0.002	0.0278	16.3	223

1. Concentrations should be based on Normal conditions of temperature and pressure, (i.e. 0^{o}C,101.3kPa). Wet/dry should be the same as given in Table E.1(ii) unless clearly stated otherwise.

TABLE E.1(iii): MAIN EMISSIONS TO ATMOSPHERE- Chemical characteristics of the emission (1 table per emission point)

Emission Point Reference Number: A2-2, A2-3, A2-4

This table is applicable to each gas engine stack / emission point (A2-2, A2-3 and A2-4).

Parameter[25]	Prior to treatment[(1)]				Brief description of treatment	As discharged[(1)]					
	mg/Nm^3		kg/h			mg/Nm^3		kg/h.		kg/year[26]	
	Avg	Max	Avg	Max		Avg	Max	Avg[27]	Max[28]	Avg	Max
NO_X	500	500	4.76	5.21	SCR	50	50	1.27	1.39	10,172	27,845
CO	2,220	2,220	21.13	23.14	Combustion control	50	50	1.27	1.39	10,172	11,138
Particulates	To be confirmed pending final selection of engine manufacturer				Syngas scrubbing and conditioning	To be confirmed pending final selection of engine manufacturer					
Volatile Organic Compounds (VOCs)					Combustion control						

1. Concentrations should be based on Normal conditions of temperature and pressure, (i.e. 0^{o}C,101.3kPa). Wet/dry should be the same as given in Table E.1(ii) unless clearly stated otherwise.

[25] Reference conditions are 273K, 101.3kPa, dry gas, 5% oxygen
[26] Based on 8,000 hours per year operation
[27] Based on average daily flowrate of 9,518Nm^3/h
[28] Based on maximum daily flowrate of 10,422Nm^3/h

TABLE E.1(iii): MAIN EMISSIONS TO ATMOSPHERE- Chemical characteristics of the emission (1 table per emission point)

Emission Point Reference Number: A2-5

Parameter	Prior to treatment[1]				Brief description of treatment	As discharged[1]					
	Odour Unit/Nm^3		**Odour Unit/h**			**Odour Unit/Nm^3**		**Odour Unit/h**		**Odour Unit/year**[29]	
	Avg	Max	Avg	Max		Avg	Max	Avg	Max	Avg	Max
Odour	2,000	4,000	2.26×10^7	4.95×10^7	Regenerative Thermal Oxidiser	500	500	5.65×10^6	6.19×10^6	4.52×10^{10}	4.95×10^{10}

1. Concentrations should be based on Normal conditions of temperature and pressure, (i.e. 0^{o}C,101.3kPa). Wet/dry should be the same as given in Table E.1(ii) unless clearly stated otherwise.

[29] Based on continuous operation (8,760 hours per year)

TABLE E.1(iii): MAIN EMISSIONS TO ATMOSPHERE- Chemical characteristics of the emission (1 table per emission point)

Emission Point Reference Number: A2-6

Parameter	Prior to treatment(1)				Brief description of treatment	As discharged(1)					
	Odour Unit/Nm^3		**Odour Unit/h**			**Odour Unit/Nm^3**		**Odour Unit/h**		**Odour Unit/year**	
	Avg	Max	Avg	Max		Avg	Max	Avg	Max	Avg	Max
Odour	2,000	4,000	1.43×10^8	3.14×10^8	Odour abatement unit (UV / ionisation / ozone based system)	500	500	3.59×10^7	3.93×10^7	3.14×10^{11}	3.44×10^{11}

1. Concentrations should be based on Normal conditions of temperature and pressure, (i.e. 0^oC,101.3kPa). Wet/dry should be the same as given in Table E.1(ii) unless clearly stated otherwise.

TABLE E.1(iv): EMISSIONS TO ATMOSPHERE - Minor /Fugitive

Emission point Reference Numbers	Description	Emission details[1]				Abatement system employed
		material	mg/Nm$^{3(2)}$	kg/h.	kg/year	
A2-7	Emergency Generator	NO_X	500	To be confirmed during detailed design		Maintenance as per supplier recommendation
		CO	650			Maintenance as per supplier recommendation
		TOC	150			Maintenance as per supplier recommendation
		Particulates	100			Maintenance as per supplier recommendation

1 The maximum emission should be stated for each material emitted, the concentration should be based on the maximum 30 minute mean.
2 Concentrations should be based on Normal conditions of temperature and pressure, (i.e. 0^{o}C101.3kPa). Wet/dry should be clearly stated. Include reference oxygen conditions for combustion sources.

APPENDIX E.3

DETAILS OF EMISSIONS TO SURFACE WATER

TABLE E.2(i): EMISSIONS TO SURFACE WATERS
(One page for each emission)

Emission Point:

Emission Point Ref. N^{o}:	SW1
Source of Emission:	Surface water drainage outfall
Location :	Outfall to drainage ditch network west of site See drawing no. IE0310150-22-DR-0015 (included as Appendix E.1)
Grid Ref. (10 digit, 5E,5N):	23507E, 22022N
Name of receiving waters:	Drainage ditch network through site ultimately discharges to the Clodiagh River, approximately 5km to the west of the site.
Flow rate in receiving waters[30]:	0.019 $m^3.sec^{-1}$ Dry Weather Flow 0.059 $m^3.sec^{-1}$ 95%ile flow
Available waste assimilative capacity:	Not available ~~kg/day~~

Emission Details:

(i) Volume to be emitted			
Normal/day[31]	31.2m^3	Maximum/day[32]	743.9m^3
Maximum rate/hour[33]	31.0m^3		

(ii) Period or periods during which emissions are made, or are to be made, including daily or seasonal variations (*start-up /shutdown to be included):*

Periods of Emission (avg)	Dependent on rainfall – normal volumetric flow rate stated above assumes continuous discharge based on annual average rainfall

[30] Flow rate in river Clodiagh taken from recording at Gorteen monitoring station (Summary of low flow statistics at selected hydrometric stations - June 2011, EPA).

[31] Flow dependent on periods of rainfall. Normal flow averaged over yearly rainfall of 950mm and non-permeable collection area of 12,000m^2 (1.2ha)
[32] Based on maximum discharge of 8.62l/s
[33] Based on maximum discharge of 8.62l/s

TABLE E.3(i): EMISSIONS TO SEWER (One page for each emission)

Emission Point:

Emission Point Ref. Nº:	Not applicable
Location of connection to sewer :	
Grid Ref. (10 digit, 5E,5N):	
Name of sewage undertaker:	

Emission Details:

(i) Volume to be emitted			
Normal/day	Not applicable m^3	Maximum/day	Not applicable m^3
Maximum rate/hour	Not applicable m^3		

(ii) Period or periods during which emissions are made, or are to be made, including daily or seasonal variations (*start-up /shutdown to be included):*

Periods of Emission (avg)	Not applicable

TABLE E.3(ii): EMISSIONS TO SEWER - Characteristics of the emission (1 table per emission point)

Emission point reference number: Not applicable

Parameter	Prior to treatment				As discharged				% Efficiency
	Max. hourly average (mg/l)	Max. daily average (mg/l)	kg/day	kg/year	Max. hourly average (mg/l)	Max. daily average (mg/l)	kg/day	kg/year	
Not applicable									

APPENDIX E.4

DETAILS OF EMISSIONS TO GROUNDWATER

TABLE E.4(i): EMISSIONS TO GROUNDWATER (1 Page for each emission point)

Emission Point or Area:

Emission Point/Area Ref. N^{o}:	GW1
Emission Pathway: (borehole, well, percolation area, soakaway, landspreading, etc.)	Percolation area
Location :	South-west corner of site See drawing no. IE0310150-22-DR-0015 (included as Appendix E.1)
Grid Ref. (10 digit, 5E,5N):	23512E, 22015N
Elevation of discharge: (relative to Ordnance Datum)	Trench invert level 0.5m above ground level
Aquifer classification for receiving groundwater body:	LI (Locally important)
Groundwater vulnerability assessment (including vulnerability rating):	H (High)
Identity and proximity of groundwater sources at risk (wells, springs, etc):	No wells within 1km of site. Figure 7.8 of the EIS shows the location of groundwater wells in the regions surrounding the site. The nearest groundwater well is located a minimum distance of 1.5km east of the site.
Identity and proximity of surface water bodies at risk:	River Clodiagh - 5km from site

Emission Details:

(i) Volume to be emitted			
Normal/day	<1.5 m^3	Maximum/day	1.5 m^3
Maximum rate/hour	0.0625 m^3		

(ii) Period or periods during which emissions are made, or are to be made, including daily or seasonal variations (*start-up /shutdown to be included):*

Periods of Emission (avg)	60 min/hr 24 hr/day 365 day/yr

APPENDIX E.5

DETAILS OF NOISE EMISSIONS

Table E.5(i): NOISE EMISSIONS - Noise sources summary sheet

Source	Emission point Ref. No	Equipment Ref. No	Sound Pressure[1] dBA at reference distance	Octave bands (Hz) Sound Pressure[1] Levels dB(unweighted) per band									Impulsive or tonal qualities	Periods of Emission
				31.5	63	125	250	500	1K	2K	4K	8K		
Regenerative Thermal Oxidiser	N1													
Pump House	N2													
Transformer	N3													
Transformer	N4													
Steam Condensing Units	N5													

1. For items of plant sound power levels may be used.

APPENDIX F

CONTROL & MONITORING - SUPPORTING INFORMATION

(30 pages)

- Appendix F.1 Certificates of Analysis for Syngas Composition
- Appendix F.2 Details of Abatement/Treatment of Emissions to Air
  - Table F.1 (A2-1)
  - Table F.1 (A2-2 / A2-3 / A2-4)
  - Table F.1 (A2-5)
  - Table F.1 (A2-6)
  - Table F.1 (A2-7)
- Appendix F.3 Details of Abatement/Treatment of Emissions to Surface Water
  - Table F.1 (SW-1)
- Appendix F.4 Details of Abatement/Treatment of Emissions to Groundwater
  - Table F.1 (GW-1)
- Appendix F.5 Monitoring & Sampling for Point Emissions to Air
  - Table F.2 (A2-1)
  - Table F.2 (A2-2 / A2-3 / A2-4)
  - Table Ff (AA1-1 / AA1-2)
- Appendix F.6 Monitoring & Sampling for Point Emissions to Surface Water
  - Table F.2 (SW-1)
- Appendix F.7 Monitoring & Sampling for Point Emissions to Groundwater
  - Table F.2 (GW-1)
- Appendix F.8 Monitoring & Sampling for Fugitive Emissions to Groundwater
  - Table Ff (AGW1-1, AGW1-2)
- Appendix F.9 Monitoring & Sampling for Fugitive Noise Emissions
  - Table Ff (AN1, AN2, AN3, AN4, AN5)
- Appendix F.10 Meteorological Monitoring & Sampling
  - Table Ff (AA2)

APPENDIX F.1

CERTIFICATES OF ANALYSIS

SYNGAS COMPOSITION

(3 pages)

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TEST REPORT

Certificate No.	111-7955 Page 1 of 3
Date received	12.12.11
Analysis completed	21.12.11
Ref.	Catalyst/GA/111-7955

Results of Analysis of Tedlar Gas Bag Samples-CDU-0060

Gas Composition-Sample Analysis (% v/v) (Bag)- (Results expressed at 273K, 1 atm pressure)

Test Parameter	1.CDU-0060-R1 Tedlar Bag	2.CDU-0060-R2 Tedlar Bag	3.CDU-0060-R3 Tedlar bag	4.CDU-0060-R4 Tedlar Bag
Description	**Discharge Stack**	**Discharge Stack**	**Discharge Stack**	**Discharge Stack**
MSSL Ref.	**111-7955**	**111-7956**	**111-7957**	**111-7958**
Hydrogen	2.91	2.80	3.25	3.41
Oxygen	1.22	1.39	1.40	1.56
Nitrogen	9.37	10.56	7.61	10.06
Carbon Monoxide	12.23	11.99	12.39	10.25
Methane	42.61	40.05	40.29	39.76
Carbon Dioxide	20.81	22.47	22.61	24.27
Ethene	4.11	4.86	5.09	4.16
Ethane	1.01	1.24	1.82	2.23
Propene	4.59	3.77	3.60	3.30
Propane	0.61	0.23	0.45	0.59
C4	0.49	0.62	1.41	0.35
C5	0.04	0.02	0.08	0.06
Total Volume	100.00	100.00	100.00	100.00
CV (MJ/m^3)#	25.60	24.11	25.89	23.42

Results are expressed as Gross CV by calculation (includes all above components)

Gas Composition-Sample Analysis (% v/v) (Bag)- (Results expressed at 273K, 1 atm pressure)

Test Parameter	5.CDU-0060-R5 Tedlar Bag	2.CDU-0060-R6 Tedlar Bag
Description	**Discharge Stack**	**Discharge Stack**
MSSL Ref.	**111-7959**	**111-7960**
Hydrogen	2.79	3.61
Oxygen	1.02	1.59
Nitrogen	9.22	8.26
Carbon Monoxide	11.10	11.79
Methane	42.40	40.83
Carbon Dioxide	23.18	22.97
Ethene	3.99	4.24
Ethane	2.00	1.69
Propene	3.33	4.20
Propane	0.66	0.43
C4	0.28	0.37
C5	0.03	0.02
Total Volume	100.00	100.00
CV (MJ/m^3)#	24.69	24.89

Results are expressed as Gross CV by calculation (includes all above components)

Other Specified Compound Analysis (% v/v) (Bag)- (Results expressed at 273K, 1 atm pressure)

Test Parameter	1.CDU-0060-R1 Tedlar Bag	2.CDU-0060-R2 Tedlar Bag	3.CDU-0060-R3 Tedlar bag	4.CDU-0060-R4 Tedlar Bag
Description	**Discharge Stack**	**Discharge Stack**	**Discharge Stack**	**Discharge Stack**
MSSL Ref.	**111-7955**	**111-7956**	**111-7957**	**111-7958**
Hydrogen Sulphide	<0.01	<0.01	<0.01	<0.01
1,2-Dichloroethane	<0.01	<0.01	<0.01	<0.01
Vinyl Chloride	<0.01	<0.01	<0.01	<0.01
Tetrachloroethene	<0.01	<0.01	<0.01	<0.01
1,1,2-Trichloroethane	<0.01	<0.01	<0.01	<0.01
Chlorobenzene	<0.01	<0.01	<0.01	<0.01
Dichloromethane	<0.01	<0.01	<0.01	<0.01
Tetrachloroethane	<0.01	<0.01	<0.01	<0.01
Trichloroethene	<0.01	<0.01	<0.01	<0.01
PAHs (naphthalene)	<0.01	<0.01	<0.01	<0.01

Test Parameter	5.CDU-0060-R5 Tedlar Bag	2.CDU-0060-R6 Tedlar Bag
Description	**Discharge Stack**	**Discharge Stack**
MSSL Ref.	**111-7959**	**111-7960**
Hydrogen Sulphide	<0.01	<0.01
1,2-Dichloroethane	<0.01	<0.01
Vinyl Chloride	<0.01	<0.01
Tetrachloroethene	<0.01	<0.01
1,1,2-Trichloroethane	<0.01	<0.01
Chlorobenzene	<0.01	<0.01
Dichloromethane	<0.01	<0.01
Tetrachloroethane	<0.01	<0.01
Trichloroethene	<0.01	<0.01
PAHs (naphthalene)	<0.01	<0.01

…… J.Fursman (For/on behalf of Marchwood Scientific Services Ltd)

APPENDIX F.2

DETAILS OF ABATEMENT/TREATMENT OF EMISSIONS TO AIR

TABLE F.1 (A2-1): ABATEMENT / TREATMENT CONTROL

Emission point reference number *:* A2-1

Control[1] parameter	Equipment [2]	Equipment maintenance	Equipment calibration	Equipment back-up	Monitoring to be carried out[3]	Monitoring equipment	Monitoring equipment calibration
NO_X	Hydraulic loading system, packed bed scrubber, SNCR.	As per supplier recommendation and licence requirement	As per supplier recommendation and licence requirement	Spare parts as per supplier recommendation	Continuous	ABB automatic system (ACF-NT) or equivalent	As per supplier recommendation and licence requirement
SO_2	Pyrolysis, packed bed scrubber	As above	As above	Spare parts as per supplier recommendation	Continuous	ABB automatic system (ACF-NT) or equivalent	As above
CO	Combustion control	As above	As above	Two pyrolysis units operate in parallel	Continuous	ABB automatic system (ACF-NT) or equivalent	As above
TOC	Combustion control	As above	As above	Two pyrolysis units operate in parallel	Continuous	ABB automatic system (ACF-NT) or equivalent	As above
Particulates	Impingement baffle post pyrolyis chamber, cyclone separator, quench tower, packed bed scrubber, ceramic filters	As above	As above	Two pyrolysis units operate in parallel. Spare parts on gas scrubbing and conditioning equipment, as per supplier recommendation	Continuous	Photometer	As above
Cadmium (Cd) + Thalium (Tl)	Pyrolysis chamber and gas scrubber	As above	As above	Two pyrolysis units operate in parallel. Spare parts as per supplier recommendation	Quarterly year one. Biannual thereafter, subject to EPA agreement	Sampling and analysis by MCERTS accredited laboratory	As above

Control[1] parameter	Equipment [2]	Equipment maintenance	Equipment calibration	Equipment back-up	Monitoring to be carried out[3]	Monitoring equipment	Monitoring equipment calibration
Mercury (Hg)	Pyrolysis chamber, gas scrubber	As above	As above	Two pyrolysis units operate in parallel. Spare parts as per supplier recommendation	Quarterly year one. Biannual thereafter, subject to EPA agreement	Sampling and analysis by MCERTS accredited laboratory	As above
Sb, As, PB, Cr, Co, Cu, Mn, Ni, Va	Pyrolysis chamber, gas scrubber	As above	As above	Two pyrolysis units operate in parallel. Spare parts as per supplier recommendation	Quarterly year one. Biannual thereafter, subject to EPA agreement	Sampling and analysis by MCERTS accredited laboratory	As above
Dioxins	Pyrolysis chamber	As above	As above	Two pyrolysis units operate in parallel.	Quarterly year one. Biannual thereafter, subject to EPA agreement	Sampling and analysis by MCERTS accredited laboratory	As above
HCl	Gas scrubber	As above	As above	Spare parts as per supplier recommendation	Continuous	ABB automatic system (ACF-NT) or equivalent	As above
HF	Gas scrubber	As above	As above	Spare parts as per supplier recommendation	Continuous	ABB automatic system (ACF-NT) or equivalent	As above

[1] List the operating parameters of the treatment / abatement system which control its function.
[2] List the equipment necessary for the proper function of the abatement / treatment system.
[3] List the monitoring of the control parameter to be carried out.

TABLE F.1 (A2-2, A2-3, A2-4): ABATEMENT / TREATMENT CONTROL

Emission point reference number *:* A2-2, A2-3, A2-4

This table is applicable to each of the three syngas engine stacks (A2-2, A2-3 and A2-4).

Control[1] parameter	Equipment [2]	Equipment maintenance	Equipment calibration	Equipment back-up	Monitoring to be carried out[3]	Monitoring equipment	Monitoring equipment calibration
NO_x	SCR	As per supplier recommendation and licence requirement	As per supplier recommendation and licence requirement	Spare parts as per supplier recommendation	Quarterly	By external accredited body	As per supplier recommendation and licence requirement
CO	Combustion control	As above	As above	Three gas engines operating in parallel	Quarterly	By external accredited body	As above
Particulates	Syngas scrubbing and conditioning	As above	As above	Two syngas lines, each with separate syngas scrubbing and conditioning systems, spare parts as per supplier recommendation	Quarterly	By external accredited body	As above
Volatile Organic Compounds (VOCs)	Combustion control	As above	As above	Three gas engines operating in parallel	Quarterly	By external accredited body	As above

[1] List the operating parameters of the treatment / abatement system which control its function.
[2] List the equipment necessary for the proper function of the abatement / treatment system.
[3] List the monitoring of the control parameter to be carried out.

TABLE F.1 (A2-5): ABATEMENT / TREATMENT CONTROL

Emission point reference number *:* A2-5

Control[1] parameter	Equipment [2]	Equipment maintenance	Equipment calibration	Equipment back-up	Monitoring to be carried out[3]	Monitoring equipment	Monitoring equipment calibration
Odour	Regenerative Thermal Oxidiser	As per supplier recommendation and licence requirement	As per supplier recommendation and licence requirement	Spare parts as per supplier recommendation	Ambient	Not applicable (sniff test)	As per supplier recommendation and licence requirement

[1] List the operating parameters of the treatment / abatement system which control its function.
[2] List the equipment necessary for the proper function of the abatement / treatment system.
[3] List the monitoring of the control parameter to be carried out.

TABLE F.1 (A2-6): ABATEMENT / TREATMENT CONTROL

Emission point reference number *:* A2-6

Control[1] parameter	Equipment [2]	Equipment maintenance	Equipment calibration	Equipment back-up	Monitoring to be carried out[3]	Monitoring equipment	Monitoring equipment calibration
Odour	Odour abatement unit (UV / ionisation / ozone based treatment system)	As per supplier recommendation and licence requirement	As per supplier recommendation and licence requirement	Spare parts as per supplier recommendation	Ambient	Not applicable (sniff test)	As per supplier recommendation and licence requirement

[1] List the operating parameters of the treatment / abatement system which control its function.
[2] List the equipment necessary for the proper function of the abatement / treatment system.
[3] List the monitoring of the control parameter to be carried out.

TABLE F.1 (A2-7): ABATEMENT / TREATMENT CONTROL

Emission point reference number *:* A2-7

Control[1] parameter	Equipment [2]	Equipment maintenance	Equipment calibration	Equipment back-up	Monitoring to be carried out[3]	Monitoring equipment	Monitoring equipment calibration
NO_X	Combustion control system	As per supplier recommendation and licence requirement	As per supplier recommendation and licence requirement	Spare parts as per supplier recommendation	Emissions monitoring once during commissioning phase. Weekly generator testing.	Sampling and analysis by accredited laboratory.	Independent laboratory procedures
CO	As above	As above	As above	As above	As above	As above	As above
TOC	As above	As above	As above	As above	As above	As above	As above
Particulates	As above	As above	As above	As above	As above	As above	As above

[1] List the operating parameters of the treatment / abatement system which control its function.
[2] List the equipment necessary for the proper function of the abatement / treatment system.
[3] List the monitoring of the control parameter to be carried out.

APPENDIX F.3

DETAILS OF ABATEMENT/TREATMENT OF EMISSIONS TO SURFACE WATER

TABLE F.1 (SW-1): ABATEMENT / TREATMENT CONTROL

Emission point reference number *:* SW1

Control[1] parameter	Equipment [2]	Equipment maintenance	Equipment calibration	Equipment back-up	Monitoring to be carried out[3]	Monitoring equipment	Monitoring equipment calibration
Flow	Contaminated surface water will be held in attenuation tank	As per supplier recommendation and licence requirement	As per supplier recommendation and licence requirement	Not applicable	Continuous	Flow meter / multi-component sampling unit	As per supplier recommendation and licence requirement
pH	As above	As above	As above	Not applicable	Continuous	As above	As above
TOC	As above	As above	As above	Not applicable	Continuous	As above	As above
Conductivity	As above	As above	As above	Not applicable	Continuous	As above	As above
Temperature	As above	As above	As above	Not applicable	Continuous	As above	As above

[1] List the operating parameters of the treatment / abatement system which control its function.
[2] List the equipment necessary for the proper function of the abatement / treatment system.
[3] List the monitoring of the control parameter to be carried out.

APPENDIX F.4

DETAILS OF ABATEMENT/TREATMENT OF EMISSIONS TO GROUNDWATER

TABLE F.1 (GW-1): ABATEMENT / TREATMENT CONTROL

Emission point reference number *:* GW-1

Control[1] parameter	Equipment [2]	Equipment maintenance	Equipment calibration	Equipment back-up	Monitoring to be carried out[3]	Monitoring equipment	Monitoring equipment calibration
Biological Oxygen Demand (BOD)	Aswaflow package treatment system	As per supplier recommendation and licence requirement	As per supplier recommendation and licence requirement	Spare parts as recommended by supplier	Quarterly	Sampling and analysis by external accredited laboratory	As per supplier recommendation and licence requirement (where necessary)
Chemical Oxygen Demand (COD)	As above	As above	As above	As above	Quarterly	As above	As above
Total Suspended Solids (TSS)	As above	As above	As above	As above	Quarterly	As above	As above

[1] List the operating parameters of the treatment / abatement system which control its function.
[2] List the equipment necessary for the proper function of the abatement / treatment system.
[3] List the monitoring of the control parameter to be carried out.

APPENDIX F.5

MONITORING & SAMPLING FOR EMISSIONS TO AIR

TABLE F.2 (A2-1): EMISSIONS MONITORING AND SAMPLING POINTS - (1 table per media)

Emission Point Reference No(s). : A2-1

Parameter	Monitoring frequency	Accessibility of Sampling Points
NO_x	Continuous	All sampling points will be located at a high level on the stack connecting to the monitoring equipment at ground level. Both points and equipment will be located within the Energy Centre building and will be accessible at all times to nominated Glanpower personnel. Access to the stack will be via permanent platform, to be designed in line with Section 3.1 of EPA Guidance Note AG1 referenced below). Access will be suitable for external personnel carrying out independent monitoring, verification and/or inspection. The sampling points will be designed and located at detailed design stage (ongoing), in accordance with the requirements of the EPA Guidance Note on Site Safety Requirements for Air Emissions Monitoring (AG1) and IS EN 15259:2007 Air Quality – Measurement of stationary source emissions – Requirements for measurement sections and sites and for the measurement objective, plan and report.
SO_2	Continuous[1]	
CO	Continuous	
TOC	Continuous	
Particulates (total dust)	Continuous	
HCl	Continuous[1]	
HF	Continuous[1, 2]	
Cadmium (Cd) + Thalium (Ti)	Year 1: Quarterly. Biannual thereafter	
Mercury (Hg)		
Heavy metals (Sb + As + Pb + Cr + Co + Cu + Mn + Ni + V)	Year 1: Quarterly. Biannual thereafter[3]	
Dioxins and furans (PCDD/F)	Year 1: Quarterly. Biannual thereafter[3]	

[1] If following a period of 2 years, whereby maximum emissions of SO_2 / HCl / HF are demonstrated to be no higher than the prescribed emission limit values, the monitoring frequency for SO_2 / HCl / HF may be reduced in the future from continuous to periodic measurements, subject to the prior agreement of the EPA and in accordance with Article 11 Paragraph 6 of the Waste Incineration Directive.

[2] HCl is highly soluble in water and is treated (removed and neutralised) in the wet scrubbing process. Subject to demonstrated compliance with the prescribed emission limit value for HCl and the prior agreement of the EPA, the monitoring frequency for HF may in future be reduced from continuous to periodic measurements, in accordance with Article 11 Paragraph 4 of the Waste Incineration Directive.

[3] Monitoring of heavy metals and dioxins+furans will be carried out on a quarterly basis for at least the first 12 months of operation. Subject to demonstrated compliance with prescribed emission limit values and the prior agreement of the EPA, the monitoring frequency for heavy metals and dioxins+furans may in future be reduced to a minimum of two measurements per year. This is in accordance with Article 11 Paragraph 2(c) of the Waste Incineration Directive.

TABLE F.2 (A2-2 / A2-3 / A2-4): EMISSIONS MONITORING AND SAMPLING POINTS - (1 table per media)

Emission Point Reference No(s). : A2-2 / A2-3 / A2-4

This table is applicable to each of the three monitoring points A2-2, A2-3 and A2-4.

Parameter	Monitoring frequency	Accessibility of Sampling Points
NO_x	Quarterly	The sampling points will be designed and located at detailed design stage (ongoing), in accordance with the requirements of the EPA Guidance Note on Site Safety Requirements for Air Emissions Monitoring (AG1) and IS EN 15259:2007 Air Quality – Measurement of stationary source emissions – Requirements for measurement sections and sites and for the measurement objective, plan and report.
CO	Quarterly	
TOC	Quarterly	
Particulates (total dust)	Quarterly	

TABLE Ff (AA1-1 / AA1-2): Fugitive ENVIRONMENT MONITORING AND SAMPLING LOCATIONS (1 table per media)

Monitoring Point Reference No : AA1-1 / AA1-2

This table applies to site boundary locations for ambient odour monitoring (locations weather dependent) and monitoring required at the nearest off-site receptor.

Parameter	Monitoring frequency	Accessibility of Sampling point
Odour	Routine (weather dependent) and in response to complaints	On-site boundary locations are easily and safely accessed. Where monitoring is required at the nearest receptor, this may be access on foot or by car using the public road N80. Subject to wind direction, indicative locations for upwind and downwind monitoring locations are shown on the drawing included as Appendix E.1 (drawing no. IE0310150-22-DR-0015). These locations reflect worst case wind conditions for emission of odour from the facility to the nearest receptor.

APPENDIX F.6

MONITORING & SAMPLING FOR POINT EMISSIONS TO SURFACE WATER

TABLE F.2 (SW-1) : EMISSIONS MONITORING AND SAMPLING POINTS - (1 table per media)

Emission Point Reference No(s). : MSW-1

Parameter	Monitoring frequency	Accessibility of Sampling Points
Flow	Continuous	The sampling point will be accessible via above ground chamber located at the inlet of the underground attenuation tank
pH	Continuous	As above
TOC	Continuous	As above
Conductivity	Continuous	As above
Temperature	Continuous	As above

APPENDIX F.7

MONITORING & SAMPLING FOR POINT EMISSIONS TO GROUNDWATER

TABLE F.2 (GW-1) : EMISSIONS MONITORING AND SAMPLING POINTS - (1 table per media)

Emission Point Reference No(s). : MGW-1

Parameter	Monitoring frequency	Accessibility of Sampling Points
Biological Oxygen Demand (BOD)	Quarterly	Dedicated sampling chamber located above ground at the package wastewater treatment unit
Chemical Oxygen Demand (COD)	Quarterly	As above
Total Suspended Solids (TSS)	Quarterly	As above

APPENDIX F.8

MONITORING & SAMPLING FOR FUGITIVE EMISSIONS TO GROUNDWATER

TABLE Ff (AGW1-1, AGW1-2): Fugitive ENVIRONMENT MONITORING AND SAMPLING LOCATIONS - (1 table per media)

Monitoring Point Reference No. : AGW1-1, AGW1-2

Parameter	Monitoring frequency	Accessibility of Sampling Points
TOC	Monthly	Standard groundwater well accessed from ground level. Specialist monitoring equipment required (specialist external contractor).
Ammonia	Monthly	As above
Conductivity	Monthly	As above
pH	Biannually	As above
Nitrate	Biannually	As above
Nitrite	Biannually	As above
Chloride	Biannually	As above
Metals (Cd, Tl, Hg, Pb, Cr, Cu, Mn, Ni, As, Co, V, Sn) and their compounds	Biannually	As above
Organohalogens	Biannually	As above

APPENDIX F.9

MONITORING & SAMPLING FOR NOISE EMISSIONS

TABLE Ff (AN1, AN2, AN3, AN4, AN5): Fugitive ENVIRONMENT MONITORING AND SAMPLING LOCATIONS (1 table per media)

Monitoring Point Reference No : AN1, AN2, AN3, AN4

Parameter	Monitoring frequency	Accessibility of Sampling point
L_{Aeq}	Annual	Site boundary noise monitoring locations AN1, AN2, AN3 and AN4 are located at the site boundary and are easily accessible by foot from the Glanpower Energy Centre (ref. drawing Appendix E.1)
L_{A90}	Annual	
L_{A50}	Annual	
L_{A10}	Annual	
L_{Amax}	Annual	

Monitoring Point Reference No : AN5

Parameter	Monitoring frequency	Accessibility of Sampling point
L_{Aeq}	Annual	The noise sensitive location is located on the roadside of the public road N80 and may be accessed by a short walk or drive (depending on weather conditions) from the Glanpower facility (ref. drawing Appendix E.1)
L_{A90}	Annual	
L_{A50}	Annual	
L_{A10}	Annual	
L_{Amax}	Annual	

APPENDIX F.10

METEOROLOGICAL MONITORING & SAMPLING

TABLE Ff (AA2): Fugitive ENVIRONMENT MONITORING AND SAMPLING LOCATIONS (1 table per media)

Monitoring Point Reference No : AA2

Parameter	Monitoring frequency	Accessibility of Sampling point
Wind speed	Continuous	Subject to detailed design (ongoing) and agreement of the EPA, the meteorological monitoring station will be located as shown on the drawing included as Appendix E.1 (drawing no. IE0310150-22-DR-0015).
Wind direction	Continuous	
Atmospheric pressure	Continuous	
Precipitation	Daily	
Temperature	Daily	

APPENDIX G

RESOURCE USE & ENERGY EFFICIENCY

FURTHER INFORMATION

- G.1: Calculation of Energy Efficiency in accordance with Waste Framework Directive 'R1 Formula'
- G.2: Primary Energy Savings (PES) for High Efficiency CHP Plant

APPENDIX G.1

CALCULATION OF ENERGY EFFICIENCY IN ACCORDANCE WITH WASTE FRAMEWORK DIRECTIVE 'R1 FORMULA'

(2 pages)

The Waste Framework Directive 2009/98/EC defines 'recovery' as:

- 'Recovery' means any operation the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy. Annex II sets out a non-exhaustive list of recovery operations.

For the Glanpower facility the two key relevant recovery operations listed in Annex II of the Directive are:

- R 1 Use principally as a fuel or other means to generate energy.
- R 12 Exchange of waste for submission to any of the operations numbered R 1 to R 11.

With regard to R 1, this is further defined as including incineration facilities dedicated to the processing of municipal solid waste only where their energy efficiency is equal to or above:

- 0.60 for installations in operation and permitted in accordance with applicable Community legislation before 1 January 2009.
- 0.65 for installations permitted after 31 December 2008, using the following formula.
- Energy efficiency = (Ep - (Ef + Ei)) / (0.97 × (Ew + Ef))

In which:

- Ep means annual energy produced as heat or electricity. It is calculated with energy in the form of electricity being multiplied by 2.6 and heat produced for commercial use multiplied by 1.1 (GJ/year).
- Ef means annual energy input to the system from fuels contributing to the production of steam (GJ/year).
- Ew means annual energy contained in the treated waste calculated using the net calorific value of the waste (GJ/year).
- Ei means annual energy imported excluding Ew and Ef (GJ/year).
- 0.97 is a factor accounting for energy losses due to bottom ash and radiation.

This formula shall be applied in accordance with the reference document on Best Available Techniques for waste incineration.

Note, with regard to the definition of R 12, if there is no other R code appropriate, this can include preliminary operations prior to recovery including pre-processing such as, inter alia, dismantling, sorting, crushing, compacting, pelletising, drying, shredding, conditioning, repackaging, separating, blending or mixing prior to submission to any of the operations numbered R 1 to R 11.

For Glanpower the preparation of the Solid Recovered Fuel (SRF) from non-hazardous fractions of waste, i.e. sorting, separation and drying, falls within the

definition of R 12. The second part of the Glanpower facility is the use of this SRF as a fuel to generate energy, which falls under the definition of R 1.

For the R 1 process the fuel input equates to two lines each of 3.9 tonnes per hour, assuming an 18 MJ/kg of calorific input for the SRF, this equates to 39 MW.

Assuming 8,000 hrs of operation (pyrolysis) per year, then Ew equals: (39 x 3,600 x 8,000) / 1,000 = 1,123,200 GJ/year

The electricity output from the R 1 facility will comprise three no. 3.2 MW gas engines (9.6 MW) and one steam turbine of 1.56 MW i.e. a total of 11.16 MW. For the heat output to the SRF plant (dryer), this is calculated to be 2.608 MW.

Therefore E_p = [(11.16 x 2.6) + (2.608 x 1.1)] x (3,600 / 1,000) x 8,000 = 918,282 GJ/year

As once the system is started up there is no input of fuel, E_f is assumed as zero

E_i is also equal to zero as the gas engines / steam turbines provide internal electrical power and there is no import of electrical power.

Energy efficiency = $(E_p - (E_f + E_i))/ (0.97 \times (E_w + E_f))$ = (918,282 – (0 + 0)) / (0.97 x (1,123,200 + 0)) = 0.84

As the reference value which applies is 0.65, the plant clearly operates above this value and can be classified as R 1 recovery.

APPENDIX G.2

PRIMARY ENERGY SAVINGS (PES) FOR HIGH EFFICIENCY CHP PLANT (HE CHP)

(2 pages)

Definitions

Directive 2004/8/EC (as amended) on the promotion of cogeneration based on useful heat demand in the internal energy market provides the following definitions:

- 'Cogeneration' shall mean the simultaneous generation in one process of thermal energy and electrical and / or mechanical energy;
- 'Useful heat' shall mean heat produced in a cogeneration process to satisfy an economically justifiable demand for heat or cooling;
- 'Economically justifiable demand' shall mean the demand that does not exceed the needs for heat or cooling and which would otherwise be satisfied at market conditions by energy generation processes other than cogeneration;
- 'Electricity from cogeneration' shall mean electricity generated in a process linked to the production of useful heat and calculated in accordance with the methodology laid down in Annex II;

Furthermore Annex III of the Directive defines high efficiency cogeneration, as providing primary energy savings of at least 10% compared with the references for separate production of heat and electricity. Note: The values used for calculation of electricity from cogeneration shall be determined on the basis of the expected or actual operation of the unit under normal conditions of use. Under Annex III of the Directive, PES is primary energy savings, which is defined as:

$$PES = \left(1 - \frac{1}{\frac{CHP\ H\eta}{Ref\ H\eta} + \frac{CHP\ E\eta}{Ref\ E\eta}} \right)$$

Where:

CHP Hη is the heat efficiency of the cogeneration production defined as annual useful heat output divided by the fuel input used to produce the sum of useful heat output and electricity from cogeneration.

Ref Hη is the efficiency reference value for separate heat production.

CHP Eη is the electrical efficiency of the cogeneration production defined as annual electricity from cogeneration divided by the fuel input used to produce the sum of useful heat output and electricity from cogeneration. Where a cogeneration unit generates mechanical energy, the annual electricity from cogeneration may be increased by an additional element representing the amount of electricity which is equivalent to that of mechanical energy. This additional element will not create a right to issue guarantees of origin in accordance with Article 5.

Ref Eη is the efficiency reference value for separate electricity production.

Note: CHP stands for Combined Heat and Power, which is interchangeable with the term cogeneration.

Application to Proposed Glanpower Facility

Glanpower has submitted an application to the Commission for Energy Regulation (CER) to establish the proposed facility as High Efficiency Combined Heat and Power (HE CHP) plant. The application has been completed according to the template provided in Appendix B of the CER publication "Certification Process for High Efficiency CHP – Decision Paper" CER/12/125 of the 2nd March 2012 available from www.cer.ie.

The Primary Energy Savings (PES) has been calculated according to the applicable EU Legislation for CHP; Directive 2004/8/EC (as amended) on the promotion of cogeneration based on useful heat demand in the internal energy market. The calculation of PES for the Glanpower facility is contained in the application to the CER, with the result of **PES = 17.9%**.

As the value for primary energy savings is greater than 10%, the overall system can therefore be classified as a high efficiency CHP plant.

APPENDIX H

MATERIALS HANDLING

FURTHER INFORMATION

(15 pages)

- H.1 Waste Composition Profile
- H.2: Draft Waste Acceptance Procedure
- H.3: Draft Waste Handling Procedure
- H.4: Hazardous Waste Recovery/Disposal
- H.5 Other Waste Recovery/Disposal

APPENDIX H.1

WASTE COMPOSITION PROFILE

(1 page)

Waste Composition Profile for Proposed Glanpower Facility, Derryclure, Co. Offaly

Waste Streams	Mixed residual waste (black bin)	Mixed dry recyclables (green bin)	Mixed organics (brown bin)	Bring banks / civic amenity / retail WEEE	Total
% Total Accepted (65,000t)	100%	0%	0%	0%	100%

Waste Streams	Mixed residual waste (black bin)[1]	Quantity	Est. Moisture %	Total Moisture Content	Moisture removed by dryer (95%)	Moisture retained in SRF	Waste passing pre-treatment (incl. 5% moisture) = SRF Weight
Organic	24.0%	15,600	55%	8,580.0	8,151.0	429.0	7,449.0
Garden	6.5%	4,225	55%	2,323.8	2,207.6	116.2	2,017.4
Papers	12.5%	8,125	13%	1,056.3	1,003.4	52.8	7,121.6
Cardboard	3.6%	2,340	12%	280.8	266.8	14.0	2,073.2
Composites	1.0%	650	8%	52.0	49.4	2.6	600.6
Textiles	7.3%	4,745	8%	379.6	360.6	19.0	4,384.4
Nappies	8.4%	5,460	30%	1,638.0	1,556.1	81.9	3,903.9
Plastics	13.6%	8,840	8%	707.2	671.8	35.4	8,168.2
Glass	3.3%	2,145	0%	0.0	0.0	0.0	0.0
Metals	3.1%	2,015	0%	0.0	0.0	0.0	0.0
Wood	1.2%	780	20%	156.0	148.2	7.8	631.8
Hazardous waste	0.9%	585	0%	0.0	0.0	0.0	0.0
WEEE	0.3%	195	0%	0.0	0.0	0.0	0.0
Unclassified combustibles	1.4%	910	15%	136.5	129.7	6.8	780.3
Unclassified incombustibles	1.2%	780	0%	0.0	0.0	0.0	0.0
Fines smaller than 20mm	11.7%	7,605	45%	3,422.3	3,251.1	171.1	4,353.9
Total	100%	65,000		18,732.4	17,795.7	936.6	41,484.3

Waste materials passing through pre-treatment

Fraction	tpa
Total waste accepted	65,000.0
Waste material removed at pre-treatment	5,720.0
Total waste minus solid material removed at pre-treatment	59,280.0

equals 8.8% total waste intake

Fraction	tpa
Moisture removed by dryer (95% moisture removal)	17,795.7
Moisture remaining in SRF after pre-treatment	936.6
SRF Weight Estimate	41,484.3
Maximum SRF capacity of system	62,400.0
Energy crop biomass (non-waste) permitted	10,000.0

Note 1 = EPA Municipal Waste Characterisation Report

APPENDIX H.2

DRAFT WASTE ACCEPTANCE PROCEDURE

(4 pages)

EP01 Procedure: Waste Acceptance at Glanpower Derryclure Facility

Date of Issue: 16 May 2012 **Rev No. 0**

PURPOSE

To define the acceptance procedure for waste entering the Glanpower Derryclure Energy from Waste facility.

SCOPE

The scope of this procedure covers all shipments of waste entering the Glanpower site. This procedure does not govern the acceptance of biomass fuel or other process/office materials entering the site.

RESPONSIBILITY

It is the responsibility of all personnel working within the security hut, waste reception hall and service yard adhere to the requirements of this procedure. Office based personnel, responsible for organisation/delivery of waste shipments to/from the site, are also responsible for compliance with this procedure.

It shall be the joint responsibility of the Plant Manager, Operation Manager and QESH Manager to update this procedure prior to commencement of operations on-site to reflect the most current site conditions and any updated guidance.

PROCEDURE

EP01.1 Planning of Waste Loads to Site

The Commercial Manager has overall responsibility for the planning and scheduling of waste loads and facilitation of delivery to site by external parties. The Commercial Manager shall liaise with the Operations Manager and Plant Manager, to ensure the efficient scheduling of waste loads for the continuous operation of the pyrolysis plant.

1. Contracted Waste Materials

Contracted waste materials will be regularly supplied to the site by external parties engaged under contract by Glanpower. These waste materials shall consist of mixed municipal (non-hazardous) waste materials. The contract between Glanpower and the external party shall specify:

- Overall annual waste to be accepted by Glanpower
- Overall schedule for the arrival of material on-site over the year
- Agreement that any waste consignments containing materials for which the Glanpower facility is not licensed, shall be rejected and further agreement that any such consignment must be transported off-site by the supplier, under licence, for appropriate recovery/disposal.

All waste consignments accepted on-site shall be pre-arranged and no unplanned consignment of waste shall be accepted by security personnel.

The Commercial Manager shall have overall responsibility responsible for implementing an electronic waste intake schedule system. This system shall allow for

scheduled daily delivery of waste batches. Each waste batch shall be recorded, including the number of waste loads per batch, and assigned an expiry date. Waste must be accepted on-site before or on this expiry date. A designated assistant of the Commercial Manager shall ensure the ongoing (day-to-day) maintenance of the waste intake schedule, so as to ensure fixed batches of waste loads arrive onsite at scheduled intervals.

2. Non-Contracted Waste Materials

Non-contracted waste materials will be irregularly supplied to the site by external prospective client who request the waste management services of Glanpower.

Any such requests shall be firstly handled by the Commercial Team, who shall have responsibility for initial assessment of the waste load. The initial assessment shall, in summary, comprise a verbal questioning of the waste materials to be handled. The prospective client shall be informed that only non-hazardous municipal waste may be accepted at the facility and contaminated/unsuitable loads may be rejected upon arrival and inspection at the site.

Non-contracted waste consignments shall be notified to the planning resource, who shall assign a delivery date based on the available plant capacity. The consignment shall be entered into the waste intake schedule system, which shall be relayed to the security hut personnel. Upon arrival on-site, all non-contracted waste consignments shall be subject to visual inspection.

EP01.2 Acceptance at Site

The waste is delivered to site either in covered lift back collection trucks or covered trailers with walking floors. Waste delivery trucks with a fixed batch card (contracted waste) shall report to the security hut and then proceed to the weighbridge for recording of waste consignment weight.

Non-contract waste consignments shall also enter the site via security hut and the driver shall exchange details confirmed previously with Glanpower. Once the load is verified on the plant intake schedule, the driver shall be issued with a batch card. The driver then proceeds to the weighbridge for recording of waste consignment weight.

The following information is recorded on the electronic system for all waste material entering the facility:

- Name of Haulier/Carrier
- Name of Producer/Collector of Waste
- Registration Number of Delivery Vehicle
- Batch number
- EWC Code and Description of Waste
- Date of Delivery to Site
- Name of Weighbridge Operator
- Details of Rejected Load (if applicable)

EP01.3 Entry Weigh-in

The driver positions the truck on the weighbridge and the gross weight is recorded on the batch card. The gross weight is automatically relayed to the electronic waste tracking system. After weighing the truck shall proceed to the waste reception hall.

EP01.4 Internal Waste Reception

Following recording of weight at the external weighbridge, the trucks enter the building through an 'airlock' system of rapid operation rolling doors. The airlock consists of a double door system whereby the first door opens to allow the truck enter the airlock. The first door closes and then the second door opens to allow the truck into the unloading area. At no stage shall both doors of the airlock be open. There will be a separate airlock on the entrance and on the exit to the processing area.

The cover of the waste truck shall only be removed inside the waste reception hall, when the airlock entry doors are closed and the delivery vehicle engine has been turned off.

The operator in charge shall then direct the driver to slowly tip the waste consignment on to the processing floor.

EP01.5 Waste Inspection

A percentage of the waste received within the waste reception hall shall be subjected to visual inspection at the designated, signed Waste Inspection Area located within the waste reception hall. This is to ensure waste materials accepted on-site are compliant with the terms of the Glanpower waste licence (licence currently subject to EPA approval). Visual inspections shall be carried out on both contracted and non-contracted waste consignments.

The operator carrying out the visual inspection shall examine the load for any non-conforming waste materials. This may include large bulk waste items and/or hazardous/WEEE waste items (e.g. gas cylinders, electrical waste, tyres, chemicals etc.)

All non-conforming waste items shall be removed to the designated, signed Waste Quarantine Area. If uncertainty arises as to the nature of acceptability of a particular waste item, the operator shall contact his/her supervisor.

EP01.6 Waste Quarantine

Following Waste Inspection (EP01.5), all non-conforming waste items shall be removed to the designated, signed Waste Quarantine Area until a reject/recovery/disposal route has been identified and arranged. Depending on the nature of waste quarantined, the following action shall be implemented:

- Large, bulky items which may require separate shredding are held aside until the shredder is available
- Where items require specialist equipment (e.g. for dismantling), this is notified to the Planning Team, and if necessary the waste supplier, to determine whether the waste item is handled on-site or returned for alternative recovery/disposal off-site;

- Where waste items quarantined are in non-compliance with the waste types permitted by the waste licence (e.g. hazardous waste), the waste item shall be deemed rejected and the process supervisor shall enter a non-conformance record in the waste tracking system.

All loads deemed rejected shall be recorded, including reason for rejection, description of waste, quantity, EWC code and other comments. Where non-conforming items of waste are regularly identified within waste consignments, this shall be communicated by the process operators to supervisor grade personnel, who shall be responsible for addressing non-conformities with both management and waste suppliers.

EP01.7 Exit Weigh-in

Upon departure from the waste reception hall (via double airlock doors), the waste truck will exit via the weigh-bridge. The driver shall position the truck on the weighbridge and the tare weight will be recorded. The weight of the waste consignment deposited is calculated, based on the gross weight at entry (EP01.3) minus the tare weight prior to departure from the site. A weight ticket is automatically printed for the driver.

For contracted waste consignments, information is automatically relayed to the electronic waste tracking system. The driver then proceeds to exit the site, retaining the weigh docket and batch card.

For non-contracted waste consignments, information is automatically relayed to the electronic waste tracking system. The driver then proceeds to hand in his batch card and is then issued with the signed-off delivery docket. The weigh docket and a copy of the delivery docket are retained on-site for record keeping.

REFERENCES & RELATED DOCUMENTS

- Procedure EP02: Waste Handling at Glanpower Derryclure Facility
- Procedure EPXX: Biomass Acceptance Procedure *(in development)*

REVISION HISTORY

Rev No.	Purpose of Revision	Originated (revised) by:	Approved by:
0	Pre-construction stage. Facility operation planning	T. O'Shea	R. McEvoy

APPENDIX H.3

DRAFT WASTE HANDLING PROCEDURE

(2 pages)

EP02 Procedure: Waste Handling at Glanpower Derryclure Facility

Date of Issue: 24 May 2012 **Rev No. 0**

PURPOSE

To define the handling procedure for waste accepted at the Glanpower Derryclure Energy from Waste facility.

SCOPE

The scope of this procedure covers all waste accepted through the waste reception hall at the Glanpower site. The scope is limited to the handling of waste after initial tipping on the waste reception hall floor to entry in the pre-shredder.

This procedure does not govern the handling of quarantined or rejected waste loads.

RESPONSIBILITY

It is the responsibility of all operator personnel working within the waste reception hall to adhere to the requirements of this procedure. Supervisor and management personnel shall be aware of the requirements of this procedure and shall ensure its implementation on-site.

It shall be the joint responsibility of the Plant Manger, Operation Manager and QESH Manager to update this procedure prior to commencement of operations on-site to reflect the most current site conditions and any updated guidance.

PROCEDURE

EP01.1 Waste Loads

Approved waste loads are placed on the waste reception hall floor, in accordance with the Waste Acceptance procedure (EP01). From the floor, waste shall be lifted and loaded to the pre-shredder hopper using a grab machine.

EP01.2 Hydraulic Grab Machine

The hydraulic grab machine is fitted with a purpose made grab to pick up the waste and load it to the pre-shredder intake hopper. One machine is sufficient to load the plant at up to 12 tonnes or more per hour. Only a trained operator may use the hydraulic grab machine. Closed circuit television cameras (CCTV) in the waste reception hall will relay live visual feed to the control room, to supplement the operator's view.

The operator of the hydraulic grab machine shall be responsible for loading the waste to the pre-shredder hopper and maintaining the level of waste in the hopper during its operation. In the event of a low level in the pre-shredder hopper, an audible and visual alarm will be relayed to the operator, to notify him/her of the situation. If waste is not supplied to the hopper within a specified time following alarm activation, the pre-treatment plant will be automatically shutdown. The operator of the hydraulic grab machine shall also be responsible for mixing of the waste to ensure a uniform mix enters the pre-shredder hopper.

EP01.3 Loading Shovel

A second operator, driving a loading shovel shall ensure the floor is kept clean and that the pile of tipped waste is sufficiently close for the grab operator (EP01.2) to grab from it.

Only a trained operator may use the loading shovel.

EP01.4 Onward Feed from Waste Handling Area

Following load of waste to the pre-shredder hopper, onward waste feed will be automated on a conveyor system. This conveyor system will be connected to the central computerised control room, which shall be monitored by trained operator and supervisor grade staff.

REFERENCES & RELATED DOCUMENTS

- Procedure EP01: Waste Acceptance at Glanpower Derryclure Facility
- Procedure EPXX: Biomass Handling Procedure *(in development)*

REVISION HISTORY

Rev No.	Purpose of Revision	Originated (revised) by:	Approved by:
0	Pre-construction stage. Facility operation planning	T. O'Shea	R. McEvoy

APPENDIX H.4

HAZARDOUS WASTE RECOVERY/DISPOSAL

(1 page)

TABLE H.4(i): WASTE - Hazardous Waste Recovery/Disposal

Waste material	EWC Code	Main source[1]	Quantity[2]		On-site Recovery/Disposal (Method & Location)	Off-site Recovery, reuse or recycling (Method, Location & Undertaker)	Off-site Disposal (Method, Location & Undertaker)
			Tonnes / month	m^3 / month *(weight to volume conversion factor)*			
Wastes from incineration or pyrolysis of waste	19 01 05* 19 01 10*	Scrubber and water treatment residues (e.g. spent activated carbon, oil residues)	Minor	Minor	Recovery on-site by pyrolysis		
Spent baghouse filter bags	19 01 99	Spent baghouse filter bags from replacement	Minor	Minor	Recovery on-site by pyrolysis		
Hazardous waste (quarantined)[3]	19 12 11*	Miscellaneous items of hazardous waste or waste containing hazardous substances quarantined at pre-treatment stage	50	50 *(1.0)*	Not applicable	Where possible, items quarantined will be sent for treatment (if required) and off-site recovery/recycling	Where no possible reuse/ recovery/ recycling route is available, items shall be sent off-site for treatment and disposal
Other wastes	20 01 21* 20 01 29* 20 01 35*	Minor waste streams only - see Table H.4.1 (Attachment H)					

1 A reference should be made to the main activity / process for each waste.

2 The volumetric quantities per month are estimated using the volume-to-weight conversion factors contained in the Schedule to the Waste Management (Landfill Levy) Regulations 2011 (SI No. 434 of 2011), however this conversion is not precise for all waste streams (e.g. metals) owing to the difference in waste items encountered in each consignment. The factors applied are shown in parentheses *(purple italics)*

3 50 tonnes/month approximated from 585tonnes/year, according to waste composition profile (ref. Appendix H.1). Weight-to-volume conversion factor of 1.0 applied, owing to possible variation in waste encountered in each consignment.

APPENDIX H.5

OTHER WASTE RECOVERY/DISPOSAL

(1 page)

TABLE H.4(ii): WASTE - Other Waste Recovery/Disposal

Waste material	EWC Code	Main source[1]	Quantity[3]		On-site recovery/disposal[2] (Method & Location)	Off-site Recovery, reuse or recycling (Method, Location & Undertaker)	Off-site Disposal (Method, Location & Undertaker)
			Tonnes / month	m^3 / month *(weight to volume conversion factor)*			
Pre-treated waste for pyrolysis (Solid Recovered Fuel)	19 12 10	Waste passing pre-treatment stage for pyrolysis	5,200	13,000 *(0.4)*	Recovery within pyrolysis system on-site	Not applicable	Not applicable
Vitrified slag residue from secondary cyclonic convertors	19 04 01	Secondary cyclonic converters	267	178 *(1.5)*	Not applicable	Vitrified slag will be sent off-site for reuse as road building material	Disposal to landfill in absence of reuse or recovery route
Ferrous metal from the mechanical treatment of waste	19 12 02	Segregation at pre-treatment by drum magnets	271	271 *(1.0)*	Not applicable	Ferrous metals will be sent off-site to a suitably licensed facility for recycling	Not applicable
Non-ferrous metal from the mechanical treatment of waste	19 12 03	Segregation at pre-treatment by eddy current units	135	135 *(1.0)*	Not applicable	Non-ferrous metals will be sent off-site to a suitably licensed facility for recycling	Not applicable
Glass from mechanical treatment of waste	19 12 05	Segregation at pre-treatment by wind separator units	271	181 *(1.5)*	Not applicable	Glass will be sent off-site to a suitably licensed facility for recycling	Not applicable
Other wastes from mechanical treatment of waste i.e. hard particles e.g. ceramics, stones	19 12 09 19 12 12	Segregation at pre-treatment by wind separator units	271	181 *(1.5)*	Not applicable	Where possible, hard particles (e.g. stones) removed at pre-treatment stage will be sent off-site for reuse or recycling (e.g. fill)	Where no suitable reuse/recycling or alternative recovery route is available, inert hard particles removed at pre-treatment will be sent off-site for disposal
Other wastes (minor quantities)	Minor waste streams only - see Table H.4.1 (Attachment H)						

1 Reference should be made to the main activity/ process for each waste.
2 The method of disposal or recovery should be clearly described and referenced to Attachment H.1
3 The volumetric quantities per month are estimated using the volume-to-weight conversion factors contained in the Schedule to the Waste Management (Landfill Levy) Regulations 2011 (SI No. 434 of 2011), however this conversion is not precise for all waste streams (e.g. metals) owing to the difference in waste items encountered in each consignment. The factors applied are shown in parentheses *(purple italics)*

APPENDIX I

EXISTING ENVIRONMENT & IMPACT OF THE FACILITY

FURTHER INFORMATION

- I.1: Update to Baseline Air Quality Impact Assessment
- I.2: Screening Statement for Appropriate Assessment Report

APPENDIX I.1

UPDATE TO BASELINE AIR QUALITY IMPACT ASSESSMENT

(20 pages)

11. AIR QUALITY

11.1 Introduction

This document updates the baseline air quality impact assessment for the proposed Glanpower Energy Centre, contained in the Environmental Impact Statement (EIS) (document no. IE0310150-22-RP-0001) of 2010. The document is a revision of Chapter 11 of the EIS with updated text and data highlighted in purple bold text throughout. The update has been completed based on the advancement of design for the facility since submission of the planning application and also to reflect the issue of revised Air Quality Standards Regulations (S.I. No. 180 of 2011).

This section assesses the potential impacts of the proposed Energy Centre on Air Quality. The assessment is based on the following methodology:

- Determination of the air emissions from the facility
- Determination of the impact of the air emissions on ground level air quality using an appropriate Air Dispersion Modelling software package
- Determination of the significance or otherwise of cumulative emissions (i.e. emissions from the proposed facility in conjunction with other local emission sources)
- Assessment of the resulting ground level concentrations of the relevant emissions with respect to current background air quality in the local area and relevant air quality legislation.

This assessment has been carried out in accordance with the Irish Environmental Protection Agency *Air Dispersion Modelling from Industrial Installations Guidance Note (AG4)*.

11.2 Air Quality Legislation

Air Quality Standards for the protection of human health and the environment have been developed at European level and implemented into Irish legislation for a number of air emissions. Air Quality Standards (AQSs) set limit values for Ground Level Concentrations (GLCs) of certain emissions for both the short term (hourly, daily) and long term (annual averages). Limit values are often expressed as percentiles e.g. 98 percentile of mean hourly values which means that only 2% of the results obtained during the monitoring period can exceed the stated limit value.

The following Air Quality Legislation applies in Ireland:

- The EU Directive 2000/76/EC on the incineration of waste. The Directive sets emission limit values and monitoring requirements for pollutants to air such as dust, nitrogen oxides (NOx), sulphur dioxide (SO_2), hydrogen chloride (HCl), hydrogen fluoride (HF), heavy metals and dioxins/furans.
- Irish Statutory Instruments No. 58 2009 Arsenic, Cadmium, Mercury, Nickel, and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations 2009. These regulations set the target values to be attained, from 31 December 2012, for concentrations of arsenic, cadmium, nickel and benzo(a)pyrene (a measurable indicator of the level of polycyclic aromatic hydrocarbons) and also specify monitoring requirements for mercury and other polycyclic aromatic hydrocarbons. This statutory instrument brings into force the EU

Directive 2004/107/EC relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air.

- The EU Directive 2008/50/EC ambient air quality and cleaner air for Europe. This Directive merges most of the existing legislation into a single directive (Directives 96/62/EC, 1999/30/EC, 2000/69/EC and 2002/3/EC) with no change to existing air quality objectives. However the Directive sets out new air quality objectives for $PM_{2.5}$ (fine particles) including the limit value and exposure related objectives. **EU Directive 2008/50/EC has been transposed into Irish law by the Air Quality Standards Regulations (S.I. No. 180 of 2011).**

Emissions to the atmosphere from the Energy Centre will potentially include some of the emissions covered in the above air quality legislation. The plant may also emit a number of substances for which Irish and EU AQS limit values have not yet been set. In order to assess the impact that these substances could have on human health and the environment the UK Environment Agency Environmental Assessment Levels[1] and the World Health Organisation Air Quality Guidelines[2] are used.

The relevant air quality standards for this air quality assessment are detailed in Table 11.1.

11.3 Air Emissions from the Proposed Facility

Air Emissions from the proposed facility will arise both during the construction and operational phases of the development. It is anticipated that emissions from the construction phase will be limited in nature and duration. Emissions from the operational phase will be potentially more significant. Emissions from each phase are discussed below.

11.3.1 Construction Air Emissions and Mitigation

Construction activities on site including excavation and earthmoving could result in the generation of dust. Transportation of loose materials that are not properly contained on or off site could result in dust generation, as would the transfer of mud/soil from the wheels of construction traffic onto surrounding roads. A number of factors will affect the extent of dust generation and potential impacts on air quality including wind speed and direction, the dryness of the soil, and the proximity of sensitive receptors to the site.

The following mitigation measures will be put in place to minimise and dust generation and thus preventing any significant impacts on air quality:

- Wheel washing of all vehicles leaving site
- Good housekeeping and site management including the proper storage of spoil/loose materials on site
- Proper containment of loose materials that are transported on or off site
- Damping of site road as necessary

[1] Horizontal Guidance Note H1 – Annex (f) Air Emissions, UK Environment Agency, 2010
[2] Air Quality Guidelines for Europe, WHO, 2000 (2nd Edition)

11.3.2 Operational Air Emissions

The facility processes as described in Chapter 2 of this EIS will result in air emissions from **7** No. stacks – the main stack from the **PGE Prima 3000**[3] Pyrolysis Unit, 3 No. Engine (gas burner stacks), **1 no. Regenerative Thermal Oxidiser (RTO) stack, 1 no. emergency generator** and the odour abatement unit. Details of the emissions from each stack are provided below.

a) Main **Pyrolysis** Stack – the **PGE Prima 3000 unit** has been designed to comply with the emission limits set out in Directive 2000/76/EC on the incineration of waste. The stack dimensions, exit gas temperature and exit gas volumetric flow rate have been provided by the **pyrolysis unit** manufacturer. The main **pyrolysis unit** stack details are provided in Table 11.2. Exhausts from the two pyrolysis units will share a common flue.

b) Engine Stacks – these engines have been designed to comply at a minimum with the emission limits set out in Directive 2000/76/EC on the incineration of waste. The stack dimensions, exit gas temperatures and exit gas volumetric flow rates have been provided by the engine manufacturer. These details are provided in Table 11.2.

c) Regenerative Thermal Oxidiser (RTO) – a new stack will be installed associated with a RTO unit which itself is being installed for the abatement of odours arising from the drying of waste at pre-treatment stage. This RTO stack will replace the odour abatement unit stack included in the original design and EIS.

Table 11.1: *Air Quality Standards/Guideline Values relevant to Energy Centre*

Pollutant	AQS/Guideline Value (µg/m^3)	Source of AQS/Guideline Value
Oxides of Nitrogen NO_2/NO_x		
NO_2 99.8%ile hourly	200	EU Directive 2008/50/EC
NO_2 Annual (Human Health Protection)	40	EU Directive 2008/50/EC
NO_x Annual (Vegetation Protection)	30	EU Directive 2008/50/EC
Sulphur Dioxide SO_2		
SO_2 99.7%ile hourly	350	EU Directive 2008/50/EC
SO_2 99.2%ile daily	125	EU Directive 2008/50/EC
SO_2 Annual	20	EU Directive 2008/50/EC
Particulate Matter		
PM_{10} 90.4%ile 24-hour	50	EU Directive 2008/50/EC
PM_{10} Annual	40	EU Directive 2008/50/EC
$PM_{2.5}$ Annual	20	EU Directive 2008/50/EC
Carbon Monoxide		
Carbon Monoxide 8-hour	10,000	EU Directive 2008/50/EC

[3] **The pyrolysis unit proposed for the facility has not changed since the original EIS. The model name of the unit has been revised and accordingly references throughout this section have been updated.**

Pollutant	AQS/Guideline Value (µg/m^3)	Source of AQS/Guideline Value
Volatile Organic Compounds		
Benzene Annual	5	EU Directive 2008/50/EC
Hydrogen Chloride		
Hydrogen Chloride Hourly	750	UK Environment Agency
Hydrogen Fluoride		
Hydrogen Fluoride Hourly	250	UK Environment Agency
Heavy Metals		
Cadmium & Thallium Annual	0.005	SI 58 of 2009
Mercury Hourly	7.5	UK Environment Agency
Mercury Annual	0.25	UK Environment Agency
Total of Sb, Ar, Cr, Co, Cu, Mn, Ni, Va Hourly	400*	UK Environment Agency
Total of Sb, Ar, Cr, Co, Cu, Mn, Ni, Va Annual	1.3 x 10^{-2}*	SI 58 of 2009
Dioxins		
Dioxins	0.0000003	WHO Guidelines

*Average Air Quality guideline value for the metals within this group

d) Other Emissions to Air – Another source of potential air emission for the facility would be odours from the waste handling area of the facility. The process itself is entirely odourless however odours will potentially arise at the waste unloading area. Waste will be unloaded and stored indoors so as to minimise the escape of odours. Also the facility's structure shall be air tight with vehicles only entering the structure through airlock doors. Air from the waste handling area will also pass through a **new odour abatement unit (based on ozone / UV / ionisation technology)** to remove any residual odour. **This stream will discharge through a new vent and details** are provided in Table 11.2.

The construction and operation of the facility will generate additional traffic on the surrounding road network. Traffic can contribute to ground level concentration of certain substances, particularly NOx. However the amount of additional traffic generated will not be significant (refer to Chapter 6 on Traffic) and therefore emissions from traffic will no have a significant impact on air quality.

11.3.3 Potential Effect of Emissions from Facility Stacks

Atmospheric emissions can have adverse impacts on human health, if present at a sufficiently high concentration. This section outlines the principal effects on human health, both acute and chronic, that the emissions from the Energy Centre could potentially have. Exposure to the emissions could be as a result of:

- Direct inhalation,
- Skin absorption (of minor importance)

- Ingestion through water and food intake as a result of contamination of surface water, soil or crops

A large amount of research has been carried out on the potential health effects of exposure to high concentrations of emissions, most notably by the World Health Organisation (WHO). Based on WHO data the following sections summarise the potential effects of all substances that could potentially be emitted from the plant, when present at high concentrations.

Acid Gases and Suspended Particulates

Nitrogen dioxide can act as a respiratory irritant at elevated concentrations, and it has been noted that the incidence of asthma and bronchitis is increased by exposure to NO_2 at high concentrations. As with NO_2, sulphur dioxide (SO_2) can affect the respiratory system, primarily by causing the bronchi to constrict with very high concentration of SO_2 been linked with increased hospital admissions.

Fine suspended particulate matter (SPM) such as PM_{10} (<10µm), (1µm = 0.001mm) or $PM_{2.5}$ (<2.5µm) can penetrate deeply into the lung and therefore the health effects of SPM in humans depends very much on particle size and concentration. As with SO_2 and NO_2, fine particulates can irritate the respiratory system.

The EU limit values for NO_2, SO_2 and particulates have been set at levels which ensure that no such health effects would occur.

Hydrogen chloride (HCl) and hydrogen fluoride (HF) can also cause irritation of the respiratory system and can also cause irritation of eyes, nose and throat. While there are no EU or Irish limit values for these substances, the UK Environment Agency guideline limit value has been set for the protection of human health.

Carbon Monoxide

The binding of carbon monoxide with haemoglobin to form COHb reduces the oxygen-carrying capacity of the blood and impairs the release of oxygen from haemoglobin to extravascular tissues. These are the main causes of tissue hypoxia produced by carbon monoxide at low exposure levels. The toxic effects of carbon monoxide become evident in organs and tissues with high oxygen consumption such as the brain, the heart, exercising skeletal muscle and the developing fetus.

The EU limit value for carbon monoxide has been set at a level which ensures that no such health effects would occur.

Volatile Organic Compounds

Although there are many different volatile organic compounds in this assessment benzene has been taken to represent the more harmful VOC types (as recommended in the EPA Guidance Note AG4). The most significant adverse effects from prolonged exposure to benzene are haematotoxicity, genotoxicity and carcinogenicity. Chronic benzene exposure can result in bone marrow depression expressed as leukopenia, anaemia and/or thrombocytopenia, leading to pancytopenia and aplastic anaemia.

The EU limit value for Benzene has been set at a level which ensures that no such health effects would occur.

Heavy Metals

The Energy Centre will not produce heavy metals but can emit heavy metals if they are originally present in the incoming waste stream. Unless particular wastes (containing individual heavy metals) are present in the waste stream, individual

heavy metals will rarely be emitted at significant concentrations. Notwithstanding this, the modelling has been carried out based on the conservative assumption that heavy metals are continuously emitted at the EU Directive 2000/76/EC on the incineration of waste emission limit value.

Exposure to high levels of cadmium primarily affects the kidneys. The International Agency for Research on Cancer (IARC) has classified cadmium as a Group 2B carcinogen on the basis that there was sufficient evidence of it being carcinogenic in animals but limited evidence to suggest cadmium is a human carcinogen.

Acute exposure to thallium can cause gastrointestinal effects (abdominal pain, vomiting and diarrhoea). Exposure to high concentrations of mercury vapour can damage the nervous system, and also the oral mucosa and the kidneys.

Arsenic is a cellular and tissue poison. Acute exposure to arsenic can result in irritation of respiratory system and skin, gastrointestinal effects (nausea, vomiting abdominal pain, diarrhoea) and circulatory effects. Arsenic is also classified as a human carcinogen.

Acute exposure to certain chromium compounds causes irritation of the eyes, respiratory system (breathing difficulties) and skin as well as liver and kidney damage. Certain chromium compounds are thought to be human carcinogens.

Acute exposure to cobalt can irritate the respiratory system and skin. Exposure to copper dust can irritate the eyes, nose and mouth and may cause headaches, dizziness, nausea and diarrhoea.

The toxicity of lead may be attributed to its interference with different enzyme systems. Because of this almost all organs may be considered potential targets for lead and a wide range of biological effects of lead have been documented. Exposure to high levels is linked to cognitive dysfunctions in children such as IQ deficit, impairment of eye-hand co-ordination and attention details. According to IARC evidence of carcinogenicity of lead and lead compounds in humans is inadequate.

Exposure to manganese can result in effects on the lungs (leading to coughing and breathing difficulties) and effects on the nervous system. Exposure to vanadium can result in irritation of the respiratory system, mucous membranes, eyes and skin.

Exposure to relatively high concentrations of antimony (9 mg/m^3 of air) for a long period of time can cause irritation of the eyes, skin and lungs. As the exposure continues more serious health effects may occur, such as lung diseases, heart problems, diarrhoea, severe vomiting and stomach ulcers.
Exposure to chromium can result in skin rashes, upset stomachs and ulcers, respiratory problems, weakened immune systems, kidney and liver damage, alteration of genetic material, lung cancer and death.

In small quantities nickel is essential for humans, but a uptake of too large a quantity can result in a higher chance of development of lung cancer, nose cancer, larynx cancer and prostate cancer sickness and dizziness after exposure to nickel gas, lung embolism, respiratory failure, birth defects, asthma and chronic bronchitis, allergic reactions such as skin rashes, mainly from jewellery and heart disorders.

The only Heavy Metal for which the EU has set an AQS, is Lead. However the UK Environment Agency has derived long and short term air quality guideline values for all of the Heavy Metals detailed in the EU Directive 2000/76/EC on the incineration of waste. Where the EU Directive 2000/76/EC has grouped Heavy Metals for the purpose of applying an emission limit value the most stringent UK Environment

Agency air quality guideline value for the Heavy Metals within that group has been used in this assessment.

Dioxin Emissions

The emissions of dioxins from incineration processes is often the most controversial element associated with an incineration project. However as the process of the proposed Energy Centre is pyrolysis, the very nature of the process mitigates against dioxin formation, and prevents the pass through of pre-existing dioxin and related compounds.

Dioxins refer to a large group of structurally similar compounds which include both dioxins and furans. The polychlorinated-dibenzo-dioxins (PCDDs) include 75 individual compounds and the polychlorinated-dibenzo-furans (PCDFs) include 135 different compounds. These individual compounds are referred to as congeners. The most toxic of these compounds and also the most widely researched is 2,3,7,8-tetra-chloro-dibenzo-dioxin (TCDD). The toxicity of the other congeners is assessed relative to TCDD which is used as a reference compound. Only 7 of the 75 congeners of CDDs and only 10 of 135 congeners of CDFs are thought to have dioxin-like toxicity.

Very little of the toxicity data available for dioxins relates to exposure through inhalation and the majority of studies carried out have been for oral exposure in animals. These data indicate that TCDD is one of the most toxic compounds known and it produces a wide spectrum of toxic effects following both short-term and long-term exposure.

The most noted health effect in people exposed to large amounts of dioxin is chloracne which is a severe skin disease with acne-like lesions that occur mainly on the face and upper body. Other effects of exposure to large amounts of dioxin include skin rashes, skin discoloration, excessive body hair, and possibly mild liver damage. TCDD is a human carcinogen and long term exposure may result in a number of different cancers. Studies have also shown dioxins to have a number of other effects including include dermal toxicity, immunotoxicity, endocrine disruption, reproductive effects and teratogenicity. Reproductive or developmental effects have not been seen in human studies however there is concern that exposure to low levels of dioxins over long periods might result in these effects including weakened immune responses and behaviour changes in offspring.

While experience with accidental human exposure to dioxins over the last 100 years has not indicated an acute toxicity to humans, the experience with animal studies has shown a high level of toxicity. Carcinogenic and mutagenic properties have also been observed in animal testing. It is the extrapolation of this data to humans, which has often led to the controversy associated with these compounds. However dioxins, and dioxin-like compounds which may have similar effects, are found in all environmental compartments, are persistent and, being fat soluble, tend to accumulate in higher animals, including humans. They are also resistant to degradation. By far the majority of toxicologists are of the opinion that entry of dioxins and furans into the environment and subsequently into the human food chain needs to be reduced as precautionary measure. Over the past three decades the European Commission has implemented wide ranging legislation aimed at directly or indirectly reducing or controlling the release of dioxins into the environment, with the objective of reducing human exposure and protecting human health.

The Irish EPA has undertaken a number of assessments on dioxin levels in the Irish environment between 1995 and 2008[4]. The assessments were based on the

[4] Dioxin Levels in the Irish Environment: Sixth Assessment (Summer 2008), EPA 2009

monitoring of dioxin levels in cows milk. The results broadly indicate a favourable comparison with similar studies in other European countries and that the highest levels recorded were well below legislative limits.

The proposed plant will comply with the EU Directive 2000/76/EC emission limit and the WHO Air Quality guideline value for dioxins/furans.

Odour

An odour impact criterion defines the odour threshold concentration limit value above baseline in ambient air, which will result in an odour stimulus capable of causing an odour complaint. There are a number of interlinked factor, which causes a nearby receptor (i.e. resident) to complain. These include:

- Odour threshold concentration, odour intensity and hedonic tone-defined measurable parameters at odour source,
- Frequency of odour-how frequently the odour is present at the receptor location,
- Duration of odour-how long the odour persists at the receptor location,
- Physiological-previous experiences encountered by receptor, etc.

By assessing these combined interlinked factors, the ability for a facility to cause odour complaint can be determined. As odour is not measurable in ambient air due to issues in sampling techniques, limit of detections for olfactometers and the inability to monitor continuously, therefore dispersion models become useful tools in odour impact assessments and odour risk analysis.

When utilising dispersion models for impact assessment, specific impact criterion (odour concentrations) need to be established at receptors. For odour assessment in general terms, this is called an odour impact criterion, which defines the maximum allowable ground level concentration (GLC) of odour at a receptor location for a particular exposure period.

Commonly used odour annoyance criteria is $\leq 3.0\ Ou_E\ m^{-3}$ at the 98th percentile of hourly averages.

11.3.4 Operational Mitigation Measures

A number of measures have been incorporated into the design of Energy Centre to ensure that emissions from the plant to not exceed regulatory emission limit values and the impact on human health or the environment would be insignificant.

This pyrolysis process ensures no dioxins can be formed. Any chlorine in the feed will break down and be converted to hydrogen chloride gas (HCl). HCl is highly soluble in water, and is therefore removed and neutralised in the wet scrubbing process. The absence of oxygen prevents the formation other gases (the largest being nitrogen) that would dilute the gas produced and would increases NO_x levels in the gas engine. Acid components are removed with the pyrolysis gas and the char does not contain acid gas precursor chemicals such as sulphur and chlorine. With respect to heavy metals, volatile metals such as lead, mercury, antimony, bismuth etc. that have significant vapour pressure at the pyrolysis temperature will be reduced to metallic form and will be trapped in the gas scrubber, appearing as a component of the sludge from the scrubber.

After the pyrolysis stage the first process is gas cleaning which is performed in the primary char separation hopper. The gas exits the main chamber through a water cooled extraction pipe and is forced through a 180° turn. This serves to separate heavy particles by impingement on the baffle plate and by inertia as the gas flow

changes direction. The heavier char particles fall into the bottom of the hopper and are extracted through a rotary valve to the char system.

The syngas with fine dust content then enters the hot gas cyclone. This is a conventional single stage cyclone separator in which the remaining dust is removed to the char system.

The plant has ceramic filters installed to ensure no particulates escape to atmosphere. Ceramics are used as part of best practice as they operate at high temperatures without the requirement for dilution air to cool exhaust down changing the conditions for effective emissions monitoring. There are also more efficient in that they remove smaller particulates

11.4 Air Dispersion Modelling

The air dispersion modelling input data consist of meteorological data, detailed information on the physical environment (including building dimensions and terrain features) and design details from all emission points on-site. Using this input data, the model predicts ambient ground level concentrations beyond the site boundary for each hour of the modelled meteorological years. The model post-processes the data to identify the location and concentration of the worst-case ground level concentrations.

Emissions from the proposed site have been modelled using the AERMOD dispersion model (Version 7) which has been developed by the U.S. Environmental Protection Agency (USEPA). The model is a steady-state Gaussian plume model used to assess pollutant concentrations associated with industrial sources. The model has been designated the regulatory model by the USEPA for modelling emissions from industrial sources in both flat and complex terrain. The modelling methodology has been based on the Irish Environmental Protection Agency's (EPA) *Air Dispersion Modelling from Industrial Installation Guidance Note (AG4)*.

11.4.1 Meteorological Data

The meteorological data required by the dispersion model is wind speed, wind direction, Pasquill-Gifford stability category, boundary layer height and ambient temperature. The stability category and boundary layer height are used to characterise the turbulence within, and the height of the lower levels of the atmosphere.

Extremely unstable conditions can cause plume looping and elevated concentrations close to the stack. Under stable conditions elevated concentrations can occur due to the emissions being trapped below the boundary layer. Neutral conditions, characterised by cloudy skies and strong winds, are most favourable for dispersion due to the mechanical mixing of the lower atmosphere. The wind direction determines the direction in which the plume is blown, and for a particular stability, higher wind speeds will result in reduced plume rise so causing the plume to reach ground level closer to the stack with elevated emission concentrations. The boundary layer height determines the total vertical distance over which the plume may spread.

The model **was** run for each pollutant using five years of meteorological data (2004-2008) from the Birr Met Station – this is the closest meteorological station to the proposed site that also experiences similar weather conditions. **The updated model run for nitrogen oxides was completed using the 2006 data only.**

The meteorological windrose for 2008 is presented in Figure 11.1.

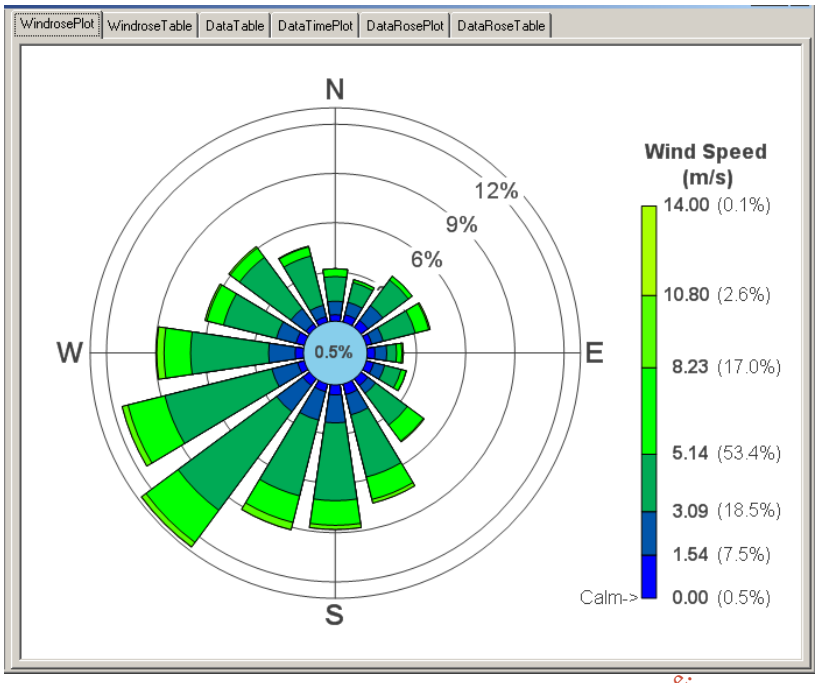

Fig 11.1: *2008 Windrose for Birr Meteorological Station*

11.4.2 Building Downwash

Air streams blowing across buildings can become disrupted, with turbulent eddies occurring downwind in the building wake. If an emission point is sufficiently close to a building, then the plume may become entrained in the turbulent eddies of the building wake.

This entrainment can cause plume downwash resulting in elevated emission concentrations close to the emission point. The stack modelled is subject to downwash and, as a result, direction specific building dimensions were calculated.

The AERMOD model interprets the influence zone of each building for a given wind direction using the Building Profile Input Program (BPIP). All of the main proposed buildings on the site were included in the modelling analysis.

11.4.3 Receptors

The model was set up to examine the impact of emissions on the area surrounding the site of the proposed facility using a series of receptors. A receptor is a location at which the model will calculate maximum process contributions (PCs). A cartesian co-ordinate receptor grid system was established with its centre at the location of the Stein Pyrolysis Unit (SPU) stack.

A 3-layer receptor grid system was created around the site. A 400m x 400m grid with receptors at 10m spacing was created with the location of the SPU stack at its centre. Around this a coarser 4km x 4km grid with 100m receptor spacings was created. Finally a 10km x 10km grid with 500m receptor spacings was positioned around the site.

11.4.4 Terrain Data

A terrain height for each of the receptors on the grid was input to the model in order to accurately represent the changing elevations of the surrounding landscape. Digitised terrain data was incorporated into the model for a 10km x 10km square

around the site and centred on the SPU stack. The heights of the model receptors positioned on the Derryclure landfill were adjusted further to reflect the actual height of the landfill which was not originally incorporated into the digitised terrain data.

11.4.5 Sources

The only potential emissions resulting from the proposed facility **during normal conditions** relate to the **pyrolysis unit** (1 common flue for two units), the gas-fired engines (3 flues), **the Regenerative Thermal Oxidiser stack and the new odour abatement system vent. A new external Emergency Generator will result in minor emissions. As this generator will only be operated during abnormal conditions (i.e. power failure), these emissions have not been included in the air dispersion model.**

11.4.6 Pollutants

The main emissions from the flues will comprise nitrogen oxides (NO_X), sulphur dioxide (SO_2), carbon monoxide (CO) **and odour**. The design and operation of the facility will ensure that the levels of emissions of these pollutants will not exceed the limits set out in EU Directive 2000/76/EC on the incineration of waste **or best practice guidelines in the case of odour**. Other pollutant emissions limits stipulated in the Directive include particulates (PM), volatile organic compounds (VOCs), heavy metals, hydrogen chloride (HCl), hydrogen fluoride (HF) and dioxins/furans. The design and operation of the facility will also ensure that the levels of emissions of these pollutants will not exceed the limits set out in the Directive during normal operation. In particular the emissions from the gas engines will pass through a catalytic converter **/ Selective Catalytic Reduction abatement system** that will minimize NOx emissions. Potential odour emissions, in the form of Odour Units (OUe) from the waste handling area were also modelled.

With respect to abnormal conditions such as start-up and shut down the facility operators will ensure, in agreement with the EPA and in accordance with the facility's Waste Licence, that the abnormal operating conditions set out in the EU Directive 2000/76/EC on the incineration of waste (Article 13) are met.

The normal operating details of the SPU, engines flues**, Regenerative Thermal Oxidiser (RTO), odour abatement unit** and resultant emissions are outlined in Table 11.2. These details represent maximum flow conditions and were modelled with meteorological data from 2004-2008 inclusive, as stated above in Section 11.4.1. **The updated model run for nitrogen oxides was completed using meteorological data from 2006 only.** However as recommended under Section 6.4 of the EPA Guidance Note (AG4) each model was also run at 75% of the flow conditions.

The output from each flue was treated as a point source in the model. As well as details of the locations and characteristics of the sources details of the facility buildings (heights and dimensions) were also input to the model.

11.4.7 Existing Environment

Air quality data that is representative of the locality of the proposed Energy Centre was gathered. Air quality data relating to oxides of nitrogen, sulphur dioxide, particulates, carbon monoxide, lead and benzene are readily available from the Environmental Protection Agency air quality monitoring results.

The site of the proposed Energy Centre is classified as Zone D (Non-Urban) for the purposes of air quality assessment. EPA air quality monitoring data for four Zone D

locations are available; Ferbane, Co. Offaly; Mountrath, Co. Laois; Mullingar, Co. Westmeath; Kilkitt, Co. Monaghan. Although classified as Zone D the monitoring carried out in Mountrath and Mullingar was undertaken in relatively close proximity to the town centres (<500m). Therefore it was considered appropriate to take the highest data from the Ferbane and Kilkitt monitoring as representative of the worst-case air quality in the vicinity of the proposed Energy Centre.

Since the air quality monitoring at both locations was conducted for periods of 5-6 months only there were no annual average results available. Therefore the mean hourly background concentration values were taken as a conservative estimate of the annual averages.

The combination of short term process contributions and background concentrations of NO_2, SO_2 and PM_{10} were calculated in accordance with the method recommended in Appendix E of the EPA AG4 Guidance Note.

Ambient air quality data for the remaining potential pollutants that were modelled were not easily available and the modelling results had to be analysed in the absence of this data (see Section 11.4.8 on the modelling results).

Where available the existing background concentration is combined with the predicted process contribution in order to give the predicted ambient concentration. The predicted ambient concentration is then compared with the relevant ambient air quality standard for the protection of human health to assess the significance of the releases from the facility.

11.4.8 Assessment of Cumulative Impacts

The cumulative air quality impact assessment for the proposed Energy Centre has taken into account the emissions from the flare at the Derryclure Landfill as well as the ambient air quality as outlined above. The emissions from the landfill flare that have been input to the model are outlined in Table 11.3.

Table 11.2: *Energy Centre Stack Emissions Details*

Parameter	**Exhaust Stack 1 (from SPU) A2-1**		**Exhaust Stacks 2,3,4 (one stack from each Gas Engine) A2-2, A2-3, A2-4**		**Exhaust Stack 5 (from Regenerative Thermal Oxidiser) A2-5**		**Exhaust Vent 6 (from new Odour Abatement Unit) A2-6**	
Stack Height (m)	30		30		**18.9**		**15**	
Stack Internal Diameter (m)	**0.9**		0.55		**0.7**		**1.78**	
Stack Exit Gas Temperature (K)	**545**		**413**		**403**		**293**	
Normalised Stack Volumetric Flow Rate (m^3/hr)	27,845[1] (20,884)		10,422[2] (7,817)		**12,375 (9,281)**			
Actual Stack Volumetric Flow Rate (m^3/hr)	**52,265**		**23,600**		**18,268**		**78,572**	
	(mg/Nm^3)[1]	(g/s)	(mg/Nm^3)[2]	(g/s)	(Ou_E/Nm^3)[3]	(Ou_E /s)	(Ou_E/Nm^3)[3]	(Ou_E /s)
NO_X	200	1.547 (1.16)	**50**[2]	**0.145 (0.11)**	-	-	-	-
SO_2	50	0.387 (0.29)	50[2]	0.145 (0.11)	-	-	-	-
CO	50	0.387 (0.29)	50[2]	0.145 (0.11)	-	-	-	-
Particulates	10	0.077 (0.058)	10[2]	0.03 (0.02)	-	-	-	-
Volatile Organic Compounds	10	0.077 (0.058)	10[2]	0.03 (0.02)	-	-	-	-
Cadmium (Cd) + Thalium (Tl) – Total	0.05	0.00039 (0.00029)	-	-	-	-	-	-
Mercury (Hg)	0.05	0.00039 (0.00029)	-	-	-	-	-	-
Sb,As,Pb,Cr,Co,Cu,Mn,Ni,Va – Total	0.5	0.00387 (0.0029)	-	-	-	-	-	-
Dioxins	1E-7	7.73E-10 (5.8E-10)	-	-	-	-	-	-
HCl	10	0.077 (0.058)	-		-	-	-	-
HF	1	0.0077 (0.0058)	-	-	-	-	-	-
Odour (Odour Unit/Nm^3 & Odour Unit/s)	**4,000**[6]	**24,200**[6]	-	-	**500**	**1719**	**500**	**10,200**

Note 1: Reference conditions – 273K, 101.3kPa, dry gas, 11% O_2
Note 2: Reference conditions – 273K, 101.3kPa, dry gas, 5% O_2
Note 3: Reference conditions – 273K, 101.3kPa, dry gas
Note 4: Bracketed Figures – 75% load emissions
Note 5: Assumptions – Ideal Gas Law applies and pressure losses in system are negligible
Note 6: Reference conditions for odour scenario (air bypass to SPU stack when SPU not in operation): 273K, 101.3kPa, dry gas.
During normal operation, waste drawn from the reception hall for use as combustion air will have no odour component (following combustion).
The scenario included in the model allows for times when the pyrolysis system is not in operation and air normally drawn for combustion is discharged directly to stack (on bypass)

There are a number of other EPA-licensed facilities in the vicinity of the proposed site but there will be no significant cumulative impact with the proposed facility due to the distance between the sites and the low levels of emissions. Appendix F (Cumulative Impact Assessments) of the EPA Guidance Note AG4 states, that in order for a nearby major air emission source to be considered to have a cumulative impact, the nearby air emission source needs to produce a minimum of 100 tonnes of any pollutant annually. Potential sources in the area which produce under the 100 tonnes are

- Castle Paints located approx 5km north of site in Tullamore
- Advanced Environmental Solutions located approx 5km north of site in Tullamore
- KMK Metals Recycling Limited located approx 5km north of site in Tullamore

Each pollutant emission value for these sites is well below the 100 tonne requirement set out in the EPA Guidance Note AG4 and so can be regarded as having no significant cumulative impact with the emissions from the proposed Energy Centre.

Table 11.3: *Derryclure Landfill Flare Stack Emissions Details*

Parameter	**Exhaust Stack 6 (Flare)**	
Stack Height (m)	7.5[1]	
Stack Internal Diameter (m)	1.18[1]	
Stack Exit Gas Temperature (K)	473[3]	
Normalised Stack Volumetric Flow Rate (m^3/hr)	680[1,2]	
Actual Stack Volumetric Flow Rate (m^3/hr)	1,178	
	(mg/Nm^3)[1,2]	(g/s)
NO_X	150	0.03
SO_2	-	-
CO	50	0.01
Particulates	-	-
Volatile Organic Compounds	-	-
Cadmium (Cd) + Thalium (Tl) – Total	-	-
Mercury (Hg)	-	-
Sb,As,Pb,Cr,Co,Cu,Mn,Ni,Va – Total	-	-
Dioxins	-	-
HCl	50	0.01
HF	5	0.001

Note 1: From Offaly Co. Co. and EPA Waste Licence conditions.
Note 2: Reference Conditions as per Waste Licence, Schedule C
Note 3: Not available (assumed)

11.4.9 Modelling Results

The results of the air dispersion modeling for all potential pollutants from the proposed Energy Centre are detailed in Table 11.4 below.

The results for each pollutant are discussed in the following sections.

Nitrogen Oxides

The 99.8%ile 1 hour result for NOx which resulted from modeling of the combined NOx emissions of the proposed Energy Centre facility and the Derryclure Landfill flare was **161**µg/m^3. **The updated model run for nitrogen oxides used the 2006 meteorological data.**

The 99.8%ile 1 hour result (**161**µg/m^3) was combined with the 99.8%ile 1 hour monitoring result from the EPA data (43µg/m^3) in accordance with method in Appendix E of EPA AG4 Guidance Note to give an overall 99.8%ile 1 hour ground level concentration of **175**µg/m^3. This represents **88**% of the air quality standard of 200µg/m^3. However it is noted that the higher concentrations occur very close to the site and low levels are reached within a very short distance.

The annual result for NOx was **18**µg/m^3 **(using the 2006 meteorological data)**. This was combined with the mean hourly value monitoring result from the EPA data (7µg/m^3 – this is a very conservative estimation of the ambient annual concentration) to give an overall maximum annual ground level concentration of **25**µg/m^3. This **conservative estimate** represents **83%** of the air quality standard for the protection of vegetation 30µg/m^3. Therefore it is concluded that flora and fauna will not be adversely affected by nitrogen deposition and acidification.

With respect to the protection of human health the annual average NO_2 limit is 40µg/m^3. If it is conservatively assumed that the conversion from NOx to NO_2 is 100% then the maximum annual result for NO_2 is also 18µg/m^3. This was combined with the mean hourly value monitoring result from the EPA data to give an overall maximum annual ground level concentration of 25µg/m^3. This represents **63%** of the air quality standard for the protection of human health.

Sulphur Dioxide

The maximum 99.7%ile 1 hour result for SO_2 which resulted from modeling of the SO_2 emissions of the proposed Energy Centre facility was 35µg/m^3. This result occurred in the model run using the 2005 meteorological data.

The maximum 99.7%ile 1 hour result (35µg/m^3) was combined with the 99.7%ile 1 hour monitoring result from the EPA data (14µg/m^3) in accordance with method in Appendix E of EPA AG4 Guidance Note to give an overall maximum 99.7%ile 1 hour ground level concentration of 41µg/m^3. This represents only 12% of the air quality standard of 350µg/m^3.

The maximum 99.2%ile 24 hour result for SO_2 was 11µg/m^3 and occurred in the model run using the 2004 meteorological data. This was combined with the 99.2%ile 24 hour monitoring result from the EPA data (3µg/m^3) in accordance with method in Appendix E of EPA AG4 Guidance Note to give an overall maximum 99.2%ile 24 hour ground level concentration of 17µg/m^3. This represents only 14% of the air quality standard of 125µg/m^3.

The maximum annual result for SO_2 was 1µg/m^3 and occurred in the model run using the 2008 meteorological data and the 75% flowrate. This was combined with the mean hourly value monitoring result from the EPA data (8µg/m^3 – this is a very conservative estimation of the ambient annual concentration) to give an overall maximum annual ground level concentration of 9µg/m^3. This represents only 45% of the air quality standard of 20µg/m^3.

(This was the only modeling result for which the 75% flowrate run produced a higher ground level concentration than the equivalent 100% flowrate run).

Particulates

The modeling results for particulates were compared to the air quality standards for both PM_{10} and $PM_{2.5}$.

The maximum 90.4%ile 24 hour result for PM_{10} which resulted from modeling of the particulate emissions of the proposed Energy Centre facility was 0.9µg/m^3. This result occurred in the model run using the 2008 meteorological data.

The maximum 90.4%ile 24 hour result was combined with the 90.4%ile 24 hour monitoring result from the EPA data (31µg/m^3) in accordance with method in Appendix E of EPA AG4 Guidance Note to give an overall maximum 90.4%ile 24 hour ground level concentration of 39µg/m^3. This represents 78% of the air quality standard of 50µg/m^3.

The maximum annual result for particulates was 0.3µg/m^3 and occurred in the model run using the 2008 meteorological data. This was combined with the mean daily value monitoring result from the EPA data (19µg/m^3 – this is a very conservative estimation of the ambient annual concentration) to give an overall maximum annual ground level concentration of 19µg/m^3. This represents 48% & 97%, respectively of the air quality standards for PM_{10} and $PM_{2.5}$. However the particulates resulting from the operation of the proposed Energy Centre represents only 3% and 1.5% of the PM_{10} and $PM_{2.5}$ air quality standards, respectively.

Carbon Monoxide

The maximum 8 hour result for CO which resulted from modeling of the carbon monoxide emissions of the proposed Energy Centre facility was 26µg/m^3. This result occurred in the model run using the 2007 meteorological data.

The maximum 8 hour result was combined with the 8 hour monitoring result from the EPA data (1,400µg/m^3) to give an overall maximum 8 hour ground level concentration of 1,426µg/m^3. This represents only 14% of the air quality standard of 10,000µg/m^3.

Volatile Organic Compounds

The modeling results for VOCs were compared to the air quality standard for Benzene as per the EPA Guidance Note (AG4).

The maximum annual result for VOCs which resulted from modeling of the VOC emissions of the proposed Energy Centre facility was 0.3µg/m^3. This result occurred in the model run using the 2008 meteorological data.

The maximum annual result was combined with the mean hourly value monitoring result from the EPA data (0.2µg/m^3 – this is a very conservative estimation of the ambient annual concentration) to give an overall maximum annual ground level concentration of 0.5µg/m^3. This represents only 10% of the air quality standard of 5µg/m^3.

Hydrogen Chloride

The maximum hourly result for HCl which resulted from modeling of the combined HCl emissions of the proposed Energy Centre facility and the Derryclure Landfill flare was 12µg/m^3. This result occurred in the model run using the 2008 meteorological data.

There was no available ambient air quality data for HCl so it was not possible to determine the cumulative value. However since the modeled emission

represents only 1.6% of the air quality standard of 750µg/m^3 it is considered reasonable to conclude that the impact of the proposed facility with respect to ambient air concentrations of HCl is not significant.

The maximum hourly result for HFl which resulted from modeling of the combined HF emissions of the proposed Energy Centre facility and the Derryclure Landfill flare was 1µg/m^3. This result occurred in the model run using the 2008 meteorological data.

There was no available ambient air quality data for HF so it was not possible to determine the cumulative value. However since the modeled emission represents only 0.4% of the air quality standard of 250µg/m^3 it is considered reasonable to conclude that the impact of the proposed facility with respect to ambient air concentrations of HF is not significant.

Heavy Metals

The maximum annual result for Cadmium and Thallium was 4.7 x 10^{-4}µg/m^3 and occurred in the model run using the 2005 meteorological data.

There was no available ambient air quality data for Heavy Metals so it was not possible to determine the cumulative value. However since the modeled emission represents only 9% of the air quality standard of 0.005µg/m^3 therefore it is reasonable to conclude that the impact of the proposed facility with respect to ambient air concentrations of Cadmium and Thallium is not significant.

The maximum hourly result for the emissions of Mercury which resulted from modeling of the potential Mercury emissions of the proposed Energy Centre facility was 0.016µg/m^3. This result occurred in the model run using the 2004 meteorological data.

There was no available ambient air quality data for Heavy Metals so it was not possible to determine the cumulative value. However since the modeled emission represents only 0.2% of the air quality standard of 7.5µg/m^3 it is considered reasonable to conclude that the impact of the proposed facility with respect to ambient air concentration of Mercury is not significant.

The maximum annual result for Mercury was 4.7 x 10^{-4}µg/m^3 and occurred in the model run using the 2005 meteorological data. This modeled emission represents only 0.2% of the air quality standard of 0.25µg/m^3 therefore it is reasonable to conclude that the impact of the proposed facility with respect to ambient air concentrations of Mercury is not significant.

The maximum hourly result for the combined emissions of the remaining Heavy Metals (see Table 11.1 for details) which resulted from modeling of the potential Heavy Metal emissions of the proposed Energy Centre facility was 0.16µg/m^3. This result occurred in the model run using the 2004 meteorological data.

There was no available ambient air quality data for Heavy Metals so it was not possible to determine the cumulative value. However since the modeled emission represents only 0.04% of the air quality standard of 400µg/m^3 it is considered reasonable to conclude that the impact of the proposed facility with respect to ambient air concentration of Heavy Metals is not significant.

The maximum annual result for the remaining Heavy Metals was 4.7 x 10^{-3}µg/m^3 and occurred in the model run using the 2005 meteorological data. This modeled emission represents only 36% of the air quality standard of 1.3 x 10^{-2}µg/m^3 it is considered reasonable to conclude that the impact of the proposed facility with respect to ambient air concentration of Heavy Metals is not significant.

Dioxins/Furans

The maximum hourly result for Dioxins/Furans which resulted from modeling of the potential Dioxin/Furan emissions of the proposed Energy Centre facility was 3.2 x 10^{-8}µg/m^3. This result occurred in the model run using the 2004 meteorological data.

There was no available ambient air quality data for Dioxins/Furans so it was not possible to determine the cumulative value. However since the modeled emission represents only 11% of the air quality standard of 3.2 x 10^{-7}µg/m^3 it is considered reasonable to conclude that the impact of the proposed facility with respect to ambient air concentrations of Dioxins/Furans is not significant.

Due to the very low concentration levels modeled for Dioxins/Furans it was not possible to generate a contour plot.

Odour

The **maximum 98%ile** hourly result for Odour which resulted from modeling of the potential odour emissions of the proposed Energy Centre facility was **1.1**Ou_E m^{-3}. This result occurred in the model run using the 2004 meteorological data.

There was no available ambient air quality data for Odour so it was not possible to determine the cumulative value.

However since the modeled emission represents less than **40%** the generally applied criteria[5] (3 Ou_E m^{-3}) it is considered reasonable to conclude that the impact of the proposed facility with respect to ambient air concentrations of odour is not significant.

11.5 Conclusions

The construction phase of the proposed Energy Centre will be temporary (of approx. 12 months duration) and Good Management Practice will be used to minimise air emissions, in particular dust during this period.

The results of the air quality modelling analysis undertaken, as summarised in Table 11.4 indicate that even at maximum potential emissions from the operation of the proposed Energy Centre ambient air quality will remain below the relevant air quality standard limits and guidelines values. However it should also be noted that the modelling has represented the worst case scenario[6] and it is anticipated that actual emissions from the facility will be below the modelled values.

Therefore it is concluded that there will be no significant impact on air quality from the construction or operation of the proposed facility.

[5] EPA Limit (composting, landfilling, wastewater treatment, slaughterhouse etc.)
[6] The updated model run for nitrogen oxides was carried out using one year of meteorological data only (2006)

Table 11.4: *Modelling Results*

Scenario	Description	Predicted Max. Average (µg/m^3)	Predicted Max. %ile of Average (µg/m^3)	Predicted %ile/Max Occurred at Location	Predicted %ile/Max Occurred in Year	Background Conc. (µg/m^3)	Total Conc.: BG + Predicted (µg/m^3)	Air Quality Standards/ Guideline Values (µg/m^3)	Predicted Result as Percentage of Limit
Nitrogen Oxides	1 hr NOx	**171**	**161** (99.8%ile)	**E235212, N220293**	**2006**[2]	43	**175**[1]	200	**88%**
	Annual NOx	**18**	N/A	E235362, N220395	2008	7	**25**	30	**83%**
Sulphur Dioxide	1 hr SO_2	40	35 (99.7%ile)	E235158, N220120	2005	14	41[1]	350	**12%**
	Daily SO_2	22	11 (99.2%ile)	E235172, N220277	2004	3	17[1]	125	**14%**
	Annual SO_2	1	N/A	E235362 N220395	2008	8	9	20	**45%**
Particulates	Daily PM_{10}	4	0.9 (90.4%ile)	E235362, N220395	2008	31	39[1]	50	**78%**
	Annual PM_{10}	0.3	N/A	E235362, N220395	2008	19	19	40	**48%**
	Annual $PM_{2.5}$	0.3	N/A	E235362, N220395	2008	19	19	20	**97%**
Carbon Monoxide	8 hr CO	26	N/A	E235158, N220120	2007	1,400	1,426	10,000	**14%**
Volatile Organic Compounds	Annual VOC	0.3	N/A	E235362, N220395	2008	0.2	0.5	5	**10%**

Note 1: Calculated in accordance with Short-term Process Contribution Method provided in Appendix E of the EPA AG4 Guidance Note
Note 2: The updated air dispersion model for NO_X was run using one year of meteorological data (2006)

Scenario	Description	Predicted Max. Average ($\mu g/m^3$)	Predicted Max. %ile of Average ($\mu g/m^3$)	Predicted %ile/Max Occurred at Location	Predicted %ile/Max Occurred in Year	Background Conc. ($\mu g/m^3$)	Total Conc.: BG + Predicted ($\mu g/m^3$)	Air Quality Standards/ Guideline Values ($\mu g/m^3$)	Predicted Result as Percentage of Limit
Hydrogen Chloride	1 hr HCl	12	N/A	E235362, N220595	2008	N/A	12	750	**1.6%**
Hydrogen Fluoride	1 hr HF	1	N/A	E235362, N220595	2008	N/A	1	250	**0.4%**
Heavy Metals	Annual Cd+Th	4.7×10^{-4}	N/A	E235172, N220277	2005	N/A	4.7×10^{-4}	5×10^{-3}	**9%**
	1 hr Hg	0.016	N/A	E235158, N220120	2004	N/A	0.016	7.5	**0.2%**
	Annual Hg	4.7×10^{-4}	N/A	E235172, N220277	2005	N/A	4.7×10^{-4}	0.25	**0.2%**
	1 hr Others	0.16	N/A	E235158, N220120	2004	N/A	0.16	400	**0.04%**
	Annual Others	4.7×10^{-3}	N/A	E235172, N220277	2005	N/A	4.7×10^{-3}	1.3×10^{-2}	**36%**
Dioxins	1 hr Dioxins	3.2×10^{-8}	N/A	E235158, N220120	2004	N/A	3.2×10^{-8}	3×10^{-7}	**11%**
Odour Unit	1 hr Odour Unit	-	1.1	E234965, N220593	2004	N/A	1.1[3]	3.0[4]	37%
								1.5-6.0[5]	18-73%

Note 3: 1.1 odour units/hour is the 98%ile of predicted max average
Note 4: Unit is odour unit/m^3. EPA Limit (composting, landfilling, wastewater treatment, slaughterhouse etc.)
Note 5: Unit is odour unit/m^3. UK Environment Agency H4 Guidance Range

APPENDIX I.2

SCREENING STATEMENT FOR APPROPRIATE ASSESSMENT REPORT

July 2010

Scott Cawley

(9 pages)

SCREENING STATMENT FOR APPROPRIATE ASSESSMENT REPORT

FOR

DERRYCLURE ENERGY CENTRE

PREPARED IN ACCORDANCE WITH ARTICLE 6(3) AND (4)

OF THE EUROPEAN COMMISSION HABITATS DIRECTIVE 92/43/EUROPEAN COMMISSION

Prepared July 2010

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1. Introduction

The information in this report, has been prepared by Scott Cawley Ltd., on behalf of Glanpower Ltd. It provides information on and assesses the potential impacts of the Derryclure Energy Centre. The information in this report forms part of, and should be read in conjunction with, the Environmental Impact Statement that has been prepared for the proposed development.

All planning applications should have due regard to Schedule 27 and 33 of the Habitats Regulations (1997).

Schedule 27.

27. (1) A local authority when duly considering an application for planning permission, or the Board when duly considering an appeal on a application for planning permission, in respect of a proposed development that is not directly connected with, or necessary to the management of, a European site but likely to have a significant effect thereon either individually or in combination with other developments, shall ensure that an appropriate assessment of the implications for the site in view of the site's conservation objectives is undertaken.

(2) An environmental impact assessment in respect of a proposed development prepared in accordance with a requirement of or under the Local Government (Planning and Development) Regulations, 1994 (S.I. No. 86 of 1994), shall be an appropriate assessment for the purposes of paragraph (1).

(3) Notwithstanding section 26 of the Local Government (Planning and Development) Act, 1963 , and subject to paragraphs (4), (5) and (6) a local authority or the Board, as the case may be, shall, having regard to the conclusions of the assessment to which paragraph (1) relates, decide to grant permission for the proposed development only after having ascertained that it will not adversely affect the integrity of the European site concerned.

(4) In considering whether a development will adversely affect the integrity of the European site concerned, the local authority or the Board, as the case may be, shall have regard to the manner in which it is proposed to be carried out or to any conditions or restrictions subject to which they propose that the permission should be given.

(5) A local authority or the Board, as the case may be, may, notwithstanding a negative assessment and in the absence of alternative solutions, decide to grant planning permission for a proposed development where such development has to be carried out for imperative reasons of overriding public interest.

(6) (a) Subject to subparagraph (b), imperative reasons of overriding public interest shall include reasons of a social or economic nature:

(b) If the site concerned hosts a priority natural habitat type of or priority species the only considerations of overriding public interest shall be—

(i) those relating to human health or public safety, or

(ii) the beneficial consequences of primary importance for the environment, or

(iii) further to an opinion from the Commission to other imperative reasons of overriding public interest.

(7) Where a local authority or the Board desire to obtain the opinion of the Commission as to whether reasons are to be considered imperative reasons of overriding public interest, they shall refer the matter to the Minister for the

Environment and the Minister for the Environment shall communicate with the Commission on behalf of the local authority or the Board and by notice shall convey the Commission's opinion to the local authority or the Board, as the case may be.

(8) A decision shall not be made on the application or the appeal, as the case may be, by the local authority or the Board until the Commission's opinion has been communicated to them.

(9) For the purposes of the Board's objectives under subsection (2) of section 2 of the Local Government (Planning and Development) Act, 1992 , to determine the appeal within a period of 4 months or such other period as may be prescribed under paragraph (b) of that subsection, there shall not be included the period beginning on the day the matter is referred by the Board to the Minister for the Environment under that paragraph and ending on the day of receipt by the Board of notice by the Minister for the Environment of an opinion by the Commission on the matter.

(10) Notwithstanding subsection (4) of section 26 of the Local Government (Planning and Development) Act, 1963 , the appropriate period referred to in that subsection shall not, in a case in which a request is made to the Minister for the Environment under paragraph (7), include the period beginning on the day the matter is referred by the local authority to the Minister for the Environment under that paragraph and ending on the day of receipt by the local authority concerned of notice by the Minister for the Environment of an opinion by the Commission on the matter.

(11) Where immediately before the making of these Regulations a planning authority or the Board, as the case may be, have granted permission in respect of a development within a European site and such development is considered by the Minister to have a significant adverse effect on the ecological features of the site that Minister may request the local authority or the Board to review the permission in accordance with the provisions of this Regulation and the local authority or the Board shall affirm, modify or revoke such permission depending on the results of the review.

Schedule 33:

Where in accordance with Regulations 27 (5), 28 (5), 29 (4), 30 (5), 31 (5) or 32 (5) an operation or activity is agreed to, notwithstanding a negative assessment of the implications for a European site, the Minister shall ensure that the necessary compensatory measures are taken to ensure that the overall coherence of Natura 2000 is protected.

This report has been prepared in accordance with the following documents:

- EC Environment Directorate-General (DG) *Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC* referred to as the “EC Article 6 Guidance Document”. The guidance within this document provides a non-mandatory methodology for carrying out assessments required under Article 6(3) and (4) of the Habitats Directive.

- EC Environment Directorate-General (DG) *Managing Natura 2000 sites: The Provisions of Article 6 of the Habitat's Directive 92/43/EEC*, referred to as "MN2000".

- Department of Environment, Heritage and Local Government (2010 revision) *Appropriate Assessment of Plans and Projects in Ireland Guidance for Planning Authorities.*

The assessment itself is often referred to as an 'appropriate assessment' or AA.

The European Commission guidance document sets out a four stage process for carrying out the AA, the first of which, referred to as "Stage One: Screening", identifies the likely impacts on a Natura 2000 site, if any, which would arise from a proposed development, and further considers whether these impacts are likely to be significant.

If the conclusions at the end of the Stage One Screening are that there would be no significant impacts on the Natura 2000 site, there is no requirement to proceed to subsequent stages. However, even if the Stage One Screening makes a finding of no significant impacts, and therefore concludes that further stages of the Appropriate Assessment process are not required, a 'Findings of No Significant Effects' report is required in order to provide transparency of decision-making, and to ensure the application of the 'precautionary principle'[1]. This is termed a *Statement for AA Screening* in the Irish Guidance.

It is the responsibility of the competent authority, in this instance Offaly County Council to make a decision as to whether or not the proposed development should be permitted, taking into consideration any potential impact upon any Natura 2000 within its scope of influence.

2. Screening Exercise

The Screening Exercise comprises four steps:

1. Determining whether the project or plan is directly connected with or necessary to the conservation management of any Natura 2000 sites;
2. Describing the specifications of the development and other cumulative developments that may affect any Natura 2000 sites;
3. Describing the characteristics of relevant Natura 2000 sites, identification of, and compilation of information on their qualifying interests and conservation objectives.
4. Identifying the potential effects on any Natura 2000 sites and assessment of likely effects – direct, indirect and cumulative – undertaken on the basis of available information as a desk study or field survey or primary research as necessary.
5. Assessing the significance of any likely effects on any Natura 2000 sites.

[1] One of the primary foundations of the precautionary principle, and globally accepted definitions, results from the work of the Rio Declaration. Principle #15 declaration notes:
"In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation."

The outcome of screening for this project was that it can be objectively concluded that there are not likely to be significant effects on any Natura 2000 sites. Therefore no further assessment is required. Table 2.1 (Screening report matrix) provides a summary of the information gathered for Steps 1 to 3 and the assessment of significance for Step 4.

Table 2.1: Finding of No Significant Effects report matrix	
Information about project	
Brief description of the project	ADD PROJECT DESCRIPTION
Brief description of the Natura 2000 sites with 15km of the site	There are several Natura 2000 sites within 15km of the proposed development location. These include the following: • Charleville Wood cSAC 000571 3.5km northwest of the site. Ancient woodland site with a varied age structure. Contains Old Oak woodland and the rare snail species, *Vertigo moulinsiana*. The wetland areas have good bird populations and rare insect and *Myxomycete* species. • River Barrow and River Nore cSAC 002162 5.6km southeast of the site The site is a SAC selected for alluvial wet woodlands and petrifying springs, priority habitats and also for old oak woodlands, floating river vegetation, estuary, tidal mudflats, *Salicornia* mudflats, Atlantic salt meadows, Mediterranean salt meadows, dry heath and eutrophic tall herbs, all habitats listed on Annex I of the E.U. Habitats Directive. The site is also selected for the following species listed on Annex II of the same directive - Sea Lamprey, River Lamprey, Brook Lamprey, Freshwater Pearl Mussel, Nore Freshwater Pearl Mussel, Crayfish, Twaite Shad, Atlantic Salmon, Otter, Desmoulin's Whorl Snail *Vertigo moulinsiana* and the Killarney Fern • Slieve Bloom Mountains SPA 004160 9.4km southwest of the site Hen Harrier breeding site. • Clara Bog cSAC 00572 12km northwest of the site. Clara Bog has long been regarded as one of the most important lowland raised bogs in the country, being the largest remaining example of the true Midland sub-type. It has well

	developed hummock and hollow complexes and one of the few remaining soak systems. The bog vegetation has been much studied and is well known. Variations in the proportions of Bog moss (*Sphagnum spp.*), Heather (*Calluna vulgaris*) and Cottongrass (*Eriophorum spp.*) has been related to ecological features such as pools, soaks and ridges. Several rare invertebrate species are associated with the soak, including the midge, *Lasiodiamesa sphagnicola*, for which Clara Bog is its only known Irish site, a click beetle, *Ampedus pomorum* and another midge, *Parhelophilus consimilis*. The bog is also important for the rare moss, *Tetraplodon angustatus*, at its only known Irish station here. Clara Bog supports breeding Merlin (1-2 pairs), a scarce species in Ireland and one that is listed on Annex I of the EU Birds Directive. Red Grouse also breeds, along with other common bogland species such as Meadow Pipit and Skylark. • Raheenmore Bog cSAC 00582 14.3km northeast of the site. This raised bog developed in a small basin in the catchment of two major river systems i.e. the Brosna and the Boyne. It is situated about 5 km from Daingean. The peat is very deep, being up to 15 m in places. The bog has a well-developed hummock and hollow system.The hummocks are often colonised by the mosses *Sphagnum imbricatum* and *S. fuscum*. In 1959, the very rare Rannock Rush (*Scheuchzeria palustris*), found only in its only Irish Station in a nearby bog, was transplanted to Raheenmore Bog. However, it has not been recorded recently and may be now extinct. Raheenmore Bog is within the breeding territory of a pair of Merlin, a scarce species in Ireland and one that is listed on Annex I of the EU Birds Directive. Other typical bogland birds which breed include Red Grouse and Snipe. • Clonaslee Eskers and Derry Bog cSAC 00859 10.5km southwest of the site To the northwest the Derry Hills are two isolated hills situated in a bog, which forms part of the site. The main esker ridge runs along the southern part of the site. The site contains a population of the rare snail Vertigo geyeri, a species listed under Annex II of the EU Habitats Directive. Derry Bog, which is a cutaway raised bog, lies to the northwest of the site. This supports a typical range of bog mosses and flowering plants, such as Ling Heather and Bog Asphodel (*Narthecium ossifragum*). The rare snail *Vertigo geyeri* was recorded from the fen area at this site in 1998. This species is a glacial relic with a disjunct European population, which is considered vulnerable due to loss of habitat, particularly through drainage. It is

	listed on Annex II of the EU Habitats Directive. Two plant species, protected under the Flora (Protection) Order, 1999, occur within the site. Wood Bitter-Vetch (*Vicia orobus*) occurs in quantity among Oak/Birch scrub on Derry Hills. This species has declined due to land reclamation and has only been seen at one other location since l970. Basil Thyme (*Acinos arvensis*) occurs in a disused gravel pit and has been seen at only three other sites since l970. This species favours open gravel and has declined due to the agricultural use of herbicides. Blue Fleabane (*Erigeron acer*) had been recorded with Basil Thyme at this site. This species is rare and threatened in Ireland and is listed in the Red Data Book as a species confined mostly to open gravel habitats in central and south-eastern Ireland. These are identified in Figure 1.
Is the project directly connected with or necessary to the management of the site?	No
Are there other projects or plans that together with the project being assessed could affect the sites	There are no other known projects that would combine with the effects of the proposed developments to give rise to likely significant effects.
Assessment of significance of effects	
Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the Natura 2000 site.	There are very few elements of the project that have an impact outside of the site boundary. The small scale and nature of the development is such that all construction impacts will be localised and not extend beyond the site footprint. During operation, the only element that could reasonably give rise to effects outside of the site boundary would be the emissions to air from the energy centre. Air dispersion modelling has demonstrated no adverse impact on air quality standards.
Describe any likely direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on the Natura 2000 site by virtue of: Size and Scale, land-take, distance from the Natura 2000 site or key features of the site, resource requirements, emissions, excavation requirements, transportation requirements, duration of construction,	Primary emissions from proposed energy centre will be to air. Air dispersion modelling has been completed and demonstrates no exceedence of air quality standards.

(operation, decommissioning, etc)	
Describe any likely changes to the site arising as a result of reduction of habitat area, disturbance to key species, habitat or species fragmentation, reduction in species density, changes in key indicators of conservation value and climate change.	No likely changes have been predicted.
Describe any likely impacts on the Natura 2000 site as a whole in terms of interference with the key relationships that define the structure or function of the site:	No likely significant impacts have been predicted.
Provide indicators of significance as a result of the identification of effects set out above in terms of loss, fragmentation, disruption, disturbance or change to elements of the site.	No likely significant impacts have been predicted.
Describe from the above those elements of the project or plan, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known:	No likely significant impacts have been predicted.

APPENDIX L

STATUTORY REQUIREMENTS

FURTHER INFORMATION

- L.1: Application of BAT for Waste Incineration
- L.2: Application of BAT NEEC for Waste Sector (IPPC)
- L.3: Application of BAT for Waste Sector – Transfer and Materials Recovery

APPENDIX L.1

APPLICATION OF BAT FOR WASTE INCINERATION

Assessment of Compliance with BAT Guidance Document:

Reference Document on the Best Available Techniques for Waste Incineration, European Commission, August 1996

(8 pages)

In order to provide for levels of facility performance that are generally compatible with BAT, general BAT for waste incineration is described in points numbered 1 to 56 within Chapter 5 of the BREF document.

An assessment of the compliance of the proposed development with these points is provided in Table L.1.a

Table L.1.a: Assessment of Compliance with Generic BAT for Waste Incineration (Points 1 to 56 of BREF Chapter 5)

No.	Assessment of Compliance
1	The waste type is based on a pre-treatment step, such that waste is supplied in a dried and shredded form, as is specified in Table 4.9 in Section 4.2.1 of the BREF. The combustion chamber design has been based on vendor unit pilot trials and CFD modelling.
2	All waste consignments will be unloaded indoors to prevent the generation of windblown litter. The site will be maintained by good housekeeping practice in a clean and tidy condition. The site will be regularly inspected for litter as described in Attachment E.6.
3	As described in Section D.2.18, Attachment D.2, a scheduled equipment maintenance programme will be operated for the calibration, repair and maintenance of all equipment throughout the plant. A dedicated on-site maintenance area is provided adjacent to the waste reception hall as shown on the drawing included as Appendix D.8 (drawing no. IE0310150-22-DR-0011).
4	Quality controls will be implemented based on the process description outlined in Attachment D.2. A suitably qualified QESH Manager and a suitably qualified Training Manager will be recruited by Glanpower, prior to the start-up of the plant, to originate and implement standard operating procedures (SOPs) for the site. Draft waste acceptance and handling procedures (including waste inspection and quarantine provisions) have been developed prior to facility construction and these are included in Appendices H.2 and H.3. The pre-treatment stage provides the primary method of controlling waste feed quality to the incineration stage. Waste will be sourced from household and standard commercial streams only and waste will not be accepted from sources handling radioactive material.
5	All waste will be stored internally, in areas with sealed and resistant surfaces. Drainage from the waste reception hall will be to an external underground effluent storage tank, which shall be emptied periodically for treatment off-site.
6	The retention time of waste within the waste reception hall will be 24 hours (up to a maximum of 48 hours for Bank Holiday and extended periods during abnormal operating conditions), based on continuous (24/7)

No.	Assessment of Compliance
	operation of the facility. Waste acceptance hours will be limited to daytime hours whilst hours of waste handling will be 24/7. Deliveries to site will be managed as described in the Waste Acceptance Procedure (included as Appendix H.2).
7	Combustion air for the secondary cyclonic convertors will be drawn from the waste reception hall. Remaining air to be vented from the waste reception hall will be passed through an odour abatement unit (ozone / ionisation / UV treatment to be selected) to minimise the release of odours to the external environment.
8	Waste streams segregated at the pre-treatment step will be removed to dedicated areas as shown on the layout drawing included as Appendix D.8 (drawing no. IE0310150-22-DR-0011).
9	Waste placed in the Waste Quarantine Area will be labelled for identification and segregation purposes.
10	HAZOP studies and implementation of a safety management system on-site will ensure the prevention, detection and control of fire hazards, as described in Attachment J. Details of the fire control system planned for the facility are included in Section D.1.o, Attachment D.1.
11	The pre-treatment steps incorporated for the proposed facility are described in Section D.2.3, Attachment D.2.
12	Ferrous and non-ferrous metals will be removed, prior to incineration, during the pre-treatment stage as described in Section D.2.3, Attachment D.2
13	The waste storage and handling areas will be continuously monitored by operators working in the area
14	The hydraulic loading system, described in Section D.2.5, Attachment D.2 has been designed for the exclusion of air from the waste feed.
15	CFD modelling has been completed for the proposed design, as described for the Residence Tube in Section D.2.8, Attachment D.2.
16	The facility has been designed for continuous operation. Key operational equipment items (including hydraulic and gas cleaning pump sets, filters and strainers) are engineered in duty / standby arrangement. The maintenance requirements will be detailed in the Operation & Maintenance Manual(s) for the plant.

No.	Assessment of Compliance
17	The pre-treatment and pyrolsis steps are designed to ensure that finely powdered char provides good combustion characteristics. The combustion control philosophy has been extensively researched by the vendor during pilot trials. The output from the control system from the initial test burns has demonstrated that the combustion process is very stable, with nearly straight line recordings of key variables, such as temperature.
18	Fuel and oxygen input are monitored and automatically controlled. Air flow to each char burner is monitored by a mass flow meter with thermal dispersion. The cyclonic design of the secondary cyclonic convertor chamber (based on development work with a smaller scale unit and CFD design) is such as to maximise residence time and combustion efficiency.
19	While Directive 2000/76/EC specifies a minimum temperature of 850˚C for the waste characteristics of the char, the secondary cyclonic convertor will operate at a temperature in excess of 1,000˚C. This is necessary to provide sufficient thermal input to the pyrolysis chamber itself. However, the system once started up will operate auto-thermally, as there is sufficient energy input from the char to maintain the necessary temperature in the secondary cyclonic convertor, without recourse to supplementary firing by the oil burners. This has been demonstrated to be the case, based on vendor pilot trials.
20	The combustion air for the secondary cyclonic convertors will be drawn from the waste reception hall. Based on the two-step pyrolysis method of thermal treatment, the preheating of combustion air is not considered necessary.
21	Oil fired burners will be installed with the necessary control system to maintain the temperatures specified in the Directive.
22	The pyrolysis system does not comprise direct combustion in a furnace, but rather a two-stage thermal treatment system designed to maximise energy yield by production of syngas. However, the furnace itself is highly insulated for heat retention and this has been verified during the wood chip trials using a thermal imager.
23	Effective combustion control in the secondary cyclonic convertors is inherently required to ensure consistent supply of heat to the pyrolysis chambers.
24	The proposed system provides a subsequent combustion stage to the standards in Directive 2000/76/EC for the char produced in the pyrolysis step.
25	Not applicable. Two stage thermal treatment process prevents the

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	generation of higher temperature sticky fly ashes.
26	The two-stage pyrolysis system reduces the impact of corrosivity and allows for maximum energy recovery. The Glanpower plant will be equipped with gas engines for electrical generation. Energy efficiency is addressed in Section G.2 of the waste licence application.
27	The Glanpower facility will recover waste heat from the pyrolysis system and syngas engines on a continuous basis in two Heat Recovery Steam Generators (HRSGs). Steam produced by the HRSG units will feed a steam turbine, which in turn will drive a generator for the production of electricity. Residual heat in the syngas engine flue gas will also be recovered, via heat exchanger for use in the waste dryer unit.
28	The location of the proposed facility is considered to strike an appropriate balance between the requirements for self sufficiency and proximity (addressed in Attachment L.4), environmental impact (site selection addressed in EIS) and maximum utilisation of heat/steam energy. The facility will export approximately 9MWe (nominal capacity) to the national grid. The facility is located in proximity to the ESBN 38kV station at Clonminch. In the current absence of local district heating infrastructure and low residential density in the surrounding area, the facility will utilise steam generated on-site in a steam turbine for the generation of electricity.
29	Heat Recovery Steam Generators will be used to recover residual heat from the operation of pyrolysis and gas engine units. The design has been optimised for the utilisation of steam generated in a 1.56MW steam turbine which will generate additional electricity for export.
30	The combined efficiency of the system (linked to gas engines) was assessed against the use of gas turbines. As described in Section G.2.1, Attachment G.2, the relative efficiencies are higher for the selected design.
31	The condenser pressure will be minimised as part of detailed design (ongoing).
32	The energy consumption of the plant has been assessed in detail to ensure the highest possible level of efficiency. The energy efficiency of the plant meets the requirements of high performance CHP and the 'R1 criteria' of the Waste Framework Directive, as described in Attachment G.2. SNCR has been chosen for flue gas treatment on the pyrolysis system exhaust. The requirement for primary fuels is limited to initial priming/firing of the secondary cyclonic convertor, which is fuelled by pyrolysis-derived char once the requisite combustion temperature is achieved.

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33	The selection of steam condensing units is part of ongoing detailed design.
34	The combination of waste pre-treatment plus the two-stage pyrolysis process (incorporating the cyclonic action in the secondary cyclonic convertor) means that the dust leaving the secondary cyclonic convertor unit is minimised.
35	The pyrolysis process (including syngas scrubbing and syngas conditioning) significantly reduces both the quantitative and qualitative impacts of contaminants in the flue gas. The flue gas treatment to be applied includes for SNCR and ceramic filter steps on the pyrolysis system emissions to ensure compliance with WID emission limits. The gas engines will be equipped with SCR injection system for the abatement of NO_X.
36	The flue gas treatment systems have been chosen to achieve compliance with relevant emission limit values. The facility will be a net exporter of electricity.
37	The pyrolysis system (superheating in the absence of oxygen), syngas scrubbing and syngas conditioning steps are key process steps to ensure that flue gas treatment requirements are minimised. Ceramic filters and SNCR systems have been chosen as the most practicable methods for abatement of particulates and NO_X respectively in the pyrolysis flue gas. A SCR injection system will be installed for the minimisation of NO_X emissions arising from the gas engines.
38	Two bag filters will not be placed on any single flue gas treatment line.
39	The optimisation of flue gas treatment systems will be addressed during detailed design and following selection of plant manufacturers. Glanpower will work closely with chosen vendors to develop robust operating procedures and methods for the use of flue gas treatment materials.
40	The system is designed with primary NO_x reduction measures, such as the optimisation of the cyclonic combustion chamber using CFD, the control of oxygen concentration and temperature and pre-treatment of the waste to produce a higher quality char. Secondary NO_x controls (including SNCR and ceramic filter systems) will be installed to ensure compliance with WID NO_x limit of 200mg/m^3.
41	The pyrolysis process is based on the thermal decomposition in the absence of oxygen, so combustion related by-products, such as PCDD/F are avoided. The syngas generated is scrubbed and conditioned to remove chlorine and chlorides before combustion in the gas engines. The char

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	contains negligible quantities of halogenated compounds.
42	The pyrolysis of feedstock prevents formation of dioxins and the pass through of pre-existing dioxin and related compounds.
43	Only those residues which may be safely reprocessed within the pyrolysis system will be recirculated. Where residues arising have potential for disruption of system operation leading to accumulation of metals, these will not be recirculated but rather, sent off-site under permit for suitable treatment.
44	A comprehensive gas scrubbing and condition system will be employed, as described in Sections D.2.9 and D.2.10, Attachment D.2.
45	A comprehensive gas scrubbing and condition system will be employed, as described in Sections D.2.9 and D.2.10, Attachment D.2.
46	The process waste water treatment system proposed for the facility has been designed as a continuous recycle loop, with no effluent emission to water body or public sewer. Residues arising from the scrubber water treatment system will be reprocessed within the two stage thermal system. Excess water from the system will be diverted to the secondary cyclonic convertor. The system allows the absolute maximum re-utilisation of water.
47	All rainwater collected on-site will be diverted to a dedicated surface water management system as described in Section D.1.k, Attachment D.1.
48	Scrubber effluents will not be discharged from site, but rather treated using the on-site scrubber water treatment system, as described in Section D.2.16, Attachment D.2. Recirculation of treated scrubber water, electro-coagulation and electro-oxidation are proposed as part of the scrubber water treatment system. Twin water treatment reservoirs ($24m^3$) will be provided to ensure a stable waste water treatment process.
49	Pre-treatment of the waste has been included as part of facility design. The two stage pyrolysis system as described in Section D.2, Attachment D.2, has been carefully designed for optimisation of char combustion in the secondary cyclonic convertors.
50	The slag collected from the base of the secondary cyclonic convertors is collected separately in floor pits and stored apart from other residues arising.
51	The syngas conditioning and scrubbing steps (Sections D.2.9 and D.2.10, Attachment D.2) include for pre-dedusting. Solid and liquid residues arising

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	from these steps will be combusted in the secondary cyclonic convertor. Oil based residues (hydrocarbons) will be added to the SRF feedstock prior to pyrolysis.
52	Not applicable. Ferrous and non-ferrous metals will removed during the pre-treatment stage.
53	The char arising from pyrolysis is combusted in the secondary cyclonic convertors, which results in the generation of inert, vitrified slag material. No further treatment of the slag will be necessary.
54	Treatment of FGT residues.
55	Noise emissions from the vendor pilot unit are not excessive and BAT techniques have been applied, such as the use of quality acoustic housings on the fans and the installation of an improved hydraulic unit to reduce the 'piston' noise from the hydraulic feeder to the retort.
56	An Environmental Management System (EMS) will be developed and implemented for the facility, as described in Section C.2, Attachment C.2. It is the intention of Glanpower to seek external accreditation to the international standard ISO 14001 for this EMS. While external accreditation in itself is not explicitly required by BAT, it is concluded that the goal of external accreditation will provide the driver and main motivation for Glanpower personnel to expedite the establishment of a comprehensive EMS which meets BAT requirements.

In addition to the generic measures addressed in Table L.1.a above, the Waste Incineration BREF includes specific BAT for pre-treated or selected municipal waste incineration. These are documented in Section 5.3 (points 64 to 68) of the Waste Incineration BREF.

An assessment of the compliance of the proposed development with these points is provided in Table L.1.b.

Table L.1.b: Assessment of Compliance with Specific BAT for Pre-treated Waste Incineration (Points 64 to 68 of BREF Chapter 5)

No.	Assessment of Compliance
64	Waste will be stored indoors within the waste reception hall. The waste reception hall floor is a sealed surface. Drainage from the waste reception hall will be directed to an underground effluent storage tank beneath the service yard, separate from the domestic effluent and surface water drainage systems. The site drainage layout is shown on the drawing

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	included as Appendix D.6 (IE0310150-22-DR-0009).
65	Baling facilities have been included at the pre-treatment stage, as described in Section D.2.3, Attachment D.2.
66	The energy efficiency of the plant is described in Attachment G.2. The total parasitic load will be approximately 2MW with a total export load (MEC) at 9.16MW.
67	As described in Attachment G.2, the primary energy savings value for the plant (17.9%) is greater than 10%. The overall system can therefore be classified as a high efficiency CHP plant. As described in Appendix G.2, Glanpower has submitted its HE CHP application to the Commission for Energy Regulation.
68	The energy efficiency of the plant is described in Attachment G.2. The total parasitic load will be approximately 2MW with a total export load (MEC) at 9.16MW.

APPENDIX L.2

APPLICATION OF BATNEEC FOR WASTE SECTOR

Assessment of Compliance with BATNEEC Guidance Document:

Batneec Guidance Note for the Waste Sector (Revision 1 – May 1996), EPA

(3 pages)

The BATNEEC Guidance Note for the Waste Sector was introduced to provide guidance for activities specified in the First Schedule to the EPA Act, 1992.

"11.1 The incineration of hazardous waste
11.2 The incineration of hospital waste
11.3 The incineration of waste other than that mentioned in 11.1 and 11.2 in plants with a capacity exceeding 1 tonne per hour
11.4 The use of heat for the manufacture of fuel from waste"

These activities have been superseded by the Protection of the Environment Act 2003 (No. 27 of 2003):

"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."

While the note is primarily concerned with activities permitted under IPPC licence, the BAT noted addresses important items for the waste sector, including incineration facilities. An assessment of the compliance of the proposed development with the relevant sections of the BATNEEC Guidance Note is provided in Table L.1.c.

Table L.1.c: Assessment of Compliance with BATNEEC for Waste Sector

BATNEEC Ref.	Assessment of Compliance
4.2	***Incineration*** Liquid wastes arising from the process (eg, scrubber liquor) are directed to a dedicated water treatment system as described in Section D.2.16, Attachment D.2. The water treatment stage includes centrifuge, media filtration, electro-coagulation, electro-oxidation, activated carbon filtration and reverse osmosis steps. An uncontaminated fuel supply is supplied to the secondary cyclonic convertor auxiliary burners, in the form of a dedicated kerosene oil storage tank (Section D.1.g, Attachment D.1). The optimum combustion temperature at the secondary cyclonic convertor is achieved initially by auxiliary oil burners prior to char feed and the char feed is interlocked with the temperature monitoring and control system. Syngas from the pyrolysis chamber is directed immediately to a gas quench step, as described in Section D.2.9, Attachment D.2. The operating temperature (at inner wall of combustion chamber) and residence time of 2 seconds at the operating temperature are addressed in Section D.2.8.

BATNEEC Ref.	Assessment of Compliance
	Waste Derived Fuel The wind separator unit (part of the waste pre-treatment stage described at Section D.2.3, Attachment D.2) will remove hard particles including grit and gravel. The facility will be operated so that waste is accepted during standard daytime hours, while waste will be handled and processed on a continuous (24/7) basis. This provides the primary means of inventory control whereby all waste received at the facility will be directed for pre-treatment within a maximum period of 24 hours. The waste reception hall has been designed for a maximum retention period of 48 hours to cover abnormal conditions (e.g. Bank Holidays, extended downtime for repairs/maintenance).
4.3	***Incineration*** Material storage, handling, processing and transfer will be within the enclosed building as described in Attachment D.2. ***Waste Derived Fuel*** All storage tanks will be bunded in accordance with EPA guidelines. Cooling water, surface water and process effluent streams will each have dedicated drainage / pipeline systems to ensure their separation.
4.4	The pre-treatment step is consistent with the waste hierarchy insofar as it removes dry recyclables from the waste stream for recycling. The recovery, by thermal treatment, of solid recovered fuel (SRF) is also preferable to landfill disposal. Heat recovery will also be incorporated in the overall system, as described in Sections D.2.11 and D.2.13, Attachment D.2.
4.5	The technologies incorporated for treating air emissions include wet scrubbing and activated carbon filtration of syngas; SNCR and ceramic filters for the flue gas treatment of pyrolysis system emissions and SCR treatment for gas engine emissions.
4.6	The scrubber water treatment system (described at Section D.2.16) includes pH correction, electro-coagulation and activated carbon polishing.
4.7	The main residual waste arising from the incineration stage comprises inert vitrified slag from the secondary cyclonic convertor.
5.3.1	The pyrolysis system (including associated secondary cyclonic convertors) has been designed with effective combustion control to

BATNEEC Ref.	Assessment of Compliance
	ensure emissions are in compliance with the Waste Incineration Directive. A description of the emissions and emission control/abatement is included in Sections E and F of the application (with reference to corresponding Attachments and Appendices).
5.4	There will be no process effluent discharge to surface waters. The scrubber water treatment system is continuous recycle loop, whereby excess water is diverted to the secondary cyclonic convertor as required. The only discharge to waters will comprise sanitary effluent (via wastewater treatment plant) to groundwater and uncontaminated stormwater to ditch.
6.1	Temperature monitoring will be provided at the secondary cyclonic convertor, as described at Section D.2.8. Carbon monoxide and oxygen concentration together with flue gas temperature prior to discharge will be monitored by a CEMS unit on the pyrolysis system emission via primary 30m stack.
6.2	Continuous on line real-time instrumental monitoring will be provided as described in Section F.2.1, Attachment F.2.
6.3	There will be no discharge of sanitary or trade effluent to the sewer of a sanitary authority. A package wastewater treatment plant will treat sanitary wastewater, as described in Section D.1.k, Attachment D.1. The emission and emission monitoring for this system is described in Section E.4.1, Attachment E and Section F.5.2, Attachment F.2. The wastewater treatment system will treat sanitary waste only.
6.4	Glanpower will operate an electronic document management system for the filing and maintenance of waste records regarding waste management. The draft waste acceptance procedure developed for the site (Appendix H.2) includes for the recording of waste type, dates and manner of disposal. The quantity of waste will be quantified at the weighbridge and automatically recorded. Waste consigned for disposal to landfill from the facility will be screened and tested prior to transport off-site.

APPENDIX L.3

APPLICATION OF BAT FOR WASTE SECTOR – WASTE TRANSFER AND MATERIALS RECOVERY

Assessment of Compliance with BAT Guidance Document:

BAT Guidance Note on Best Available Techniques for the Waste Sector: Waste Transfer and Materials Recovery, EPA, December 2011

(7 pages)

The BAT Guidance Note for the Waste Sector (Transfer and Materials Recovery) applies to waste transfer and materials recovery facilities (MRFs), as described in Section 3 of the guidance note. Therefore, the scope of this BAT note applies to the front end, or pre-treatment stage only of the proposed Glanpower facility.

The guidance notes cover four types of waste transfer facilities and MRFs (namely inert, non-hazardous, hazardous, inert and clinical) and is relevant to Classes D11, D12, D13, R2, R3, R4 and R13 as defined in the Third and Fourth Schedules of the Waste Management Acts 1996 to 2011. The Glanpower facility will not accept hazardous waste consignments.

An assessment of the compliance of the proposed development with the relevant sections of the BAT Guidance Notes is provided in Table L.1.c.

Table L.1.d: Assessment of Compliance with BAT for Waste Sector Transfer Activities

BAT Note Ref.	Assessment of Compliance
4.1.2.1	The site location is examined in detail in the EIS (Sections 2.4.4, 2.4.5 and 2.4.6). The site is located in an area of low residential density. The boundary of the site is located approximately 350m from the nearest residence. There are no sensitive recreational areas in proximity to the site. Chapter 4 of the EIS describes the site location in the context of human beings, local amenities, distance to water bodies and surrounding land-use. The relevant Waste Management Plan and Development Plans for the area are addressed in Chapter 3 of the EIS. There are no groundwater, coastal water or nature protection zones in the area, as identified in EIS. A number of site investigations have been undertaken, details of which are included as part of the EIS. The EIS identifies potential environmental effects and risks and mitigation measures to prevent environmental impact. Emission control measures (e.g. surface water management system, sanitary effluent treatment system, flue gas treatment system) are described in the relevant sections of the waste licence application. These will prevent the developed site posing an environmental risk during its operation.
4.1.2.2	The nearest sensitive receptor is a house located 350m northwest of the facility. The site is located adjacent to the Derryclure Landfill and Civic Amenity Centre. There are no foreseen adverse impacts on these nearby premises. The facility will comprise a 7,740m^2 building with associated services (described in Attachment D.1) on a 4.5ha site owned by Glanpower. The facility has been designed to receive and process 65,000tpa municipal

BAT Note Ref.	Assessment of Compliance
	waste and 10,000tpa energy crop biomass. Environmental control measures are summarised in Attachment F. Measures to control emissions of odour from the facility are described in Section F.1.1, Attachment F.1 (under "Fugitive Air Emissions"). The surface water management system has been designed to control the rate and quality of surface water runoff from the site as described in Section D.1.k, Attachment D.1 and Section F.1.2, Attachment F.1. The approach to accident prevention and emergency response is addressed in Attachment J. Landscaping and visual impact are addressed in Chapter 6 of the EIS.
4.1.2.3	Decommissioning is addressed in Section K of the application.
4.1.3	The provision of an Environmental Management System (EMS) for the facility is addressed in Attachment C.2.
4.1.4	A weighbridge is included in the design for the automatic weighing of all loads. Waste will be unloaded indoors in the dedicated waste reception hall for inspection. Records will be maintained by facility employees daily in accordance with the requirements of the waste licence.
4.1.4.1	The Waste Acceptance Procedure is addressed within Attachment H.2 of the application. Hazardous waste, chemical wastes and contaminated soils will not be accepted at the facility. Waste will only be accepted from permitted hauliers, who have been approved by the facility's management.
4.1.5	Following pre-treatment, the majority of waste will be recovered on-site. Waste consigned off-site will include metals, glass, ceramics, hard particles and minor quantities of non-conforming waste items (hazardous waste, WEEE etc. These materials will only be transported under permit by authorised hauliers.
4.3.1.1	The energy efficiency of the plant is addressed in Attachment G.2. It is noted that the facility will be a net exporter of electricity to the National Grid. The plant will have a total generating capacity of approximately 11MW, parasitic load of approximately 2MW and total export load (MEC) of approximately 9MW.

BAT Note Ref.	Assessment of Compliance
4.3.1.2	The selection and use of construction materials and products is addressed in Section 2.3.4 of the EIS. Materials have been carefully selected with regard to the requirements of foundation design and acoustic attenuation.
4.3.2.1	Dust/Fine Particulates/Bioaerosols: Standard Operating Procedures (SOPs) will be implemented during the operation of the facility for dust / particulate control. The facility will not accept hazardous dusty waste. A Construction Waste Management Plan will be implemented in accordance with the planning consent for the facility. This will include for enclosed waste handling and storage areas and cleaning/maintenance of site roads. All waste handling activities will be undertaken indoors. A wheelwash will be installed at the site for the maintenance of site roads and entrance. Odour: The facility is sited 350m from the nearest residence. Waste will be delivered in enclosed trucks. Odorous air from the waste reception hall will be abated as described in Sections D.2.14(c) and D.2.14(d), Attachment D.2. All waste will be processed within 48 hours of arrival. Periodic sniff tests will be undertaken at site boundary locations in accordance with EPA requirements for the monitoring of odour.
4.3.2.2	Surface Water: The design of the paved areas and surface water management system is addressed in Attachment D.1. Surface water emissions are described in Attachment E.1. The control of surface water emissions is described in Attachment F.1. The existing surface water environment is described in Chapter 10 of the Environmental Impact Statement (EIS) and Attachment I.2. Groundwater: The activities will not give rise to groundwater emissions of effluents containing hazardous substances. The fuel oil storage tank will be bunded in line with EPA requirements. All chemicals and raw materials will be stored in designated areas located indoors. Spills (which cannot be contained by spill kit) will be contained within the surface water management system. The green/landscaped areas of site will be separated by kerbing from the hardstanding areas of site. Groundwater monitoring at on-site well locations will be undertaken, as described in Section F.5.2, Attachment F.5.
4.3.2.3	The site will be secured by perimeter fencing and will be monitored by security personnel on a 24/7 basis. The fuel oil storage tank will be bunded in accordance with EPA requirements. Bund and tank integrity will be independently assessed at scheduled intervals. Regular visual inspection of bunds will be undertaken by EHS personnel to protect against leakage. Spill kits will be provided in dry store locations at the site. All tanks and containers will be clearly labelled to indicate contents.

BAT Note Ref.	Assessment of Compliance
	Access to the rear (south) of the facility, including the fuel oil storage tank will be restricted to employees only.
4.3.3.1	All waste handling activities will be undertaken indoors and all waste will be accepted in enclosed trucks only. The nearest sensitive receptor (identified at EIS stage) is a dwelling located 350m north-west of the facility. The site is adjacent to the Derryclure Civic Amenity & Landfill site. The site is in a lowlying area and shelter is provided to the south by the Derryclure Woods. Further shelter will be provided by the site landscaping as it matures. The site will be inspected periodically by Glanpower personnel for litter. Roads and areas of hardstanding will be kept free of litter.
4.3.3.2	The nearest noise sensitive location is a dwelling 350m north-west of the facility. The assessment of noise impact from the propose facility is addressed in Chapter 9 of the EIS and Attachment I.6 of this application. All main equipment items will be housed indoors within the main building. Significant items of plant will be housed within acoustic enclosures where possible. Noise levels will be assessed on a yearly basis, or more frequently as required by the EPA. Any complaints received from external sources will be logged, notified to the EPA and investigated. All roads will be of hardstanding to minimise vehicle emissions.
4.3.3.3	The significant vehicle movements on-site will comprise external waste hauliers/contractors delivering waste consignments to site and employees travelling to/from work.
4.3.3.4	A wheelwash will be installed at the facility for trucks entering/exiting the facility. All site roads, vehicle parking and yard areas will be of hardstanding. The site will be subject to periodic inspection for litter and housekeeping measures will be implemented to ensure the ongoing cleanliness of the site.
4.3.3.5	All waste handling and processing activities will be carried on indoors. Regular inspections will be undertaken to check for vermin and insects and records of inspections will be maintained. Any litter occurring on-site will be removed and disposed off appropriately. Vermin control is addressed in Section E.6.6, Attachment E.6.
4.3.3.6	The facility has been designed with a dedicated maintenance area as shown on the drawing included as Appendix D.8 (drawing no. IE0310150-22-DR-0011). This will allow for the segregation of chemical storage where required. Suitable bunding in accordance with EPA requirements will be provided for areas of chemical storage. The exact location for material and chemical storage will be fully developed during

BAT Note Ref.	Assessment of Compliance
	detailed design (ongoing).
4.3.3.7	Not applicable (clinical waste transfer stations only).
5.1	An Environmental Management System (EMS) will be developed for the operation of the Glanpower facility as described in Section C.2. The paving layout for the facility is shown on the drawing included as Appendix D.3 (drawing no. IE0310150-22-DR-0007). The site drainage layout, showing location of underground tanks, is shown on the drawing included as Appendix D.6 (drawing no. IE0310150-22-DR-0009).
5.2	See Point 4.3.2.1 above.
5.3.1	The surface water drainage system, including petrol interceptors is designed to carry uncontaminated surface water runoff only during normal operations, as described in Section D.1.k, Attachment D.1. Foul water will be treated in a package effluent treatment plant as described in Section D.1.k, Attachment D.1. As built drawings, including the site drainage system map, will be retained at the facility following the construction phase. The drainage network will be subject to regular inspection in accordance with the conditions of the waste licence, if granted.
5.3.2	Not applicable. There will be no discharge to the sewer of a sanitary authority from the facility, either directly or by tanker. Foul water will be treated in a package effluent treatment plant as described in Section D.1.k, Attachment D.1.
5.3.3	The sole direct emission to groundwater will be the percolation area emission from the sanitary effluent package treatment plant, as described in Section E.4.1, Attachment E.4. This will not contain hazardous substances. There is no planned discharge of List II substances to groundwater. Materials will be stored internally, with the exception of fuel oil storage tank. All storage areas will be bunded in accordance with EPA requirements. Groundwater monitoring during the operation of the facility will be carried out as described in Section F.5.2, Attachment F.5.
5.3.4	The assessment of noise impact from the proposed facility is addressed in Chapter 9 of the EIS and Attachment I.6 of this application. During the operational phase of the facility, an annual noise survey will

BAT Note Ref.	Assessment of Compliance
	be conducted in accordance with the requirements of EPA guidance document NG4 "Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities".
6.1	The surface water drainage system, including petrol interceptors is designed to carry uncontaminated surface water runoff only during normal operations, as described in Section D.1.k, Attachment D.1. The foul water treatment system will not discharge to surface water.
6.2	Not applicable. There will be no discharge to the sewer of a sanitary authority from the facility, either directly or by tanker. Foul water will be treated in a package effluent treatment plant as described in Section D.1.k, Attachment D.1.
6.3.1	The impact assessment of emissions to air is included in Chapter 11 of the Environmental Impact Statement (EIS) and Attachment I.1 of this application.
6.3.2	The handling of waste will be confined to indoor areas, as described in Section D.2.2, Attachment D.2. This will minimise fugitive emissions arising from vehicle and waste/materials movements on site.
6.3.3	Measures for the abatement of odour emissions are described in Section D.2.14, Attachment D.2.
7.2	The monitoring of emissions to air is addressed in Attachment F.2. Meteorological monitoring is described in Attachment F.7.
7.3	An assessment of existing environmental conditions has been completed and documented in the Environmental Impact Statement (EIS) and Attachment I. The surface water drainage system, including petrol interceptors has been designed to carry uncontaminated surface water runoff only during normal operations, as described in Section D.1.k, Attachment D.1.
7.4	There will be no direct process emission to groundwater. A sanitary effluent treatment package for domestic foul water arising will discharge via percolation area to groundwater, as described in Section D.1.k, Attachment D.1. An assessment of the existing soils, geology and hydrogeology conditions at the site is included in Chapter 7 of the Environmental Impact Statement (EIS). Baseline groundwater quality monitoring has commenced, as described in Attachment I.4. Groundwater monitoring

BAT Note Ref.	Assessment of Compliance
	will be carried out during the operational phase as described in Section F.5.2, Attachment F.5.
7.5	Glanpower will operate an electronic document management system for the filing and maintenance of waste records regarding waste management. The draft waste acceptance procedure developed for the site (Appendix H.2) includes for the recording of waste type, dates and manner of disposal. The quantity of waste will be quantified at the weighbridge and automatically recorded. Treatment and storage quantities of waste materials on-site will be recorded. Waste consigned for disposal to landfill from the facility will be screened and tested prior to transport off-site. Glanpower will prepare an Annual Environmental Report for the attention of the EPA, in accordance with licence conditions, if granted.
7.6	During the operational phase of the facility, an annual noise survey will be conducted in accordance with the requirements of EPA guidance document NG4 "Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities".