

Certificate of Analysis

Client: Shetland Islands Council

Project: 23091913

Quote: BEC230931527 V1.1

Project Ref: Shetland Islands Council

Site: Shetland Islands Council-Energy Recovery Plant

Contact: redacted

Address: Lerwick Energy Recovery Plant
Greenhead Base
Gremista Industrial Estate
Lerwick, Shetland
ZE1 0PX

E-Mail: redacted @shetland.gov.uk

Phone: redacted

No. Samples Received: 4

Date Received: 18/09/2023

Analysis Date: 09/10/2023

Date Issued: 09/10/2023

Report Type: Final Version 01

This report supersedes any versions previously issued by the laboratory

redacted



Client: Shetland Islands Council
Project Name: Shetland Islands Council-Shetland Islands Council-Energy Recovery
Project No: 23091913
Date Issued: 09/10/2023

Samples Analysed

<u>Text ID</u>	<u>Sample Reference</u>	<u>Sampling Date</u>	<u>Sample Type</u>	<u>Sample Description</u>
23091913-001	Bottom Ash	12/09/2023 08:30:00	SOLID	Soil Sample
23091913-002	ESP	12/09/2023 09:00:00	SOLID	Soil Sample
23091913-003	Bag Filter	07/09/2023 11:00:00	SOLID	Soil Sample
23091913-004	Filter Press	13/09/2023 08:30:00	SOLID	Soil Sample

Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID	001		002		003		004
					Customer ID	Bottom Ash		ESP		Bag Filter		Filter Press
					Sample Type	LPL	SOLID	LPL	SOLID	LPL	SOLID	LPL
					Sampling Date	12/09/2023	12/09/2023	12/09/2023	12/09/2023	07/09/2023	07/09/2023	13/09/2023
Antimony as Sb	ICPMSW (Dissolved)	0.01	mg/kg [^]	N		<0.01		<0.01		<0.01		0.21
Arsenic as As	ICPMSW (Dissolved)	0.01	mg/kg [^]	N		<0.01		0.17		<0.01		<0.01
Barium as Ba	ICPWATVAR (Dissolved)	0.1	mg/kg [^]	N		3.5		0.4		6.1		0.3
Cadmium as Cd	ICPMSW (Dissolved)	0.0002	mg/kg [^]	N		<0.0002		0.159		<0.0002		0.0003
Chloride as Cl	KONENS	10	mg/kg [^]	N		5210		92200		3880		4690
Total Chromium as Cr	ICPMSW (Dissolved)	0.01	mg/kg [^]	N		0.18		<0.01		0.14		<0.01
Copper as Cu	ICPMSW (Dissolved)	0.01	mg/kg [^]	N		12.0		0.16		<0.01		<0.01
Lead as Pb	ICPMSW (Dissolved)	0.01	mg/kg [^]	N		64.0		1040		2.38		1.26
Mercury as Hg	ICPMSW (Dissolved)	0.0003	mg/kg [^]	N		<0.0003		<0.0003		<0.0003		<0.0003
Molybdenum as Mo	ICPMSW (Dissolved)	0.01	mg/kg [^]	N		0.82		6.31		0.21		0.18
Nickel as Ni	ICPMSW (Dissolved)	0.01	mg/kg [^]	N		0.08		0.06		<0.01		0.15
Phenol Index	SFAPI	0.5	mg/kg [^]	N		<0.5		3.5		<0.5		<0.5
Selenium as Se	ICPMSW (Dissolved)	0.01	mg/kg [^]	N		0.02		0.27		0.20		<0.01
Total Sulphur as SO ₄	ICPWATVAR (Dissolved)	30	mg/kg [^]	N		7880		78000		21800		16400
TDS as mg/kg	PHCONDW	700	mg/kg [^]	N		55900		231000		66800		22400
Leached Organic Carbon	WSLM13	2	mg/kg [^]	N		222		<4.0		31.6		8.4
Fluoride as F	ISEF	1	mg/kg [^]	N		5		59		5		53
Zinc as Zn	ICPMSW (Dissolved)	0.02	mg/kg [^]	N		18.1		19.2		1.80		0.27
Conductivity at 25°C	PHCONDW	100	µS/cm	N		8250		34000		9820		3320

Client: Shetland Islands Council
 Project Name: Shetland Islands Council-Shetland Islands Council-Energy Recovery Plant
 Project No: 23091913
 Date Issued: 09/10/2023



Analysis Results

					Sample ID
					004
					Filter Press
					Customer ID
					Sample Type
					SOLID
					Sampling Date
					13/09/2023
Analysis	Method Code	MDL	Units	Accred.	
Antimony as Sb	ICPMSW (Dissolved)	0.01	mg/kg^	N	
Arsenic as As	ICPMSW (Dissolved)	0.01	mg/kg^	N	
Barium as Ba	ICPWATVAR (Dissolved)	0.1	mg/kg^	N	
Cadmium as Cd	ICPMSW (Dissolved)	0.0002	mg/kg^	N	
Chloride as Cl	KONENS	10	mg/kg^	N	
Total Chromium as Cr	ICPMSW (Dissolved)	0.01	mg/kg^	N	
Copper as Cu	ICPMSW (Dissolved)	0.01	mg/kg^	N	
Lead as Pb	ICPMSW (Dissolved)	0.01	mg/kg^	N	
Mercury as Hg	ICPMSW (Dissolved)	0.0003	mg/kg^	N	
Molybdenum as Mo	ICPMSW (Dissolved)	0.01	mg/kg^	N	
Nickel as Ni	ICPMSW (Dissolved)	0.01	mg/kg^	N	
Phenol Index	SFAPI	0.5	mg/kg^	N	
Selenium as Se	ICPMSW (Dissolved)	0.01	mg/kg^	N	
Total Sulphur as SO4	ICPWATVAR (Dissolved)	30	mg/kg^	N	
TDS as mg/kg	PHCONDW	700	mg/kg^	N	
Leached Organic Carbon	WSLM13	2	mg/kg^	N	
Fluoride as F	ISEF	1	mg/kg^	N	
Zinc as Zn	ICPMSW (Dissolved)	0.02	mg/kg^	N	
Conductivity at 25°C	PHCONDW	100	µS/cm	N	

Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID	001		002		003		004
					Customer ID	Bottom Ash		ESP		Bag Filter		Filter Press
					Sample Type	LPL	SOLID	LPL	SOLID	LPL	SOLID	LPL
					Sampling Date	12/09/2023	12/09/2023	12/09/2023	12/09/2023	07/09/2023	07/09/2023	13/09/2023
pH	PHCONDW	1	pH units	N		>12.0 E		>12.0 E		>12.0 E		9.5
TDS as mg/l	PHCONDW	70	mg/l	N		5610		23100		6680		2260
Chloride as Cl	KONENS	1	mg/l	U		523		9220		388		474
Phenol Index	SFAPI	0.05	mg/l	U		<0.05		0.35		<0.05		<0.05
Fluoride as F	ISEF	0.1	mg/l	U		0.5		5.9		0.5		5.4
Total Organic Carbon	WSLM59	0.02	% m/m	U			1.09		0.40*		17.6*	
LOI @ 450°C	LOI(%MM)	0.2	% m/m	N			1.5		<0.2		4.4	
Leached Organic Carbon	TOCW	0.4	mg/l	U		22.3		<0.40		3.16		0.85
Antimony as Sb	ICPMSS	0.1	mg/kg	N			60.5					
Thallium as Tl	ICPMSS	0.1	mg/kg	N			<0.1		1.8		<0.1	
Antimony as Sb	ICPSOIL	20	mg/kg	N					1470		<20.0	
Arsenic as As	ICPSOIL	20	mg/kg	N			<20.0		191		<20.0	
Cadmium as Cd	ICPSOIL	1	mg/kg	N			<1.00		279		5.01	
Cobalt as Co	ICPSOIL	2	mg/kg	N			88.1		42.9		4.37	
Copper as Cu	ICPSOIL	5	mg/kg	N			3080		1500		81.6	
Lead as Pb	ICPSOIL	10	mg/kg	N			631		4420		126	
Manganese as Mn	ICPSOIL	10	mg/kg	N			812		586		69.3	
Mercury as Hg	ICPSOIL	10	mg/kg	N			<10.0		<10.0		25.7	
Nickel as Ni	ICPSOIL	5	mg/kg	N			122		165		9.60	

Client: Shetland Islands Council
 Project Name: Shetland Islands Council-Shetland Islands Council-Energy Recovery Plant
 Project No: 23091913
 Date Issued: 09/10/2023



Analysis Results

					Sample ID
					004
					Filter Press
					Customer ID
					Sample Type
					SOLID
					Sampling Date
					13/09/2023
Analysis	Method Code	MDL	Units	Accred.	
pH	PHCONDW	1	pH units	N	
TDS as mg/l	PHCONDW	70	mg/l	N	
Chloride as Cl	KONENS	1	mg/l	U	
Phenol Index	SFAPI	0.05	mg/l	U	
Fluoride as F	ISEF	0.1	mg/l	U	
Total Organic Carbon	WSLM59	0.02	% m/m	U	
LOI @ 450°C	LOI(%MM)	0.2	% m/m	N	
Leached Organic Carbon	TOCW	0.4	mg/l	U	
Antimony as Sb	ICPMSS	0.1	mg/kg	N	
Thallium as Tl	ICPMSS	0.1	mg/kg	N	<0.1
Antimony as Sb	ICPSOIL	20	mg/kg	N	<20.0
Arsenic as As	ICPSOIL	20	mg/kg	N	<20.0
Cadmium as Cd	ICPSOIL	1	mg/kg	N	2.73
Cobalt as Co	ICPSOIL	2	mg/kg	N	2.32
Copper as Cu	ICPSOIL	5	mg/kg	N	19.7
Lead as Pb	ICPSOIL	10	mg/kg	N	37.1
Manganese as Mn	ICPSOIL	10	mg/kg	N	97.8
Mercury as Hg	ICPSOIL	10	mg/kg	N	23.5
Nickel as Ni	ICPSOIL	5	mg/kg	N	27.6

Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID	001		002		003		004
					Customer ID	Bottom Ash		ESP		Bag Filter		Filter Press
					Sample Type	LPL	SOLID	LPL	SOLID	LPL	SOLID	LPL
					Sampling Date	12/09/2023	12/09/2023	12/09/2023	12/09/2023	07/09/2023	07/09/2023	13/09/2023
Total Chromium as Cr	ICPSOIL	5	mg/kg	N			114		104		<5.00	
Antimony as Sb	ICPMSW (Dissolved)	0.001	mg/l	U		<0.001		<0.001		<0.001		0.021
Arsenic as As	ICPMSW (Dissolved)	0.001	mg/l	U		<0.001		0.017		<0.001		<0.001
Cadmium as Cd	ICPMSW (Dissolved)	0.00002	mg/l	U		<0.00002		0.0159		<0.00002		0.00003
Total Chromium as Cr	ICPMSW (Dissolved)	0.001	mg/l	U		0.018		<0.001		0.014		0.001
Copper as Cu	ICPMSW (Dissolved)	0.001	mg/l	U		1.20		0.016		<0.001		<0.001
Lead as Pb	ICPMSW (Dissolved)	0.001	mg/l	U		6.42		104		0.238		0.127
Mercury as Hg	ICPMSW (Dissolved)	0.00003	mg/l	U		<0.00003		<0.00003		<0.00003		<0.00003
Molybdenum as Mo	ICPMSW (Dissolved)	0.001	mg/l	U		0.082		0.631		0.021		0.018
Nickel as Ni	ICPMSW (Dissolved)	0.001	mg/l	U		0.008		0.006		<0.001		0.015
Selenium as Se	ICPMSW (Dissolved)	0.001	mg/l	U		0.002		0.027		0.020		<0.001
Zinc as Zn	ICPMSW (Dissolved)	0.002	mg/l	U		1.82		1.92		0.180		0.027
Barium as Ba	ICPWATVAR (Dissolved)	0.01	mg/l	U		0.35		0.04		0.61		0.03
Total Sulphur as SO4	ICPWATVAR (Dissolved)	3	mg/l	U		790		7800		2180		1660
Acenaphthene	PAHMSUS	0.08	mg/kg	U			<0.08		<0.08*		<0.08*	
Acenaphthylene	PAHMSUS	0.08	mg/kg	U			<0.08		<0.08*		<0.08*	
Anthracene	PAHMSUS	0.08	mg/kg	U			<0.08		<0.08*		<0.08*	
Benzo[a]anthracene	PAHMSUS	0.08	mg/kg	U			<0.08		<0.08*		<0.08*	
Benzo[a]pyrene	PAHMSUS	0.08	mg/kg	U			<0.08		<0.08*		<0.08*	

Client: Shetland Islands Council
 Project Name: Shetland Islands Council-Shetland Islands Council-Energy Recovery Plant
 Project No: 23091913
 Date Issued: 09/10/2023



Analysis Results

					Sample ID
					004
					Filter Press
					Customer ID
					Sample Type
					SOLID
					Sampling Date
					13/09/2023
Analysis	Method Code	MDL	Units	Accred.	
Total Chromium as Cr	ICPSOIL	5	mg/kg	N	9.19
Antimony as Sb	ICPMSW (Dissolved)	0.001	mg/l	U	
Arsenic as As	ICPMSW (Dissolved)	0.001	mg/l	U	
Cadmium as Cd	ICPMSW (Dissolved)	0.00002	mg/l	U	
Total Chromium as Cr	ICPMSW (Dissolved)	0.001	mg/l	U	
Copper as Cu	ICPMSW (Dissolved)	0.001	mg/l	U	
Lead as Pb	ICPMSW (Dissolved)	0.001	mg/l	U	
Mercury as Hg	ICPMSW (Dissolved)	0.00003	mg/l	U	
Molybdenum as Mo	ICPMSW (Dissolved)	0.001	mg/l	U	
Nickel as Ni	ICPMSW (Dissolved)	0.001	mg/l	U	
Selenium as Se	ICPMSW (Dissolved)	0.001	mg/l	U	
Zinc as Zn	ICPMSW (Dissolved)	0.002	mg/l	U	
Barium as Ba	ICPWATVAR (Dissolved)	0.01	mg/l	U	
Total Sulphur as SO4	ICPWATVAR (Dissolved)	3	mg/l	U	
Acenaphthene	PAHMSUS	0.08	mg/kg	U	<0.08
Acenaphthylene	PAHMSUS	0.08	mg/kg	U	<0.08
Anthracene	PAHMSUS	0.08	mg/kg	U	<0.08
Benzo[a]anthracene	PAHMSUS	0.08	mg/kg	U	<0.08
Benzo[a]pyrene	PAHMSUS	0.08	mg/kg	U	<0.08

Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID	001		002		003		004
					Customer ID	Bottom Ash		ESP		Bag Filter		Filter Press
					Sample Type	LPL	SOLID	LPL	SOLID	LPL	SOLID	LPL
					Sampling Date	12/09/2023	12/09/2023	12/09/2023	12/09/2023	07/09/2023	07/09/2023	13/09/2023
Benzo[b]fluoranthene	PAHMSUS	0.08	mg/kg	U			<0.08		<0.08*		<0.08*	
Benzo[g,h,i]perylene	PAHMSUS	0.08	mg/kg	U			<0.08		<0.08*		<0.08*	
Benzo[k]fluoranthene	PAHMSUS	0.08	mg/kg	U			<0.08		<0.08*		<0.08*	
Chrysene	PAHMSUS	0.08	mg/kg	U			<0.08		<0.08*		<0.08*	
Dibenzo[a,h]anthracene	PAHMSUS	0.08	mg/kg	U			<0.08		<0.08*		<0.08*	
Fluoranthene	PAHMSUS	0.08	mg/kg	U			<0.08		<0.08*		<0.08*	
Fluorene	PAHMSUS	0.08	mg/kg	U			<0.08		<0.08*		<0.08*	
Indeno[1,2,3-cd]pyrene	PAHMSUS	0.08	mg/kg	U			<0.08		<0.08*		<0.08*	
Naphthalene	PAHMSUS	0.08	mg/kg	U			<0.08		<0.08*		<0.08*	
Phenanthrene	PAHMSUS	0.08	mg/kg	U			<0.08		<0.08*		<0.08*	
Pyrene	PAHMSUS	0.08	mg/kg	U			<0.08		<0.08*		<0.08*	
Total PAH 16	PAHMSUS	1.28	mg/kg	U			1.28		1.28*		1.28*	
Total Moisture at 105°C	TMSS	0.1	%	U					<0.1*		1.7*	
Total Moisture at 35°C	CLANDPREP	0.1	%	N			10.5		<0.1		<0.1	
Colour of Material	CLANDPREP		-	N			Grey		Beige		Grey	
Major Constituents	CLANDPREP		-	N			SILT		ASH		ASH	
Minor Constituents	CLANDPREP		-	N			Gravel		None		None	
Miscellaneous Constituents	CLANDPREP		-	N			na		na		na	
Equivalent Weight of Dry Material (kg)	Leachate Prep CEN 10:1		kg	N			0.090		0.090		0.090	

Client: Shetland Islands Council
 Project Name: Shetland Islands Council-Shetland Islands Council-Energy Recovery Plant
 Project No: 23091913
 Date Issued: 09/10/2023



Analysis Results

					Sample ID
					004
					Filter Press
					Customer ID
					Sample Type
					SOLID
					Sampling Date
					13/09/2023
Analysis	Method Code	MDL	Units	Accred.	
Benzo[b]fluoranthene	PAHMSUS	0.08	mg/kg	U	<0.08
Benzo[g,h,i]perylene	PAHMSUS	0.08	mg/kg	U	<0.08
Benzo[k]fluoranthene	PAHMSUS	0.08	mg/kg	U	<0.08
Chrysene	PAHMSUS	0.08	mg/kg	U	<0.08
Dibenzo[a,h]anthracene	PAHMSUS	0.08	mg/kg	U	<0.08
Fluoranthene	PAHMSUS	0.08	mg/kg	U	<0.08
Fluorene	PAHMSUS	0.08	mg/kg	U	<0.08
Indeno[1,2,3-cd]pyrene	PAHMSUS	0.08	mg/kg	U	<0.08
Naphthalene	PAHMSUS	0.08	mg/kg	U	<0.08
Phenanthrene	PAHMSUS	0.08	mg/kg	U	<0.08
Pyrene	PAHMSUS	0.08	mg/kg	U	<0.08
Total PAH 16	PAHMSUS	1.28	mg/kg	U	1.28
Total Moisture at 105°C	TMSS	0.1	%	U	
Total Moisture at 35°C	CLANDPREP	0.1	%	N	28.9
Colour of Material	CLANDPREP		-	N	Beige
Major Constituents	CLANDPREP		-	N	CLAY
Minor Constituents	CLANDPREP		-	N	None
Miscellaneous Constituents	CLANDPREP		-	N	na
Equivalent Weight of Dry Material (kg)	Leachate Prep CEN 10:1		kg	N	0.090

Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID	001		002		003		004
					Customer ID	Bottom Ash		ESP		Bag Filter		Filter Press
					Sample Type	LPL	SOLID	LPL	SOLID	LPL	SOLID	LPL
					Sampling Date	12/09/2023	12/09/2023	12/09/2023	12/09/2023	07/09/2023	07/09/2023	13/09/2023
Fraction above 4mm (%)	Leachate Prep CEN 10:1		%	N			0		0		0	
Fraction of non-crushable material (%)	Leachate Prep CEN 10:1		%	N			0		0		0	
Volume of Water for 10:1 Leach (ltr)	Leachate Prep CEN 10:1		l	N			0.884		0.900		0.899	
Weight of Sample Leached (kg)	Leachate Prep CEN 10:1		kg	N			0.106		0.090		0.091	
WAC Report	WAC		-	N			See Attached		See Attached		See Attached	
1,2,3,4,6,7,8-HpCDD	SUB016		ng/kg	N			9.34232		71.25274		NA	
1,2,3,4,6,7,8-HpCDF	SUB016		ng/kg	N			25.29164		53.45556		NA	
1,2,3,4,7,8,9-HpCDF	SUB016		ng/kg	N			2.84005		13.16391		NA	
1,2,3,4,7,8-HxCDD	SUB016		ng/kg	N			0.51028		2.82229		434.33683	
1,2,3,4,7,8-HxCDF	SUB016		ng/kg	N			2.78965		5.95364		3074.17606	
1,2,3,6,7,8-HxCDD	SUB016		ng/kg	N			0.79289		6.61479		1056.94920	
1,2,3,6,7,8-HxCDF	SUB016		ng/kg	N			3.01156		8.05108		NA	
1,2,3,7,8,9-HxCDD	SUB016		ng/kg	N			0.84014		4.87225		335.82560	
1,2,3,7,8,9-HxCDF	SUB016		ng/kg	N			1.04098		3.71402		NA	
1,2,3,7,8-PCDD	SUB016		ng/kg	N			0.97344		3.02459		290.23256	
1,2,3,7,8-PCDF	SUB016		ng/kg	N			1.85353		2.72249		1164.07588	
2,3,4,6,7,8-HxCDF	SUB016		ng/kg	N			3.62960		13.33213		NA	
2,3,4,7,8-PCDF	SUB016		ng/kg	N			2.06838		3.72161		1117.72688	
2,3,7,8-TCDD	SUB016		ng/kg	N			0.19816		0.49264		15.71893	

Client: Shetland Islands Council
 Project Name: Shetland Islands Council-Shetland Islands Council-Energy Recovery Plant
 Project No: 23091913
 Date Issued: 09/10/2023



Analysis Results

					Sample ID
					004
					Filter Press
					Customer ID
					Sample Type
					SOLID
					Sampling Date
					13/09/2023
Analysis	Method Code	MDL	Units	Accred.	
Fraction above 4mm (%)	Leachate Prep CEN 10:1		%	N	0
Fraction of non-crushable material (%)	Leachate Prep CEN 10:1		%	N	0
Volume of Water for 10:1 Leach (ltr)	Leachate Prep CEN 10:1		l	N	0.865
Weight of Sample Leached (kg)	Leachate Prep CEN 10:1		kg	N	0.125
WAC Report	WAC		-	N	See Attached
1,2,3,4,6,7,8-HpCDD	SUB016		ng/kg	N	25.74431
1,2,3,4,6,7,8-HpCDF	SUB016		ng/kg	N	18.00488
1,2,3,4,7,8,9-HpCDF	SUB016		ng/kg	N	7.08225
1,2,3,4,7,8-HxCDD	SUB016		ng/kg	N	1.13394
1,2,3,4,7,8-HxCDF	SUB016		ng/kg	N	2.02617
1,2,3,6,7,8-HxCDD	SUB016		ng/kg	N	1.96711
1,2,3,6,7,8-HxCDF	SUB016		ng/kg	N	2.43019
1,2,3,7,8,9-HxCDD	SUB016		ng/kg	N	1.54577
1,2,3,7,8,9-HxCDF	SUB016		ng/kg	N	1.41783
1,2,3,7,8-PCDD	SUB016		ng/kg	N	0.78976
1,2,3,7,8-PCDF	SUB016		ng/kg	N	0.83483
2,3,4,6,7,8-HxCDF	SUB016		ng/kg	N	5.72287
2,3,4,7,8-PCDF	SUB016		ng/kg	N	1.45217
2,3,7,8-TCDD	SUB016		ng/kg	N	<0.14341



Client: Shetland Islands Council
 Project Name: Shetland Islands Council-Shetland Islands Council-Energy Recovery Plant
 Project No: 23091913
 Date Issued: 09/10/2023



Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID	001		002		003		004
					Customer ID	Bottom Ash		ESP		Bag Filter		Filter Press
					Sample Type	LPL	SOLID	LPL	SOLID	LPL	SOLID	LPL
					Sampling Date	12/09/2023	12/09/2023	12/09/2023	12/09/2023	07/09/2023	07/09/2023	13/09/2023
2,3,7,8-TCDF	SUB016		ng/kg	N			1.73954		1.24548		181.55451	
D&Fs - TEQ (NATO) Lower	SUB016		ng/kg	N			3.71617		10.36275		NA	
D&Fs - TEQ (NATO) Upper	SUB016		ng/kg	N			3.71617		10.36275		NA	
D&Fs - TEQ (WHO) Birds - Lower	SUB016		ng/kg	N			6.62956		13.32574		NA	
D&Fs - TEQ (WHO) Birds - Upper	SUB016		ng/kg	N			6.62956		13.32574		NA	
D&Fs - TEQ (WHO) Fish - Lower	SUB016		ng/kg	N			4.00418		10.97714		NA	
D&Fs - TEQ (WHO) Fish - Upper	SUB016		ng/kg	N			4.00418		10.97714		NA	
D&Fs - TEQ (WHO) Mammals - Lower	SUB016		ng/kg	N			3.68619		10.85115		NA	
D&Fs - TEQ (WHO) Mammals - Upper	SUB016		ng/kg	N			3.68619		10.85115		NA	
D&Fs - TEQ SUM - Lower	SUB016		ng/kg	N			3.68619		10.85115		NA	
D&Fs - TEQ SUM - Upper	SUB016		ng/kg	N			3.68619		10.85115		NA	
OCDD	SUB016		ng/kg	N			35.69249		231.13958		NA	
OCDF	SUB016		ng/kg	N			58.52404		90.47525		NA	
PCB-105	SUB016		ng/kg	N			1.19825		1.24163		359.78253	
PCB-114	SUB016		ng/kg	N			<0.42599		<0.49186		157.18832	
PCB-118	SUB016		ng/kg	N			2.35434		1.79472		282.07128	
PCB-123	SUB016		ng/kg	N			<0.42947		<0.51465		60.39370	
PCB-126	SUB016		ng/kg	N			1.01885		2.78591		863.56524	
PCB-156	SUB016		ng/kg	N			0.66347		1.55755		641.68116	

Client: Shetland Islands Council
 Project Name: Shetland Islands Council-Shetland Islands Council-Energy Recovery Plant
 Project No: 23091913
 Date Issued: 09/10/2023



Analysis Results

					Sample ID
					004
					Filter Press
					Customer ID
					Sample Type
					SOLID
					Sampling Date
					13/09/2023
Analysis	Method Code	MDL	Units	Accred.	
2,3,7,8-TCDF	SUB016		ng/kg	N	0.33559
D&Fs - TEQ (NATO) Lower	SUB016		ng/kg	N	3.52937
D&Fs - TEQ (NATO) Upper	SUB016		ng/kg	N	3.67278
D&Fs - TEQ (WHO) Birds - Lower	SUB016		ng/kg	N	4.34834
D&Fs - TEQ (WHO) Birds - Upper	SUB016		ng/kg	N	4.49175
D&Fs - TEQ (WHO) Fish - Lower	SUB016		ng/kg	N	3.63281
D&Fs - TEQ (WHO) Fish - Upper	SUB016		ng/kg	N	3.77622
D&Fs - TEQ (WHO) Mammals - Lower	SUB016		ng/kg	N	3.47684
D&Fs - TEQ (WHO) Mammals - Upper	SUB016		ng/kg	N	3.62025
D&Fs - TEQ SUM - Lower	SUB016		ng/kg	N	3.47684
D&Fs - TEQ SUM - Upper	SUB016		ng/kg	N	3.62025
OCDD	SUB016		ng/kg	N	125.25108
OCDF	SUB016		ng/kg	N	75.13358
PCB-105	SUB016		ng/kg	N	0.92105
PCB-114	SUB016		ng/kg	N	<0.34626
PCB-118	SUB016		ng/kg	N	1.45278
PCB-123	SUB016		ng/kg	N	<0.36283
PCB-126	SUB016		ng/kg	N	1.24663
PCB-156	SUB016		ng/kg	N	0.70357

Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID	001		002		003		004
					Customer ID	Bottom Ash		ESP		Bag Filter		Filter Press
					Sample Type	LPL	SOLID	LPL	SOLID	LPL	SOLID	LPL
					Sampling Date	12/09/2023	12/09/2023	12/09/2023	12/09/2023	07/09/2023	07/09/2023	13/09/2023
PCB-157	SUB016		ng/kg	N			0.27630		0.66116		379.23092	
PCB-167	SUB016		ng/kg	N			0.30121		0.54793		232.12911	
PCB-169	SUB016		ng/kg	N			<0.29932		1.58304		435.49878	
PCB-189	SUB016		ng/kg	N			0.40911		2.02847		815.72434	
PCB-77	SUB016		ng/kg	N			2.03447		2.42348		747.51403	
PCB-81	SUB016		ng/kg	N			0.49340		0.55656		273.50251	
PCBs - TEQ (WHO) Birds - Lower	SUB016		ng/kg	N			0.25213		0.45729		151.68472	
PCBs - TEQ (WHO) Birds - Upper	SUB016		ng/kg	N			0.25246		0.45730		151.68472	
PCBs - TEQ (WHO) Fish - Lower	SUB016		ng/kg	N			0.00556		0.01457		4.56575	
PCBs - TEQ (WHO) Fish - Upper	SUB016		ng/kg	N			0.00557		0.01457		4.56575	
PCBs - TEQ (WHO) Mammals - Lower	SUB016		ng/kg	N			0.10239		0.32674		99.66612	
PCBs - TEQ (WHO) Mammals - Upper	SUB016		ng/kg	N			0.11139		0.32676		99.66612	
PCBs - TEQ SUM - Lower	SUB016		ng/kg	N			0.10239		0.32674		99.66612	
PCBs - TEQ SUM - Upper	SUB016		ng/kg	N			0.11139		0.32676		99.66612	
Total 2,3,7,8-Dioxins	SUB016		ng/kg	N			48.34972		320.21888		NA	
Total 2,3,7,8-Furans	SUB016		ng/kg	N			102.78897		195.83517		NA	
Total PCBs	SUB016		ng/kg	N			<8.74940		15.18045		5248.28192	
Free Lime Content	SUB051	0.1	%	N					3.94		6.78	

Client: Shetland Islands Council
 Project Name: Shetland Islands Council-Shetland Islands Council-Energy Recovery Plant
 Project No: 23091913
 Date Issued: 09/10/2023



Analysis Results

					Sample ID
					004
					Filter Press
					Customer ID
					Sample Type
					SOLID
					Sampling Date
					13/09/2023
Analysis	Method Code	MDL	Units	Accred.	
PCB-157	SUB016		ng/kg	N	0.47317
PCB-167	SUB016		ng/kg	N	0.36517
PCB-169	SUB016		ng/kg	N	1.28515
PCB-189	SUB016		ng/kg	N	0.89176
PCB-77	SUB016		ng/kg	N	1.39532
PCB-81	SUB016		ng/kg	N	0.66696
PCBs - TEQ (WHO) Birds - Lower	SUB016		ng/kg	N	0.26284
PCBs - TEQ (WHO) Birds - Upper	SUB016		ng/kg	N	0.26287
PCBs - TEQ (WHO) Fish - Lower	SUB016		ng/kg	N	0.00679
PCBs - TEQ (WHO) Fish - Upper	SUB016		ng/kg	N	0.00679
PCBs - TEQ (WHO) Mammals - Lower	SUB016		ng/kg	N	0.16369
PCBs - TEQ (WHO) Mammals - Upper	SUB016		ng/kg	N	0.16371
PCBs - TEQ SUM - Lower	SUB016		ng/kg	N	0.16369
PCBs - TEQ SUM - Upper	SUB016		ng/kg	N	0.16371
Total 2,3,7,8-Dioxins	SUB016		ng/kg	N	<156.43197
Total 2,3,7,8-Furans	SUB016		ng/kg	N	114.44036
Total PCBs	SUB016		ng/kg	N	<9.40156
Free Lime Content	SUB051	0.1	%	N	

WASTE ACCEPTANCE CRITERIA TESTING
BSEN 12457/2

Client	Shetland Islands Council	
Site	Shetland Islands Council-Energy	
Project	23091913	
Sample No	Sample Description	Issue Date
23091913-001	Bottom Ash	09/10/2023

Leaching Data	
Weight of Sample (kg)	0.106
Moisture content @ 105°C (% Wet Weight)	14.7
Equivalent weight based on drying @ 105°C (kg)	0.090
Volume of Water required for 10:1 stage (litres)	0.884
Fraction of sample above 4mm %	0
Fraction of non-crushable material %	0

Note: The >4mm fraction is crushed using a disc mill

Accreditation	Method Code	Solid Waste Analysis (Dry Basis)	Concentration in Solid (Dry Weight Basis)	Landfill Waste Acceptance Criteria Limit Values		
				Inert Waste Landfill	Stable Non-Reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
		Total Organic Carbon (% M/M)		3	5	6
	LOI450	Loss on Ignition (%)				10
	BTEXHSA	Sum of BTEX (mg/kg)		6		
	PCBUSECD	Sum of 7 Congener PCBs (mg/kg)		1		
	TPHFIDUS	>C10-C40 Aliphatic (mg/kg) EH_1D_AL		500		
	PAHMSUS	Sum of 17 PAHs (mg/kg)		100		
	PHSOIL	pH (pH Units)			>6	
	ANC	Acid Neutralisation Capacity (mol/kg)			To be evaluated	To be evaluated

Accreditation	Method Code	Leachate Analysis	10:1 Single Stage Leachate	Cumulative Amount Leached at 10:1	Landfill Waste Acceptance Criteria Limit Values		
			mg/l except **	mg/kg (dry wt)	Inert Waste Landfill	Stable Non-Reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
N	WSLM3**	pH (pH Units)	>12.0				
N	WSLM2**	Conductivity (µS/cm)	8250				
U	ICPMSW	Arsenic	<0.001	<0.01	0.5	2	25
U	ICPWATVAR	Barium	0.35	3.5	20	100	300
U	ICPMSW	Cadmium	<0.00002	<0.0002	0.04	1	5
U	ICPMSW	Chromium	0.018	0.18	0.5	10	70
U	ICPMSW	Copper	1.20	12.0	2	50	100
U	ICPMSW	Mercury	<0.00003	<0.0003	0.01	0.2	2
U	ICPMSW	Molybdenum	0.082	0.82	0.5	10	30
U	ICPMSW	Nickel	0.008	0.08	0.4	10	40
U	ICPMSW	Lead	6.42	64.0	0.5	10	50
U	ICPMSW	Antimony	<0.001	<0.01	0.06	0.7	5
U	ICPMSW	Selenium	0.002	0.02	0.1	0.5	7
U	ICPMSW	Zinc	1.82	18.1	4	50	200
U	KONENS	Chloride	523	5210	800	15000	25000
U	ISEF	Fluoride	0.5	5	10	150	500
U	ICPWATVAR	Sulphate as SO4	790	7880	1000	20000	50000
N	WSLM27	Total Dissolved Solids	5610	55900	4000	60000	100000
U	SFAPI	Phenol Index	<0.05	<0.5	1		
U	WSLM13	Dissolved Organic Carbon	22.3	222	500	800	1000

Tests where the accreditation is set to U are UKAS accredited, those where the accreditation is set to N are not UKAS accredited.

Calculated data is not UKAS accredited

Landfill Waste Acceptance Criteria limit values correct as of 11th March 2009.

WASTE ACCEPTANCE CRITERIA TESTING
BSEN 12457/2

Client	Shetland Islands Council	
Site	Shetland Islands Council-Energy	
Project	23091913	
Sample No	Sample Description	Issue Date
23091913-002	ESP	09/10/2023

Leaching Data	
Weight of Sample (kg)	0.090
Moisture content @ 105°C (% Wet Weight)	0.1
Equivalent weight based on drying @ 105°C (kg)	0.090
Volume of Water required for 10:1 stage (ltres)	0.900
Fraction of sample above 4mm %	0
Fraction of non-crushable material %	0

Note: The >4mm fraction is crushed using a disc mill

Accreditation	Method Code	Solid Waste Analysis (Dry Basis)	Concentration in Solid (Dry Weight Basis)	Landfill Waste Acceptance Criteria Limit Values		
				Inert Waste Landfill	Stable Non-Reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
		Total Organic Carbon (% M/M)		3	5	6
	LOI450	Loss on Ignition (%)				10
	BTEXHSA	Sum of BTEX (mg/kg)		6		
	PCBUSECD	Sum of 7 Congener PCBs (mg/kg)		1		
	TPHFIDUS	>C10-C40 Aliphatic (mg/kg) EH_1D_AL		500		
	PAHMSUS	Sum of 17 PAHs (mg/kg)		100		
	PHSOIL	pH (pH Units)			>6	
	ANC	Acid Neutralisation Capacity (mol/kg)			To be evaluated	To be evaluated

Accreditation	Method Code	Leachate Analysis	10:1 Single Stage Leachate	Cumulative Amount Leached at 10:1	Landfill Waste Acceptance Criteria Limit Values		
			mg/l except **	mg/kg (dry wt)	Inert Waste Landfill	Stable Non-Reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
N	WSLM3**	pH (pH Units)	>12.0				
N	WSLM2**	Conductivity (µS/cm)	34000				
U	ICPMSW	Arsenic	0.017	0.17	0.5	2	25
U	ICPWATVAR	Barium	0.04	0.4	20	100	300
U	ICPMSW	Cadmium	0.0159	0.159	0.04	1	5
U	ICPMSW	Chromium	<0.001	<0.01	0.5	10	70
U	ICPMSW	Copper	0.016	0.16	2	50	100
U	ICPMSW	Mercury	<0.00003	<0.0003	0.01	0.2	2
U	ICPMSW	Molybdenum	0.631	6.31	0.5	10	30
U	ICPMSW	Nickel	0.006	0.06	0.4	10	40
U	ICPMSW	Lead	104	1040	0.5	10	50
U	ICPMSW	Antimony	<0.001	<0.01	0.06	0.7	5
U	ICPMSW	Selenium	0.027	0.27	0.1	0.5	7
U	ICPMSW	Zinc	1.92	19.2	4	50	200
U	KONENS	Chloride	9220	92200	800	15000	25000
U	ISEF	Fluoride	5.9	59	10	150	500
U	ICPWATVAR	Sulphate as SO4	7800	78000	1000	20000	50000
N	WSLM27	Total Dissolved Solids	23100	231000	4000	60000	100000
U	SFAPI	Phenol Index	0.35	3.5	1		
U	WSLM13	Dissolved Organic Carbon	<0.40	<4.0	500	800	1000

Tests where the accreditation is set to U are UKAS accredited, those where the accreditation is set to N are not UKAS accredited.

Calculated data is not UKAS accredited

Landfill Waste Acceptance Criteria limit values correct as of 11th March 2009.

WASTE ACCEPTANCE CRITERIA TESTING
BSEN 12457/2

Client	Shetland Islands Council	
Site	Shetland Islands Council-Energy	
Project	23091913	
Sample No	Sample Description	Issue Date
23091913-003	Bag Filter	09/10/2023

Leaching Data	
Weight of Sample (kg)	0.091
Moisture content @ 105°C (% Wet Weight)	1.2
Equivalent weight based on drying @ 105°C (kg)	0.090
Volume of Water required for 10:1 stage (ltres)	0.899
Fraction of sample above 4mm %	0
Fraction of non-crushable material %	0

Note: The >4mm fraction is crushed using a disc mill

Accreditation	Method Code	Solid Waste Analysis (Dry Basis)	Concentration in Solid (Dry Weight Basis)	Landfill Waste Acceptance Criteria Limit Values		
				Inert Waste Landfill	Stable Non-Reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
		Total Organic Carbon (% M/M)		3	5	6
	LOI450	Loss on Ignition (%)				10
	BTEXHSA	Sum of BTEX (mg/kg)		6		
	PCBUSECD	Sum of 7 Congener PCBs (mg/kg)		1		
	TPHFIDUS	>C10-C40 Aliphatic (mg/kg) EH_1D_AL		500		
	PAHMSUS	Sum of 17 PAHs (mg/kg)		100		
	PHSOIL	pH (pH Units)			>6	
	ANC	Acid Neutralisation Capacity (mol/kg)			To be evaluated	To be evaluated

Accreditation	Method Code	Leachate Analysis	10:1 Single Stage Leachate	Cumulative Amount Leached at 10:1	Landfill Waste Acceptance Criteria Limit Values		
			mg/l except **	mg/kg (dry wt)	Inert Waste Landfill	Stable Non-Reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
N	WSLM3**	pH (pH Units)	>12.0				
N	WSLM2**	Conductivity (µS/cm)	9820				
U	ICPMSW	Arsenic	<0.001	<0.01	0.5	2	25
U	ICPWATVAR	Barium	0.61	6.1	20	100	300
U	ICPMSW	Cadmium	<0.00002	<0.0002	0.04	1	5
U	ICPMSW	Chromium	0.014	0.14	0.5	10	70
U	ICPMSW	Copper	<0.001	<0.01	2	50	100
U	ICPMSW	Mercury	<0.00003	<0.0003	0.01	0.2	2
U	ICPMSW	Molybdenum	0.021	0.21	0.5	10	30
U	ICPMSW	Nickel	<0.001	<0.01	0.4	10	40
U	ICPMSW	Lead	0.238	2.38	0.5	10	50
U	ICPMSW	Antimony	<0.001	<0.01	0.06	0.7	5
U	ICPMSW	Selenium	0.020	0.20	0.1	0.5	7
U	ICPMSW	Zinc	0.180	1.80	4	50	200
U	KONENS	Chloride	388	3880	800	15000	25000
U	ISEF	Fluoride	0.5	5	10	150	500
U	ICPWATVAR	Sulphate as SO4	2180	21800	1000	20000	50000
N	WSLM27	Total Dissolved Solids	6680	66800	4000	60000	100000
U	SFAP1	Phenol Index	<0.05	<0.5	1		
U	WSLM13	Dissolved Organic Carbon	3.16	31.6	500	800	1000

Tests where the accreditation is set to U are UKAS accredited, those where the accreditation is set to N are not UKAS accredited.

Calculated data is not UKAS accredited

Landfill Waste Acceptance Criteria limit values correct as of 11th March 2009.

WASTE ACCEPTANCE CRITERIA TESTING
BSEN 12457/2

Client	Shetland Islands Council	
Site	Shetland Islands Council-Energy	
Project	23091913	
Sample No	Sample Description	Issue Date
23091913-004	Filter Press	09/10/2023

Leaching Data	
Weight of Sample (kg)	0.125
Moisture content @ 105°C (% Wet Weight)	28.0
Equivalent weight based on drying @ 105°C (kg)	0.090
Volume of Water required for 10:1 stage (litres)	0.865
Fraction of sample above 4mm %	0
Fraction of non-crushable material %	0

Note: The >4mm fraction is crushed using a disc mill

Accreditation	Method Code	Solid Waste Analysis (Dry Basis)	Concentration in Solid (Dry Weight Basis)	Landfill Waste Acceptance Criteria Limit Values		
				Inert Waste Landfill	Stable Non-Reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
		Total Organic Carbon (% M/M)		3	5	6
	LOI450	Loss on Ignition (%)				10
	BTEXHSA	Sum of BTEX (mg/kg)		6		
	PCBUSECD	Sum of 7 Congener PCBs (mg/kg)		1		
	TPHFIDUS	>C10-C40 Aliphatic (mg/kg) EH_1D_AL		500		
	PAHMSUS	Sum of 17 PAHs (mg/kg)		100		
	PHSOIL	pH (pH Units)			>6	
	ANC	Acid Neutralisation Capacity (mol/kg)			To be evaluated	To be evaluated

Accreditation	Method Code	Leachate Analysis	10:1 Single Stage Leachate	Cumulative Amount Leached at 10:1	Landfill Waste Acceptance Criteria Limit Values		
			mg/l except **	mg/kg (dry wt)	Inert Waste Landfill	Stable Non-Reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
N	WSLM3**	pH (pH Units)	9.5				
N	WSLM2**	Conductivity (µS/cm)	3320				
U	ICPMSW	Arsenic	<0.001	<0.01	0.5	2	25
U	ICPWATVAR	Barium	0.03	0.3	20	100	300
U	ICPMSW	Cadmium	0.00003	0.0003	0.04	1	5
U	ICPMSW	Chromium	0.001	<0.01	0.5	10	70
U	ICPMSW	Copper	<0.001	<0.01	2	50	100
U	ICPMSW	Mercury	<0.00003	<0.0003	0.01	0.2	2
U	ICPMSW	Molybdenum	0.018	0.18	0.5	10	30
U	ICPMSW	Nickel	0.015	0.15	0.4	10	40
U	ICPMSW	Lead	0.127	1.26	0.5	10	50
U	ICPMSW	Antimony	0.021	0.21	0.06	0.7	5
U	ICPMSW	Selenium	<0.001	<0.01	0.1	0.5	7
U	ICPMSW	Zinc	0.027	0.27	4	50	200
U	KONENS	Chloride	474	4690	800	15000	25000
U	ISEF	Fluoride	5.4	53	10	150	500
U	ICPWATVAR	Sulphate as SO4	1660	16400	1000	20000	50000
N	WSLM27	Total Dissolved Solids	2260	22400	4000	60000	100000
U	SFAP1	Phenol Index	<0.05	<0.5	1		
U	WSLM13	Dissolved Organic Carbon	0.85	8.4	500	800	1000

Tests where the accreditation is set to U are UKAS accredited, those where the accreditation is set to N are not UKAS accredited.

Calculated data is not UKAS accredited

Landfill Waste Acceptance Criteria limit values correct as of 11th March 2009.

Socotec
ESG
ESG House, Bretby Business Park
Bretby
Burton upon Trent
United Kingdom
DE15 0YZ



Attention : Chem Subcon
Date : 28th September, 2023
Your reference : 23091913
Our reference : Test Report 23/15519 Batch 1
Location : Shetland Islands Council-Energy Recovery Plant
Date samples received : 20th September, 2023
Status : Final Report
Issue : 1

Two samples were received for analysis on 20th September, 2023 of which two were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

The greenhouse gas emissions generated (in Carbon – Co2e) to obtain the results in this report are estimated as:

Scope 1&2 emissions - 1.448 kg of CO2

Scope 1&2&3 emissions - 3.422 kg of CO2

Authorised By:

redacted

Please include all sections of this report if it is reproduced

Element Materials Technology

Client Name: Socotec
Reference: 23091913
Location: Shetland Islands Council-Energy Recovery Plant
Contact: Chem Subcon

Sample Date: 12 Sep 2023
Date of Receipt: 20 Sep 2023
Date Analysed: 28 Sep 2023

Sample ID: ESP
Depth:
EMT Job No: 23/15519
EMT Sample No: 1
Matrix: Solid (Soil)
Method: TM206/PM139 Dioxins, Furans and PCBs in solid samples by HR-GCMS

ANALYSIS OF PCDDs and PCDFs

Q : Qualifiers

SV Indicates surrogate recovery outside performance criteria
>> Indicates value exceeds calibration range

Key

LOD Limit of Detection
ISO 17025 (UKAS)
M MCERTS accredited

CAS No	Compound	Q	Result ng/kg	LOD	I-TEFs	TEQ Lower Bound	TEQ Upper Bound	% Recovery
1746-01-6	2378-TCDD		0.49264	0.28274	1	0.49264	0.49264	94
40321-76-4	12378-PCDD		3.02459	0.68929	1	3.02459	3.02459	76
39227-28-6	123478-HxCDD		2.82229	0.89158	0.1	0.28223	0.28223	81
57653-85-7	123678-HxCDD		6.61479	0.95398	0.1	0.66148	0.66148	74
19408-74-3	123789-HxCDD		4.87225	0.95087	0.1	0.48722	0.48722	
35822-46-9	1234678-HpCDD		71.25274	0.54738	0.01	0.71253	0.71253	77
3268-87-9	OCDD		231.13958	0.39346	0.0003	0.06934	0.06934	77
	Total 2,3,7,8-Dioxins		320.21888					
51207-31-9	2378-TCDF		1.24548	0.45394	0.1	0.12455	0.12455	70
57117-41-6	12378-PCDF		2.72249	0.75529	0.03	0.08167	0.08167	69
57117-31-4	23478-PCDF		3.72161	0.77164	0.3	1.11648	1.11648	72
70648-26-9	123478-HxCDF		5.95364	0.71803	0.1	0.59536	0.59536	88
57117-44-9	123678-HxCDF		8.05108	0.86543	0.1	0.80511	0.80511	79
60851-34-5	234678-HxCDF		13.33213	0.97515	0.1	1.33321	1.33321	75
72918-21-9	123789-HxCDF		3.71402	1.16433	0.1	0.37140	0.37140	73
67562-39-4	1234678-HpCDF		53.45556	0.49310	0.01	0.53456	0.53456	79
55673-89-7	1234789-HpCDF		13.16391	0.55559	0.01	0.13164	0.13164	78
39001-02-0	OCDF		90.47525	0.39386	0.0003	0.02714	0.02714	78
	Total 2,3,7,8-Furans		195.83517					
	TEQ (WHO) Mammals					10.85115	10.85115	
	TEQ (WHO) Birds					13.32574	13.32574	
	TEQ (WHO) Fish					10.97714	10.97714	
	TEQ (NATO)					10.36275	10.36275	

Upper-Bound: 'Upper-bound' means the concept which requires using the limit of quantification for the contribution of each non-quantified congener

Lower-Bound: 'Lower-bound' means the concept which requires using zero for the contribution of each non-quantified congener

TEQ: Toxic Equivalent Value

TEF: Toxic Equivalent Factor

Element Materials Technology

Client Name: Socotec
Reference: 23091913
Location: Shetland Islands Council-Energy Recovery Plant
Contact: Chem Subcon

Sample Date: 12 Sep 2023
Date of Receipt: 20 Sep 2023
Date Analysed: 28 Sep 2023

Sample ID: ESP
Depth:
EMT Job No: 23/15519
EMT Sample No: 1
Matrix: Solid (Soil)
Method: TM206/PM139 Dioxins, Furans and PCBs in solid samples by HR-GCMS

ANALYSIS OF PCBs

Q : Qualifiers

SV Indicates surrogate recovery outside performance criteria
>> Indicates value exceeds calibration range

Key

LOD Limit of Detection
ISO 17025 (UKAS)
M MCERTS accredited

CAS No	Compound	Q	Result ng/kg	LOD	I-TEFs	TEQ Lower Bound	TEQ Upper Bound	% Recovery
70362-50-4	PCB-81		0.55656	0.12699	0.0003	0.00017	0.00017	68
32598-13-3	PCB-77		2.42348	0.09460	0.0001	0.00024	0.00024	64
65510-44-3	PCB-123		<0.51465	0.51465	0.00003	0.00000	0.00002	70
31508-00-6	PCB-118		1.79472	0.54614	0.00003	0.00005	0.00005	66
74472-37-0	PCB-114		<0.49186	0.49186	0.00003	0.00001	0.00001	72
32598-14-4	PCB-105		1.24163	0.60504	0.00003	0.00004	0.00004	63
57465-28-8	PCB-126		2.78591	0.54177	0.1	0.27859	0.27859	75
52663-72-6	PCB-167		0.54793	0.26767	0.00003	0.00002	0.00002	74
38380-08-4	PCB-156		1.55755	0.29294	0.00003	0.00005	0.00005	70
69782-90-7	PCB-157		0.66116	0.30503	0.00003	0.00002	0.00002	67
32774-16-6	PCB-169		1.58304	0.25829	0.03	0.04749	0.04749	72
39635-31-9	PCB-189		2.02847	0.21812	0.00003	0.00006	0.00006	79
	Total PCBs		15.18045					
	TEQ (WHO) Mammals					0.32674	0.32676	
	TEQ (WHO) Birds					0.45729	0.45730	
	TEQ (WHO) Fish					0.01457	0.01457	

Upper-Bound: 'Upper-bound' means the concept which requires using the limit of quantification for the contribution of each non-quantified congener

Lower-Bound: 'Lower-bound' means the concept which requires using zero for the contribution of each non-quantified congener

TEQ: Toxic Equivalent Value

TEF: Toxic Equivalent Factor

Element Materials Technology

Client Name: Socotec
Reference: 23091913
Location: Shetland Islands Council-Energy Recovery Plant
Contact: Chem Subcon

Sample Date: 7 Sep 2023
Date of Receipt: 20 Sep 2023
Date Analysed: 28 Sep 2023

Sample ID: BAG FILTER
Depth:
EMT Job No: 23/15519
EMT Sample No: 2
Matrix: Solid (Soil)
Method: TM206/PM139 Dioxins, Furans and PCBs in solid samples by HR-GCMS

ANALYSIS OF PCDDs and PCDFs

Q : Qualifiers

SV Indicates surrogate recovery outside performance criteria
>> Indicates value exceeds calibration range

Key

LOD Limit of Detection
ISO 17025 (UKAS)
M MCERTS accredited

CAS No	Compound	Q	Result ng/kg	LOD	I-TEFs	TEQ Lower Bound	TEQ Upper Bound	% Recovery
1746-01-6	2378-TCDD	SV	15.71893	3.97229	1	15.71893	15.71893	21
40321-76-4	12378-PCDD	SV	290.23256	19.69665	1	290.23256	290.23256	6
39227-28-6	123478-HxCDD	SV	434.33683	44.97974	0.1	43.43368	43.43368	2
57653-85-7	123678-HxCDD	SV	1056.94920	52.20178	0.1	105.69492	105.69492	3
19408-74-3	123789-HxCDD		335.82560	52.03164	0.1	33.58256	33.58256	
35822-46-9	1234678-HpCDD		NDP	63.70834	0.01	NDP	NDP	NDP
3268-87-9	OCDD		NDP	154.49110	0.0003	NDP	NDP	NDP
	Total 2,3,7,8-Dioxins		NDP					
51207-31-9	2378-TCDF		181.55451	5.24419	0.1	18.15545	18.15545	25
57117-41-6	12378-PCDF	SV	1164.07588	47.30930	0.03	34.92228	34.92228	3
57117-31-4	23478-PCDF	SV	1117.72688	13.65062	0.3	335.31807	335.31807	9
70648-26-9	123478-HxCDF	SV	3074.17606	53.35258	0.1	307.41761	307.41761	2
57117-44-9	123678-HxCDF		NDP	76.24912	0.1	NDP	NDP	NDP
60851-34-5	234678-HxCDF		NDP	116.98948	0.1	NDP	NDP	NDP
72918-21-9	123789-HxCDF		NDP	217.31012	0.1	NDP	NDP	NDP
67562-39-4	1234678-HpCDF		NDP	127.03343	0.01	NDP	NDP	NDP
55673-89-7	1234789-HpCDF		NDP	78.37185	0.01	NDP	NDP	NDP
39001-02-0	OCDF		NDP	93.14056	0.0003	NDP	NDP	NDP
	Total 2,3,7,8-Furans		NDP					
	TEQ (WHO) Mammals					NDP	NDP	
	TEQ (WHO) Birds					NDP	NDP	
	TEQ (WHO) Fish					NDP	NDP	
	TEQ (NATO)					NDP	NDP	

Upper-Bound: 'Upper-bound' means the concept which requires using the limit of quantification for the contribution of each non-quantified congener

Lower-Bound: 'Lower-bound' means the concept which requires using zero for the contribution of each non-quantified congener

TEQ: Toxic Equivalent Value

TEF: Toxic Equivalent Factor

Element Materials Technology

Client Name: Socotec
Reference: 23091913
Location: Shetland Islands Council-Energy Recovery Plant
Contact: Chem Subcon

Sample Date: 7 Sep 2023
Date of Receipt: 20 Sep 2023
Date Analysed: 28 Sep 2023

Sample ID: BAG FILTER
Depth:
EMT Job No: 23/15519
EMT Sample No: 2
Matrix: Solid (Soil)
Method: TM206/PM139 Dioxins, Furans and PCBs in solid samples by HR-GCMS

ANALYSIS OF PCBs

Q : Qualifiers

SV Indicates surrogate recovery outside performance criteria
>> Indicates value exceeds calibration range

Key

LOD Limit of Detection
ISO 17025 (UKAS)
M MCERTS accredited

CAS No	Compound	Q	Result ng/kg	LOD	I-TEFs	TEQ Lower Bound	TEQ Upper Bound	% Recovery
70362-50-4	PCB-81		273.50251	0.76423	0.0003	0.08205	0.08205	46
32598-13-3	PCB-77		747.51403	0.73526	0.0001	0.07475	0.07475	60
65510-44-3	PCB-123		60.39370	3.76041	0.00003	0.00181	0.00181	72
31508-00-6	PCB-118		282.07128	3.66099	0.00003	0.00846	0.00846	72
74472-37-0	PCB-114		157.18832	3.76672	0.00003	0.00472	0.00472	71
32598-14-4	PCB-105		359.78253	4.01946	0.00003	0.01079	0.01079	70
57465-28-8	PCB-126		863.56524	0.99192	0.1	86.35652	86.35652	68
52663-72-6	PCB-167		232.12911	3.40193	0.00003	0.00696	0.00696	73
38380-08-4	PCB-156		641.68116	3.56289	0.00003	0.01925	0.01925	70
69782-90-7	PCB-157		379.23092	3.79434	0.00003	0.01138	0.01138	68
32774-16-6	PCB-169		435.49878	2.85531	0.03	13.06496	13.06496	66
39635-31-9	PCB-189		815.72434	2.15561	0.00003	0.02447	0.02447	82
	Total PCBs		5248.28192					
	TEQ (WHO) Mammals					99.66612	99.66612	
	TEQ (WHO) Birds					151.68472	151.68472	
	TEQ (WHO) Fish					4.56575	4.56575	

Upper-Bound: 'Upper-bound' means the concept which requires using the limit of quantification for the contribution of each non-quantified congener

Lower-Bound: 'Lower-bound' means the concept which requires using zero for the contribution of each non-quantified congener

TEQ: Toxic Equivalent Value

TEF: Toxic Equivalent Factor

Client Name: Socotec
Reference: 23091913
Location: Shetland Islands Council-Energy Rcovery Plant
Contact: Chem Subcon

Matrix : Solid

[illegible]

Client Name:	Socotec
Reference:	23091913
Location:	Shetland Islands Council-Energy Rcovery Plant
Contact:	Chem Subcon

[illegible]

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.

It is a requirement under ISO 17025 that we inform clients if samples are deviating i.e. outside what is expected. A deviating sample indicates that the sample 'may' be compromised but not necessarily will be compromised. The result is still accredited and our analytical reports will still show accreditation on the relevant analytes.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 23/15519

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overestimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a requirement of our Accreditation Body for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above quantitative calibration range. The result should be considered the minimum value and is indicative only. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

EMT Job No: 23/15519

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM206	Analysis of Dioxins, Furans and PCBs in solid samples by HR-GCMS.	PM139	Extraction and clean-up of Dioxins (PCDDs), Furans (PCDFs) and dioxin like PCBs from solid samples using accelerator solvent extractor and clean up system.			AD	Yes

Socotec
ESG
ESG House, Bretby Business Park
Bretby
Burton upon Trent
United Kingdom
DE15 0YZ



4225



Attention :	Chem Subcon
Date :	6th October, 2023
Your reference :	23091913
Our reference :	Test Report 23/15984 Batch 1
Location :	Shetland Islands Council-Energy Recovery Plant
Date samples received :	27th September, 2023
Status :	Final Report
Issue :	1

Two samples were received for analysis on 27th September, 2023 of which two were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

The greenhouse gas emissions generated (in Carbon – Co2e) to obtain the results in this report are estimated as:

Scope 1&2 emissions - 1.448 kg of CO2

Scope 1&2&3 emissions - 3.422 kg of CO2

Authorised By:

redacted

Please include all sections of this report if it is reproduced

Element Materials Technology

Client Name: Socotec
 Reference: 23091913
 Location: Shetland Islands Council-Energy Recovery Plant
 Contact: Chem Subcon

Sample Date: 12 Sep 2023
 Date of Receipt: 27 Sep 2023
 Date Analysed: 5 Oct 2023

Sample ID: 23091913-001
 Depth:
 EMT Job No: 23/15984
 EMT Sample No: 1
 Matrix: Solid (Ash)
 Method: TM206/PM139 Dioxins, Furans and PCBs in solid samples by HR-GCMS

ANALYSIS OF PCDDs and PCDFs

Q : Qualifiers

SV Indicates surrogate recovery outside performance criteria
 >> Indicates value exceeds calibration range

Key

LOD Limit of Detection
 # ISO 17025 (UKAS)
 M MCERTS accredited

CAS No		Compound	Q	Result ng/kg	LOD	I-TEFs	TEQ Lower Bound	TEQ Upper Bound	% Recovery
1746-01-6	#	2378-TCDD		0.19816	0.16674	1	0.19816	0.19816	94
40321-76-4	#	12378-PCDD		0.97344	0.47538	1	0.97344	0.97344	73
39227-28-6	#	123478-HxCDD		0.51028	0.43540	0.1	0.05103	0.05103	76
57653-85-7	#	123678-HxCDD		0.79289	0.44495	0.1	0.07929	0.07929	72
19408-74-3	#	123789-HxCDD		0.84014	0.46347	0.1	0.08401	0.08401	
35822-46-9	#	1234678-HpCDD		9.34232	0.12077	0.01	0.09342	0.09342	77
3268-87-9	#	OCDD		35.69249	0.29957	0.0003	0.01071	0.01071	70
		Total 2,3,7,8-Dioxins		48.34972					
51207-31-9	#	2378-TCDF		1.73954	0.40516	0.1	0.17395	0.17395	70
57117-41-6	#	12378-PCDF		1.85353	0.62658	0.03	0.05561	0.05561	74
57117-31-4	#	23478-PCDF		2.06838	0.60058	0.3	0.62051	0.62051	75
70648-26-9	#	123478-HxCDF		2.78965	0.36398	0.1	0.27896	0.27896	82
57117-44-9	#	123678-HxCDF		3.01156	0.38496	0.1	0.30116	0.30116	76
60851-34-5	#	234678-HxCDF		3.62960	0.52131	0.1	0.36296	0.36296	67
72918-21-9	#	123789-HxCDF		1.04098	0.51448	0.1	0.10410	0.10410	70
67562-39-4	#	1234678-HpCDF		25.29164	0.33008	0.01	0.25292	0.25292	79
55673-89-7	#	1234789-HpCDF		2.84005	0.37381	0.01	0.02840	0.02840	75
39001-02-0	#	OCDF		58.52404	0.26861	0.0003	0.01756	0.01756	62
		Total 2,3,7,8-Furans		102.78897					
		TEQ (WHO) Mammals					3.68619	3.68619	
		TEQ (WHO) Birds					6.62956	6.62956	
		TEQ (WHO) Fish					4.00418	4.00418	
		TEQ (NATO)					3.71617	3.71617	

Upper-Bound: 'Upper-bound' means the concept which requires using the limit of quantification for the contribution of each non-quantified congener

Lower-Bound: 'Lower-bound' means the concept which requires using zero for the contribution of each non-quantified congener

TEQ: Toxic Equivalent Value

TEF: Toxic Equivalent Factor

Element Materials Technology

Client Name: Socotec
Reference: 23091913
Location: Shetland Islands Council-Energy Recovery Plant
Contact: Chem Subcon

Sample Date: 12 Sep 2023
Date of Receipt: 27 Sep 2023
Date Analysed: 5 Oct 2023

Sample ID: 23091913-001
Depth:
EMT Job No: 23/15984
EMT Sample No: 1
Matrix: Solid (Ash)
Method: TM206/PM139 Dioxins, Furans and PCBs in solid samples by HR-GCMS

ANALYSIS OF PCBs

Q : Qualifiers

SV Indicates surrogate recovery outside performance criteria
>> Indicates value exceeds calibration range

Key

LOD Limit of Detection
ISO 17025 (UKAS)
M MCERTS accredited

CAS No		Compound	Q	Result ng/kg	LOD	I-TEFs	TEQ Lower Bound	TEQ Upper Bound	% Recovery
70362-50-4	#	PCB-81		0.49340	0.20649	0.0003	0.00015	0.00015	77
32598-13-3	#	PCB-77		2.03447	0.10273	0.0001	0.00020	0.00020	77
65510-44-3	#	PCB-123		<0.42947	0.42947	0.00003	0.00000	0.00001	80
31508-00-6	#	PCB-118		2.35434	0.44547	0.00003	0.00007	0.00007	78
74472-37-0	#	PCB-114		<0.42599	0.42599	0.00003	0.00000	0.00001	80
32598-14-4	#	PCB-105		1.19825	0.49591	0.00003	0.00004	0.00004	73
57465-28-8	#	PCB-126		1.01885	0.34806	0.1	0.10188	0.10188	88
52663-72-6	#	PCB-167		0.30121	0.17105	0.00003	0.00001	0.00001	78
38380-08-4	#	PCB-156		0.66347	0.17523	0.00003	0.00002	0.00002	78
69782-90-7	#	PCB-157		0.27630	0.19328	0.00003	0.00001	0.00001	74
32774-16-6	#	PCB-169		<0.29932	0.29932	0.03	0.00000	0.00898	88
39635-31-9	#	PCB-189		0.40911	0.10519	0.00003	0.00001	0.00001	92
		Total PCBs		8.74940					
		TEQ (WHO) Mammals					0.10239	0.11139	
		TEQ (WHO) Birds					0.25213	0.25246	
		TEQ (WHO) Fish					0.00556	0.00557	

Upper-Bound: 'Upper-bound' means the concept which requires using the limit of quantification for the contribution of each non-quantified congener

Lower-Bound: 'Lower-bound' means the concept which requires using zero for the contribution of each non-quantified congener

TEQ: Toxic Equivalent Value

TEF: Toxic Equivalent Factor

Element Materials Technology

Client Name: Socotec
Reference: 23091913
Location: Shetland Islands Council-Energy Recovery Plant
Contact: Chem Subcon

Sample Date: 12 Sep 2023
Date of Receipt: 27 Sep 2023
Date Analysed: 5 Oct 2023

Sample ID: 23091913-004
Depth:
EMT Job No: 23/15984
EMT Sample No: 2
Matrix: Solid (Ash)
Method: TM206/PM139 Dioxins, Furans and PCBs in solid samples by HR-GCMS

ANALYSIS OF PCDDs and PCDFs

Q : Qualifiers

SV Indicates surrogate recovery outside performance criteria
>> Indicates value exceeds calibration range

Key

LOD Limit of Detection
ISO 17025 (UKAS)
M MCERTS accredited

CAS No		Compound	Q	Result ng/kg	LOD	I-TEFs	TEQ Lower Bound	TEQ Upper Bound	% Recovery
1746-01-6	#	2378-TCDD		<0.14341	0.14341	1	0.00000	0.14341	80
40321-76-4	#	12378-PCDD		0.78976	0.45249	1	0.78976	0.78976	74
39227-28-6	#	123478-HxCDD		1.13394	0.42822	0.1	0.11339	0.11339	74
57653-85-7	#	123678-HxCDD		1.96711	0.47278	0.1	0.19671	0.19671	69
19408-74-3	#	123789-HxCDD		1.54577	0.49246	0.1	0.15458	0.15458	
35822-46-9	#	1234678-HpCDD		25.74431	0.34642	0.01	0.25744	0.25744	71
3268-87-9	#	OCDD		125.25108	0.26079	0.0003	0.03758	0.03758	69
		Total 2,3,7,8-Dioxins		156.43197					
51207-31-9	#	2378-TCDF		0.33559	0.24514	0.1	0.03356	0.03356	61
57117-41-6	#	12378-PCDF		0.83483	0.39918	0.03	0.02505	0.02505	67
57117-31-4	#	23478-PCDF		1.45217	0.40607	0.3	0.43565	0.43565	63
70648-26-9	#	123478-HxCDF		2.02617	0.46491	0.1	0.20262	0.20262	72
57117-44-9	#	123678-HxCDF		2.43019	0.48445	0.1	0.24302	0.24302	71
60851-34-5	#	234678-HxCDF		5.72287	0.54572	0.1	0.57229	0.57229	63
72918-21-9	#	123789-HxCDF		1.41783	0.58551	0.1	0.14178	0.14178	70
67562-39-4	#	1234678-HpCDF		18.00488	0.29595	0.01	0.18005	0.18005	73
55673-89-7	#	1234789-HpCDF		7.08225	0.31550	0.01	0.07082	0.07082	76
39001-02-0	#	OCDF		75.13358	0.27645	0.0003	0.02254	0.02254	67
		Total 2,3,7,8-Furans		114.44036					
		TEQ (WHO) Mammals					3.47684	3.62025	
		TEQ (WHO) Birds					4.34834	4.49175	
		TEQ (WHO) Fish					3.63281	3.77622	
		TEQ (NATO)					3.52937	3.67278	

Upper-Bound: 'Upper-bound' means the concept which requires using the limit of quantification for the contribution of each non-quantified congener

Lower-Bound: 'Lower-bound' means the concept which requires using zero for the contribution of each non-quantified congener

TEQ: Toxic Equivalent Value

TEF: Toxic Equivalent Factor

Element Materials Technology

Client Name: Socotec
Reference: 23091913
Location: Shetland Islands Council-Energy Recovery Plant
Contact: Chem Subcon

Sample Date: 12 Sep 2023
Date of Receipt: 27 Sep 2023
Date Analysed: 5 Oct 2023

Sample ID: 23091913-004
Depth:
EMT Job No: 23/15984
EMT Sample No: 2
Matrix: Solid (Ash)
Method: TM206/PM139 Dioxins, Furans and PCBs in solid samples by HR-GCMS

ANALYSIS OF PCBs

Q : Qualifiers

SV Indicates surrogate recovery outside performance criteria
>> Indicates value exceeds calibration range

Key

LOD Limit of Detection
ISO 17025 (UKAS)
M MCERTS accredited

CAS No		Compound	Q	Result ng/kg	LOD	I-TEFs	TEQ Lower Bound	TEQ Upper Bound	% Recovery
70362-50-4	#	PCB-81		0.66696	0.07739	0.0003	0.00020	0.00020	73
32598-13-3	#	PCB-77		1.39532	0.14162	0.0001	0.00014	0.00014	69
65510-44-3	#	PCB-123		<0.36283	0.36283	0.00003	0.00000	0.00001	69
31508-00-6	#	PCB-118		1.45278	0.37631	0.00003	0.00004	0.00004	66
74472-37-0	#	PCB-114		<0.34626	0.34626	0.00003	0.00000	0.00001	73
32598-14-4	#	PCB-105		0.92105	0.42456	0.00003	0.00003	0.00003	62
57465-28-8	#	PCB-126		1.24663	0.31617	0.1	0.12466	0.12466	93
52663-72-6	#	PCB-167		0.36517	0.16452	0.00003	0.00001	0.00001	74
38380-08-4	#	PCB-156		0.70357	0.17442	0.00003	0.00002	0.00002	71
69782-90-7	#	PCB-157		0.47317	0.19780	0.00003	0.00001	0.00001	66
32774-16-6	#	PCB-169		1.28515	0.26032	0.03	0.03855	0.03855	97
39635-31-9	#	PCB-189		0.89176	0.11514	0.00003	0.00003	0.00003	86
		Total PCBs		9.40156					
		TEQ (WHO) Mammals					0.16369	0.16371	
		TEQ (WHO) Birds					0.26284	0.26287	
		TEQ (WHO) Fish					0.00679	0.00679	

Upper-Bound: 'Upper-bound' means the concept which requires using the limit of quantification for the contribution of each non-quantified congener

Lower-Bound: 'Lower-bound' means the concept which requires using zero for the contribution of each non-quantified congener

TEQ: Toxic Equivalent Value

TEF: Toxic Equivalent Factor

[illegible]

It is a requirement under ISO 17025 that we inform clients if samples are deviating i.e. outside what is expected. A deviating sample indicates that the sample 'may' be compromised but not necessarily will be compromised. The result is still accredited and our analytical reports will still show accreditation on the relevant analytes.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 23/15984

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overestimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a requirement of our Accreditation Body for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above quantitative calibration range. The result should be considered the minimum value and is indicative only. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

EMT Job No: 23/15984

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM206	Analysis of Dioxins, Furans and PCBs in solid samples by HR-GCMS.	PM139	Extraction and clean-up of Dioxins (PCDDs), Furans (PCDFs) and dioxin like PCBs from solid samples using accelerator solvent extractor and clean up system.			AD	Yes
TM206	Analysis of Dioxins, Furans and PCBs in solid samples by HR-GCMS.	PM139	Extraction and clean-up of Dioxins (PCDDs), Furans (PCDFs) and dioxin like PCBs from solid samples using accelerator solvent extractor and clean up system.	Yes		AD	Yes

KIRTON CONCRETE SERVICES LTD

Manor House, Station Road
Hibaldstow DN20 9EB

T: 01652 656931
E: office@kirtonlab.co.uk

www.kirtonlab.co.uk

An independent testing laboratory specialising in the testing of cementitious materials

TEST REPORT PREPARED FOR SOCOTEC

REPORT REFERENCE	SOC	263
Client REFERENCE	23091913-002	2023
JOB NUMBER	23091913	
Purchase Order Number	B174455BEC	
DATE OF RECEIPT OF SAMPLE	20-Sep-23	
DATE OF TESTS	20-Sep-23	to 25-Sep-23
DATE OF REPORT	25-Sep-23	

ALL RESULTS RELATE ONLY TO SAMPLE TESTED

PFA RESULTS TO EN 450: 2012

FREE CALCIUM OXIDE	3.94 %
--------------------	--------

END OF REPORT

KIRTON CONCRETE
SERVICES LTD

redacted

SIGNED:.....

Certificate signed by:



redacted

redacted

redacted

KIRTON CONCRETE SERVICES LTD

Manor House, Station Road
Hibaldstow DN20 9EB

T: 01652 656931
E: office@kirtonlab.co.uk

www.kirtonlab.co.uk

An independent testing laboratory specialising in the testing of cementitious materials

TEST REPORT PREPARED FOR SOCOTEC

REPORT REFERENCE	SOC	264
Client REFERENCE	23091913-003	2023
JOB NUMBER	23091913	
Purchase Order Number	B174455BEC	
DATE OF RECEIPT OF SAMPLE	20-Sep-23	
DATE OF TESTS	20-Sep-23	to 25-Sep-23
DATE OF REPORT	25-Sep-23	

ALL RESULTS RELATE ONLY TO SAMPLE TESTED

PFA RESULTS TO EN 450: 2012

FREE CALCIUM OXIDE	6.78 %
--------------------	--------

END OF REPORT

redacted

SIGNED:.....

Certificate signed by:

redacted



Client: Shetland Islands Council
Project Name: Shetland Islands Council-Shetland Islands Council-Energy Recovery Plant
Project No: 23091913
Date Issued: 09/10/2023

Deviating Sample Report

All samples received in an appropriate condition with no deviancies noted with the samples.



Client: Shetland Islands Council
 Project Name: Shetland Islands Council-Shetland Islands Council-Energy Recovery Plant
 Project No: 23091913
 Date Issued: 09/10/2023

Analysis Method

<u>Method Code</u>	<u>Method Description</u>	<u>Analysis Method</u>
CLANDPREP	CLand Prep Dry Weight Content @ 35°C	As Received
CLANDPREP	Solid Material Description	As Received
ICPMSS	Antimony in IBA by ICPMS	Air Dried & Ground
ICPMSS	Thallium in IBA by ICPMS	Air Dried & Ground
ICPMSW (Dissolved)	Antimony (Diss.) in Lab Leachate by ICPMS	Filtered
ICPMSW (Dissolved)	Antimony in Solids (BSEN 12457-2)	Filtered
ICPMSW (Dissolved)	Arsenic (Diss.) in Lab Leachate by ICPMS	Filtered
ICPMSW (Dissolved)	Arsenic in Solids (BSEN 12457-2)	Filtered
ICPMSW (Dissolved)	Cadmium (Diss.) in Lab Leachate by ICPMS	Filtered
ICPMSW (Dissolved)	Cadmium in Solids (BSEN 12457-2)	Filtered
ICPMSW (Dissolved)	Chromium (Diss.) in Lab Leachate by ICPMS	Filtered
ICPMSW (Dissolved)	Chromium in Solids (BSEN 12457-2)	Filtered
ICPMSW (Dissolved)	Copper (Diss.) in Lab Leachate by ICPMS	Filtered
ICPMSW (Dissolved)	Copper in Solids (BSEN 12457-2)	Filtered
ICPMSW (Dissolved)	Lead (Diss.) in Lab Leachate by ICPMS	Filtered
ICPMSW (Dissolved)	Lead in Solids (BSEN 12457-2)	Filtered
ICPMSW (Dissolved)	Mercury (Diss.) in Lab Leachate by ICPMS	Filtered
ICPMSW (Dissolved)	Mercury in Solids (BSEN 12457-2)	Filtered
ICPMSW (Dissolved)	Molybdenum (Diss.) in Lab Leachate by ICPMS	Filtered
ICPMSW (Dissolved)	Molybdenum in Solids (BSEN 12457-2)	Filtered
ICPMSW (Dissolved)	Nickel (Diss.) in Lab Leachate by ICPMS	Filtered
ICPMSW (Dissolved)	Nickel in Solids (BSEN 12457-2)	Filtered
ICPMSW (Dissolved)	Selenium (Diss.) in Lab Leachate by ICPMS	Filtered
ICPMSW (Dissolved)	Selenium in Solids (BSEN 12457-2)	Filtered
ICPMSW (Dissolved)	Zinc (Diss.) in Lab Leachate by ICPMS	Filtered
ICPMSW (Dissolved)	Zinc in Solids (BSEN 12457-2)	Filtered
ICPSOIL	Antimony in IBA by ICPOES	Air Dried & Ground
ICPSOIL	Arsenic in IBA by ICPOES	Air Dried & Ground
ICPSOIL	Cadmium in IBA by ICPOES	Air Dried & Ground
ICPSOIL	Chromium in IBA by ICPOES	Air Dried & Ground
ICPSOIL	Cobalt in IBA by ICPOES	Air Dried & Ground
ICPSOIL	Copper in IBA by ICPOES	Air Dried & Ground
ICPSOIL	Lead in IBA by ICPOES	Air Dried & Ground
ICPSOIL	Manganese in IBA by ICPOES	Air Dried & Ground
ICPSOIL	Mercury in IBA by ICPOES	Air Dried & Ground
ICPSOIL	Nickel in IBA by ICPOES	Air Dried & Ground
ICPWATVAR (Dissolved)	Barium (Diss.) in Lab Leachate by ICPOES	Filtered
ICPWATVAR (Dissolved)	Barium in Solids (BSEN 12457-2)	Filtered
ICPWATVAR (Dissolved)	Total Sulphur as SO ₄ (Diss.) in Lab Leachate	Filtered
ICPWATVAR (Dissolved)	Total Sulphur as SO ₄ in Solids (BSEN 12457-2)	Filtered
ISEF	Fluoride by ISE	Filtered
ISEF	Fluoride in Solids (BSEN 12457-2)	Filtered
KONENS	Chloride by Colorimetry	Filtered
KONENS	Chloride in Solids (BSEN 12457-2)	Filtered
Leachate Prep CEN 10:1	WAC Leachate Prep, 1-Stage 10:1 (BSEN 12457-2)	As Received
LOI(%MM)	LOI: Loss on Ignition @ 450°C	Air Dried & Ground
PAHMSUS	16 PAHs by GCMS	As Received
PHCONDW	Electrical Conductivity @ 25°C	Filtered
PHCONDW	pH	Filtered
PHCONDW	TDS: Total Dissolved Solids (Calc)	Filtered



Client: Shetland Islands Council
 Project Name: Shetland Islands Council-Shetland Islands Council-Energy Recovery Plant
 Project No: 23091913
 Date Issued: 09/10/2023

PHCONDW	Total Dissolved Solids in Solids (BSEN 12457-2)	Filtered
SFAP1	Phenol Index (Total) by SFA	Filtered
SFAP1	Phenol Index in Solids (BSEN 12457-2)	Filtered
SUB016	Dioxins, Furans & PCBs inc. TEQs in Solids	
SUB051	Free Lime Content (Calcium Oxide) in Ash	
TMSS	Total Moisture @ 105°C	As Received
TOCW	LOC: Leached Organic Carbon	Filtered
WAC	WAC Report	
WSLM13	Leached Organic Carbon in Solids (BSEN 12457-2)	Filtered
WSLM59	TOC: Total Organic Carbon	Air Dried & Ground

Project Report Notes

As part of method development the upper calibration limit for the PHCONDW method has been reduced from pH 13 to pH 12. A result of 12.73 pH units was obtained for this sample. This is outside the new working range of the method and should therefore be used for guidance purposes only. Any accreditation has been removed where applicable.

Result Report Notes

Letters alongside results signify that the result has associated report notes.
 The report notes are as follows:

<u>Letter</u>	<u>Note</u>
A	Due to the matrix of the sample the laboratory has had to deviate from our standard protocols to be able to process the sample and provide a result. Where applicable the accreditation has been removed and this should be taken into consideration when utilising the data.
B	The QC associated with this result has not wholly met the QMS requirements, the accreditation has therefore been removed. However, the Laboratory has confidence in the performance of the method as a whole and that the integrity of the data has not been significantly compromised.
C	Due to matrix interference, the internal standard and/or surrogate has not met the QMS requirements. This should be taken into consideration when utilising the data.
D	A non-standard volume or mass has been used for this test which has resulted in a raised detection limit.
E	Due to the parameter value being beyond our calibration range (and following the maximum size of dilution allowed, where applicable), the result cannot be quantified and as such the result will appear as a greater than symbol (>) with the accreditation removed. This data should be used for indicative purposes only.
F	Based on the sample history, appearance and smell a dilution was applied prior to testing. Unfortunately, the result is either above (>) or below (<) our calibration range. Results above our calibration range have accreditation removed. The data should be used for indicative purposes only.
G	The day 5 oxygen reading was below the capability of the instrument to detect, and therefore the calculated BOD has been reported unaccredited for guidance purposes only.



Client: Shetland Islands Council
Project Name: Shetland Islands Council-Shetland Islands Council-Energy Recovery Plant
Project No: 23091913
Date Issued: 09/10/2023

HWOL Acronym Key

<u>Acronym</u>	<u>Description</u>
HS	Headspace Analysis
EH	Extractable Hydrocarbons - i.e everything extracted by the solvent(s)
CU	Clean up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
+	Operator to indicate cumulative e.g. EH_CU+HS_1D_Total

Additional Information

This report refers to samples as received. SOCOTEC UK Ltd takes no responsibility for accuracy or competence of sampling by others.

Results within this report relate only to the samples tested.

The accreditation codes are as follows:

U = UKAS accredited analysis
M = MCERT accredited analysis
N = Unaccredited analysis

Any units marked with ^ signify results are reported on a dry weight basis of 105° c.

All Air Dried and Ground Samples (ADG) are oven dried at less than 35° c.

This report shall not be reproduced except in full, without written approval of the laboratory.

Opinions and interpretations given are outside the scope of our UKAS accreditation.

Any samples marked with * are not covered by our scope of UKAS accreditation. If applicable, further report notes have been added.

Any solid samples where the Major Constituents are not one of the following (Sand, Silt, Clay, Made Ground) are not one of our accredited matrix types.

Any samples marked with ‡ have had MCERTS accreditation removed for this result

Any samples marked with a tick in the deviant table is deviant for the specific reason.

Any samples reported as IS, NA, ND mean the following:

IS = Insufficient Sample to complete analysis
NA = Sample is not amenable for the required analysis
ND = Results cannot be determined

Items listed with a 'SUB' method code prefix have been carried out by an external subcontracted laboratory.

Our deviating sample report does not include deviancy information for Subcontracted analysis. Please see the report from the subcontracted lab for information regarding any deviancies for this analysis.

Summaries of analysis methods are available upon request.

End of Certificate of Analysis