

Appendix 2

Fairhurst Trial Pit Logs

TRIAL PIT RECORD

Trial Pit 2

Project: LANDFILL MONITORING

Client:

Job No: 111644

Logged by: Meganne Paul-Bird

Depth (m BGL)	Description of Strata		Samples		Groundwater details
			Depth	Type	
0.4 m	Grass over dark brown TOPSOIL				
2.5 m	MADE GROUND: Black/grey reworked PEAT with slight organic odour. No plant remains recognisable.				0.7m SEEPAGE
3.4 m	Light brown/grey slightly sandy gravelly CLAY. Gravel is angular to sub rounded, fine to coarse of mixed lithology's.				
PIT TERMINATED AT 3.4m bgl					

Date:	16/11/15	Weather:	Clear/dry
Plant:	JCB JS130		
Pit Dimensions:	Width	2m	Length 3.5m
Stability:	Stable		
Remarks: No waste encountered but peat appeared to have been reworked.			

TRIAL PIT RECORD

Trial Pit 3

Project: LANDFILL MONITORING

Client:

Job No: 111644

Logged by: Meganne Paul-Bird

Depth (m BGL)	Description of Strata		Samples		Groundwater details
			Depth	Type	
0.3 m	Grass over dark brown TOPSOIL				
1.0 m	MADE GROUND: WASTE Grey brown sandy angular to sub angular, fine to coarse GRAVEL, with high COBBLE content and low BOULDER content comprising of concrete, granite and other mixed lithology's.				NONE
3.3 m	MADE GROUND: WASTE Red brown slightly clayey sandy angular to sub angular, fine to coarse GRAVEL with high cobble and boulder content of granite, concrete and other mixed lithologies. Re-bar noted in some of the concrete.				
5.5 m	Pit terminated at 5.m bgl				

Date:	16/11/15	Weather:	Clear/dry		
Plant:	JCB JS130				
Pit Dimensions:	Width	2.5m	Length	3.5m	
Stability:	Unstable				
Remarks:	Odourless				



Fairhurst (Environmental & Geotechnical Services), Spademill Studios, Spademill Lane, Aberdeen, AB15 4EZ
Tel: 01224 321222; www.fairhurst.co.uk

TRIAL PIT RECORD

Trial Pit 4

Project: LANDFILL MONITORING

Client:

Job No: 111644

Logged by: Meganne Paul-Bird

Depth (m BGL)	Description of Strata		Samples		Groundwater details
			Depth	Type	
0.3 m	Grass over dark brown TOPSOIL				
1.0	MADE GROUND: WASTE Brown sandy angular to sub angular, fine to coarse GRAVEL with high cobble and boulder content of concrete, granite and various mixed lithology's. Frequent timber, wire, metal, polyethene and occasional ash noted within the arisings making up ~10-20% of arisings				2.10m bgl FAST
2.0					
3.0	4.10m				
4.0	Pit terminated at 4.10m bgl due to significant water ingress at 2.10m bgl causing side walls to collapse and unable to achieve further excavation.				
5.0					

Date:	16/11/15	Weather:	Clear/dry
Plant:	JCB JS130		
Pit Dimensions:	Width	2m	Length 3.5m
Stability:	Unstable		
Remarks: Odourless			

TRIAL PIT RECORD

Trial Pit 5

Project: LANDFILL MONITORING

Client:

Job No: 111644

Logged by: Meganne Paul-Bird

Depth (m BGL)	Description of Strata		Samples		Groundwater details
			Depth	Type	
0.3	Grass over dark brown TOPSOIL			NONE	
0.7	MADE GROUND: WASTE Dark brown clayey angular-sub rounded, fine to coarse GRAVEL of various lithology's. Clay is slightly peaty with low organic content.				
5.0	MADE GROUND: WASTE Grey sandy angular to sub angular, fine to coarse GRAVEL with medium to high cobble and boulder content throughout of granite, concrete, reinforced concrete and other mixed lithology's. Occasional brick, metal, wire and cables noted in arisings (~10%)				
5.6	Brown very clayey sandy angular to sub rounded, fine to coarse GRAVEL with occasional pockets (300x300mm) of soft/firm sandy gravelly clay.				
	Pit terminated in natural strata at 5.6m bgl				

Date:	17/11/15	Weather:	Clear/dry
Plant:	JCB JS130		
Pit Dimensions:	Width	2.5m	Length 4m
Stability:	Unstable		
Remarks:	Odourless.		



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TRIAL PIT RECORD

Trial Pit 6

Project: LANDFILL MONITORING

Client:

Job No: 111644

Logged by: Meganne Paul-Bird

Depth (m BGL)	Description of Strata		Samples		Groundwater details
			Depth	Type	
0.3	Grass over dark brown TOPSOIL			NONE	
2.2	MADE GROUND: WASTE Black/brown slightly clayey sandy angular to sub angular, fine to coarse GRAVEL with medium to high cobble and boulder content of mixed lithology's and concrete				
4.7	MADE GROUND: WASTE Soft black fibrous PEAT (reworked) with frequent fine to coarse gravel and occasional cobbles throughout				
4.8	Firm grey sandy CLAY				
	Pit terminated in natural strata at 4.8m bgl				

Date:	17/11/15	Weather:	Clear/dry
Plant:	JCB JS130		
Pit Dimensions:	Width	2m	Length 3m
Stability:	Stable		
Remarks:	Peaty odour from 2.2m bgl		

TRIAL PIT RECORD

Trial Pit 7

Project: LANDFILL MONITORING

Client:

Job No: 111644

Logged by: Meganne Paul-Bird

Depth (m BGL)	Description of Strata		Samples		Groundwater details
			Depth	Type	
0.3 m	Grass over dark brown TOPSOIL				
1.0	MADE GROUND: WASTE Brown sandy angular to sub angular, fine to coarse GRAVEL with high cobble content and medium boulder content. Gravel, cobbles and boulders are of mixed lithology's and concrete. High timber content (~20%) Metal, rebar and ash also noted within arising (~5%) From 2.0m bgl frequent ash and burnt material with strong odour				2.0m SEEPAGE
2.0					
3.0					
4.0	5.3 m				4.5m SEEPAGE
5.0			Pit terminated at 5.3m bgl due to water ingress and collapsing sidewalls at base of pit.		

Date:	16/11/15	Weather:	Clear/dry
Plant:	JCB JS130		
Pit Dimensions:	Width	2.5m	Length 4m
Stability:	Unstable		
Remarks: Contaminated odour, very ashy pit			



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TRIAL PIT RECORD

Trial Pit 8

Project: LANDFILL MONITORING

Client:

Job No: 111644

Logged by: Meganne Paul-Bird

Depth (m BGL)	Description of Strata		Samples		Groundwater details
			Depth	Type	
0.3 m	Grass over dark brown TOPSOIL				
1.0 m	<p>MADE GROUND: WASTE</p> <p>Brown sandy angular to sub angular, fine to coarse GRAVEL with high cobble and medium boulder content. Gravel, cobbles and boulders predominantly comprise mixed lithology's and concrete.</p> <p>Frequent polyethene observed between 1-2m bgl.</p> <p>Timber, metal, wires and plastic noted (~5%) between 1-3m bgl</p> <p>From 2.5m bgl becoming very clayey with less frequent cobbles and boulder (low content) and occasional pockets of soft sandy gravelly clay encountered.</p>				2.1m SEEPAGE
4.3 m	Pit terminated at 4.30m on large boulder or rockhead(?)				
5.0 m					

Date:	16/11/15	Weather:	Clear/dry
Plant:	JCB JS130		
Pit Dimensions:	Width	2.5m	Length 3.5m
Stability:	Unstable		
Remarks:	Water ingress at 2.10m bgl causing stability issues on sidewalls		
	Odourless		



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TRIAL PIT RECORD

Trial Pit 9

Project: LANDFILL MONITORING

Client:

Job No: 111644

Logged by: Meganne Paul-Bird

Depth (m BGL)	Description of Strata		Samples		Groundwater details
			Depth	Type	
0.3	Grass over dark brown TOPSOIL				
1.0	MADE GROUND: WASTE Brown/grey/black sandy angular to sub angular, fine to coarse GRAVEL with medium cobble content. Gravel and cobbles are of concrete, brick, granite and various other lithology's.				1.4m SEEPAGE
2.0	MADE GROUND: WASTE Brown sandy slightly clayey angular to sub angular, fine to coarse GRAVEL of various lithology's and concrete. Low to medium cobble and boulder content comprising granite. Occasional timber encountered (generally up to 1m lengths) Occasional localised pockets (100x100mm) of soft sandy clay				
3.0					
4.0	4.4				
5.0	Pit terminated at 4.4m bgl				

Date:	16/11/15	Weather:	Clear/dry
Plant:	JCB JS130		
Pit Dimensions:	Width	2m	Length 3.5m
Stability:	Unstable		
Remarks:	Odourless		

111644: A.F.C. Proposed Kingsford Stadium

Geo-Environmental Interpretative Report and Outline Site Reclamation Strategy

FAIRHURST

Appendix 3

Groundwater Level Data

Boreholes Groundwater Strike Data.

Exploratory Hole No.	Depth of Water Strike/Seepage (mbgl)	Water Level after 20 minutes	Nature of Groundwater Strike/Seepage	Strata in which Strike was Encountered
BH01	4.10	4.10	Seepage	MADE GROUND: Slightly gravelly sandy clay. Gravel of mixed lithology including brick. Driller noted boulders.
	7.50	7.50	Very heavy	Large Psammite and granite boulders#
BH02	5.00	1.00		MADE GROUND: Waste
	8.00	7.80		Soft and firm brown soil *
BH03	4.10	4.10	Seepage	MADE GROUND: Waste (Wood, concrete, brick, plastic etc.) #
BH04	7.00	7.00	Damp	Very clayey fine to coarse SAND and fine to coarse GRAVEL.
BH05	6.00	5.40		MADE GROUND: Waste (Sandy and timber and gravel)#
	8.00	3.30		SAND and GRAVEL *
BH06	6.00	5.10		SAND AND GRAVEL.
BH07	5.40	2.80		Hard Brown clay *
BH10	4.00	3.60		MADE GROUND: Waste (Timber and gravel and sand).
BH11	5.00	2.20		MADE GROUND: Fill with wood, clay, plastic
	8.00	5.70		Possible boulders
BH12	9.00	6.60		Possible boulders (no arisings).
BH13	7.00	7.00		MADE GROUND: Granite boulders, brick, plastic etc. #
BH14	7.00	6.80		MADE GROUND: fill and boulders and clay fill #
BH15	2.10	2.00		MADE GROUND: Waste (FILL AND BOULDERS).
BH16	6.00	5.80		BOULDERS.
BH102	4.30	4.30		MADE GROUND: Brick, concrete, wood, soil and building waste #
BH103	6.50	6.50	Seepage	Clayey fine to coarse SAND and subangular to subrounded fine to medium GRAVEL.
BH104	6.00	6.00	Damp	MADE GROUND: Large boulders #
BH105	5.50	5.50		MADE GROUND: Fill #

Denotes Driller's description.

* Denotes Driller's description provided over the 'phone during ground investigation

Trial Pits Groundwater Strike Data.

Exploratory Hole No.	Depth of Water Strike/Seepage (mbgl)	Water Level after 20 minutes	Nature of Strike/Seepage	Strata in which Strike was Encountered
TP02	0.70m	-	Seepage	MADE GROUND: Reworked PEAT. No plant remains recognisable.
TP04	2.10	-	Fast	MADE GROUND: Waste (Sandy fine to coarse GRAVEL with high cobble and boulder content of granite, and various mixed lithology. Frequent timber, wire, metal, polyethene and occasional ash).
TP07	2.00	-	Seepage	MADE GROUND: Waste (Sandy fine to coarse GRAVEL with high cobble and medium boulder content. Gravel, cobbles and boulders are of mixed lithology and concrete. High timber content as well as metal, rebar and ash.
	4.50	-	Seepage	
TP08	2.10	-	Seepage	MADE GROUND: Waste (Sandy fine to coarse GRAVEL with high cobble and medium boulder content. Gravel, cobbles and boulders predominately comprise mixed lithology and concrete. Timber, metal, wires and plastic noted.
TP09	1.40	-	Seepage	MADE GROUND: Waste (Fine to coarse GRAVEL with medium cobble content. Gravel and cobbles are of concrete, brick, granite and various other lithology.
TP103	4.50	4.30		Slightly gravelly fine to coarse SAND with low cobble content.
TP107	4.80	4.60		MADE GROUND: Waste (Coarse SAND with low cobble and boulder content. Cobbles and boulders of mixed lithology including tar plastic and brick).
TP109	2.00	N/A		MADE GROUND: Waste (Coarse SAND and coarse GRAVEL with medium cobble and boulder content. Gravel, cobbles and boulders of wood, metal, psammite, granite, burnt wood, plastic pipe and fabric),
TP112	3.10	3.00		MADE GROUND: Waste (Clayey gravelly fine to coarse SAND with medium cobble and boulder content. Gravel, cobbles and boulders of brick, granite blocks, building rubble, wood and glass).
TP114	3.60	2.60		MADE GROUND: Waste (Gravelly silty fine to coarse SAND with high cobble and boulder content. Gravel, cobbles and boulders of brick, wood, concrete, tile, clay pipe, wood sleepers, plastic buckets and plastic sheets.
TP116	4.00	3.80		MADE GROUND: Waste (Slightly gravelly fine to coarse SAND with medium boulder content. Gravel and boulders of mixed lithology including wood and tree branches.
TP117	3.30	3.25		MADE GROUND: Waste (Slightly clayey fine to coarse sand and fine to coarse gravel of glass and clay pipe with medium cobble and boulder content. Cobbles and boulders of wood, tar, brick, plastic and granite blocks).
TP118	4.00	3.40		MADE GROUND: Waste (Slightly clayey gravelly fine to coarse SAND with medium cobble and boulder content. Gravel, cobbles and boulders of tree stumps, metal, plastic, brick and reinforcing).

Groundwater Monitoring Data

Exploratory Hole No.	4 th May 2016		13 th May 2016		20 th June 2016		26 th July 2016	
	Depth (mbgl)	Elevation (mAOD)	Depth (mbgl)	Depth (mbgl)	Elevation (mAOD)	Elevation (mAOD)	Depth (mbgl)	Elevation (mAOD)
BH01	0.85	112.39	0.90	0.98	112.26	112.34	1.05	112.19
BH02	0.25	113.12	0.30	0.28	113.09	113.07	0.40	112.97
BH03	4.95	114.37	5.05	5.57	113.75	114.27	5.7	113.62
BH04	3.80	113.65	3.80	4.06	113.39	113.65	4.14	113.31
BH05	2.20	112.88	2.25	2.19	112.89	112.83	3.37	111.71
BH06	3.55	112.77	3.65	3.68	112.64	112.67	3.8	112.52
BH07	2.60	115.16	2.75	2.71	115.05	115.01	2.88	114.88
BH08	4.35	115.86	4.45	4.87	115.34	115.76	4.91	115.30
BH09	4.55	116.09	4.70	4.5	116.14	115.94	5.12	115.52
BH10	1.40	120.33	1.55	1.32	120.41	120.18	1.62	120.11
BH11	1.80	113.44	1.85	1.88	113.36	113.39	2	113.24
BH12	4.35	114.11	4.45	4.56	113.90	114.01	4.67	113.79
BH13	5.00	115.91	5.05	5.1	115.81	115.86	6.5	114.41
BH14	1.95	120.12	2.15	1.72	120.35	119.92	2.2	119.87
BH15	0.80	121.73	1.10	0.68	121.85	121.43	1.01	121.52
BH16	1.00	121.75	1.30	1.09	121.66	121.45	1.47	121.28

Exploratory Hole No.	4 th May 2016		13 th May 2016		20 th June 2016		26 th July 2016	
	Depth (mbgl)	Elevation (mAOD)	Depth (mbgl)	Depth (mbgl)	Elevation (mAOD)	Elevation (mAOD)	Depth (mbgl)	Elevation (mAOD)
BH101	2.35	114.07	2.40	2.64	113.78	114.02	3.78	112.64
BH102	4.70	114.45	4.75	3.94	115.21	114.40	5.07	114.08
BH103	5.90	114.02	6.00	5.83	114.09	113.92	6.11	113.81
BH104	5.30	116.28	5.55	5.65	115.93	116.03	5.58	116.00
BH105	4.00	117.62	4.20	4.28	117.34	117.42	4.44	117.18

111644 A.F.C. Proposed Kingsford Stadium

Environmental Interpretative Report and Outline Site Reclamation Strategy

FAIRHURST

Appendix 4

Tier 1 Assessment Criteria

111644 A.F.C. Proposed Kingsford Stadium

Environmental Interpretative Report and Outline Site Reclamation Strategy

FAIRHURST

WATER

Tier 1 Generic Assessment Criteria (GAC) for the Water Environment (as applicable to Part Ila 1990 EPA / PAN33)						
Chemical	SURFACE WATER (µg/l)		GAC source (Environmental Standard)	GROUNDWATER (µg/l)	GAC source (Resource Protection Value)	Notes
	FW	Marine				
METALS						
Aluminium				200	UK DWS	
Arsenic	50	25	Annex G EQS	10	EU DWS	
Antimony				5	EU DWS	
Barium				700	WHO DW	
Beryllium				4	US EPA	
Boron	2000	7000	Annex G EQS	1000	EU DWS	
Cadmium	0.08-0.25 ^a	0.2	EU standard	5	EU DWS	a
Chromium (III)	4.7	not given	proposed UKTAG	50 (total Cr)	EU DWS	
Chromium (VI)	3.4	0.6	proposed UKTAG			
Cobalt	3	3	Annex G EQS			
Copper	1-28 ^a	5	Annex G EQS	2000	EU DWS	a
Iron	1000	1000	Annex G EQS	200	UK DWS	
Lead	7.2	7.2	EU standard	25	EU DWS	
Manganese	30		Annex G EQS	50	UK DWS	
Mercury	0.05	0.05	EU standard	1	EU DWS	
Nickel	20	20	EU standard	20	EU DWS	
Selenium				10	EU DWS	
Silver	0.05	0.5	Annex G EQS	10	UK DWS	
Tin	25	10	Annex G EQS			
Vanadium	20	100	Annex G EQS			
Zinc	8-125 ^a	40	Annex G EQS	3000	WHO taste threshold	p
INORGANICS						
Cyanide	1 (free)	1 (free)	Annex G EQS	50 (total)	EU DWS	
Ammonia	15 ^c (NH ₃ -N)	21 (NH ₃ -N)	Annex G EQS	500	UK DWS	c
Bromate				10	UK DWS	
Sulphate				250,000	UK DWS	
ORGANICS						
Organometals						
Triphenyltin	0.02	0.008	Annex G EQS			
Tributyltin	0.0002	0.0002	EU standard			
Primary hydrocarbons						
BTEX						
Benzene	10	8	EU standard	1	UK DWS	
Ethylbenzene	20	20	Annex G EQS	300	WHO DW	
Toluene	74	40	UKTAG(2013)	700	WHO DW	
Xylene	30	30	Annex G EQS	500	WHO DW	
TPH						
Aliphatic 5-6	0.58	.58	US-EPA standard for hexane	300	WHO DWS for C8-16 ⁿ	n
Aliphatic 6-8						
Aliphatic 8-10						
Aliphatic 10-12	49	49	US-EPA standard for decane	300	WHO DWS	
Aliphatic 12-16						
Aliphatic 16-35			insoluble		insoluble	
Aliphatic 35-44			insoluble		insoluble	
Aromatic 6-7	10	8	benzene EQS	1	UK DWS for benzene	
Aromatic 7-8	50	40	toluene EQS	700	WHO DWS for toluene	
Aromatic 8-10				300	WHO DWS for ethylbenzene	
Aromatic 10-12						
Aromatic 12-16	20	20	ethylbenzene EQS as a surrogate ^o	100	WHO DWS	
Aromatic 16-21						
Aromatic 21-35				90	WHO DWS	
Aromatic 35-44						

Tier 1 Generic Assessment Criteria (GAC) for the Water Environment (as applicable to Part Ila 1990 EPA / PAN33)						
Chemical	SURFACE WATER (µg/l)		GAC source (Environmental Standard)	GROUNDWATER (µg/l)	GAC source (Resource Protection Value)	Notes
	FW	Marine				
PAH (US EPA-16)						
Acenaphthene	no standard [†]					f
Acenaphthylene	no standard [†]					f
Anthracene	0.1	0.1	EU standard			
Benz(a)anthracene	0.05	0.05	<i>B(a)P threshold</i> ^g			g
Benzo(a)pyrene	0.05	0.05	EU standard	0.01	EU DWS	
Benzo(b)fluoranthene	0.03	0.03 (sum)	EU standard	0.1 (sum)	EU DWS	
Benzo(k)fluoranthene	(sum)					
Benzo(ghi)perylene	0.002 (sum)	0.002 (sum)	EU standard			
Indeno(123-cd)pyrene						
Chrysene	no standard [†]					f
Dibenzo(ah)anthracene	0.05	0.05	<i>B(a)P threshold</i> ^g			
Fluoranthene	0.1	0.1	EU standard			
Fluorene	no standard [†]					f
Naphthalene	2.4	1.2	EU standard			
Phenanthrene	no standard [†]					f
Pyrene	no standard [†]					f
Styrene	50	50	Annex G EQS	20	WHO DW	
Other HCs (unchlorinated)						
Phenol	7.7	7.7	proposed UKTAG			
Biphenyl	25	25	Annex G EQS			
Di(2-ethylhexyl)phthalate	1.3	1.3	EU standard	6	US EPA	
<i>other phthalates</i> ^e			<i>see Annex G</i>			
Nonylphenol	0.3	0.3	EU standard			
Octylphenol	0.1	0.01	EU standard			
Formaldehyde	5		Annex G EQS			
Acrylamide				0.1	EU DWS	
Chlorinated HCs – n.b. this is not a complete list						
1,1,1-Trichloroethane	100	100	Annex G EQS	200	US EPA	
1,1,2-Trichloroethane	400	300	Annex G EQS	5	US EPA	
1,1-dichloroethylene				0.007	US EPA	
1,2-dichlorobenzene				600	US EPA	
1,4-dichlorobenzene				80	US EPA	
1,2-dichloroethane	10	10	EU standard	3 [†]	UK DWS	j
1,2-dibromoethane				0.4	WHO DW	
2,4-dichlorophenol	20	20	Annex G EQS			
2-Chlorophenol	50	50	Annex G EQS			
4-Chloro-3-methylphenol	40	40	Annex G EQS			
Brominated dipylether	0.0005	0.0002	EU standard			
C10-C13 chloroalkanes	0.4	0.4	EU standard			
Carbon tetrachloride	12	12	EU standard	3	UK DWS	
Chlorobenzene				100	US EPA	
Chloronitrotoluenes (all)	10	10	Annex G EQS			
Dichloromethane	20	20	EU standard	5	US EPA	
Hexachlorobenzene	0.01	0.01	EU standard	0.1	UK DWS	
Hexachlorobutadiene	0.1	0.1	EU standard	0.6	UK DWS	
Hexachlorocyclohexane	0.02	0.002	EU standard			
Pentachlorobenzene	0.007	0.0007	EU standard			
Pentachlorophenol	0.4	0.4	EU standard	0.1	UK DWS	
Tetrachloroethylene	10	10	EU standard			
Tetra / Tri - chloroethene				10	EU DWS	
Trichlorobenzenes (sum)	0.4	0.4	EU standard	70	US EPA	
Trichloroethylene	10	10	EU standard			
Trichloromethane	2.5	2.5	EU standard			
Tetrachloromethane				3	UK DWS	
Vinyl chloride				0.5	EU DWS	

Tier 1 Generic Assessment Criteria (GAC) for the Water Environment (as applicable to Part Ila 1990 EPA / PAN33)						
Chemical	SURFACE WATER (µg/l)		GAC source (Environmental Standard)	GROUNDWATER (µg/l)	GAC source (Resource Protection Value)	Notes
	FW	Marine				
PESTICIDES – n.b. this is <u>not</u> a complete list						
2,4-D	0.3	0.3	proposed UKTAG	(30)0.1 ^{k,l}	WHO DW	k l
Alachlor	0.3	0.3	EU standard	0.1	DW Directive	
Atrazine	0.6	0.6	EU standard	0.1	DW Directive	
Bentazone	500	500	Annex G EQS			
Carbofuran				(7) ^k	WHO DW	k
Chlorfenvinphos	0.1	0.1	EU standard	0.1	UK DWS	
Chlorotoluron				(30) ^k	WHO DW	k
Chlorpyrifos	0.03	0.03	EU standard	(30) ^k	WHO DW	k
Cyclodiene pesticides (sum) ^d	0.01	0.005	EU standard	0.03 ⁱ	EU DWS	i
Cypermethrin	0.0001	0.0001	proposed UKTAG			
DDT	0.025	0.025	EU standard			
para-para-DDT	0.01	0.01	EU standard			
Diazinon	0.01	0.01	proposed UKTAG	0.1 ^m		m
Dichlorvos	0.001	0.04	Annex G EQS			
Dimethoate	0.48	0.48	proposed UKTAG	(6) ^k	WHO DW	k
Diuron	0.2	0.2	EU standard			
Endosulfan	0.005	0.0005	EU standard			
Fenitrothion	0.01	0.01	Annex G EQS	0.1	UK DWS	
Isoproturon	0.3	0.3	EU standard			
Lindane				0.1	UK DWS	
Linuron	0.5	0.5	proposed UKTAG			
Malathion	0.01	0.02	Annex G EQS	0.1	UK DWS	
Mecoprop	5.5	0.3	proposed UKTAG	0.1	UK DWS	
Permethrin	0.01 ^b	0.01	Annex G EQS	0.1	UK DWS	b
Simazine	1	1	EU standard	0.1	UK DWS	
Trifluralin	0.03	0.03	EU standard			
'Total' pesticides ^k				0.5	UK DWS	k

N.B. Further pesticide EQSs are specified under Annex G (but not referred to in later guidance)

a – threshold dependent on alkalinity of receiving water

b – 95th %ile value (not actual limit)

c – the classification thresholds for 'good' status in SW in the Scottish River Basin Directions 2009 are significantly higher. It is assumed that the WAT-SG-53 thresholds should be used as protective.

Copper:

CaCO ₃ (mg/l)	EQS (µg/l)
0 – 10	1
11 – 50	6
51 – 100	10
101+	28

Zinc:

CaCO ₃ (mg/l)	EQS (µg/l)
10	8
50	50
100	75
500	125

Cadmium:

CaCO ₃ (mg/l)	EQS (µg/l)
<40	<0.08
40-49	0.08
50-99	0.09
100-199	0.15

Specific standards should be calculated by linear interpolation

d – aldrin, dieldrin, endrin and isodrin

- e – six further phthalates have tentative EQS values under Annex G
- f – there are no applicable EQS standards for these PAHs. Therefore, it is suggested that these are not specifically assessed and the PAHs which *do* have EQS values should be used as protective. Note that these are all relatively 'low risk' species with no or limited mutagenic / carcinogenic potential.
- g - there are no applicable EQS standards for these PAHs. However, benz(a)anthracene and dibenzo(ah)anthracene are known carcinogens / mutagens of a comparable order to benzo(a)pyrene (according to the IARC). Therefore, it would be reasonable to adopt the B(a)P threshold of 0.05 µg/l.
- h – also DDE and TDE
- i – aldrin + dieldrin have a UK DWS of 0.03 µg/l individually - probably sensible to adopt this as a summed threshold for all cyclodiene pesticides as per the EQS approach.
- j – SEPA(2010) cites the US EPA threshold of 5 µg/l – this is presumably an oversight?
- k – SEPA(2010) cites a number of non-EU/UK pesticide thresholds that are above 0.5 µg/ whereas the Water Supply (Water Quality) (Scotland) Regulations 2001 provides a Total Pesticides limit of 0.5 µg/l. It is recommended, therefore, that a Tier 1 threshold of 0.5 µg/l is adopted as precautionary for all cumulative pesticides. This could be looked at in more detail if the situation required it.
- l – SEPA cites a generous threshold of 100 µg/l for this pesticide taken from the Water Supply (Water Quality) (Scotland) Regulations 2001. However, this doesn't appear to be correct. Therefore, WHO DW standards are presented instead.
- m – SEPA cites a UK DWS for this pesticide taken from the Water Supply (Water Quality) (Scotland) Regulations 2001. However, this doesn't appear to be correct. WHO does not have a standard either. However, 0.1 µg/l would probably be protective.
- n – the WHO threshold for this fraction (15,000 µg/l) seems excessively generous so should not be used.
- o – in the absence of EQS for TPH fractions is suggested that the most conservative threshold for the substituted BTEX compounds be used as a conservative surrogate, i.e. ethylbenzene.

Sources of threshold:

Groundwater: SEPA WAT-PS-10-01 (2010) presents a list of Resource Protection Values (RPVs), i.e. human health thresholds, for Non-Hazardous substances (Annex 6) and a second list of RPVs for *other* chemicals specifically intended for use under the Contaminated Land regime. These lists draw on UK and international sources, specifically:

- The Water Supply (Water Quality) (Scotland) Regulations 2001
- Directive 98/83/EC – the Drinking Water Directive
- WHO Guidelines for Drinking Water Quality
- US EPA National Primary Drinking Water Regulations

Although not explicitly stated, it is assumed that the above sources are considered hierarchical, e.g. a US threshold would only be used in the absence of UK, UE and WHO thresholds. However, tacit adoption of US thresholds without caveats on use or modification indicates that SEPA considers this to be an authoritative source of human health thresholds.

Note that the only groundwater thresholds applied to the Contaminated Land regime set at European level (WFD) are for nitrates and total pesticides.

Surface Water: SEPA WAT-SG-53 (2009) presents a list of Environmental Quality Standards. Most of these are *either* the old Annex G EQS values (which have been used for some time) or new European standards. However, there are additional provisional standards suggested by UKTAG that SEPA consider reasonable to use at present. The specific references where these thresholds are taken from are as follows:

- SEPA Report WAT-SG-53 "Environmental Standards for Discharges to Surface Waters" v.2 (June 2009)
- Scotland River Basin District (Surface water Typology, Environmental Standards, Condition Limits and Groundwater Threshold Values) Directions 2009.

SOIL ASSESSMENT CRITERIA FOR HUMAN HEALTH RISK ASSESSMENT

Parameter	Residential																		Commercial	Allotment	Public Open Space near Residential land (POSres)	Public Park Land (POSpark)	Source	Model										
	With Home Grown Produce						Without Home Grown Produce						1-6% SOM (mg kg ⁻¹)			1-6% SOM (mg kg ⁻¹)									1-6% SOM (mg kg ⁻¹)									
	1-6% SOM (mg kg ⁻¹)		1-6% SOM (mg kg ⁻¹)		1-6% SOM (mg kg ⁻¹)		1-6% SOM (mg kg ⁻¹)		1-6% SOM (mg kg ⁻¹)		1-6% SOM (mg kg ⁻¹)		1-6% SOM (mg kg ⁻¹)		1-6% SOM (mg kg ⁻¹)		1-6% SOM (mg kg ⁻¹)								1-6% SOM (mg kg ⁻¹)									
Metals/Metalloids (a)																																		
Antimony	Not Derived						550						7,500			Not Derived			-			-		CL-AIRE	CLEA v1.06									
Arsenic (inorganic)	37						40						640			43			79			170		LQM/CIH S4ULS	CLEA v1.071									
Barium	Not Derived						1,300						22,000			Not Derived			-			-		CL-AIRE	CLEA v1.06									
Beryllium	1.7						1.7						12			35			2.2			63		LQM/CIH S4ULS	CLEA v1.071									
Boron	290						11,000						240,000			45			21,000			46,000		LQM/CIH S4ULS	CLEA v1.071									
Cadmium (d)	11						85						190			1.9			120			560		LQM/CIH S4ULS	CLEA v1.071									
Chromium (III)	910						910						8,600			18,000			1,500			33,000		LQM/CIH S4ULS	CLEA v1.071									
Chromium (VI) (e)	6						6						33			1.8			7.7			220		LQM/CIH S4ULS	CLEA v1.071									
Copper	2,400						7,100						68,000			520			12,000			44,000		LQM/CIH S4ULS	CLEA v1.071									
Lead (f)	200						310						2,330			80			630			1,300		CL-AIRE C4SL	CLEA									
Mercury (Elemental)	1.2						1.2						58			21			16			30		LQM/CIH S4ULS	CLEA v1.071									
Mercury (Inorganic)	40						56						1,100			19			120			240		LQM/CIH S4ULS	CLEA v1.071									
Mercury (Methyl)	11						15						320			6			40			68		LQM/CIH S4ULS	CLEA v1.071									
Molybdenum	Not Derived						670						17,000			Not Derived			-			-		CL-AIRE	CLEA v1.06									
Nickel	130						180						980			53			230			800		LQM/CIH S4ULS	CLEA v1.071									
Selenium	250						430						12,000			88			1,100			1,800		LQM/CIH S4ULS	CLEA v1.071									
Vanadium	410						1,200						9,000			91			2,000			5,000		LQM/CIH S4ULS	CLEA v1.071									
Zinc	3,700						40,000						730,000			620			81,000			170,000		LQM/CIH S4ULS	CLEA v1.071									
Other Inorganics																																		
Asbestos	Non Detection						Non Detection						Non Detection			Non Detection			Non Detection			Non Detection		ATKINS ATRISK SSV	CLEA v1.04									
Free Cyanide	34						34						34			34			34			34		-	-									
pH	<5						<5						<5			<5			<5			<5		-	-									
Total Sulphate	2400						2400						2400			2400			2400			2400		BRE (2005)	-									
Water-Soluble Sulphate	0.5g/l						0.5g/l						0.5g/l			0.5g/l			0.5g/l			0.5g/l		BRE (2005)	-									
Parameter	Residential																		Commercial	Allotment	Public Open Space near Residential land (POSres)	Public Park Land (POSpark)	Source	Model										
	With Home Grown Produce (mg kg⁻¹)						Without Home Grown Produce (mg kg⁻¹)						Commercial (mg kg⁻¹)			Allotment (mg kg⁻¹)			Public Open Space near Residential land (POSres) (mg kg⁻¹)			Public Park Land (POSpark) (mg kg⁻¹)												
	1% SOM		2.5% SOM		6% SOM		1% SOM		2.5% SOM		6% SOM		1% SOM		2.5% SOM		6% SOM		1% SOM		2.5% SOM		6% SOM		1% SOM		2.5% SOM		6% SOM					
Organics																																		
Biphenyl	66	160	360	220	500	980	18,000	33,000	48,000	14	35	83	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	CL-AIRE	CLEA v1.06		
Organometals																																		
Tributyl tin oxide	0.25	0.59	1.3	1.4	3.1	5.7	130	180	200	0.042	0.1	0.24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	CL-AIRE	CLEA v1.06		
PAHs																																		
Acenaphthene	210	510	1,100	3,000	4,700	6,000	84,000	97,000	100,000	34	85	200	15,000	15,000	15,000	29,000	30,000	30,000	29,000	30,000	30,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	LQM/CIH S4ULS	CLEA v1.071	
Acenaphthylene	170	420	920	2,900	4,600	6,000	83,000	97,000	100,000	28	69	160	15,000	15,000	15,000	29,000	30,000	30,000	29,000	30,000	30,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	LQM/CIH S4ULS	CLEA v1.071	
Anthracene	2,400	5,400	11,000	31,000	35,000	37,000	520,000	540,000	540,000	380	950	2,200	74,000	74,000	74,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	LQM/CIH S4ULS	CLEA v1.071	
Benzo(a)anthracene	7.2	11	13	11	14	15	170	170	180	2.9	6.5	13	29	29	29	49	56	62	49	56	62	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	LQM/CIH S4ULS	CLEA v1.071	
Benzo(a)pyrene	2.2	2.7	3.0	3.2	3.2	3.2	35	35	36	0.97	2	3.5	5.7	5.7	5.7	11	12	13	11	12	13	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	LQM/CIH S4ULS	CLEA v1.071	
Benzo(b)fluoranthene	2.6	3.3	3.7	3.9	4.0	4.0	44	44	45	0.99	2.1	3.9	7.1	7.2	7.2	13	15	16	13	15	16	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	LQM/CIH S4ULS	CLEA v1.071	
Benzo(g,h,i)perylene	320	340	350	360	360	360	3,900	4,000	4,000	290	470	640	640	640	640	1,400	1,500	1,600	1,400	1,500	1,600	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	LQM/CIH S4ULS	CLEA v1.071	
Benzo(k)fluoranthene	77	93	100	110	110	110	1,200	1,200	1,200	37	75	130	190	190	190	370	410	440	370	410	440	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	LQM/CIH S4ULS	CLEA v1.071	
Chrysene	15	22	27	30	31	32	350	350	350	4.1	9.4	19	57	57	57	93	110	120	93	110	120	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	LQM/CIH S4ULS	CLEA v1.071	
Dibenz(a,h)anthracene	0.24	0.28	0.30	0.31	0.32	0.32	3.5	3.6	3.6	0.14	0.27	0.43	0.57	0.57	0.58	1.1	1.3	1.4	1.1	1.3	1.4	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	LQM/CIH S4ULS	CLEA v1.071	
Fluoranthene	280	560	890	1,500	1,600	1,600	23,000	23,000	23,000	52	130	290	3,100	3,100	3,100	6,300	6,300	6,400	6,300	6,300	6,400	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	LQM/CIH S4ULS	CLEA v1.071	
Fluorene	170	400	860	2,800	3,800	4,500	63,000	68,000	71,000	27	67	160	9,900	9,900	9,900	20,000	20,000	20,000	20,000	20,000	20,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	LQM/CIH S4ULS	CLEA v1.071	
Indeno(1,2,3-cd)pyrene	27	36	41	45	46	46	500	510	510	9.5	21	39	82	82	82	150	170	180	150	170	180	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	LQM/CIH S4ULS	CLEA v1.071	
Naphthalene	2.3	5.6	13	2.3	5.6	13	190	460	1,100	4.1	10	24	4,900	4,900	4,900	1,200	1,900	3,000	1,200	1,900	3,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	LQM/CIH S4ULS	CLEA v1.071	
Phenanthrene	95	220	440	1,300	1,500	1,500	22,000	22,000	23,000	15	38	90	3,100	3,100	3,100	6,200	6,200	6,300	6,200	6,200	6,300	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	LQM/CIH S4ULS	CLEA v1.071
Pyrene	620	1,200	2,000	3,700	3,800	3,800	54,000	54,000	54,000	110	270	620	7,400	7,400	7,400	15,000	15,000	15,000	15,000	15,000	15,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	LQM/CIH S4ULS	CLEA v1.071	
Coal Tar (Bap as surrogate marker)	0.79	0.98	1.1	1.2	1.2	1.2	15	15	15	0.32	0.67	1.2	2.2	2.2	2.2	4.4	4.7	4.8	4.4	4.7	4.8	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	LQM/CIH S4ULS	CLEA v1.071	
TPHs																																		
Aliphatic EC 5-6 (benzene)	24	40	80	24	40	80	2,400	4,000	8,000	752	1,730	3,900	570,000	590,000	600,000	95,000	130,000	180,000	95,000	130,000	180,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	LQM/CIH S4ULS	CLEA v1.071	
Aliphatic EC >6-8 (toluene)	52	110	250	52	110	250	5,200	11,000	25,000	2,304	5,580	13,000	600,000	610,000	620,000	150,000	220,000	320,000	150,000	220,000	320,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	LQM/CIH S4ULS	CLEA v1.071	
Aliphatic EC >8-10	13	30	70	13	30	70	1,300	3,000	7,000	321	770	1,700	13,000	13,000	13,000	14,000	18,000	21,000	14,000	18,000	21,000	150,000	150,000	150,000										