The Sizewell C Project

6.3 Volume 2 Main Development Site
Chapter 4 Description of Operation
Appendices 4A - 4C

Revision: 1.0
Applicable Regulation: Regulation 5(2)(a)
PINS Reference Number: EN010012

May 2020

Planning Act 2008
Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

VOLUME 2, CHAPTER 4, APPENDIX 4A: OPERATIONAL NOISE SOURCES

Contents

Tables

Plates

None provided.

Figures

None provided.

1. Operational Noise Sources

Table 1.1: Operational noise emissions from main platform (excl. reactor buildings).

Description	Noise Source	Quantity per Building	Sound Power Level (dB)								Overall LwA (dB)
			63	125	250	500	1k	2k	4k	8k	
Turbine Hall	Building façade – south	1	99	99	70	48	40	32	24	20	82
	Building façade – east	1	104	104	75	54	45	38	30	26	88
	Building façade – north	1	98	98	74	65	59	60	49	37	82
	Building façade – west	1	103	103	76	62	56	56	46	34	87
	Building façade – roof	1	106	105	76	55	46	38	30	26	89
	Vent opening	2	102	102	96	91	88	85	81	77	97
	Roof vents	40	78	72	78	68	67	69	61	56	75
Fuel building	Chimney stack (breakout)	1	94	89	91	92	77	75	75	66	92
	Chimney stack (outlet)	1	108	104	105	103	100	95	87	65	105
Safeguard building 1	Intake ventilation opening	2	84	84	88	83	80	79	61	49	86
	Refrigeration plant	9	84	86	87	95	89	88	83	75	95
	Exhaust ventilation opening	1	94	83	92	93	92	86	76	62	95
	Steam piping	4	-	-	-	86	-	-	-	-	83
Safeguard building 2 & 3	Intake ventilation opening	1	95	84	93	94	93	87	77	63	91
	Exhaust ventilation opening	1	95	93	94	89	86	80	73	64	96

Description	Noise Source	Quantity per Building	Sound Power Level (dB)								Overall LwA (dB)
			63	125	250	500	1k	2k	4k	8k	
	Steam piping	4	-	-	-	86	-	-	-	-	83
Safeguard building 4	Intake ventilation opening	1	84	84	88	83	80	81	63	50	86
	Exhaust ventilation opening	1	84	86	87	95	89	88	83	75	95
	Steam piping	4	-	-	-	86	-	-	-	-	83
Nuclear auxillary building	Ventilation opening	1	78	77	82	77	74	73	55	43	80
Radioactive waste	Compressors – roof mounted	2	85	88	93	96	97	96	94	89	101
Conventional island electrical building	Refrigeration – roof mounted	2	88	88	86	89	87	85	83	73	92
	Condensers CR71K	8	88	85	78	73	70	68	69	71	78
	Condensers CR90K	6	89	87	80	75	72	70	71	73	80
Cooling water pump house	Breakout from building	1	87	89	81	89	76	68	60	50	90
Main transformer platform	Transformer	3	85	105	111	97	81	72	68	68	102
	Ventilation plant	3	96	94	96	92	85	82	76	64	93
Unit transformer platform	Transformer	2	77	91	101	91	86	64	55	56	96
	Ventilation plant	2	93	91	89	87	83	78	69	62	88
Auxillary transformer platform	Transformer	1	77	91	101	91	86	64	55	56	96
	Ventilation plant	1	93	81	89	87	83	78	69	62	88

Table 1.2: Operational noise sources from reactor buildings

Building		Sound Sources.	Sound Power Level dB LWA.
Emergency diesel generator building	Emergency diesel generator building A & B (Reactor 1)	Fresh air in/warm air out louvre (high-level)	90 per opening
		Generator fresh air intake (mid-level)	105 per opening
		Generator exhaust stack	105 per opening
	Emergency diesel generator building C & D (Reactor 2)	Fresh air in/warm air out louvre (high-level)	90 per opening
		Generator fresh air intake (mid-level)	105 per opening
		Generator exhaust stack	105 per opening

VOLUME 2, CHAPTER 4, APPENDIX 4B: OPERATIONAL LIQUID DISCHARGES

Contents

Tables

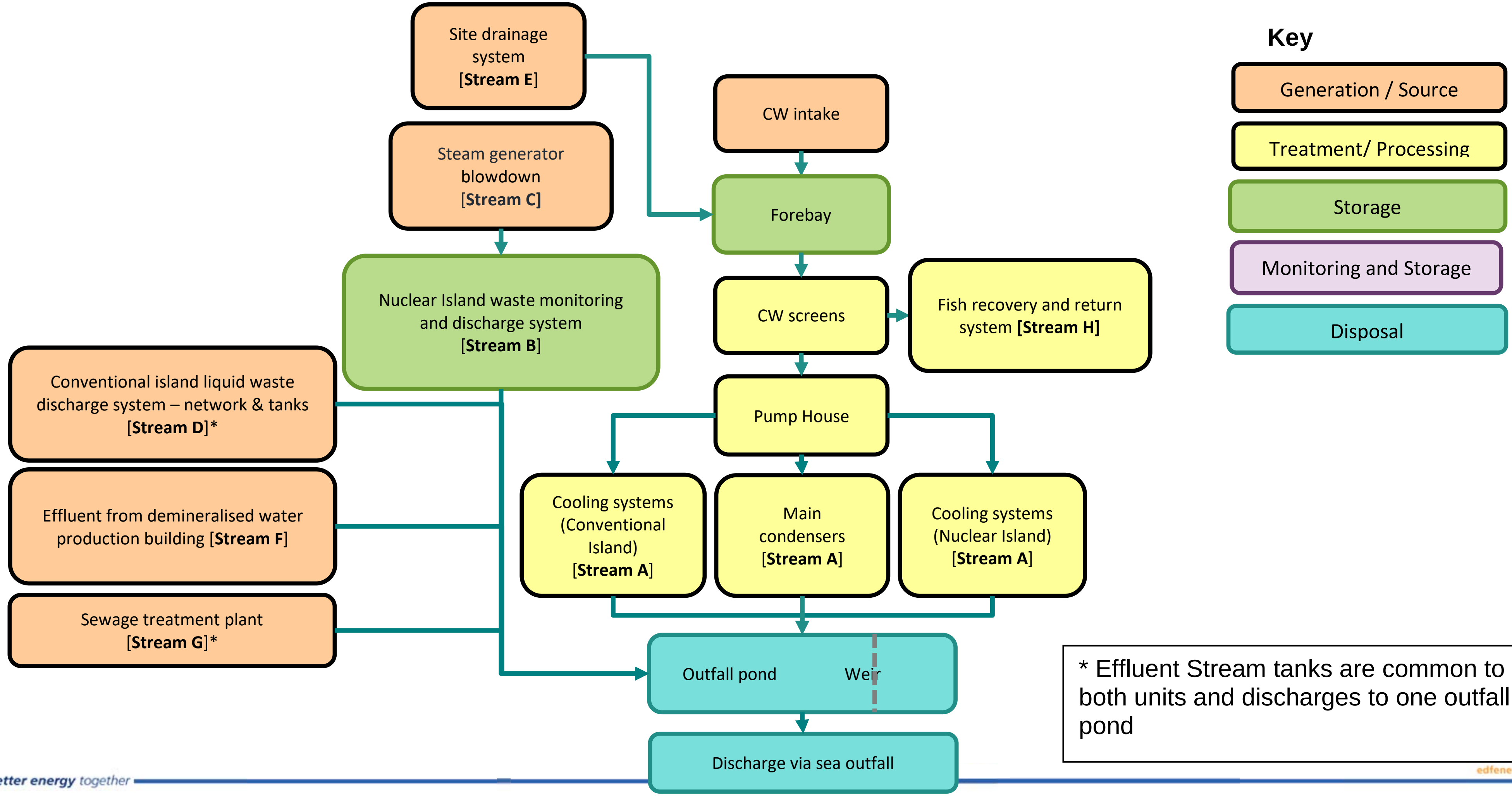
Plates

Figures

None provided.

1. Operational Liquid Discharges

Plate 1.1: Overview of operational liquid discharge streams - Extracted from Sizewell C Project Water Discharge Activity Submission.



* Effluent Stream tanks are common to both units and discharges to one outfall pond

1.1 Waste Stream A: Main cooling water return

Table 1.1: Sources of emissions associated with the sea water cooling systems.

Activity	Pollutants Present in the Effluent Stream.
Use of sea water for cooling	Use of the sea water for cooling will result in a discharge of heat to the marine environment. Under normal power operation, the discharged cooling water (Stream A) will have a temperature of 11.6°C above the sea water temperature at the intake.
Chlorination of the sea water cooling systems	Chlorine will be dosed as sodium hypochlorite solution in sea water (generated by electrolysis or by addition as solution tankered to site) to provide a target concentration of total residual oxidants (as chorine) of 0.2 mg/l at the condensers. This would be <0.2 mg/l at the outfall pond and estimated to result in a TRO concentration of <0.15 mg/l at entry to the sea at the end of the sea-outfall.

Table 1.2: Flow rates of discharges from the cooling water system (Stream A).

Descriptor	Flow Rate of Effluent Stream A (Abstracted Flow Will Vary with Tidal Water Level).
Effluent discharged from each EPR™ unit during normal power operation	During normal operation, the sea water pumping stations nominal intake for a single EPR™ unit, at mean tidal water level, is distributed as follows: 61 m^3/s for via 2 pumps each 30.5 m3/s nominal flow; 2.8 m^3/s for the via 4 pumps (2 in operation at any time) each 1.4 m^3/s nominal flow; 2.0 m^3/s for the via 4 pumps (2 normally in operation at any time) each 1.0 m^3/s nominal flow; 0.14 m^3/s for the via one pump of 0.14 m^3/s nominal flow; 0.04 m^3/s for the electro-chlorination system via one pump of 0.04 m^3/s nominal flow; 0.56 m^3/s for wash water for the drum screens and band screens via 2 pumps for drum screens and 2 pumps for band screens. Thus, the maximum abstracted flow at mean tidal water level, which will be the same as the tidally averaged flow rate, will be 66.54 m^3/s. Of this, 0.3 m^3/s will be discharged through the fish recovery and return system outfall. Therefore, the net discharge per EPR™ unit of Stream A at mean tidal level (= tidally averaged flow) will be 66.25 m^3/s
Combined effluent discharged from both EPR™ units at Sizewell C during normal power operation	For both EPR™ units the discharge rate (as a tidal mean) will be 132 m^3/s. For both EPR™ units the minimum discharge rate (instantaneous) at low tide will be 116 m^3/s.

Descriptor	Flow Rate of Effluent Stream A (Abstracted Flow Will Vary with Tidal Water Level).
Combined effluent discharged from both EPR™ units at Sizewell C during outage of one EPR™ unit	For both EPR™ units the discharge rate (as a tidal mean) will be 71.5 m^3/s (pumps for one unit not operating)
Combined effluent discharged from both EPR™ units at Sizewell C during normal power operation but with outage of one pump	For both EPR™ units the discharge rate (as a tidal mean) will be 102 m^3/s (one pump not operating)

Table 1.3: Characteristics of discharges from the cooling water system (Stream A).

Substance	EQS for Sea Water.	Mean	Maximum	Annual Load.	Note
Total residual oxidants.	10 µg/l (as Cl) (as 95%ile).	200 µg/l (as Cl).	200 µg/l (as Cl).	N/a	Target value at outfall pond. Predicted discharge concentration = 0.15 mg/l.
pH		6–9		N/a	Limits of range of pH.
Oil and grease.			None visible.	N/a	

Table 1.4: Temperature characteristics of cooling water discharges (Stream A).

Temperature Parameter.	Temperature
Maximum temperature of effluent Stream A.	35°C (as a 99.5 %ile).
Maximum temperature increase between sea water inlet (forebay) and outfall pond during normal power operation including outage of one EPR™ unit.	11.6°C (as a tidal mean).
Maximum temperature increase between sea water inlet (forebay) and outfall pond during an outage of one pump for maintenance, the minimum likely cooling water flow (combined flow from both EPR™ units) corresponds to operation of three out of the four pumps, with all other cooling water pumps and operating normally.	23.2°C (as a tidal mean).

1.2 Waste Streams B and C: Main cooling water return

Table 1.5: Sources of emissions associated with effluent streams B and C.

Activities	Components of the Effluent.
Dosing the primary circuit.	The primary circuit will be treated with the following chemicals, which may be present in reactor let-down discharged to the radwaste system: • boric acid for its neutron-absorbing properties. Throughout the fuel cycle, increased volumes of borated water will be let down (removed) from the reactor coolant system and replaced by water or boric acid at lower concentrations. As the fuel burn-up increases during the fuel cycle and less boron is required in the reactor cooling water (primary system). A larger volume of borated water will need to be let down each month progressively through the fuel cycle. Currently there are no proposals to recycle boron at Sizewell C; • lithium hydroxide, to offset the acidity of the boric acid, to keep the pH slightly alkaline and prevent equipment corrosion; • zinc acetate to inhibit corrosion; • hydrogen peroxide during shut-down to produce an oxidising environment; and • hydrazine during start up to eliminate oxygen from the reactor coolant to minimise corrosion. Any hydrazine present in the effluent will be treated in the tanks before discharge of the effluent at an agreed limit.
Dosing the secondary circuit.	In order to obtain a pH where minimum levels of corrosion occur, a basic compound must be injected into the secondary circuit. Compounds that can be used for this dosing include ammonia, morpholine and ethanolamine. Whichever dosing compound is used to maintain the pH for minimum corrosion, ammonia will always be present in the secondary circuit. Dosing will be supplemented with hydrazine to eliminate oxygen in the feedwater to prevent fouling of the steam generators caused by corrosion products (mainly iron oxides). Hydrazine decomposes when heated to produce ammonia. Where the conditioning uses ammonia, the quantity of ammonia produced by the decomposition of hydrazine is not sufficient to maintain the pH for minimum corrosion, and therefore additional ammonia needs to be added. Where the conditioning uses morpholine or ethanolamine, the thermal decomposition of hydrazine means that ammonia is also present in the secondary circuit.
Dosing of the circuits during shutdown/ Maintenance of steam generators.	The feedwater plant for the secondary circuit is kept dry during shutdown. To minimise corrosion, the steam generators will potentially be filled with demineralised water treated during shutdown with: • hydrazine; and • morpholine, ammonia or ethanolamine. Once the outage is over, the solution used for wet lay-up may be either drained into the tanks as effluent Stream C or directly heated in the steam generators as the installation restarts. Any hydrazine present in the effluent will be treated in the tanks before discharge of the effluent at an agreed limit.

Activities	Components of the Effluent.
Dosing in the auxiliary nuclear and conventional circuits.	Trisodium phosphate will be dosed to the cooling and heating circuits to inhibit corrosion in circuits in contact with air, where an all-volatile treatment cannot be used, and may be discharged into the environment during the plant operation.
Decontamination of tools and parts used during unit outage.	Chemicals will be used in the decontamination workshop. The effluent generated will be filtered, sampled and sent either to the liquid waste processing system for further treatment or to the liquid radwaste monitoring and discharge system tanks.
Wear in the circuits.	Metals arising from wear in the circuits will be found in the discharged liquids associated with radioactive effluent. These metals will be those used to manufacture either the circuits or some of the equipment (aluminium, copper, chromium, iron, lead, manganese, nickel and zinc). Appropriate chemical conditioning and operation during hot functional testing is a major factor in limiting the amount produced. Although the effluent will be filtered and treated with ion exchange resins, small quantities of these metals will be released from the discharge tanks.
Miscellaneous contaminants.	Floor and equipment drains may be contaminated with cement dust (calcium compounds), possibly small concentrations of soaps and detergents, chemicals from closed cooling systems leaks or spills, decontamination water and other sources. The floor drains may also be high in dissolved organic materials and salts. The radioactive chemistry laboratory sink drains will give rise to releases of mixed hazardous/radioactive wastes or other radioactive wastes with a high dissolved solids content. Suspended solids will arise from collected effluent that may be polluted either by dust. There will only be limited suspended solids in the liquid radwaste monitoring and discharge system storage tanks, because the effluent will be filtered. The effluent will also include chemical oxygen demand, which will come from the organic compounds (particularly detergents) to be used and also from oxidisable mineral salts in the water used. Potential metal contaminants in process chemicals are present in only trace amounts, as is reflected in the low discharge loading values determined for cadmium and mercury, even after applying conservative and bounding assumptions.

Table 1.6: Flow rates of discharges from the radwaste system (Streams B and C combined).

Descriptor	Flow Rate.
Maximum volume of effluent discharged per day from tanks	1,500 m^3/d.
Maximum rate of discharge from a single tank.	0.08 m^3/s (83.3 litres/s)*.

**Based on a maximum pump capacity of 300m^3/h.*

Table 1.7: Characteristics of discharges from the radwaste system for 2 EPR™ units (Streams B and C combined).

Substance	Environmental Quality Standard for Sea Water.	Daily Load kg/day.	Annual Load kg/year.	Maximum Pre-dilution Concentration mg/l.	Note
Boron	Annual Average (AA) – 7 mg/l.	984	2448	656	Environment Agency operational Environmental Quality Standard (EQS).
Lithium (as LiOH).	-	4.4	8.8	2.93	
Hydrazine[1]	PNEC (AA) – 0.4 ng/l PNEC (maximum allowable concentration (MAC)) – 4 ng/l.	1.00	3.00	0.67	Optimisation of hydrazine destruction and system to be developed. Predicted no-effect concentration (PNEC) based on EDF R & D review.
Morpholine	PNEC (AA) – 17 µg/l PNEC (MAC) – 28 µg/l.	75.00	210	50.0	PNEC based on EDF R & D review.
Ethanolamine	PNEC (AA) – 160 µg/l PNEC (MAC) – 160 µg/l.	15.00	65	10.0	PNEC based on EDF R & D review.
Nitrogen (as N).[2]	Loading assessed against natural background using modelling	8.2	253.25	5.33	Assessment made using combined phytoplankton macroalgal modelling section 5
Nitrogen (in terms of ammonia ions NH_4).	AA – 21 µg/l (un-ionised).	1.83	325.2	0.95	
Phosphate (as P).	-	150.00	602.5	100	
Suspended solids.	-	20.24	135	13.5	

Substance	Environmental Quality Standard for Sea Water.	Daily Load kg/day.	Annual Load kg/year.	Maximum Pre-dilution Concentration mg/l.	Note
Chemical oxygen demand.	-	39.27	601	26.2	
Aluminium	-	0.09	0.41	0.06	
Copper	MAC – 3.76 µg/l where DOC ≤1 mg/l (dissolved).	0.01	0.03	<0.01	Where dissolved organic carbon (DOC) concentration exceeds 1 mg/l: EQS is 3.76+(2.677*((DOC/2)-0.5)).
Chromium	Cr^{vi} only AA – 0.6 µg/l MAC – 32 µg/l.	0.14	0.65	0.09	
Iron	AA – 1 mg/l (dissolved).	0.60	2.70	0.40	
Manganese	-	0.06	0.26	0.04	
Nickel	AA – 8.6 µg/l MAC – 34 µg/l.	0.01	0.03	0.01	
Lead	AA- 1.3 µg/l MAC – 14 µg/l.	0.01	0.02	<0.01	
Zinc	AA- 6.8 µg/l plus ambient.	0.10	0.46	0.07	

AA – annual average.

MAC – maximum allowable concentration.

PNEC – predicted no-effect concentration.

[1] Effluent streams B+C are fed from the primary circuit and so the hydrazine loads are not factored into daily and annual discharge calculations as they have no daily discharge and only apply during start up or shut down periods. The worst-case daily hydrazine discharge would be after wet lay-up of steam generators. The assumption is that this would be treated until the hydrazine concentration falls below a level that is acceptable for a batch discharge. Wet lay-up is not expected in a normal refuelling outage (i.e. for Sizewell B this was ~15 years after first operation). Only emissions which are derived from the secondary circuit (Effluent Stream D) daily loads are therefore used in the environmental impact assessment.

[2] Excluding hydrazine, morpholine and ethanolamine.

Table 1.8: Temperature characteristics of discharges from the radwaste system (Streams B and C combined).

Temperature Parameter.	Temperature
Maximum temperature of effluent Stream B + C.	Ambient, no greater than 25°C.

1.3 Waste Stream D: Trade effluents from the conventional island

Table 1.9: Sources of emissions associated with releases from the conventional island (Stream D).

Activities	Components of the Effluents.
Dosing the secondary circuit.	In order to obtain a pH where minimum levels of corrosion occur, a basic compound must be injected into the secondary circuit. Compounds that can be used for this dosing include ammonia, morpholine and ethanolamine. Whichever dosing compound is used to maintain the pH for minimum corrosion, ammonia will always be present in the secondary circuit. Dosing will be supplemented with hydrazine to eliminate oxygen in the feedwater to prevent fouling of the steam generators caused by corrosion products (mainly iron oxides). Hydrazine decomposes when heated to produce ammonia. Where the conditioning uses ammonia, the quantity of ammonia produced by the decomposition of hydrazine is not sufficient to maintain the pH for minimum corrosion, and therefore additional ammonia needs to be added. Where the conditioning uses morpholine or ethanolamine, the thermal decomposition of hydrazine means that ammonia is also present in the secondary circuit. Additional ammonia will also be injected to ensure sufficient conditioning in the vapour and liquid phases of the secondary circuit.
Dosing in the conventional circuits.	Trisodium phosphate will be dosed to the cooling and heating circuits to inhibit corrosion in circuits in contact with air, where an all-volatile treatment cannot be used, and may be discharged into the environment during the plant operation.
Wear in the circuits.	Metals arising from wear in the secondary circuits will be found in the discharged liquids. These metals will be those used to manufacture either the circuits or some of the equipment (aluminium, copper, chromium, iron, lead, manganese, nickel and zinc).
Miscellaneous	Potential metal contaminants in process chemicals are present in only trace amounts, as is reflected in the low discharge loading values determined for cadmium and mercury, even after applying conservative and bounding assumptions.
Miscellaneous contaminants.	Floor and equipment drains may be contaminated with cement dust (calcium compounds), possibly small concentrations of soaps and detergents, chemicals from closed cooling systems leaks or spills, decontamination water and other sources. The floor drains may also be high in dissolved organic materials and salts. Corrosion products associated with the metallurgy of the systems and will also be present in the effluent. Suspended solids will arise from collected effluent that may be polluted either by dust. The effluent will also include chemical oxygen demand, which will come from the organic compounds (particularly detergents) to be used and also from oxidisable mineral salts in the water used.

Table 1.10: Flow rates of discharges from the conventional island (Stream D).

Descriptor	Flow Rate.
Maximum volume of effluent discharged per day from tanks.	1,500 m^3/d.
Maximum rate of discharge from a single tank.	0.08 m^3/s (83.3 litres/s).

**Based on a maximum pump capacity of 300m^3/h.*

Table 1.11: Characteristics of discharges from the conventional island tanks for 2 EPR™ units combined (Stream D).

Substance	EQS for Sea Water.	Daily Load kg/day.	Annual Load kg/year.	Maximum Pre-Dilution Concentration mg/l.	Note
Hydrazine	PNEC (AA) – 0.4 ng/l PNEC (MAC) – 4 ng/l.	3.0	24.3	2.0	Optimisation of hydrazine destruction and system to be developed. PNEC based on EDF R & D review.
Morpholine	PNEC (AA) – 17 µg/l PNEC (MAC) – 28 µg/l.	17.25	1464	11.5	PNEC based on EDF R & D review.
Ethanolamine	PNEC (AA) – 160 µg/l PNEC (MAC) – 160 µg/l.	9.75	854	6.5	PNEC based on EDF R & D review.
Nitrogen (as N).[1]	Loading assessed against natural background using modelling	319.8	9876.7	8.0	Assessment made using combined phytoplankton macroalgal modelling section 5
Nitrogen (in terms of ammonia ions NH_4).	AA – 21 µg/l (un-ionised).	71.3	12683.7	47.53	
Phosphate (as P).	-	202.5	187.5	135.0	
Suspended solids.	-	399.8	2665	267	
Chemical oxygen demand	-	290.7	4449	194	

Substance	EQS for Sea Water.	Daily Load kg/day.	Annual Load kg/year.	Maximum Pre-Dilution Concentration mg/l.	Note
Aluminium	-	1.01	4.85	0.67	
Copper	MAC – 3.76 µg/l where DOC ≤1 mg/l (dissolved).	0.074	0.39	0.05	Where DOC concentration exceeds 1 mg/l: EQS is 3.76+(2.677*((DOC/2)-0.5)).
Chromium	Cr^{VI} only AA – 0.6 µg/l MAC – 32 µg/l.	1.56	7.72	1.04	
Iron	AA – 1 mg/l (dissolved).	6.55	32.27	4.37	
Manganese	-	0.61	3.07	0.41	
Nickel	AA – 8.6 µg/l MAC – 34 µg/l.	0.083	0.41	0.06	
Lead	AA- 1.3 µg/l MAC – 14 µg/l.	0.055	0.28	0.04	
Zinc	AA- 6.8 µg/l plus ambient.	1.10	5.54	0.73	

[2] *Excluding hydrazine, morpholine and ethanolamine.*

Table 1.12: Temperature characteristics of discharges from the conventional island (Stream D).

Temperature Parameter.	Temperature
Maximum temperature of effluent Stream D.	Ambient, no greater than 25°C.

1.4 Waste Stream E: Site drainage system

Table 1.13: Sources of emissions associated with releases from the site drainage system (Stream E).

Activities	Components of the Effluent.
Transfer of solid and liquid contaminants to the site drainage network.	Hydrocarbons will be present in run-off from operational areas. Silt and suspended solids will also be released into the system. The oil/water separators will be specified to the meet the requirements of the BS-EN-858 Class 1 standard to provide effective treatment for hydrocarbons. The bypass oil/water separator will reduce hydrocarbon concentrations in the effluent discharged to the

Activities	Components of the Effluent.
	forebay to less than 5 mg/l. Hydrocarbons retained in the oil/water separator together with the resultant sludge will be disposed of off-site at an appropriately licensed waste management facility.
Pollutants associated with condensate.	Although chiller condensate is essentially generated as distilled water it may contain low levels of metals from corrosion of metal equipment.

Table 1.14: Characteristics of discharges from the site drainage network (Stream E).

Substance	EQS for Sea Water.	Mean	Maximum	Annual Load.	Note
Petroleum hydrocarbons.	-	-	5 mg/l	N/a	Concentration limited by use of Class 1 oil/water separators to BS-EN-858.
Oil and grease.	-		None visible.		

Table 1.15: Temperature characteristics discharges from the site drainage network (Stream E).

Temperature Parameter.	Temperature
Maximum temperature of effluent Stream E (including demineralisation pit flows from Stream F).	Ambient, no greater than 25°C.

1.5 Waste Stream F: Demineralised water production trade effluent

Table 1.16: Sources of emissions associated with releases from water demineralisation (Stream F).

Activities	Components of the Effluents.
Treatment of potable water.	The effluent released from the demineralised water plant will be characterised by the quality of potable water.
Miscellaneous	Potential metal contaminants in process chemicals are present in only trace amounts, as is reflected in the low discharge loading values determined for cadmium and mercury, even after applying conservative and bounding assumptions.
Increasing the solubility of salts to decrease scale formation on reverse osmosis membranes.	Sequestering agents are used in the desalination plant to prevent mineral deposits forming on the reverse osmosis membranes. Use of such chemicals would result in additional components released in the reject water.
Filter washing. Regeneration of mixed bed ion exchange resins.	Self-cleaning filter washing would involve use of additional water and result in an increase of suspended solids. CIP and ion exchange bed regeneration will involve use of

Activities	Components of the Effluents.
Cleaning in place (CIP) of reverse osmosis membranes.	sulphuric acid and sodium hydroxide. Effluent from these processes as well as reverse osmosis reject water will pass to the neutralisation pit for pH balancing and effluent will be released after testing to the outfall pond. After neutralisation the effluent will comprise sodium and sulphate ions at a pH within the acceptable range. These are not regarded as polluting materials when discharged to sea water. Use of additional chemicals would result in additional contaminants in the neutralisation pit effluent.

Table 1.17: Flow rates of discharges associated with waste Stream F.

Flow Characteristics.	Demineralised Water Production Trade Effluent.
Maximum volume of effluent discharged per day (m^3/day).	4000
Maximum rate of discharge (l/s).	46

Table 1.18: Characteristics of the demin system (Stream F).

Substance	EQS for Sea Water.	Daily Load kg/day.	Annual Load kg/year.
Detergents			624
Suspended solids.		450	88000
Iron	AA – 1 mg/l (dissolved).	250	46000
Chloride		450	87100
Sulphates		2000	98400
Sodium		855	52400
ATMP		45	9100
HEDP		4.5	890
Acetic acid.		0.1	14
Phosphoric acid.		0.1	12
Sodium polyacrylate.		40	8030
Acrylic acid.		1	165

Discharges from demineralisation of mains water not yet determined figures represent combined demineralisation and desalination and therefore bounding.

Table 1.19: Constituent chemicals and by-products for an ATMP sequestering agent.

Constituent Chemicals.	Proportion of Commercial Solution.	24-hour Loading. (kg d-1).	Annual Loading. (kg yr-1).
ATMP[1]	100	45	9100
Sodium	100	45	9100

[1] ATMP = Amino Trimethylene Phosphonic Acid CAS No: 6419-19-8.

Table 1.20: Constituent chemicals and by-products for a sodium polymer sequestering agent.

Constituent Chemicals.	By-products	Proportion of Commercial Solution.	24 Hour Loading (kg d-1).	Annual Loading (kg yr-1).
Alkyl phosphonic acid (10%).	HEDP	9.75	4.5	890
	Acetic acid.	0.15	0.1	14
	Phosphoric acid.	0.13	0.1	12
Sodium polyacrylate (90%).	Sodium polyacrylate (polymer).	88.2	40	8030
	Acrylic acid (residual monomer).	1.8	1	165
Total		100%	45	9100

Table 1.21: Temperature characteristics discharges from sewage treatment plant (Stream G).

Temperature Parameter.	Temperature
Maximum temperature of effluent Stream G.	Ambient, no greater than 25°C.

1.6 Waste Stream G: Sanitary effluent

Table 1.22: Sources of emissions associated with releases from the sewage treatment plant (Stream G).

Activities	Components of the Effluents.
Releases from the Foul Sewer Network.	The sewage treatment plant will be designed to achieve the following treatment specification: • biochemical oxygen demand ($BOD_{5\text{-}atu}$) concentration of 20 mg/l; • ammoniacal nitrogen 20 mg/l (as N); and • total suspended solids of 30 mg/l.

Table 1.23: Flow rates of discharges from the sewage treatment plant (Stream G).

Descriptor	Flow Rate.
Normal flow based on population equivalent of 900 using 100 litres/day (combined flow for two EPR™ units).	90 m^3/day.
Maximum flow during an outage based on population equivalent of 1,900 using 100 litres/day (combined flow for two EPR™ units).	190 m^3/day.

Table 1.24: Characteristics of the sewage treatment plant (Stream G).

Substance	EQS for Sea Water.	Maximum	Annual Load
Biochemical oxygen demand (BOD5 -atu).	-	20 mg/l	1387 kg
Suspended solids.	-	30 mg/l	2080 kg
Total ammonia	-	20 mg/l	1387 kg
Total nitrogen (as N).	980 µg/l (as 99%ile).	23 mg/l	1595 kg

1 Based on estimated 1900 staff on site and water volume 100l/head/day

Table 1.25: Temperature characteristics discharges from sewage treatment plant (Stream G).

Temperature Parameter.	Temperature
Maximum temperature of effluent Stream G.	Ambient, no greater than 25°C.

1.7 Waste Stream H: Fish recovery and return system effluent

Table 1.26: Flow rates of discharges from the fish recovery and return systems (Stream H).

Descriptor	Flow Rate.
Discharge from fish recovery and return system outfall for one EPR™ unit.	0.3m^3/s
Combined discharge from fish recovery and return system outfalls at Sizewell C power station.	0.6m^3/s
Annual volume discharged from fish recovery and return system outfalls at Sizewell C power station.	189 000 000 m^3/y

Table 1.27: Temperature characteristics discharges from the fish recovery and return system (Stream H).

Temperature Parameter.	Temperature
Maximum temperature of effluent Stream H.	Ambient, no greater than 25°C.

VOLUME 2, CHAPTER 4, APPENDIX 4C: OPERATIONAL GASEOUS EMISSIONS

Contents

Tables

Plates

None provided.

Figures

None provided.

1. Operational Gaseous Emissions

Table 1.1: Operational gaseous emissions from emergency diesel generators

Parameter	Value	Units
Emergency Diesel Generator (EDG) emissions		
Stack internal diameter	1.1	m
Stack height	27.2	m
Exit velocity	28.9	m/s
Ambient temperature of discharge gases	375	ºC
Sulphur Dioxide (SO_2) emission rate	1.1	g/s
Nitrogen Oxide (NO_x) emission rate	30.7	g/s
Particulate matter (PM) emission rate	0.8	g/s
Carbon Monoxide (CO) emission rate	2.4	g/s
Ultimate Diesel Generator (UDG) emissions.*		
Stack internal diameter	1.1	m
Stack height	27.2	m
Exit velocity	8.3	m/s
Ambient temperature of discharge gases	515	ºC
SO_2 emission rate	0.001	g/s
NO_x emission rate	4.3	g/s
PM emission rate	0.02	g/s
CO emission rate	0.73	g/s

** Also referred to as Station Blackout (SBO) generators*

Table 1.2: Operational gaseous emissions from main stack*

Parameter	Value	Units
Stack internal diameter	3.0	m
Stack height	70.0	m
Exit velocity	0.982	m/s
Ambient temperature of discharge gases	15	ºC
Formaldehyde (H_2CO) emission rate (commissioning)	0.0342	g/s
CO emission rate (commissioning)	0.0320	g/s
H_2CO emission rate (operation)	0.0243	g/s
CO emission rate (operation)	0.0229	g/s

Parameter	Value	Units
Ammonia (NH_3) emissions		
Ambient temperature of discharge gases	100	^oC
NH_3 emission rate	3.12	g/s

** Refer to **Volume 2, Chapters 7** and **25** for radioactive gaseous emissions.*