SEPA
Scottish Environment Protection Agency

DINGWALL
07 APR 2010
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Radioactive Substances Act 1993 (as amended)

APPLICATION FORM

For

Authorisation to accumulate and dispose of radioactive waste

PLEASE SEND TO THE REGISTRY DEPARTMENT AT THE APPROPRIATE AREA OFFICE:

Aberdeen Office
Greyhope House
Greyhope Road
Aberdeen
AB11 9RD
Tel: 01224 248338
Fax: 01224 248591

East Kilbride Office
5 Redwood Crescent
Peel Park
East Kilbride
G74 5PP
Tel: 01355 574200
Fax: 01355 574688

Dingwall Office
Fodderty Way
Dingwall Business Park
Dingwall
IV15 9XB
Tel: 01349 862021
Fax: 01349 863987

Perth Office
Strathearn House
Broxden Business Park
Lamberkine Drive
Perth
PH1 1RX
Tel: 01738 627989
Fax: 01738 630997

Edinburgh Office
Clearwater House
Heriot Watt Research Park
Avenue North
Riccarton
Edinburgh
EH14 4AP
Tel: 0131 4497296
Fax: 0131 4497277

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The information provided will be processed by the Scottish Environment Protection Agency to deal with your application, to monitor compliance with the licence/permit/registration conditions, to process renewals, and for maintaining the relevant public register(s).
We may also process and/or disclose it in connection with the following:

- offering/providing you with our literature/services relating to environmental affairs
- consulting with the public, public bodies and other organisations (e.g. Health and Safety Executive, Local Authorities, Emergency Services, Scottish Executive) on environmental issues
- carrying out statistical analysis, research and development on environmental issues
- providing public register information to enquirers
- investigating possible breaches of environmental law and taking any resulting action
- preventing breaches of environmental law
- assessing customer service satisfaction and improving our service.

We may pass it on to our agents/representatives to do these things on our behalf.

You should ensure that any persons named on this form are informed of the contents of this Data Protection Notice

THE SCOTTISH ENVIRONMENT PROTECTION AGENCY
APPLICATION FOR AUTHORISATION TO DISPOSE OF AND TO ACCUMULATE RADIOACTIVE WASTE UNDER SECTIONS 13 AND 14 OF THE RADIOACTIVE SUBSTANCES ACT 1993 (as amended)

Please complete this form clearly in black ink. Further information may be submitted on additional sheets that should be clearly marked with the name and address of the applicant. Applications that are incorrect or incomplete may be deemed not to be Duly Made.

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1 APPLICANT DETAILS

1a Please State the company registered address

Name: Dounreay Site Restoration Limited
Address: Building D2003, Dounreay, Thurso, Caithness.

Post Code: KW14 7TZ Telephone No: 01847 802121

1b Please state the registered company number (if applicable)

SC307493

1c If there are existing certificates of registration or authorisation at the address on or from which radioactive waste will be accumulated or disposed provide details below

Registration Certificate number/s: None
Authorisation Certificate number/s: RSA/N/50010/99, RSA/N/50011/99, RSA/N/50012/99

Please give details of why a new authorisation is being sought.

A new authorisation is required to bring the scope of the DSRL authorisation in line with the undertakings of decommissioning the Dounreay site.

1d Please state when you would like the authorisation to come into effect

When determined

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2 CONTACT DETAILS

2a Please provide details about the person that we may contact about the application

Name:	Mr A Scullion	
Address:	Dounreay Site Restoration Ltd, Bld D2003, Dounreay, Thurso Caithness	
Post Code:	KW14 7TZ	Tel No: 01847 806810
Email:	alan.scullion@dounreay.com	
Position /Designation:	Director of Assurance	

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3 National Security

3a Please inform us about any National Security claim

Is there any information that you believe should be kept from the public register on the grounds of national security?

No

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4 DETAILS OF PREMISES TO WHICH THE APPLICATION RELATES

4a Please provide details of the premises to be authorised

Name:	Dounreay
Address:	Dounreay, Thurso, Caithness
Postcode:	KW14 7TZ
Telephone No:	01847 802121
Fax:	01847 802697

4b Please provide details of the location of the premises

Please enclose a map detailing the location of the above premises and delineate the site boundary by marking this clearly in red on each copy. The map scale must be sufficient to allow the location to be identified and a clear distinction to be made between the premises for which authorisation is being sought and surrounding premises.

See Appendix 1

Please give the grid reference of the main entrance to the premises

NC 9960 6705

4c Please provide a detailed site plan

Please enclose 3 copies of a plan showing the extent of the premises for which authorisation is being sought by marking this clearly in red on each copy.

In circumstances where the premises comprise a building that is occupied by more than one organisation, a site that contains several buildings or where only part of a building or premises is used, then the plan must clearly delineate the boundary or boundaries for which authorisation is being sought.

See Appendix 2

4d Please provide a description of the premises to be authorised

Please provide a sufficiently detailed written description of the premises to support the plan provided. Together the plan and description must clearly allow identification of the locations on the authorised premises where radioactive waste will be accumulated and disposed.

See Appendix 2 and 3

The Dounreay site is located on the coastline in the county of Caithness in the north of Scotland. It is situated approximately 3 km from the village of Reay to the west and 14km from the town of Thurso to the east. The Dounreay nuclear licensed site covers approximately 55 hectares of land and is shown on the Dounreay Site Location map (Appendix 1), along with other adjacent land owned by the NDA.

Approximately 630 people live in a 5 km radius from Dounreay. These are predominantly in the village of Reay but also in sparsely scattered farmhouses closer to the site.

The surrounding area is largely moorland although agriculture is predominant on the coastal strip. Both the arable and grazing land surrounding Dounreay are relatively flat and treeless.

The site is located close to a number of environmentally sensitive areas. There are Sites of Special Scientific Interest (SSSIs) in the region, as well as sites proposed for protection as Special Areas of Conservation (SACs) under the Habitats Directive, or Special Protection Areas (SPAs) under the Wild Birds Directive. The Highland Council has proposed that 61 hectares of the west part of Sandside Bay should be designated as an "Area of Great Landscape Value".

The land owned by the NDA is not of significant conservation interest. However, there is an interesting area of maritime heath just outside of the NDA's boundary adjacent to the coast, although this does not have SSSI status. There are five archaeological sites around Dounreay, two of which are scheduled ancient monuments (both burial mounds). Dounreay Castle, which dates from the late 16th century, is located just outside the nuclear licensed site boundary.

4e Please state the local government area in which the premises are situated

Highland

4f Please give details of offshore installations operating in the Scottish area

Not Applicable

4g Please give the operational contact who will have the responsibility for the day to day overall supervision of the accumulation and disposal of the radioactive waste

Name:	Mr A Anderson
Address:	DSRL, Bldg D1300, Dounreay, Thurso, Caithness
Postcode:	KW14 7TZ
Telephone No:	01847 803071
Email:	alex.anderson@dounreay.com
Position/Designation:	Major Project Unit Manager Site Decommissioning Waste & Characterisation Unit

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5 DETAILS OF THE UNDERTAKING FOR WHICH THE PREMISES ARE USED

5a Please provide details of the undertaking carried on by the applicant at the premises specified at question 4a or 4f above

Decommissioning of the Nuclear Licensed site at Dounreay
More specifically:

1 The decommissioning of the premises;
2 The storage of nuclear material and radioactive material on the premises;
3 Nuclear material recovery/conditioning operations on the premises;
4 The handling and treatment of waste transferred to the Authorisation Holder from the Vulcan Naval Reactor Test Establishment[1];
5 The treatment of nuclear material for storage, transfer for permanent safe storage or for disposal;
6 The treatment of radioactive wastes to place them in an accepted form for storage, disposal and/or transfer;
7 The receipt, treatment, storage and disposal of NDA liability nuclear materials and radioactive wastes, from the Fast Breeder Reactor programme, returned from EU Member states;
8 Analytical services in support of the above by destructive and non-destructive analysis and to characterise the environmental effects of the above; and
9 Land remediation and restoration to achieve the Interim and Final End Points.

[1] The Vulcan Naval Reactor Test Establishment, a Ministry of Defence site, transfers liquid and solid wastes to Dounreay for disposal, treatment and storage under letters of agreement with both SEPA and DRSL.

5b Please say how the radioactive wastes are produced

SOLIDS

The processes involved in the 'Undertakings at Dounreay' are generally identified as either:
wastes for disposal from or on the premises at Dounreay; or
material resulting, after treatment, in the arising of wastes to be disposed from or on the premises at Dounreay.

Solid low level waste[2] arisings from the operations detailed under 'Undertakings at Dounreay' typically consisting of general plant wastes (including paper, polythene, redundant plant equipment, plastics, and other consumables) which have been contaminated due to contact with radioactive material. These wastes exist on the Dounreay site in storage pending disposal and will further arise from the decommissioning of the site and activities/processes necessary in the management of the wastes and fuels identified in the undertakings.

Internal building materials removed as a part of the demolition of a building. This type of waste arises where decontamination of the surfaces is not practicable or the contamination cannot be removed due to its being absorbed into the material.

Soils found to be radioactive after excavation, are categorised as radioactive waste requiring disposal to a facility authorised to accept such waste for permanent deposit.

Aerosol (HEPA) and liquid filters (e.g. ion exchange resins and fabric candle filters) used to remove particulate from the gases and liquors, at source or immediately, prior to discharge to the environment.

Solids (sludges) settling out from suspension in liquids (e.g. pond water, effluents).

The cementation of the liquid raffinates[3] and ADU Floc held in storage tanks.

The cementation of Thorium Nitrate, including material returned under Government agreement from Peru.

Plutonium contaminated material (PCM) exists on the site in a storage facility and will further arise from the undertakings. PCM takes the form of soft wastes contaminated with plutonium to levels unacceptable for LLW disposal but for which recovery has no current economic justification. This waste will not be placed in final disposal without further treatment either at Dounreay or Sellafield.

The destruction of 514 drums of sodium metal from Forschungszentrum Karlsruhe GmbH.

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[2] Low Level Waste (LLW) – a waste having an activity content greater than 0.4 Gigabecquerels per tonne alpha and beta/gamma activity and not greater than 4 Gigabecquerels per tonne alpha or 12 Gigabecquerels per tonne beta/gamma activity.
[3] The aqueous by-product of reprocessing containing a high proportion of dissolved fission products

The treatment of unirradiated and irradiated nuclear material to place the material into a form suitable for further processing or storage will result in solid radioactive waste arisings. The nuclear material, the treatment of which will produce the aforementioned radioactive wastes, includes:

- DFR breeder material
- PFR irradiated oxide fuel
- PFR irradiated carbide fuel
- Un-irradiated PFR type oxide fuel subassemblies
- Un-irradiated PFR type carbide fuel subassemblies
- Un-irradiated oxide fuel residues
- Un-irradiated carbide fuel residues
- Irradiated Test Reactor fuel comprising highly enriched uranium used in the production of medical isotopes and physics experiments (HELIOS target and uranium hydroxide)
- Un-irradiated high enriched uranium and thorium (includes treated HELIOS material)
- Plutonium laden liquor
- Plutonium in ZEBRA plates
- Natural and depleted uranium materials
- Irradiated thorium
- Unirradiated thorium
- Irradiated miscellaneous fuels including fuels that are the property of other countries.

LIQUIDS

Liquid radioactive wastes will be produced from activities of the undertakings and disposed to the North Atlantic Ocean via the sea disposal pipeline including:

- Salt solutions from the destruction of alkali metal coolants;
- Aqueous solutions from the cleaning/decontamination of components from PFR and DFR;
- Aqueous solutions from the cleaning of shielded flasks used for intra-site movements.

The control of water in seepage to the ILW storage shaft results in radioactive aqueous effluent being pumped to the Low Level Liquid Effluent Treatment Plant (LLLETP) for final disposal.

Ground water flow through the Low Level Waste pits is collected and transferred to the LLLETP for final disposal.

Analytical methods result in the transfer of radioactive liquid effluents being transferred to the LLLETP for final disposal.

Pond waters used for the storage of radioactive material will be transferred to the LLLETP for final disposal.

Ground water in seepage to boreholes, on the licensed site, will be transferred, where appropriate, to the LLLETP for final disposal.

The treatment of unirradiated and irradiated nuclear material to place the material into a form suitable for further processing or storage will result in liquid radioactive waste arisings.

Waste aqueous effluents received from the adjacent Ministry of Defence Establishment.

Liquid wastes exist or will arise that are not suitable for disposal to the marine environment.

The Dounreay site currently holds a variety of radioactively contaminated waste solvents, accumulated as a result of irradiated fuel reprocessing operations and oils from electrical transformers, gearboxes and other lubrication purposes. The waste solvent is mainly composed of Tributyl Phosphate in Odourless Kerosene (TBP/OK) and this contains most of the radioactivity. The waste oils include transformer oils, which contain very small quantities of radioactivity, and lubricating oils.

Other liquid radioactive waste (e.g. zinc bromide, counting scintillants, organics), that are not suitable for disposal to the North Atlantic Ocean, exist on the Dounreay site in storage and will further arise during the undertakings.

GASEOUS (including gases dusts and mists)

Gaseous radioactive waste, comprising of radioactive gases, dusts and mists, will be produced from the undertakings and disposed to the atmosphere via dedicated stacks (chimneys) constructed for the purpose.

Dusts and mists released during the processes used to treat the wastes and/or fuels enter the gaseous streams by elevation into the ventilation airflow.

Radioactive gases, principally tritium and krypton 85, are released during the processes used to treat the wastes and/or fuels to put them into the passive states required for long term storage or disposal, including:

- ✓ Destruction of alkali metal coolants;
- ✓ Destruction of 514 drums of sodium metal from Forschungszentrum Karlsruhe GmbH;
- ✓ Transfer and cementation of raffinates;
- ✓ Cleaning/decontamination of components from PFR and DFR.

The treatment of unirradiated and irradiated nuclear material to place the material into a form suitable for further processing, transportation to another licensed site or storage will result in gaseous radioactive waste arisings. (see previous listing) The release of krypton 85 from unirradiated fuel pins, as they are de-pelletted for treatment or transfer elsewhere for treatment, is included here.

Radioactivity may potentially arise, at very low levels, as a result of re-suspension of activity from contaminated ground, the release of volatile species from the low level solid waste disposal pits, re-suspension from external tanks and the non-forced ventilation of buildings and offices where radioactive contamination has the potential to be present (fugitive discharge). Application is made for these to be recognised and monitored by the environmental monitoring programme carried out by DSRL.

5c Do any of the processes result in the accumulation or disposal of alpha emitting radionuclides?

Yes

5d Describe the process and the modifications considered for reducing the quantities of radioactive waste likely to arise.

DSRL has a Waste & Characterisation Unit that regularly reviews waste minimisation, waste strategy and waste characterisation with the aim to ensure that all wastes are routed through the most appropriate route.

Integrated Waste Strategy

In support of the delivery of NDA strategy, all NDA sites are required to produce and implement an optimised Integrated Waste Strategy (IWS). This is provided though a formal specification and a companion document.

The overall objective of the IWS is to demonstrate how Dounreay will assess and manage all wastes, both radioactive and non-radioactive (including those in solid, liquid or gaseous form) arising from the site's past, present and future operations. The IWS may also include any other waste transferred from other non-NDA sites for management of disposal.

The IWS demonstrates how all waste related activities on the site are integrated and includes a demonstration that the waste can be appropriately managed in accordance with BPEO and BPM, at the time and rate at which it will arise. It is submitted to the NDA as part of the Lifetime Plan review process and will enable Dounreay to demonstrate to its regulators and stakeholders that it is complying with legislation and standards.

DSRL, as Nuclear Site Licensee, is responsible for managing all decommissioning and waste management works on the Site, utilising both DSRL personnel and suitably qualified and experienced specialist contracting companies. The DSRL management team will, throughout the decommissioning works, act in liaison with the regulators.

Sustainable Development

DSRL's plans for waste management are in line with Government policy on sustainable development as expressed in Cm 2919 (as amended). In particular, the plans do not foreclose any options for the storage, treatment and final disposal of ILW waste until decision is made on the UK strategy for radioactive waste management. However, in accord with RWMD Letters of Compliance ILW liquid wastes are being converted into a solid form, by cementation, as a part of the requirement to reduce the radioactive hazards on the site. The plans also accord with the agreements given as part of Agenda 21 of the Rio Conference (Cm 2822) and the statutory guidance to SEPA by the Scottish Government under Section 31 of the Environment Act 1995.

The objective of restoring the Dounreay site, as defined in the LTP, is to make it available for unrestricted alternative use or to achieve a permanently safe condition that requires minimal institutional care. In this respect, DSRL is striving to ensure that a burden is not placed on future generations by the nuclear liabilities on the site, both in terms of safety and financially. The decommissioning of facilities and the safe processing of wastes, is achieving a "progressive reduction of the hazard" on the site in line with Government policy and the objectives of the NDA. As described in the section below, particular attention is being given to the minimisation of wastes and discharges to the environment. This is being ensured by undertaking a BPEO study to underpin the management of decommissioning wastes.

Waste Minimisation

Waste minimisation is an integral part of a comprehensive waste management and safety culture that aims to reduce the environmental impact of the wastes generated at Dounreay.

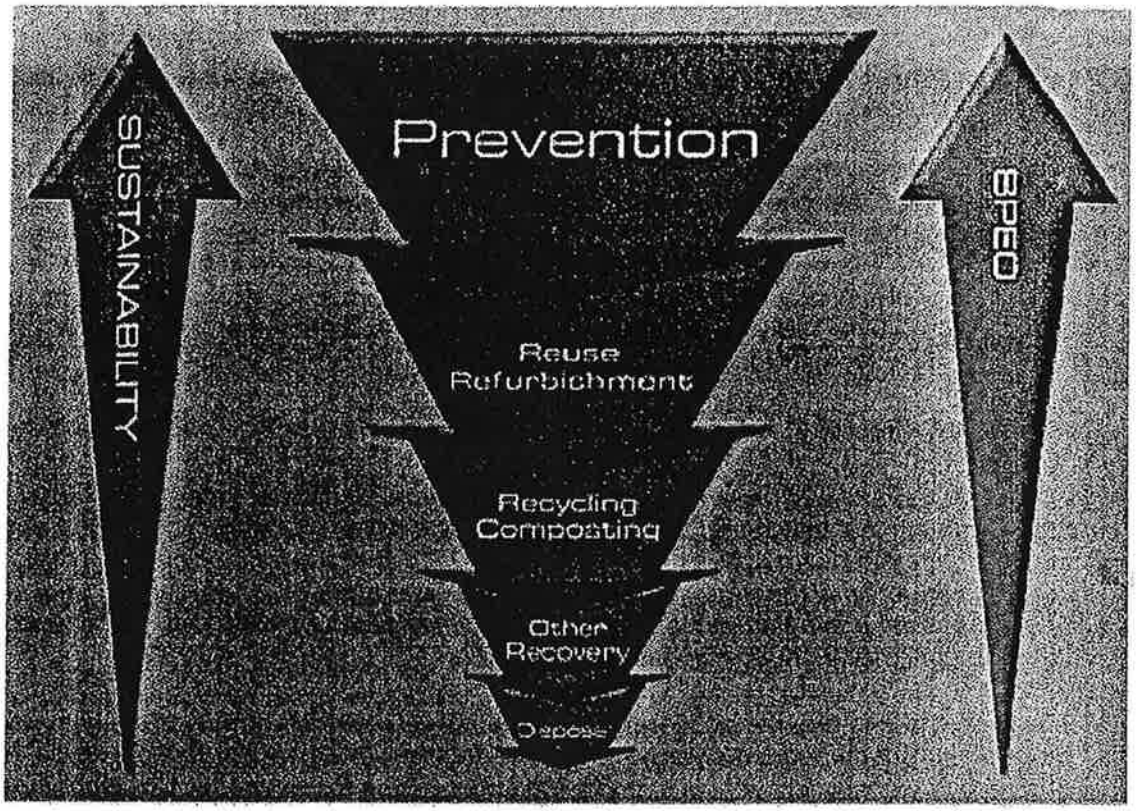
The waste minimisation strategy involves a comprehensive approach which considers all the different parts of a process. These parts include process selection, the choice of plant design and equipment, plant operation and decommissioning practices. The minimisation strategy is influenced by the whole spectrum of activities, including source reduction, operational practices involving recycling and reuse, and administrative controls of waste management optimisation. The strategy requires an integrated approach considering the relationship between all the types of waste produced by a process.

The Waste Hierarchy[4]

The waste hierarchy aims to encourage the management of waste materials in order to reduce the amount of waste materials produced, and to recover maximum value from the wastes that are produced. It is not applied as a strict hierarchy as many complex factors influence the optimal management for any given waste material. However, as a guide, it encourages the prevention of waste, followed by the reuse and refurbishment of goods, then value recovery through recycling and composting.

The next option is energy recovery, an important level in the hierarchy as many materials have significant embedded energy that can be recovered. Waste prevention, reuse, recycling and recovery are collectively defined by the Organisation for Economic Co-operation and Development (OECD) as waste minimisation. Finally, waste disposal should only be used when no option further up the hierarchy is possible.

[4] Taken from the SEPA website
http://www.sepa.org.uk/waste/moving_towards_zero_waste/waste_hierarchy.aspx



The Waste Hierarchy

This concept invokes a key component of waste minimisation by requiring generators to develop ideas on prevention before looking to the reuse, recycling and disposal options. The Waste Hierarchy reinforces that minimising waste needs to be addressed at the early stages of a process to prevent effectively the generation of waste.

5e Do you intend to receive and dispose of radioactive waste from other premises? (give details)

Yes.

The neighbouring site operated by the Ministry of Defence (Vulcan) transfers low level liquid wastes to the low level liquid effluent treatment plant (LLLETP) for disposal and transfers solid radioactive waste to DSRL for treatment, storage and disposal.

6 GASEOUS WASTE – DISPOSAL OF GASEOUS RADIOACTIVE WASTE

6a Do you intend to dispose of radioactive waste in the form of gas, mist or dust

Yes.

6b For each discharge point please give a full description of the waste and identify or describe the discharge point.

Radioactive Gaseous Discharge Points: Identification, Height, Efflux Velocity, Effluent Type and Estimated Maximum Discharge*

Discharge Point	Height (m) (from ground level)	Efflux Velocity (m/s)	Radionuclides	Estimated maximum discharge (Bq/yr)	
D1213	55	8.26	Alpha and beta particulate, tritium gas, iodine gas	Alpha Beta ^{3}H ^{129}I	3.24E+06 7.28E+08 5.13E+11 1.00E+09
D2164 (New D1213 replacement North)	31	>15	Alpha and beta particulate, tritium gas, iodine gas	Alpha Beta ^{3}H ^{129}I	
D2170 (New D1213 replacement South)	31	>15	Alpha and beta particulate, tritium gas	Alpha Beta ^{3}H	
PFR	40	3.02	Alpha and beta particulate, tritium gas, krypton gas	Alpha Beta ^{3}H ^{85}Kr	- 3.86E+08 1.2E+12 5.69E+14
PFR (New location)	40	15	Alpha and beta particulate, tritium gas, krypton gas	Alpha Beta ^{3}H ^{85}Kr	- 3.86E+08 1.2E+12 5.69E+14
IFBS	18	6.73	Alpha and beta particulate, krypton gas	Alpha Beta ^{85}Kr	4.00E+03 6.00E+04 5.69E+14
PFR AML	40	4.97	Alpha and beta particulate, tritium gas	Alpha Beta ^{3}H	6.00E+04 5.00E+05 1.00E+09
PFR SSC	32	0.00	Not currently in use		
PFR NaTkFm/SID	6	0.10	Tritium gas		8.13E+09
DFR Pond	51	16.28	Alpha and beta particulate, tritium gas, krypton gas	Alpha Beta ^{3}H ^{85}Kr	1.52E+05 3.41E+08 1.36E+12 3.00E+12
DFR Sphere	51	19.65			
DFR ESB	51	21.75			
DFR NDP	51	19.34			
DFR C4	51	29.86			
D9833	10	6.99	Alpha and beta particulate	Alpha Beta	1.00E+03 1.00E+04

D3000	17	16.45	Alpha and beta particulate, tritium gas	Alpha Beta ^{3}H	5.00E+03 2.00E+04 1.00E+10
D1200	18	6.60	Alpha and beta particulate	Alpha Beta	5.00E+04 1.00E+05
D1226	20	6.40	Alpha and beta particulate	Alpha Beta	2.00E+04 2.00E+05
D2670	21	14.17	Alpha and beta particulate, krypton gas	Alpha Beta ^{85}Kr	5.8E+04 3.60E+05 4.00E+12
DN141	17.5	12.98	Alpha and beta particulate	Alpha Beta	5.00E+03 1.00E+04
D2900	18	12.08	Alpha and beta particulate, tritium gas	Alpha Beta	4.00E+04 1.00E+05 1.00E+10
D9867	17	12.29	Alpha and beta particulate	Alpha Beta	5.00E+03 1.00E+04
D8570	13	6.50	Alpha and beta particulate	Alpha Beta	5.00E+03 1.00E+04
DNO60	13.5	0.00	Not currently in use	Alpha Beta	
D2167	8	11.17	Alpha and beta particulate	Alpha Beta	5.00E+03 1.00E+04
D1211	18	TBC	Alpha and beta particulate	Alpha Beta	TBC
D1115 Pipe	6	0.00	Alpha and beta particulate, tritium gas. Intermittent purge flow only	Alpha Beta	10 10

***For detail on facility and stack discharge estimates please refer to supporting document No 8 (Ref RSA Application (09) Estimate)**

6c List the radionuclides you intend to discharge

Radionuclide	Maximum discharge in a single day (Bq)	Maximum discharge in a year (Bq)
Alpha	2.00E+04	7.28E+06
Beta (excl ^{3}H and ^{85}Kr)	8.06E+06	2.94E+09
Tritium	2.14E+11	7.82E+13
Krypton 85	1.58E+12	5.76E+14
Iodine 129	2.74E+06	1.00E+09

Maximum number of days in a year gaseous waste will be discharged:

365(6)

6d For each of the radionuclides listed above, what will be the concentrations in the waste disposed of?

Radionuclide	Concentration in waste disposed of (m^3)
Alpha	Various across all discharge points
Beta	Various across all discharge points
Tritium	Various across all discharge points
Krypton-85	Various across all discharge points
Iodine-129	Of the order of 0.27 Bq/m^3

6e How do you intend to measure or estimate the activity of the discharge? Please explain

Frequency of Gaseous Sampling and Analysis Required

Facility	Sampling Frequency	Frequency	Analysis required
PFR	Weekly	Weekly	1) Beta 2) Alpha
PFR	Weekly	Weekly	1) Tritium
DFR	Weekly	Weekly	1) Beta 2) Alpha 3) Tritium
DFR	As required	As required	1) Krypton-85
D1213	Weekly	Weekly	1) Iodine-129 2) Tritium
D1213	Daily	Monthly Bulk	1) Beta 2) Alpha
D1200	Weekly	Weekly	1) Beta 2) Alpha
D1226	Weekly	Weekly	1) Beta 2) Alpha
D2670	Weekly	Weekly	1) Beta 2) Alpha
D2900	Weekly	Weekly	1) Beta 2) Alpha
D9867	Weekly	Weekly	1) Beta 2) Alpha
D8570	Weekly	Weekly	1) Beta 2) Alpha
D9833	Weekly	Weekly	1) Beta 2) Alpha
Sodium Tank Farm	Weekly when operational	As required	1) Tritium
D1115	As required	As required	1) Beta 2) Alpha
D3000	Weekly	Weekly	1) Beta 2) Alpha 3) Tritium
Sodium Analysis	Weekly	Weekly	1) Beta 2) Alpha

Laboratory			3) Tritium
Secondary Sodium Circuits	Weekly when operational	As required	1) Tritium
DN141	Weekly	Weekly	1) Beta 2) Alpha
D2167	Weekly	Weekly	1) Beta 2) Alpha

Calculation of Activity Discharged - Gaseous

The activity of tritium and tritiated water vapour discharged is estimated by multiplying the activity measured in the samples taken by the ratio of the discharge flow rates to the sampling flow rates.

The activity of total alpha particulate, total beta particulate and other radionuclides discharged is estimated by multiplying the activity in the samples taken by the ratio of the discharge flow rates to the sampling flow rates.

The activity of iodine-129 discharged is estimated by multiplying the activity in the samples taken by the ratio of the discharge flow rates to the sampling flow rates.

The activity of krypton-85 discharged is estimated on the basis of the calculated krypton-85 content of the fuel. The calculation makes use of the known and recorded history of the fuel and the FISPIN model.

The activity of krypton-85 discharged from DFR reactor cover gas the activity of the krypton-85 is estimated in accordance with the procedure set out in the Dounreay Environment Committee paper DEC(06)P85.

The total alpha particulate and total beta particulate activities discharged from D1115 will be taken directly from the sample taken.

ANALYTICAL METHODS – Gaseous Discharges

The generic methods, noted by a key letter will be in accordance with the appropriate procedures listed.

Description		Generic Method
1.	**Stack gaseous discharge analysis**	
1.1	Total alpha (excluding ^{242}Cm and ^{244}Cm)	B
1.2	Total beta (excluding ^{3}H and ^{85}Kr)	A
1.3	Tritium	C
1.4	Iodine-129	D
1.5	Krypton-85	E

Generic Method Key

A. Solid source counting.
B. Liquid scintillation counting.
C. Chemical separation followed by Liquid scintillation counting.

D. Sample preparation followed by high resolution Gamma spectrometry.
E. Calculation.

6f Please attach your radiological assessment of the proposed discharges to this form

Dose assessment included ref. RSA Application (09) Doses

The nearest building to which the public has unfettered access is the dwelling at Buidoo approximately 735 metres from the D1226 stack, the nearest discharge stack.

The dose model PC CREAM 97 has a limitation that only allows up to 5 stack locations and 5 receptor points to be modelled in any one assessment. The model has used the DFR stack as the reference stack and the nearest habitations are:

- Residence adjacent to the visitor centre 1200m (E)
- Cottages to the south of the A836 near Vulcan entrance 1074m (SE)
- Residence to the south of the A836 identified as Isauld 1938m (SSW)
- Isauld House 1832m (SW)
- Goat Farm at Shebster 4100m (S)

The adjacent buildings are residences to which there is general public access. The other adjacent buildings are those that comprise the Ministry of Defence site Vulcan.

The ventilation system incorporates systems designed to minimise the discharge of activity. These systems are chosen relative to the process that gives rise to the activity release and the type of activity. The systems used are High Efficiency Particulate Arrestor (HEPA) filters, wet scrubbers, dry scrubbers and cyclones.

The discharge points are identified in the plan shown at Appendix 3 of this application.

The efflux velocities are shown in the table at question 6b above.

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7 LIQUID WASTE – ACCUMULATION AND DISPOSAL OF LIQUID RADIOACTIVE WASTE

7a Do you intend to accumulate or dispose of radioactive aqueous waste, including organic combustible waste?

Yes

7b What is the chemical and physical nature of the waste you intend to accumulate or dispose of?

The liquid radioactive wastes to be disposed from the premises to the North Atlantic Ocean will be:

- Chloride solutions;
- Nitrate solutions; and
- Aqueous solutions contaminated with soluble radionuclides, radionuclides held up in colloidal suspension and radionuclides held as suspended solids of dimensions less than 60μm in any dimension.

These aqueous liquids, at any time are potentially a mix of the above mentioned forms, may be treated by addition of acid or alkali, when required, to ensure the hydrogen ion concentration of the effluent at time of discharge to the marine environment is between pH5 and pH9.

Other aqueous and organic liquids in the forms of oils, solvents, zinc bromide solution and scintillant gels are accumulated pending disposal to TRADEBE High Temperature Incinerator at Fawley, Southampton (Supporting Document 5).

7c Why do you intend to accumulate aqueous waste?

Aqueous wastes are accumulated until sufficient volume is collected (~500 m^3) for disposal to the North Atlantic Ocean within a tidal window of 2 hours before and ½ hour after high tide. (High tide is as determined for Scrabster, Caithness, Highland).

Other aqueous wastes will be unsuitable for direct disposal to the environment and these are accumulated until the identified disposal route is authorised

7d How do you intend to accumulate aqueous waste?

The aqueous wastes are collected in the Sea Discharge Tanks of the Low Level Liquid Effluent Treatment Plant.

Other liquids are held in suitable containers within stores where appropriate environmental protection measures are installed e.g. Bunds.

7e How long do you intend to accumulate aqueous waste for?

Aqueous wastes are accumulated for up to 5 days.

Other liquids will be stored until such time as the identified disposal routes are authorised.

7f How much radioactive waste do you intend to accumulate?

Radionuclide	Maximum activity (Bq)	Maximum Volume at any one time (m^3)
Alpha	6.0E+07	1100
Beta	5.0E+10	1100
Strontium 90	5.0E+09	1100
Caesium 137	2.5E+10	1100
Sodium 22	2.5E+08	1100
Tritium	2E+12	1100
Americium 241	3E+05	1100

7g Where will you dispose of the aqueous waste?

1. The North Atlantic Ocean at grid reference NC 981 676.

2. Where it has been identified that there is continuous groundwater flow with an activity concentration of less than 5 Bq/l Alpha and less than 100 Bq/l beta that these are authorised for discharge from the Dounreay site via the most appropriate drain outfall. The outfalls for which authorisation is requested are Outfalls 2, 3 and 4 and each will require suitable modification and modelling prior to any radioactive aqueous liquor discharge.

3. Waste samples for characterisation and/or analysis will be sent to appropriate analytical laboratories that hold all necessary authorisations and consents relating to the handling, analysis and disposal of radioactive wastes.

4. Disposal to TRADEBE High Temperature Incinerator at Fawley, Southampton (Supporting Document 5).

DISPOSAL TO A PUBLIC SEWER, WATER COURSE OR BODY

7h What is the name and 8 figure National Grid Reference of the sewerage treatment to which your premises discharges liquid radioactive waste?

Not applicable

7i What is the approximate daily total volume of water which you intend to discharge from the premises into the sewer?

The discharge volumes are estimated at:
230 m^3

7j What is the maximum monthly total of each radionuclide you intend to discharge?

Radionuclide	Maximum total activity in any single month (Bq)	Concentrations in the waste disposed (Bq/m^3)
Alpha	6.0E+08	1.0E+05
Beta	5.0E+11	8.7E+07
Strontium 90	5.0E+10	8.7E+06
Caesium 137	2.5E+11	4.3E+07
Sodium 22	2.5E+09	4.3E+05
Tritium	2E+13	3.5E+09
Americium 241	3E+06	2.0E+03

Detailed estimates from facilities are shown in Supporting Document 8 (Ref RSA Application (09) Estimate).

7k Will the waste include any substances liable to render it unacceptable for disposal to the drainage system serving the premises?

Yes, aqueous wastes containing zinc bromide are unsuitable for discharge.

7l How do you intend to measure or estimate the activity of the discharge? Pleae explain.

Calculation of Activity Discharged - Liquid

DSRL shall ascertain or estimate activity by suitable analytical techniques conducted in accordance with a Quality Assurance Plan to the standard required by ISO 9001. DSRL propose to use the analytical methods described and in accordance with the following:

- The activity of the effluent discharged will be estimated by multiplying the activity concentration in the samples prepared by the volume of effluent discharged.
- Gross alpha shall be measured by sample preparation and Liquid scintillation counting and reported in units of Becquerels.
- Gross beta (excluding tritium) shall be measured by sample preparation and solid source counting and reported in units of Becquerels.
- Gross gamma shall be measured by sample preparation and liquid source counting and reported in units of gammas per second.

ANALYTICAL PROCEDURES – Liquid Discharges

The activities of radionuclides or groups of radionuclides will be assessed in accordance with the analytical procedures listed below.

Radionuclide	Generic Method
Gross alpha	B
Gross beta (excluding 3H)	A
Tritium	B
Gross gamma	F
90-Strontium	C
137-Caesium	E
22- Sodium	E

Generic Method Key

A. Solid source counting
B. Liquid scintillation counting
C Chemical separation followed by Cherenkov counting
D. Chemical separation followed by high resolution Alpha spectrometry
E. Sample preparation followed by high resolution Gamma spectrometry
F. Liquid source counting

7m Please attach your radiological assessment of the proposed discharge to this form

Dose assessment included ref. RSA Application (09) Doses.

7n What is the name of the watercourse or body of water that your sewage treatment works discharges into and your SEPA consent to discharge reference (i.e. – WPC/x/xxxx)?

There are 6 surface water, trade effluent, sewage outfalls on the Dounreay site discharging to the North Atlantic Ocean.

CAR Licence numbers

CAR/L/1002038	Outfall 1 & 1S	10/04/06
CAR/L/1002037	Outfall 2 & 2S	10/04/06
CAR/L/1002036	Outfall 3 & 3S	29/06/09
CAR/L/1002035	Outfall 4	10/04/06
CAR/L/1002034	Outfall 5	10/04/06
CAR/L/1003977	Outfall 6	10/05/06

7o What is the approximate daily total volume of water which you intend to discharge from the premises?

Of the order of 480 m^3 in each batch from LLLETP.
Of the order of 200 m^3 from the sources discharging via the extant inactive outfalls.

7p How do you intend to treat your liquid waste to minimise the radioactivity being disposed of?

Aqueous wastes are subjected to abatement at source, including pH adjustment, ion exchange, particulate filtration and settlement, prior to discharge and final filtration during discharge.

7q What is the maximum monthly total of each radionuclide you intend to discharge?

Radionuclide	Maximum total activity in any single month (Bq)	Proposed 12 month total activity
Alpha	6.0E+08	3.67E+09
Beta	5.0E+11	2.73E+12
Strontium 90	5.0E+10	2.74E+11
Caesium 137	2.5E+11	1.27E+12
Sodium 22	2.5E+09	1.30E+10
Tritium	2E+13	1.02E+14
Americium 241	3E+06	1.50E+07

7r What do you intend to do with any sludge or solids which are left after treatment?

Sludges will be immobilised through encapsulation in cement and solids will be stored pending final disposal options yet to be decided.

Solids arising from the Outfalls will be assessed and the waste management options decided prior to any radioactive aqueous liquid discharges.

7s How do you plan to assess the activity of any sludge or solids which are left after treatment before final disposal?

Sludge activity will be determined through radiochemical analysis. Solids activity will generally be though NDA processes.

7t Please attach your radiological assessment of the proposed discharge to this form.

Dose assessment included ref. RSA Application (09) Doses.

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8 SOLID WASTE – ACCUMULATION AND DISPOSAL OF SOLID WASTE

8a Do you intend to accumulate solid waste

Yes.

Radioactive wastes in both solid and liquid forms are accumulated on the Dounreay site. The Dounreay site is licensed under the Nuclear Installations Act 1965 (as amended) by the Health and Safety Executive Nuclear Installations Inspectorate. The accumulation of waste is regulated under Site Licence Sc 17 Licence Conditions 32 – Accumulation of Radioactive Waste, 33 – Disposal of Radioactive Waste and 34 – Leakage and Escape of Radioactive Material and Radioactive Waste.

The aqueous radioactive liquid waste disposal is via pipes, extending 600 m from the site licence boundary, ending in up-risers to the seabed surface. The original cast iron pipes and mild steel up-risers are no longer used and there is a long term intent for disposal. Whilst the disposal options are investigated the near term intent is to store the pipes in situ in the subsurface tunnel in which they are laid. Storage will commence when the pipes and risers are isolated from the marine environment and thus rendered unusable. This storage is an accumulation as defined in the Radioactive Substances Act 1993 due to the pipes existing beyond the licensed site boundary.

8b How much radioactive waste do you intend to store?

Approximately 1731 tonnes of steel

Radionuclide	Maximum activity (Bq)	Maximum time of accumulation
Alpha	1.0E+12	15 years
Beta	1.0E+13	15 years

8c How will you record and label this solid waste

The waste will be stored in situ until the disposal option is identified. Labelling and recording is not required.

8d How will you store the accumulated waste until it is disposed of?

The lines will be isolated by capping at both ends and will be left in the confines of the access tunnel.

8e Do you intend to dispose of solid waste?

Yes

8f How do you intend to dispose of solid waste?

Transfer of wastes to:

- Low Level Waste Repository to be built at Dounreay;
- Transfer of Intermediate Level Wastes encapsulated in concrete to the waste owners, under existing contracts, in countries outwith the boundaries of the United Kingdom;
- Transfer of tritiated alkali metals to licensed companies for disposal by incineration;
- Transfer of contaminated metals for processing and reuse;

9 DISPOSAL OF SOLID WASTE WITH ORDINARY REFUSE CONTAINING NO OTHER RADIOACTIVE WASTE

Not Applicable

10 TRANSFER TO THE OPERATOR OF THE NUCLEAR PREMISES AT DRIGG OR SELLAFIELD SITES

Not Applicable

11 INCINERATION ON THE PREMISES

Not Applicable

12 TRANSFER TO A CONTRACTOR (OTHER THAN THE OPERATOR OF THE NUCLEAR SITE AT DRIGG OR SELLAFIELD)

12a Give details of the radioactive waste you intend to transfer to your contractor

Radionuclide	Physical form of radionuclide	Maximum annual activity (Bq)
Alpha		4.00E+09
Beta		12.00E+09
Tritium	Elemental and organic	6.00E+11

Maximum volume of solids in any one year (m^3)	51
Maximum volume of combustible/liquid in any one year (m^3)	50

12b1 What is the registered company name of the contractor?

Studsvik UK Limited

12c1 What are the contact details and address of the contractor's site which will receive the waste?

Name: Kevin Wilkinson
Address: Studsvik UK Limited
Unit 14, Princes Park, 4th Avenue
Team Valley Trading Estate, Gateshead
Tyne and Wear
Postcode: NE11 0NF
Telephone No: +44 (0) 191 482 1744
E:mail: kevin.wilkinson@studsvik.co.uk
Position/Designation: Vice President - Waste Management

12d1 In which local authority area is the contractor's premises?

Tyne and Wear

12b2 What is the registered company name of the contractor?

TRADEBE

12c2 What are the contact details and address of the contractor's site which will receive the waste?

Name: Customer Services Tradebe Fawley
Address: Charleston Road, Hardley, Hythe, Southampton
Postcode: SO45 3NX
Telephone No: 023 8088 3000
E:mail: sales@tradebe-fawley.co.uk
Position/Designation:

12d2 In which local authority area is the contractor's premises?

Hampshire

12e Please describe contingency arrangements if your planned transfer routes become unavailable.

Another contractor will be identified and a variation to authorisation applied for.
Interim safe storage will be arranged.
If another contractor cannot be found then the disposal options will be reassessed.

13 SUPPORTING DOCUMENTS AND ATTACHMENTS

13a Please list any supporting documents or additional pages supplied.

1	APPENDIX 1 – Site Location
2	APPENDIX 2 – Extent of the Premises at Dounreay
3	APPENDIX 3 – Dounreay Gaseous and Liquid Discharge Points
4	WAC/MM/UK, Studsvik Metal Treatment – Customer Owned Waste Service, Rev D, 2009
5	TRADEBE, Code of Practice – Conditions of Acceptance of Radioactive Waste (Issue 4)
6	RSA Authorisation (09) INFO, Information in Support of an Application for Authorisation for the Disposal of Liquid, Gaseous and Solid Radioactive Wastes from Dounreay
7	RSA Application (09) DOSE, An Assessment of the Radiological Impacts of Proposed Atmospheric and Liquid Radioactive Waste Disposals from Dounreay
8	RSA Application (09) Estimate, Estimated Releases of Radioactivity to the Environment: Justification and the Uncertainty Related to the Estimates
9	RSA Application (09) Glossary, Glossary of Terms Used in the Documents Applying for an Authorisation to Dispose of Radioactive Wastes on or from the Premises at Dounreay
10	DEC(09)P196 – The 2008 DSRL Site Waste BPEO
11	DSRP WASTES BPEO – June 2003
12	DEC(09)P175 – A Review of National and International Best Practice on Waste Minimisation
13	WSU/Strategy/P033(08) – Dounreay 'Interim' Integrated Waste Strategy

14 COMMERCIAL IN CONFIDENCE

14a Absence of relevant processes or trade secrets

I accept that the information contained in the application form will form part of the publicly available information held by the Scottish Environment Protection Agency and relevant public registers.

SIGNED:  DATE: 31-3-10

AUTHORISED ON BEHALF OF: DSRL
(Company, corporate body, firm etc).

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15 DECLARATION

I/we hereby apply for authorisation under section 13 & 14 in respect of the premises referred to in Section 4 and in respect of the accumulation and disposal of radioactive material of the description and quantities referred to above.
I/we declare that to the best of my/our knowledge the above particulars are true and accept that the information contained in the application form will form part of the publicly available information held by the Scottish Environment Protection Agency and relevant public registers.

SIGNED:  PRINT NAME: ANTHONY WRATTEN

POSITION & DESIGNATION: DEPUTY MANAGING DIRECTOR DATE: 31/03/10

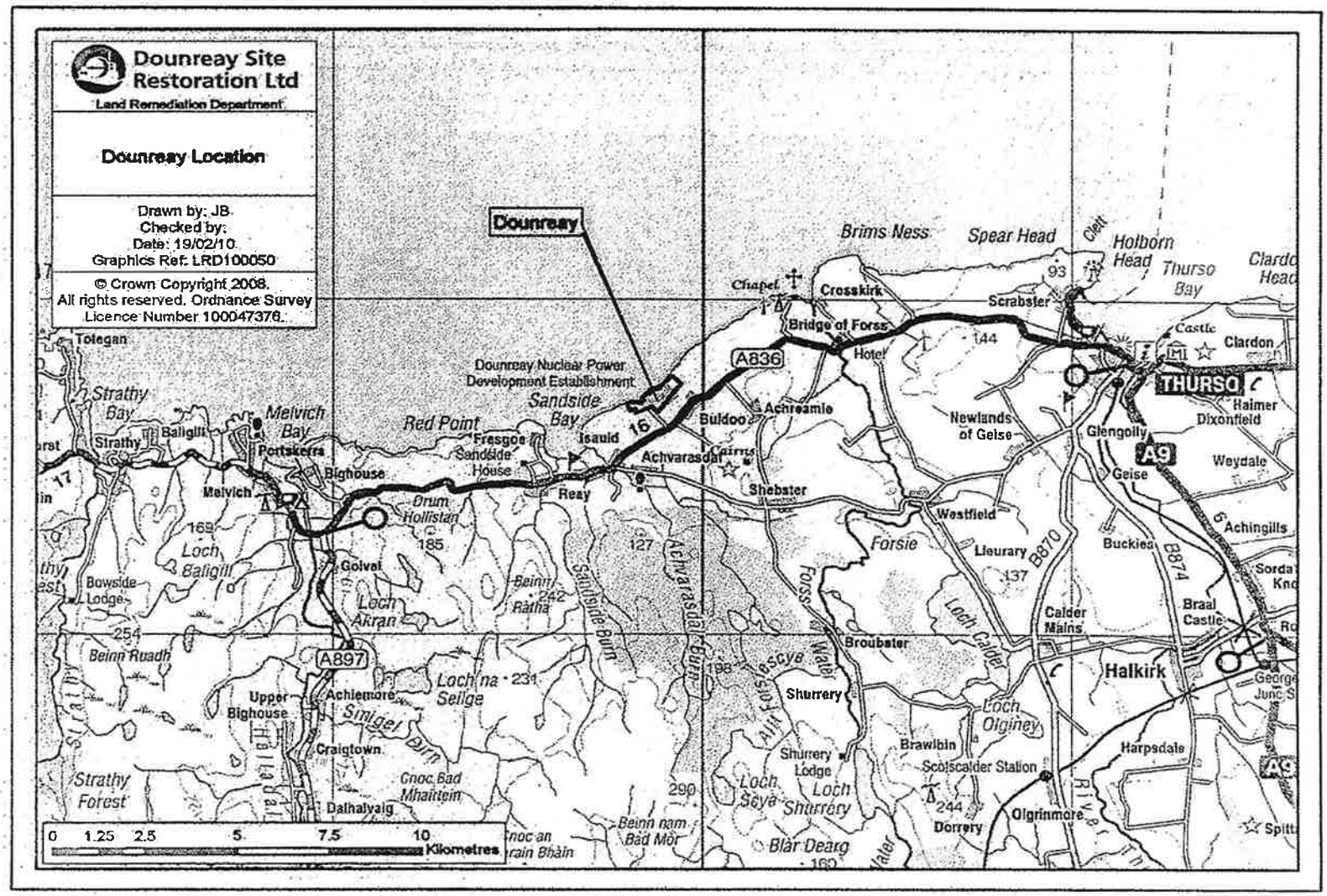
AUTHORISED ON BEHALF OF:
(Company, corporate body, firm etc). DOUNREAY SITE RESTORATION LTD

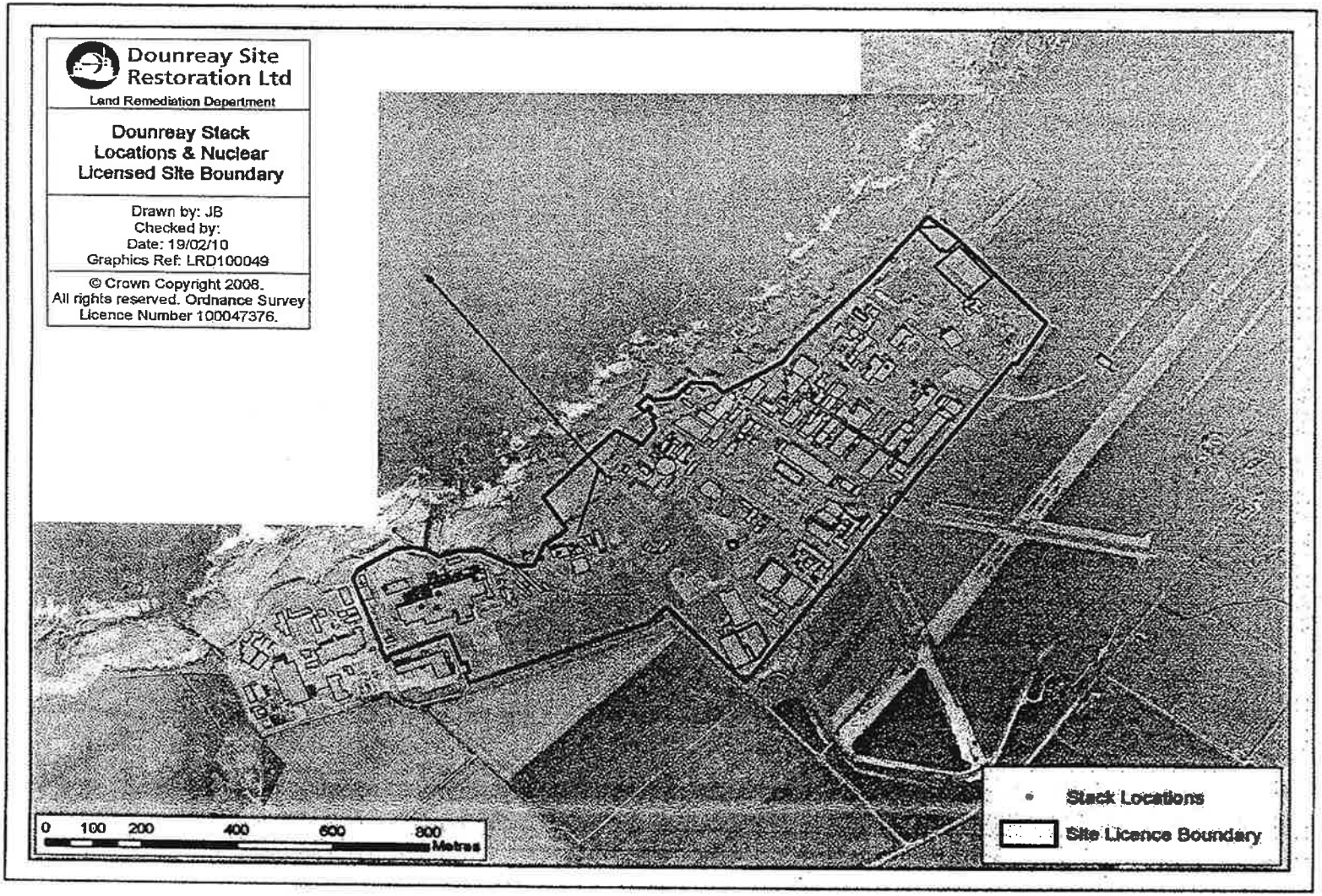
16 DATA PROTECTION

I have read the data protection notice and understand the implications of the Data Protection Act 1998. (Also all persons mentioned in the form should sign the data protection part).

Signed 
Signed 
Signed

APPENDIX 1 – Site Location




Dounreay Site Restoration Ltd
Land Remediation Department
Dounreay Stack Locations & Nuclear Licensed Site Boundary
Drawn by: JB
Checked by:
Date: 19/02/10
Graphics Ref: LRD100049
© Crown Copyright 2008. All rights reserved. Ordnance Survey Licence Number 100047376.
0 100 200 400 600 800 Metres
Stack Locations
Site Licence Boundary

APPEN[illegible]3 – Dounreay Gaseous and Liquid Discha[illegible] Points