

Magnox Limited

Chapelcross Site

Environmental Management Plan

2017





Executive Summary

In October 2004, the former licensee of Chapelcross Power Station, British Nuclear Fuels plc (now Magnox Limited) applied to the Health and Safety Executive (HSE) for consent to decommission the power station in accordance with the Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999 (as Amended). An Environmental Statement accompanied the application.

After a period of public consultation, the HSE duly granted consent in September 2005. Conditions were attached to the consent, primarily relating to the production and maintenance of an Environmental Management Plan, describing the ongoing mitigation measures to prevent, reduce and, if possible, offset any significant adverse environmental effects of the decommissioning work.

This document is the thirteenth issue of the Chapelcross Environmental Management Plan. It will be re-issued annually or at intervals agreed with the Office for Nuclear Regulation (ONR).

As Closure Director for Chapelcross, I look forward to a successful decommissioning project and on behalf of Magnox Limited; I give my commitment to minimising any adverse effect on the environment as a consequence of our decommissioning operations.

John Grierson, Regional Closure Director, Chapelcross

December 2017



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1. Introduction

Chapelcross Nuclear Power Station (hereafter Chapelcross) ceased generating electricity in June 2004. In accordance with Government Policy, work has now begun to systematically remove (or decommission) the plant and buildings associated with electricity generation at the site. Prior to commencing decommissioning work on the reactor site the Licensee of the site was legally required to seek consent from the Health and Safety Executive (HSE) for consent to carry out the decommissioning project.

An application was made to the HSE for consent to carry out the decommissioning project at Chapelcross in October 2004. In support of this application an Environmental Statement was produced; this assessed the impacts of the project on the environment. In September 2005, following an extensive public consultation, the HSE granted consent to carry out the decommissioning project at Chapelcross. This Consent is subject to certain conditions (listed in full in Appendix A). The consent requires the licensee to prepare and implement an Environmental Management Plan (EMP) which shall:

- list the mitigation measures that are already identified in the environmental statement and evidence submitted to verify information in the environmental statement;
- list the options to implement work activities, where mitigation measures may be required but where selection of an option will only be possible in the future; and
- list the work activities where mitigation may be required but where assessments to identify mitigation measures will only be possible in the future.

may be of interest to the public, but is not directly required by the consent conditions, is located in the Appendices B,C and D (e.g. stakeholder engagement, biodiversity).

A detailed decision report was prepared by the HSE (now ONR) in 2005, describing the content of the conditions attached to the consent, the main reasons and considerations for the decision. Copies of this document are available from:

Office for Nuclear Regulation
Building 4
Redgrave Court
Merton Road
Bootle
Merseyside
L20 7HS

Tel: 0151 951 4000
email: eia.team@onr.gov.uk

Or via the internet from:
<http://www.onr.org.uk/nuc24.pdf>

Any queries relating to decommissioning activities at Chapelcross or requests for copies of this EMP should be addressed to:

Regional Closure Director
Chapelcross Site
Annan
Dumfriesshire
DG12 6RF



Figure 1. Decommissioning Chapelcross

It is a requirement of the conditions attached to the consent to describe the effectiveness of the mitigation measures over time. This EMP is therefore a living document that will be periodically reviewed and revised throughout the decommissioning project. The EMP will be reissued annually as agreed with the Office for Nuclear Regulation (ONR). Other supporting information which

2. Scope of the Environmental Management Plan

The EMP provides a means of ensuring that appropriate environmental mitigations are identified and implemented, monitoring is undertaken during the works to measure the effectiveness of the mitigations and that amendments to the mitigations are identified as necessary.

Geographical Scope

The project area at Chapelcross is the area contained within the Nuclear Licensed Site consisting of the nuclear reactors and associated buildings. In addition to this, the project area includes the active effluent discharge line.

Duration

The current plan to deliver the decommissioning project at Chapelcross is divided into three phases:

- Care and Maintenance Preparations;
- Care and Maintenance; and
- Final Site Clearance.

These phases are explained in Figure 2.

The mitigation measures listed in section 4.1 of this EMP are similarly divided into the three phases.

Mitigation measures may change in the future in light of experience and developing technologies. The impacts of the later phases of work have been documented in the original Environmental Statement but due to the difficulty in predicting the nature of environmental and regulatory regimes over long periods, more confidence should be attached to the assessment relating to the earlier stages of the project. Where mitigation measures are still to be identified, developed in more detail, or require changes, these will be described in subsequent issues of the EMP together with the reasons for any changes made.

Topics

Beneficial or adverse environmental impacts are divided into 9 topic areas within the Environmental Statement as are the mitigation measures described in this EMP (see Figure 3).

In addition to the mitigation measures, a brief description of the Chapelcross Site and its surroundings is presented in this EMP together with an overview of the types of operations that will be carried out during Care & Maintenance Preparations. Further details for all phases of the decommissioning project at Chapelcross are presented in the Environmental Statement.

Figure 2. **Summary of the main decommissioning phases**

- **Care and Maintenance Preparations.** In this phase reactors have been defuelled, and Intermediate Level Waste (ILW) is being retrieved, packaged and stored in a new ILW Interim Storage Facility (ISF). The site will be reduced to a condition that includes four safe stored reactor buildings and associated blower houses, with heat exchangers stored horizontally, an ILW ISF and the Chapelcross Processing Plant, all other significant buildings will be decontaminated and demolished.
- **Care and Maintenance.** A mainly quiescent period during which the site will continue to be managed, monitored and maintained but human intervention will be minimised.
- **Final Site Clearance.** This will involve the dismantling of all the remaining structures on the site, including the reactors, the clearance of any residual radioactivity and de-licensing of the site to make it available for alternative use.

Following the transition to a new Parent Body Organisation in 2014, Magnox has completed a period of consolidation and is now working to the lifetime plan (LTP).

Figure 3. **Environmental Assessment Topics**

- **Air Quality and Dust**
- **Archaeology and Cultural Heritage**
- **Ecology**
- **Geology, Hydrogeology and Soils**
- **Landscape and Visual**
- **Noise and Vibration**
- **Socio-Economic**
- **Surface Water Quality**
- **Traffic and Transport.**

3. The Site and Surrounding Area

Site Description

Chapelcross is a complicated site by virtue of its history (the site was built on a former Royal Air Force base and part of the nuclear site was previously operated by the Ministry of Defence), its current users (Magnox Limited and Scottish Power), and its inland location. For convenience the site may be divided thus:

Main Site: All parts of the site associated with the operation of the power station, and the access routes. The main features are the four reactor buildings, the ponds building, the Chapelcross processing plant, the turbine hall, the flask handling building and the fuel transfer rail system.

The largest structures on the site are the four reactor buildings, each rising to 60 m. The reactor buildings each contain a Magnox¹ type reactor consisting of a graphite core enclosed in a cylindrical steel pressure vessel surrounded by a concrete biological shield. Defuelling of all four reactors was completed in 2013. When operating, the reactors were cooled using carbon dioxide. Each reactor has four heat exchangers (or boilers), located outside the biological shield, which supplied steam to drive the turbines. The heat exchangers and turbine hall are now stripped of accessible asbestos and physical decommissioning of the heat exchangers has commenced.

North Site: A number of ex-RAF buildings occupied the North Site for over 60 years. As part of normal site operations these buildings have been demolished. Various waste storage and handling facilities are also located on the North Site.

Pipelines: Radioactive effluent is discharged under an Authorisation, issued by the Scottish Environment Protection Agency (SEPA), into the Solway Firth at Seafield approximately 6 km from Chapelcross. The original concrete effluent discharge pipeline was deemed unsuitable shortly after commissioning and was replaced by a steel pipeline; this runs parallel to the original pipeline, following the same route. During the site's operational phase, cooling water was brought into the site from the River Annan; the water intake pipeline is about 2 km long from the pumping station at Warmanbie. This facility is no longer in use and has been drained and sealed.

South Site: This is an area of largely unused land within the licensed site, to the south of the main site. Recently a new substation has been constructed in this area as part of the Electrical Overlay Project. An upgrade to the 132 kV transformer compound is currently being carried out by Iberdrola and Scottish Power.

Surrounding Landscape

Chapelcross is located at approximately 70 to 80 m Above Ordnance Datum (AOD), at the head of a small valley encompassing Gullielands Burn. To the north, the ground gently rises to a local high point, at 126 m AOD. The small hamlet of Creca rises to 108 m AOD. To the south the ground falls gently east towards Kirtle Water and, beyond that towards the estuarine landscape of the Solway Firth.

To the west, the ground falls towards the pronounced valley of the River Annan, into which drains Gullielands Burn, south west of Chapelcross.

Transport Infrastructure

The main vehicular access route to Chapelcross is via minor roads, which connect to the A74 (M) to the north of the site or the A75 trunk road and B6357 to the south. There is a railway-line, which passes through Annan, but there is no railhead near Chapelcross.

Local Watercourses

The nearest watercourse to Chapelcross is Gullielands Burn, a tributary of the River Annan. The burn flows into the site on its north east boundary and is culverted beneath the site, before re-appearing on the south western boundary.

The site is located within the catchment of the River Annan. The Annan catchment has an area of 960 km², of which 670 km² is under agricultural management. The River Annan runs for approximately 70 km from its headwaters to the Solway Estuary. It is an upland watercourse for the first 25 km or so and then slows and broadens as it reaches the lowland agricultural plains.

The Solway Firth is a well mixed, macro-tidal estuary (mean spring range of 8.5 m) with asymmetric tidal currents dominated by an 8 hour ebb (at Powfoot). The fine sandy substrate of the bed is highly mobile and the channels regularly shift.

Geology and Hydrogeology

The deep geology at Chapelcross is predominantly Carboniferous Limestone. This layer is isolated from hydrogeological processes at the surface by a layer of evaporates and overlying shales. Above this lies a layer of St Bees Sandstone, approximately 65 m thick, composed of interbedded sandstones and mudstones. Superficial drift deposits are of stiff silty sandy clay with fragments of sandstone.

The St Bees Sandstone is identified on the Scotland Hydrogeology Map as a 'locally important' aquifer, although it is not currently used for public water supply in the vicinity of Chapelcross. The overlying soils and glacial till afford some protection from contamination to the aquifer, but this may be bypassed by excavations on the site.

¹ The term 'Magnox' refers to the first generation of gas-cooled nuclear reactors used for electricity generation. It is derived from the cladding material (magnesium non-oxidising alloy) that surrounds each individual uranium metal fuel element.

Sensitivity of the Receiving Environment

The nearest large settlement is Annan, some 3 km to the south. There are no residential or other sensitive properties within 500 m of the reactor site boundary. The hamlet of Creca is approximately 500 m from the licensed site boundary.

Chapelcross does not lie within any designated landscape area. The nearest designated site is the Solway Coast Area of Outstanding Natural Beauty (AONB) 10 km to the south east. Approximately 7 km from Chapelcross to the south across the Solway Firth lies Hadrian's Wall which is a Scheduled Ancient Monument (SAM) and World Heritage Site.

The following designated sites of nature conservation interest are located within 10 km of Chapelcross:

- Upper Solway Flats and Marshes Site of Special Scientific Interest (SSSI)
- Upper Solway Flats and Marshes Special Protection Area (SPA)
- Upper Solway Flats and Marshes Ramsar site
- The Solway Firth Special Area of Conservation (SAC)
- Raeburn Flow SSSI
- Raeburn Flow SAC
- Royal Ordnance Powfoot SSSI

While no designated sites of nature conservation interest are located within 2 km of Chapelcross, the effluent pipeline discharges into the Upper Solway Flats and Marshes SSSI/SPA/Ramsar site and the Solway Firth SAC. The Upper Solway supports one of the largest continuous areas of intertidal habitat in Britain and the site is of international importance for a range of coastal habitats and for the passage and wintering of waterfowl supported by them. The Upper Solway is also noted for supporting two species of lamprey, natter jack toads (*Bufo calamita*), great-crested newts (*Triturus cristatus*) and high densities of marine/estuarine invertebrates.

The Solway Firth is one of the largest, least populated and industrialised natural sandy estuaries in Europe. It extends from the Mull of Galloway in Scotland, across to St. Bees Head on the Cumbrian coast. The area of the Inner Solway Firth extends as far as the Upper Solway Flats and Marshes SSSI/SPA/Ramsar site and the Solway Firth SAC, all of which coincide. The western edge of the designated site is a line between Dubmill Point in Cumbria to the sand banks south of Sandyhills and Craigneuk Point, Kirkcudbrightshire. It is the joint estuary of the Rivers Wampool, Waver, Eden, Esk, Annan, Nith and Lochar Water, most of which have water quality classification of Grade 1.



Figure 4. The Chapelcross reactors are now in the Care and Maintenance Preparations phase

4. Mitigation Measures

4.1 Mitigation measures that have been identified

Introduction

There are no significant changes to the mitigation measures that were submitted in the Environmental Statement and reported in previous issues of the Environmental Management Plan.

Chapelcross site will notify the ONR of any significant change to a mitigation measure no less than 30 days before the change is made, or within such shorter time as the ONR may agree.

The following tables list the mitigation measures for each phase of the decommissioning project at Chapelcross.

Care & Maintenance Preparations Phase

Mitigation measures already identified (Condition 3a)

Topic	Nature of impact	Mitigation Measures Proposed
Air Quality and Climatic Factors	No significant adverse environmental impacts identified arising from decommissioning activities.	
Archaeology and Cultural Heritage	No significant adverse environmental impacts identified arising from decommissioning activities.	
Ecology	Surface water quality Release of contaminants resulting in reduction in water quality of the River Annan and tributaries, which could affect aquatic ecological receptors.	The potential release of contaminants into the aquatic environment will be controlled through the adoption of best management practices, for example SEPA pollution prevention guidance notes and CIRIA guidance. Where required water will be treated to agreed standards prior to discharge to surface waters. The release of silt from construction traffic will be minimised through the use of wheel washes on site (PPG 6).
	Nesting Birds Disturbance of nesting birds	<ul style="list-style-type: none"> Nest sites will be checked by a qualified expert prior to any demolition works being carried out during the breeding season (March – Aug). If nesting birds are present, demolition works that could have an impact on them will be postponed until after the breeding season. Advice will be taken from appropriate specialists including the regional Raptor Society Where appropriate, decommissioning and demolition projects will provide nesting sites at agreed locations to encourage birds to nest in locations which minimise disruption to the decommissioning programme.
	Bats If bat roosts/hibernacula are present, demolition of buildings that support bats could result in their injury or death.	<ul style="list-style-type: none"> Surveys will be carried out by qualified experts prior to the demolition of buildings containing potential roosts/hibernacula. Where necessary, any entrances to roosts/hibernacula will be blocked (under licence from the Scottish Natural Heritage) and alternative roosts/hibernacula will be provided. 'Hold points' will be established in individual decommissioning project plans for potentially affected buildings and bat surveys carried out prior to any work commencing.

Care & Maintenance Preparations Phase

Mitigation measures already identified (Condition 3a) - continued

Topic	Nature of impact	Mitigation Measures Proposed
Ecology (continued)	<p>Badgers</p> <p>Badgers could be disturbed if new setts are established within 30 m of decommissioning areas. In addition, badgers could become trapped in any trenches excavated during decommissioning works.</p>	<ul style="list-style-type: none"> • If a sett is established within 30 m of decommissioning areas, expert advice will be sought from Scottish Natural Heritage and appropriate mitigation incorporated. • Any trenches created as a result of decommissioning works will be backfilled at the end of each working day or a suitable means of escape provided.
	<p>Active effluent discharge pipelines</p> <p>Disturbance of SPA qualifying species using the Solway Firth; several species of internationally important birds are supported during the winter months.</p> <p>Damage to inter-tidal mudflat / sand-flat during removal of the seaward end of the effluent pipeline.</p>	<ul style="list-style-type: none"> • The removal of the seaward ends of the pipeline will be carried out in the summer months to avoid peak periods of use of the Solway Firth by SPA qualifying species. • All decommissioning materials resulting from the pipeline decommissioning will be removed from inter-tidal areas to avoid any loss of habitat. • Work will be carried out in consultation with Scottish Natural Heritage under the terms of the Wildlife and Countryside Act.
Geology, Hydrogeology and Soils	<p>Groundwater</p> <p>Degradation of existing groundwater supplies by way of yield and/or water quality.</p>	<ul style="list-style-type: none"> • Any water ingress to excavation areas will be controlled to minimise the volume of water that could become contaminated (if contamination were present) and require subsequent management. • Where soil contamination is identified, any water that enters excavations will also be sampled and analysed. If there is a need to pump contaminated water out of excavations, this will be done such as to ensure that the waste water is disposed of appropriately. • Before any blasting or excavation of any soil that may be required, ground will be surveyed to ensure that no contamination is present. • Any excavated material will be monitored prior to reuse as infill. • Demolition wastes will be subject to analysis to determine their suitability for later use as a backfill material to below-ground voids on the site.

Care & Maintenance Preparations Phase

Mitigation measures already identified (Condition 3a) - continued

Topic	Nature of impact	Mitigation Measures Proposed
Geology, Hydrogeology and Soils (continued)	<p>Contaminated soils</p> <p>Mobilisation of existing ground contamination by rainwater leaching or groundwater ingress.</p> <p>Mixing and movement of contaminated soils by wind blown dust, vehicle movements or soil handling operations.</p> <p>Contamination arising from temporary storage of demolition materials, by mobilisation or mixing/movement.</p>	<ul style="list-style-type: none"> Any water ingress to excavation areas will be controlled to minimise the volume of water that could become contaminated (if contamination were present) and require subsequent management. Where soil contamination is identified, any water that enters excavations will also be sampled and analysed. If there is a need to pump contaminated water out of excavations, this will be done such as to ensure that the waste water is disposed of appropriately. Before the excavation of any soil that may be required, ground will be surveyed to ensure that no contamination is present. Any soils identified as contaminated will be segregated from non-contaminated soils and carefully managed to prevent spread of contamination, then disposed of off-site at appropriate disposal facilities, subject to the necessary regulatory permissions. Any excavated material will be monitored prior to reuse as infill. Demolition wastes will be subject to analysis to determine their suitability for later use as a backfill material to below-ground voids on the site. Demolition wastes identified as contaminated will be appropriately managed.
	<p>Spills and Leaks</p> <p>Spills and leaks of non-radioactive chemicals.</p>	<ul style="list-style-type: none"> Fuel and lubricating/hydraulic oil or other chemicals stored on site will be stored in above ground tanks located within bunded facilities, as recommended in GPP 2 and PPG 6. Refilling or emptying of these tanks will be in accordance with the guidelines in PPG 6. Underground tanks will be decommissioned and removed in accordance with PPG 27. Any accidental spills of fuel/oil/chemicals will follow procedures in the Spill Response Plan for the site in accordance with GPP 21.
Landscape and Visual	<p>Reduction in the magnitude of visual impacts</p>	<ul style="list-style-type: none"> Construction of temporary screening in selected locations around the perimeter of the site to obscure low level operations and site vehicle movements. Careful positioning of the contractors' compound and temporary buildings within less visible parts of the site. Careful design and positioning of site or construction lighting. Avoiding lit facades on buildings. Use of low level, directional lighting where this is practical. Use of recessive coloured cladding on the reactor buildings.
Noise and Vibration	<p>Local Residential Properties</p> <p>Noise and vibration generated during construction work.</p>	<ul style="list-style-type: none"> Good working practices to ensure noise and vibration generation is minimised. Demolition activities to be undertaken predominantly during the daytime.

Care & Maintenance Preparations Phase

Mitigation measures already identified (Condition 3a) - continued

Topic	Nature of impact	Mitigation Measures Proposed
Socio-economic	<p>Employment</p> <p>Employment levels will be reduced as the Care and Maintenance stage progresses (full time members of staff and contractors).</p>	<p>Where possible staff will be re-deployed elsewhere within the nuclear industry. Opportunities for re-skilling, retraining and early retirement will also be provided.</p>
Surface Water Quality and Drainage	<p>Turbid Water</p> <p>Release of turbid and/or contaminated water into Gullielands Burn, River Annan or Solway Firth, impacting ecology or water quality. A release could be from site run-off or ground-works.</p>	<ul style="list-style-type: none"> • Adoption of best management practices to control release of turbid water (e.g. SEPA GPPs and CIRIA guidance) such as, buffer strips next to watercourses, cut-off drains, sumps for collecting turbid water, minimisation of soil stockpiling and diversion of any site runoff in close proximity to watercourses. • Surface water discharges will be made in accordance with site discharge limits.
	<p>Traffic Related Effects</p> <p>Release of sediments and other pollutants from traffic, entering Gullielands Burn or the River Annan, impacting ecology and water quality.</p>	<ul style="list-style-type: none"> • A wheel wash will be used by traffic leaving demolition areas. • Water used in the wheel wash will be recycled, thereby avoiding discharges into the aquatic environment. • All on site roads close to the site exit points will be kept swept to ensure that there is no soiling of public highways. • Vehicles will also be kept in good working order.
	<p>Minor Spills and Leaks</p> <p>Minor spills and leaks of non-radioactive chemicals, impacting aquatic ecology and water quality.</p>	<ul style="list-style-type: none"> • The use of chemicals will be minimised as far as practicable. • All chemicals, fuels, lubricants, oils and other potential contaminants will be stored on-site in designated areas in accordance with best practice and SEPA PPGs. • Spill response kits will be available.
Traffic and Transport	<p>No significant adverse environmental impacts identified arising from decommissioning activities.</p>	

Care & Maintenance Phase

Mitigation measures already identified (Condition 3a) - continued

Topic	Nature of impact	Mitigation Measures Proposed
During Care and Maintenance no significant works are planned.		No mitigation actions are required.

Final Site Clearance Phase

Mitigation measures already identified (Condition 3a)

Topic	Nature of impact	Mitigation Measures Proposed
Air Quality and Climatic Factors	No significant adverse environmental impacts identified arising from decommissioning activities.	
Archaeology and Cultural Heritage	No significant adverse environmental impacts identified arising from decommissioning activities.	
Ecology	<p>Surface water quality</p> <p>Release of contaminants and resulting reduction in water quality of the River Annan and tributaries, which could affect aquatic ecological receptors.</p>	<p>The potential release of contaminants into the aquatic environment will be controlled through the adoption of best management practices, for example those currently provided in SEPA Pollution Prevention Guidelines and CIRIA guidance.</p>
	<p>Nesting Birds</p> <p>Disturbance of nesting birds.</p>	<p>Suitable nest sites will be checked prior to any demolition works being carried out during the breeding season (March – July).</p>
	<p>Bats</p> <p>If bat roosts/hibernacula are present, demolition of buildings that support bats could result in their injury or death.</p>	<p>Surveys will be carried out prior to the demolition of buildings containing potential roosts/hibernacula. Where necessary, any entrances to roosts/hibernacula will be blocked (under licence from the Scottish Natural Heritage) and alternative roosts/hibernacula will be provided.</p>
Geology, Hydrogeology and Soils	<p>Groundwater</p> <p>Degradation of existing groundwater supplies by way of yield and/or water quality.</p>	<ul style="list-style-type: none"> • Any water ingress to excavation areas will be controlled to minimise the volume of water that could become contaminated (if contamination were present) and require subsequent management. • Where soil contamination is identified, any water that enters excavations will also be sampled and analysed. If there is a need to pump contaminated water out of excavations, this will be done such as to ensure that the waste water is disposed of appropriately. • Before any excavation of any soil that may be required, ground will be surveyed to ensure that no contamination is present. • Any excavated material will be monitored prior to reuse as infill. • Demolition wastes will be subject to analysis to determine their suitability for later use as a backfill material to below-ground voids on the site.

Final Site Clearance Phase

Mitigation measures already identified (Condition 3a) - continued

Topic	Nature of impact	Mitigation Measures Proposed
Geology, Hydrogeology and Soils (continued)	<p>Contaminated soils</p> <p>Mobilisation of existing ground contamination by rainwater leaching or groundwater ingress.</p> <p>Mixing and movement of contaminated soils by wind blown dust, vehicle movements or soil handling.</p> <p>Contamination arising from temporary storage of demolition materials, by mobilisation or mixing/movement.</p> <p>Remediation of existing contaminated land.</p>	<ul style="list-style-type: none"> Any water ingress to excavation areas will be controlled to minimise the volume of water that could become contaminated (if contamination were present) and require subsequent management. Where soil contamination is identified, any water that enters excavations will also be sampled and analysed. If there is a need to pump contaminated water out of excavations, this will be done such as to ensure that the waste water is disposed of appropriately. Before the excavation of any soil that may be required, ground will be surveyed to ensure that no contamination is present. Any soils identified as contaminated will be segregated from non-contaminated soils and carefully managed to prevent spread of contamination, then disposed of off-site at appropriate disposal facilities, subject to the necessary regulatory permissions. Any excavated material will be monitored prior to reuse as infill. Demolition wastes will be subject to analysis to determine their suitability for later use as a backfill material to below-ground voids on the site. Demolition wastes identified as contaminated will be appropriately managed.
	<p>Spills and Leaks</p> <p>Spills and leaks of non-radioactive chemicals.</p>	<ul style="list-style-type: none"> Fuel and lubricating/hydraulic oil or other chemicals stored on site will be stored in above ground tanks located within bunded facilities, as currently recommended in GPP 2 and PPG 6. Refilling or emptying of these tanks will be in accordance with the guidelines currently provided in PPG 6. Underground tanks will be decommissioned and removed in accordance with best practices available at the time. Best practice will be adopted to avoid and deal with any accidental spills of fuel/oil/chemicals.
Landscape and Visual	<p>Reduction in the magnitude of visual impacts</p> <p>To reduce the magnitude of visual impacts from within the power station site.</p>	<ul style="list-style-type: none"> Construction of temporary screening in selected locations around the perimeter of the site to obscure low level operations and site vehicle movements. Careful positioning of the contractors' compound and temporary buildings within less visible parts of the site. Careful design and positioning of site or construction lighting. Avoiding lit facades on buildings. Use of low level, directional lighting where this is practical.
Noise and vibration	<p>Local Residential Properties</p> <p>Noise and vibration generated during construction work.</p>	<ul style="list-style-type: none"> Good working practices to ensure noise and vibration generation is minimised. Demolition activities to be undertaken predominantly during the daytime.
Socio-economic	No significant adverse environmental impacts identified arising from decommissioning activities.	

Final Site Clearance Phase

Mitigation measures already identified (Condition 3a) - continued

Topic	Nature of impact	Mitigation Measures Proposed
Surface Water Quality and Drainage	<p>Turbid Water</p> <p>Release of turbid and/ or contaminated water into Gullielands Burn, River Annan or Solway Firth, impacting ecology or water quality. A release could be from site run-off or groundworks.</p>	<ul style="list-style-type: none"> • Adoption of best management practices to control release of turbid water (e.g. SEPA GPPs and CIRIA guidance) such as, buffer strips next to watercourses, cut-off drains, sumps for collecting turbid water, minimisation of soil stockpiling and diversion of any site runoff in close proximity to watercourses. • Surface water discharges will be made in accordance with site discharge limits.
	<p>Traffic Related Effects</p> <p>Release of sediments and other pollutants from traffic, entering Gullielands Burn or the River Annan, impacting ecology and water quality.</p>	<ul style="list-style-type: none"> • A wheel wash will clean all traffic leaving demolition areas. • Water used in the wheel wash will be recycled, thereby avoiding discharges into the aquatic environment. • All on site roads close to the site exit points will be kept swept to ensure that there is no soiling of public highways. • Protective butts on bridge crossings will prevent turbid water running off bridges into the water environment. • Vehicles will also be kept in good working order.
	<p>Minor Spills and Leaks</p> <p>Minor spills and leaks of non-radioactive chemicals, impacting aquatic ecology and water quality.</p>	<ul style="list-style-type: none"> • The use of chemicals will be minimised as far as practicable. • All chemicals, fuels, lubricants, oils and other potential contaminants will be stored on-site in designated areas in accordance with best practice and SEPA GPPs. • Spill response kits will be available.
Traffic and Transport	No significant adverse environmental impacts identified arising from decommissioning activities.	

4.2 Options where mitigation may be required but options cannot yet be selected

Mitigation measures currently under consideration (Condition 3b)

Environmental Impact	Mitigation Measures under Consideration
Historic value	
Historical value of Chapelcross	<p>A strategy to preserve the historical and industrial value of all Magnox reactor sites, of which Chapelcross is one, is being considered. Magnox Ltd will provide supporting information to the Nuclear Decommissioning Authority (NDA) as required to assist in making any decisions. Potential options include the following:</p> <ul style="list-style-type: none">• Undertaking a comprehensive cataloguing of existing photographs and supplementing these with new photographs where appropriate.• Retaining operational records and other documents of interest.• Displaying items of plant of interest, e.g. panels from a control room, in a visitors centre and/or museum. There are several items held within a permanent exhibition at Annan Museum.

5. Implementation of the Environmental Management Plan

It is a requirement of the conditions attached to the consent (see Appendix A), to implement the mitigation measures and to describe their effectiveness. This section covers the measures (as identified in section 4) that have been implemented with details of decommissioning projects implemented during 2017 and describes how the effectiveness of these measures has been measured.

Note: Not all mitigation measures were required during 2017 due to the types of activities being undertaken and the lack of potential for a significant adverse impact.

Process for Implementation of Mitigation Measures

Under the Unified Arrangements for Regulatory Compliance in Projects During Defuelling and/or Decommissioning (See Appendix B) Chapelcross ensures that decommissioning activities are carried out in accordance with the Environmental Management Plan. All changes to the system are assessed, during the proposal stage, against the requirements of the Environmental Management Plan and, where appropriate, mitigation measures are put in place to prevent impacts identified. This is a part of the integrated management system on site that is certified against ISO 9001, ISO 14001 and OHSAS 18001. In addition, where there is the potential for an activity to produce significant discharges or disposals, either radioactive or non-radioactive, the site undertakes appropriate optioneering studies (Best Practical Environmental Option/Best Practicable Means).



Figure 5: Groundwater Monitoring at Chapelcross

Process for Determining Effectiveness of Mitigation Measures

The site aims to continually monitor the effectiveness of mitigation measures over time. Where mitigation measures are not sufficiently effective, they will be reviewed and amended as necessary to ensure success in minimising significant adverse environmental impacts. A key part of this process is the embedment of environmental advisors within the Project Teams ensuring that mitigation measures are considered, applied and, where relevant, reviewed throughout the lifespan of the project. The effectiveness of the mitigations is monitored in a variety of ways as described below.

1) Environmental Performance Monitoring

Environmental performance monitoring (e.g. dust, noise, groundwater monitoring) is performed using specialist equipment. This allows assessment of environmental impacts post-mitigation in addition to being of use for determining baseline conditions. The main use of post-mitigation environmental monitoring will be for larger projects, such as the demolition of buildings or movement of large quantities of spoil. The need for this form of monitoring is determined on an individual basis for each project based on the anticipated activities and the potential for significant adverse impact.

2) Visual Evidence

Inspections of the work area both prior to, during and after project works are used to assess the requirements for mitigation, on going suitability of the mitigations and overall success in minimising significant adverse impacts. Where it is deemed appropriate photographic evidence can be gathered to support the assessment of effectiveness.

Routine site tours by suitably qualified individuals are used to identify areas of success and areas for improvement. These tours are used to monitor the effectiveness of mitigations on environmental receptors.

A raptor specialist was contracted to visit the site on several occasions to carry out surveys and provide advice on peregrine nesting. She was able to confirm decommissioning activities were not disturbing the peregrines which visit, and in the past have roosted, at Chapelcross.

3) Review of Regulatory Action, Complaints and Internal Event Reporting

This is a form of reactive monitoring which can provide valuable information about where mitigations may not be effective or where further mitigations are required. The site operates a robust system of internal event reporting, where workers are encouraged to report conditions which are unsafe or pose a threat to the environment. As part of this system all reported events are investigated and where necessary remedial actions are put in place.

5. Implementation of the Environmental Management Plan (continued)

Examples of Work Completed Requiring Mitigation Measures

There has been significant progress in a number of decommissioning projects this year.

The Heat Exchanger De-planting Project has completely removed the top duct assemblies from all heat exchangers, and stripped the external steelwork and pipework from heat exchangers 1, 2, 12, 13, 15 and 16.

It is expected that steel and pipework will be stripped from the remaining heat exchangers by Spring 2018.



Figure 6: Reactors with top ducts removed. Steelwork and pipe work strip progressing.

The construction of an Interim Storage Facility for the storage of Intermediate Level Waste has progressed with the concrete slab and walls poured, and the erection of steel work for the outer weather protection envelope under way. An environmental risk assessment was carried out to ensure mitigations for spills and leaks from plant and machinery, and suitable arrangements were identified for the management of water and waste arisings.



Figure 7: Construction of Intermediate Level Waste Interim Storage Facility

The Solvent Plume Project carried out the physical remediation works of injecting a Hydrogen Release Compound (HRC) into the soils around the armature treatment bay and car park in 2017. The technique works by the application of an organic carbon source and microbial action to breakdown the solvent and remove the contamination. Monitoring boreholes installed down gradient of the source are sampled regularly to monitor progress.



Figure 8: Solvent plume remediation works

All of these projects recognised the requirements to minimise the risk of harm to the environment and each project had an embedded environmental adviser working closely with the Project Team. Potential impacts on EIADR99 compliance are specifically considered during the planning phase of each decommissioning project. This ensures environmental risks are identified and appropriate mitigation is applied. Throughout the execution phase of each project regular Project Safety Reviews are carried out by teams of independent specialists. These teams include senior management representation and environmental performance and protection is always considered and reviewed.

During the Heat Exchanger Projects appropriate mitigation was provided to prevent disturbance of nesting birds. Briefings were provided to the workforce and a local ornithologist visited the worksite several times before and during breeding seasons. Particular attention was paid to the protection of peregrines which are regular visitors to Chapelcross. A pair of Peregrines nested on Heat Exchanger 15 and successfully reared 2 chicks.

The potential for leaks of fuel, hydraulic fluids and other chemicals causing contamination of land or pollution of controlled waters was continually assessed and mitigated against. Oil and chemical storage inspections were regularly conducted to ensure best practice was applied to their storage and use. Site equipment is kept contained and in good order and contractors' plant and vehicles are inspected before entry to site and re-examined regularly.

In addition it should be noted that Chapelcross occupies a large area and much of the land is undeveloped. A Biodiversity Action Plan is in place to protect wildlife and their habitat and the Plan applies to decommissioning projects.

6. Changes to the Environmental Management Plan

There are no significant changes to the mitigation measures that were submitted in the Environmental Statement and reported in previous issues of the Environmental Management Plan. Chapelcross Site will notify the ONR of any significant change to a mitigation measure no less than 30 days before the change is made, or within such shorter time as the ONR may agree.

7. Distribution of the EMP

In addition to the submission of this EMP to the ONR, Magnox Ltd will make the document publicly available via the Magnox Website.

This EMP can also be viewed at the following locations:

- Annan Library, Charles Street, Annan, Dumfriesshire DG12 5AG Tel: 01461 202809;
- Gretna Library, Richard Greenhow Centre, Central Avenue, Gretna, Dumfriesshire DG16 5AQ Tel: 01461 338000;
- Lockerbie Library, 31-33 High Street, Lockerbie, Dumfriesshire DG11 2JL Tel: 01576 203380;
- Eastriggs Library, Eastriggs Community School, Eastriggs, Annan, Dumfriesshire DG12 6PZ Tel: 01461 40844;
- Annan Town Hall; 16 High Street, Annan DG12 6AQ Tel: 01461 203311; and
- Dumfries and Galloway Council Offices, English Street, Dumfries DG1 2DD Tel: 01387 260000.

8. Definitions

ALARA	As Low as Reasonably Achievable	ILW	Intermediate Level Waste
ALARP	As Low as Reasonably Practicable	ISO	International Organization for Standardization (certification body)
AOD	Above Ordinance Datum	LLW	Low Level Waste
AONB	Area of Outstanding Natural Beauty	OHSAS	Occupational Health and Safety Advisory Services (certification body)
BAT	Best Available Technique	ONR	Office for Nuclear Regulation
BPEO	Best Practicable Environmental Option	PPG	Pollution Prevention Guideline
BPM	Best Practicable Means	PWMP	Project Waste Management Plan
CIRIA	Construction Industry Research and Information Association	SAC	Special Area of Conservation
DPAF	Decommissioning Proposal Approval Form	SAM	Scheduled Ancient Monument
EIADR	Nuclear Reactors (Environmental Impact Assessment for Decommissioning Reactors) Regulations 1999	SEPA	Scottish Environment Protection Agency
EMP	Environmental Management Plan	SPA	Special Protection Area
HSE	Health and Safety Executive	SQEP	Suitably Qualified and Experienced Person
		SSSI	Site of Special Scientific Interest

APPENDIX A

Letter Providing Consent to Decommission and Attached Conditions

Decommissioning Project Consent No.1

September 2005

NUCLEAR REACTORS (ENVIRONMENTAL IMPACT ASSESSMENT FOR DECOMMISSIONING) REGULATIONS 1999

CONSENT

granted under regulation 4(b)
in accordance with regulation 8(3)
with conditions attached under regulation 8(4)

CHAPELCROSS POWER STATION

The Health and Safety Executive, for the purposes of regulation 4(b) in accordance with regulation 8(3), hereby grants consent for carrying out the project¹² applied for under regulation 4(a), in particular, to remove all buildings except the reactor buildings, alter the reactor buildings for a period of deferment, retrieve and package operational intermediate level waste, store the intermediate level waste until it can be removed from site, and clear the site, subject to the conditions under regulation 8(4) attached.

Dated:

For and on behalf of the
Health and Safety
Executive

Signed

Dr S. L. Creswell
A person authorised to act in
that behalf

¹² Project as defined in regulation 2

**NUCLEAR REACTORS (ENVIRONMENTAL IMPACT ASSESSMENT FOR
DECOMMISSIONING) REGULATIONS 1999**

CONDITIONS

attached under regulation 8(4)
to Decommissioning Project Consent No. 1 granted under regulation 4(b)

CHAPELCROSS POWER STATION

Condition 1

The project¹³ shall commence before the expiration of five years from the date of this Consent.

Condition 2

- (1) The licensee is required to prepare and implement an environmental management plan to cover mitigation measures to prevent, reduce and where possible offset any significant adverse effects on the environment.
- (2) The project shall not be carried out except in accordance with the environmental management plan.

Condition 3

Within 90 days of the date of this Consent, with reference to the environmental statement provided under regulation 5(1) and evidence to verify information in the environmental statement, provided under regulation 10(9), the environmental management plan shall:

- a. list the mitigation measures that are already identified in the environmental statement and evidence submitted to verify information in the environmental statement;
- b. list the options to implement work activities where mitigation measures may be required but where selection of an option will only be possible in the future;
- c. list the work activities where mitigation measures may be required but where assessments to identify mitigation measures will only be possible in the future.

Condition 4

Subsequent to condition 3, the environmental management plan shall:

- a. with reference to condition 3b, identify the mitigation measures for options that have been selected, giving reasons for their selection;
- b. with reference to condition 3c, identify the mitigation measures from assessments carried out, giving reasons for their selection;
- c. describe the effectiveness of the mitigation measures over time;
- d. describe significant changes to the mitigation measures in light of experience, giving reasons for such changes.

Condition 5

The licensee is required to:

- a. provide the environmental management plan to the Health and Safety Executive within 90 days of the date of this Consent and every year thereafter, or within such longer time as the Executive may agree;
- b. make the environmental management plan available to the public within 30 days of the plan being sent to the Health and Safety Executive, or within such longer time as the Executive may agree; the plan may replace earlier versions.

Condition 6

The licensee is required to provide notice to the Health and Safety Executive of any significant change to a mitigation measure to prevent, reduce and where possible offset any major adverse effects on the environment no less than 30 days before the change is made, or within such shorter time as the Executive may agree.

Dated:

For and on behalf of the
Health and Safety Executive
Signed

Dr S. L. Creswell
A person authorised to act in
that behalf

¹³ Project as defined in regulation 2

APPENDIX B

Site procedures for minimisation of impacts — Decommissioning Proposal Approval Form

PART 5 – ENVIRONMENTAL SAFETY ASSESSMENT				
Both 5.1 and 5.2 are to be categorised individually before an overall environmental category is assigned in 5.3.				
5.2	EIADR 99 ENVIRONMENTAL IMPACT AND REGULATORY COMPLIANCE The following checklist must be completed by an Environmental SQEP/S* . The assessment is for compliance with the decommissioning consent and other relevant aspects of compliance with the EIADR99 Regulations, non-radiological permits/consents, other relevant legislation and environmental issues. *Generally Environmental SQEP/s on site have competency to assess all aspects of 5.2, where this is not the case, the site must ensure that appropriate assessment is made.			
	PARAMETER	CONSIDER POTENTIAL FOR:	NO	YES
5.2.1	Decommissioning Baseline	Does this proposed modification represent a change from the Decommissioning Project baseline as described in the Environmental Impact Assessment Baseline document (in particular, is it sufficient to trigger Regulation 13 determination)? If 'YES', it is considered to be a change - complete the relevant Assessment Forms in accordance with S-159.		
5.2.2	Management	Does the proposal challenge compliance with the EIADR Regulations including adequacy of mitigation measures proposed?		
5.2.3	Discharges & Waste	Could the proposal, if inadequately conceived or executed, lead to a breach of an existing Environmental Permit, or other environmental license/regulatory requirement (e.g. wildlife management license, PCB registration, greenhouse gas trading permit, marine consent, waste management exemption)? (For Scottish sites, a breach of a Controlled Activities Regulations Discharge Consent, Pollution Prevention Control Permit, Waste Management / Exemption?)		
5.2.4	Discharges & Waste	Is a change to an existing Environmental Permit or new Environmental Permit required for this proposal? (For Scottish sites, a change to existing/or a new Controlled Activities Regulations Discharge Consent, IPC authorisation, PPC Permit, Waste Management / Exemption?)		
5.2.5	Environmental Impacts	Could the proposal, if inadequately conceived or executed, lead to an unacceptable environmental impact (e.g. inadequate storage of oils and chemicals leading to on or off-site spill, disturbing known or suspect contaminated ground)? If so, appropriate controls/ mitigation must be specified		
5.2.6	If all answers are 'NO' then the proposal is Category E3. If 'YES' is answered to any questions above, then assess the environmental impacts and provide further information below.			
5.2.7	CONTROL MEASURES AND COMMENTS Describe the control measures that will be used to ensure that environmental risks will be acceptable.			
5.2.8	Potential Environmental Category with respect to EIADR 99 Compliance and all other environmental aspects:			
	E1	E2	E3	
	Name: <i>Environment SQEP</i>	Signature:	Date:	

PART 5 – ENVIRONMENTAL SAFETY ASSESSMENT

Both 5.1 and 5.2 are to be categorised individually before an overall environmental category is assigned below.

5.3	OVERALL ENVIRONMENTAL ASSESSMENT To be completed by the NRE , with signatures from Environmental SQEP and EHSS&Q Manager as appropriate.												
5.3.1	ENVIRONMENTAL JUSTIFICATION / MITIGATION												
5.3.2	<p>OVERALL ENVIRONMENTAL CATEGORY The environmental category is determined by reviewing the adequacy of the environmental hazard identification and assessment carried out and consider whether any other relevant aspects of the category definitions given in MCP-099 Appendix 1 are relevant. Select the relevant box below.</p> <p>Environmental control and mitigation measures required have been identified above and will be incorporated in the design or working methods. Any further Environmental Justifications (e.g. BAT / BPM) should be attached.</p> <p>RECOMMENDED ENVIRONMENTAL CATEGORY:</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td style="width: 33%;">E1</td> <td style="width: 33%;">E2</td> <td style="width: 33%;">E3</td> </tr> <tr> <td>Name: <i>Environment SQEP</i></td> <td>Signature:</td> <td>Date:</td> </tr> </table> <p>For category E1 modifications, two additional signatures are required:</p> <p>1) Confirm awareness of the modification proposal.</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td style="width: 33%;">Name: <i>EHSS&Q Manager</i></td> <td style="width: 33%;">Signature:</td> <td style="width: 33%;">Date:</td> </tr> </table> <p>2) Confirm that the modification proposal has been reviewed by Head of Profession – Environment and that comments / recommendations have been addressed.</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td style="width: 33%;">Name: <i>NRE</i></td> <td style="width: 33%;">Signature:</td> <td style="width: 33%;">Date:</td> </tr> </table>	E1	E2	E3	Name: <i>Environment SQEP</i>	Signature:	Date:	Name: <i>EHSS&Q Manager</i>	Signature:	Date:	Name: <i>NRE</i>	Signature:	Date:
E1	E2	E3											
Name: <i>Environment SQEP</i>	Signature:	Date:											
Name: <i>EHSS&Q Manager</i>	Signature:	Date:											
Name: <i>NRE</i>	Signature:	Date:											

APPENDIX C

Stakeholder Engagement

Whilst decommissioning represents a new phase in the lifecycle of the site, Magnox Ltd remains committed to engaging with stakeholders at all phases in the process. Regular meetings have been held with the Chapelcross Site Stakeholder Group. In addition other organisations (see Figure 9) will be kept informed of activities at the site. The organisations listed in Figure 9 were also involved in the public consultation process for the Environmental Statement.

As well as regular meetings with stakeholders, where appropriate, other interested parties will also be kept informed of specific decommissioning activities. Some examples are shown in Figure 10.

Figure 9. Local Stakeholders

Dumfries and Galloway Council.
Scottish Environment Protection Agency.
Scottish Natural Heritage.

Figure 10. Examples of Additional Stakeholder Activities

- Liaising with the Highways Agency, Transport Scotland and the Local Highways Authority when large cranes were required to be brought to site in support of the Heat Exchanger Project.
- Forestry Commission Scotland were consulted for advice on woodland management to increase the value to society and the environment.

The role of the Nuclear Decommissioning Authority (NDA)

The Energy Act (2004, as Amended) requires that the NDA must prepare a strategy for carrying out its functions and from time to time to review that strategy. This strategy must set out the steps that the NDA proposes to take for:

- giving appropriate publicity to its responsibilities and strategy;
- explaining them both to persons having a particular interest in matters relating to the carrying out by the NDA of its functions and to the general public;
- ensuring that the NDA is kept informed at all times of the opinions about such matters of persons having such a particular interest;
- facilitating the communication by such persons of their opinions to the NDA.

The NDA is also required to give encouragement and other support to activities that benefit the social or economic life of communities living near those sites for which it has responsibilities, including Chapelcross.

APPENDIX D

Information on site working and environmental performance

Site Management and Decommissioning

General Site Management

Hours of Work

Current normal working hours are between 07:40 and 16:15 hours, Monday to Thursday and between 07:40 and 15:40 on Friday. Most decommissioning work on site will also be undertaken during these hours under a single shift working arrangement, but this may alter for certain activities. For example, from time to time the working day may be extended in order to complete specific items of work safely, and some night-time working may be required to accommodate certain activities such as concrete pouring. Seven days a week, 24 hours a day shift working may be necessary for retrieval of waste and for subsequent waste packaging operations.

Lighting

The existing night time illumination of the site consists mainly of internal lights within the transparently clad parts of the reactor building and turbine hall, together with 'street' lights.

During Care & Maintenance Preparations and Final Site Clearance, further lighting may be necessary at times. Suitable lighting will be installed to assist in the on-site works. Use of such lighting, which would only normally be at the start and end of the working day during the winter months, will be at the discretion of the relevant Project Supervisor. The existing security lighting will be retained.

During Care & Maintenance it is expected that there will be occasional low level 'street' lighting on service roads, provided for staff attending site during the hours of darkness, and lighting activated by site security systems.

Transport

Large vehicle and plant movements to and from Chapelcross will be subject to the provisions of a Traffic Management Plan. Magnox as a business encourages the minimisation of transport using cars including use of video conferencing and public transport. The company encourages use of the government cycle to work scheme. Chapelcross site promotes use of car share scheme initiatives through on-site communications.

Decommissioning Methods

Conventional Area Decommissioning

Conventional plant and buildings will be de-planted and demolished using standard construction industry methods. The methods to be employed will be detailed in method statements for individual projects. All buildings and structures will be demolished to slab level with the plan to remove slabs/foundations at final site clearance as required to meet the next planned use of the site. Any voids, e.g. the basements of the turbine halls, will, where appropriate, be filled using acceptable material from the demolition of the buildings. Any remaining structures will be punctured to assist drainage.

Heavy plant will be split into components or sub-component parts prior to removal by crane. Mechanical and flame cutting will be used to prepare the plant for lifting. Buildings will be demolished using a variety of methods including JCB type vehicles, excavators with metal shears and concrete crushing attachments. Some work will also be carried out by hand.

As outlined in the Environmental Statement, mitigation against noise and vibration will be through maximising distance and screening where possible as well as restricting hours of work where possible. However the need for mitigation will also be reviewed on a project by project basis and effective measures put in place if required.

Demolition of Radioactive Facilities

Radioactive plant in the reactor buildings will be decontaminated, where practicable, and dismantled. If practicable, plant and equipment will be decontaminated in situ and recycled. Examples of these decontamination processes are shown in Figure 11. Contamination control provisions will be applied (e.g. work will be done within temporary enclosures) and working procedures will take account of the requirement to minimise workers' exposure to radiation to As Low As Reasonably Practicable (ALARP) and ensure Best Practicable Means (BPM) are applied to minimise the creation of secondary waste and to ensure the impact of radioactive discharges on the public and the environment are As Low As Reasonably Achievable (ALARA).

Following decontamination and de-planting, buildings scheduled for demolition during Care & Maintenance Preparations will be demolished using conventional techniques. Structures will be sampled and characterised before demolition, monitoring checks will be made on the buildings as demolition proceeds and on the resulting demolished materials prior to disposal. Waste will be segregated and disposed of by the appropriate route.

Figure 11: **Examples of Decontamination Techniques**

- **Chemical decontamination** involves the use of chemicals to remove the surface contamination.
- **Scabbling** involves the physical removal of surface contamination, predominantly on concrete.
- **Shot blasting** uses high velocity shot to remove surface contamination.
- **Water jetting** involves the use of a pressurised water jet to remove surface contamination.
- **Wipe down** where contamination is removed by 'wiping'; specialist equipment and materials are usually required.

APPENDIX D — Continued

Waste Management

Intermediate Level Radioactive Waste (ILW)

During the Care and Maintenance Preparations Phase of the Site's Lifetime Plan, the Site will process a number of ILW streams which arose during the operation of the Site. These wastes will either be processed to enable them to be treated as LLW or out of scope, or they will be packaged for storage in line with the Scottish Higher Activity Waste Policy.

Low Level Radioactive Waste (LLW)

LLW arising from operational and decommissioning activities is processed and packaged on-site before being transferred to a waste permitted person for further treatment or disposal.

Out of Scope Waste

Out of scope wastes are those which have been assessed, and are not subject to control under the Radioactive Substances Act 1993. These wastes are processed and packaged on-site before being transferred to an appropriate person for further treatment or disposal.



Figure 12: **Metal waste being sampled before sentencing and disposal**

Non-radioactive Hazardous Wastes

All hazardous wastes are managed by the Site Waste Operations Team. Disposal of hazardous waste is via authorised contractors who hold the appropriate Waste Carrier's Registration and Permits or exemptions for the waste management activities to be undertaken.

These are checked for validity before any disposal occurs. The specific contractor used will depend on the type of waste being disposed. All records are auditable and are checked regularly.

Asbestos

Non-radioactive asbestos is disposed of as a special waste via licensed contractors to licensed disposal sites. Carrier's Registrations and Permits for the waste management activities to be undertaken are checked before any disposal occurs. The site carries out audits periodically to ensure Duty of Care responsibilities are met.

Liquid Radioactive Wastes

Liquid radioactive effluent requiring disposal is transferred to the Ponds Building Detention Tanks where it is settled and sampled before discharge, under the terms of a SEPA Authorisation, to the Solway Firth. A Modular Active Effluent Treatment Plant is currently being manufactured and liquid effluent will be processed through it upon successful active commissioning.

Other Wastes

Non-radioactive waste materials have arisen throughout the operating life of Chapelcross. In general, the management of waste at Chapelcross aims to minimise the need to use landfill by reducing waste volumes wherever possible by following the hierarchy of waste management (i.e. avoid, reduce, reuse, recycle, recover) in line with the Waste (Scotland) Regulations 2011, as amended. Chapelcross follows the duty of care principles for all waste management and where waste is transferred, it is accompanied by a transfer or consignment note and a full written description of the wastes.

Scrap metal (e.g. steel and copper from wiring), plastic, cardboard, paper, compostable material and glass are sent to an appropriate contractor for recycling. If it is not practicable to reuse or recycle any scrap materials they will be disposed of via approved routes in accordance with the duty of care principles.

Non-radioactive effluent is disposed of under the Water Environment (Controlled Activities) (Scotland) Regulations 2011 via surface water drains and under the Sewerage Scotland Act 1968 via foul sewer to the nearby waste water treatment works.

Radioactive Discharges and Emissions during Care & Maintenance Preparations

Radioactive discharges to air and sea from Chapelcross during decommissioning will continue to be made in accordance with the authorisation granted by the Scottish Environment Protection Agency under the provisions of the Radioactive Substances Act 1993. Annual gaseous and liquid discharges have reduced, although there may be some temporary peaks resulting from certain hazard reduction activities in the future.

Environmental Performance

Chapelcross continues to host an Environment Committee which identifies required environmental improvements, develops an Environmental Improvement Plan to deliver these improvements and monitors the progress of the actions that are placed.

The areas for improvement are identified through a comprehensive Aspects Register which has been developed as part of the site's commitment to continual improvement and as a condition of certification under ISO 14001.

A number of focussed improvement plans support the overall aims of the Environmental Improvement Plan, these are:

- **Energy Efficiency Action Plan**
to secure cost effective benefits through reductions in the amount of energy used at Chapelcross.
- **Water Resource and Active Leak Management Plan**
to improve the efficiency with which water is used at Chapelcross and to ensure water losses are minimised.
- **Biodiversity Action Plan**
to enhance biodiversity at Chapelcross and ensure wildlife and habitat is protected and enhanced where possible.



Figure 13: **Juvenile Smooth Newt - Identified on site**



Magnox

Chapelcross Site

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