



# Research Sites Restoration Ltd

## Lifetime Plan Baseline - March 2011

### Issue 1

### Winfrith Site Summary

# Site Overview

- Over 30% of the clean-up programme at Winfrith has been completed.
- Around 50% of the original site has been released for commercial use, employing over 1,000 people.
- Following a period of Care and Maintenance the decommissioning programme will resume in 2023/24 and is scheduled for completion in 2038, with site closure by 2048.
- There are now no high-hazard nuclear facilities at Winfrith.



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Figure 16-01 - Site Key Facts

Basics	Location:	Dorset
	Nearby Towns/Cities:	Dorchester, Wareham
	Site Area:	84 hectares
	Number of Employees:	80 (excluding support staff)
Key Data	WETP and EAST decommissioned.	2011
	Dragon Reactor demolished.	2032
	SGHWR Reactor demolished.	2038
	Sea Discharge Pipeline decommissioned.	2040
	Winfrith ILW Store demolished.	2045
	Site closure completed.	2048
Plant Description	Reactor Types:	Steam Generating Heavy Water Reactor & High Temperature Gas Cooled Reactor
	Number of Reactors:	Two (de-fuelled and in care and maintenance pending final decommissioning)
	Previous Operators:	UKAEA
	Adjacent Nuclear Power Station:	None
Unique Factors	The Winfrith site was acquired in the early 1950s to provide additional research and development facilities due to the Harwell Site having reached operational capacity.	
	Winfrith has had, at various times, nine R&D reactors with one supplying power to the National Grid. The eastern part of the site has been developed as a technology centre and transferred to English Partnerships for further development.	

**Site History**

Winfrith was opened in 1957 to provide additional space for the UK’s civil nuclear research programme. It was a centre for reactor development: the SGHWR provided enough electricity for a small town.

The site later diversified into other disciplines such as safety testing and oil exploration with the last operational reactor closing in 1995.

The site is situated in an area of outstanding natural beauty which has an SSSI (Site of Special Scientific Interest) designation. The eastern part of Winfrith has been developed as a technology centre and was initially transferred to English Partnerships for further development. It was subsequently transferred to a private sector development organisation.

Figure 16-02 - Prioritisation Logic

Key Phase	Focus Area	NDA Priority Area		
		1	2	3
Care and Maintenance (Key Phase 1)	Site Licence Compliance	✓		
	SGHWR and Dragon	✓		
Interim End State (Key Phase 2)	Decommissioning of the following:			
	SGHWR			✓
	Dragon			✓
	Active Drains and Effluent System			✓
	Minor Facilities			✓
	Sea Discharge Pipeline			✓
	Blacknoll Reservoir			✓
Site Closure (Key Phase 3)	Environmental Restoration			✓
	Waste Shipments Off-site			✓
	Waste Stores Decommissioning			✓

This table shows the major activities for this site and how they relate to the NDA led National Prioritisation Working Group priority areas.

**Priority area 1**

Non-discretionary work that is necessary to maintain legal compliance and prescribed and agreed levels of safety and security.

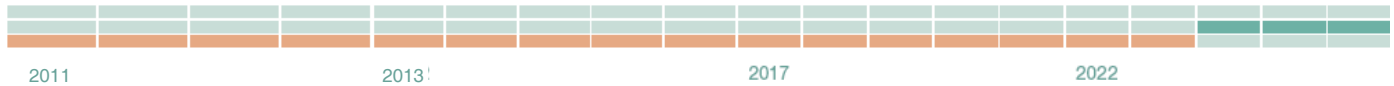
**Priority area 2**

Operations activities.

**Priority area 3**

Discretionary work is that which will allow achievement and acceleration of decommissioning and all other work.

# Work Completed in the Previous Year



The project activities shown below summarise the work completed at Winfrith during the 2010/11 financial year.

## Steam Generating Heavy Water Reactor (SGHWR)

The SGHWR facility continues to be maintained under a care and maintenance schedule. The care and maintenance activities undertaken included ventilation systems, water and drain services, electrical, control and safety related equipment, emergency lighting systems, radiological monitoring equipment, fire detection and alarm systems.



## Dragon

The Dragon facility continues to be maintained under a care and maintenance schedule. These activities comprised monitoring, testing and maintenance of radiological monitoring equipment, fire control systems, lifting equipment, ventilation plant and inspections of the building structure.

## Minor Facilities

The landscaping of the former ZEBRA reactor building area was completed.

## Winfrith Waste Compliance and Consignment.

The continue disposal of historic waste and of waste arising from decommissioning activities.

## Winfrith EAST Treatment Plant (WETP) Operations

All oversized and sandy material arising from the External Active Sludge Tanks (EAST) sludge recovery process has been disposed of to the national Low Level Waste Repository (LLWR), marking the conclusion of sludge immobilisation operations at WETP.

Size reduction of the EAST using diamond-wire sawing and planing techniques has commenced and will continue into next year.

The WETP facility began the post operational clean out (POCO) phase. Strip out and decontamination of the cell line internals and other plant items has taken place.

## Active Liquid Effluent System (ALES) Maintenance

Maintenance and refurbishment of ALES was completed in accordance with the approved engineering maintenance schedule. The sea tank gantry has been refurbished.

Repairs and underpinning of the sub-sea section of the sea discharge pipeline have been successfully undertaken following the discovery of damage to the pipeline found during the annual sea swim inspection.

The clarifier and filter system to replace the old Active Break Tank has been constructed and installed and is now awaiting commissioning.

## Land Quality Environmental Restoration

Annual routine maintenance on the groundwater boreholes across the Winfrith site was completed. The boreholes are used as sampling points to support the groundwater monitoring programme. Annual sampling of the groundwater boreholes on and around the site was performed throughout the year to provide information on groundwater condition, flow direction and gradients across the Winfrith site.

## Winfrith Restoration & Delicensing

The delicensing cases for the A4, A6 / A7, B2 and B3 project land areas are awaiting Nuclear Installations Inspectorate (NII) review and approval.

# Lifetime Plan Overview



The work to deliver the Winfrith site decommissioning programme and achieve the site end-point is covered by three key phases:

- Care and Maintenance
- Interim End State
- Site Closure

### Key Phase 1

#### Care & Maintenance

- Make radioactive waste passively safe, store on site until the Geological Disposal Facility (GDF) is available.
- Partial delicensing of site.

### Key Phase 2

#### Interim End State

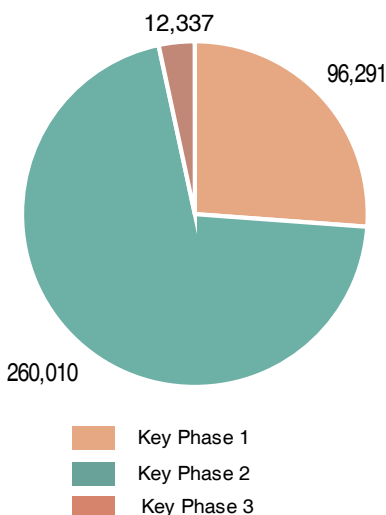
- Continue to store radioactive waste until the GDF is available.
- Decommission redundant nuclear facilities.
- Decommission off-site facilities.
- Demolish redundant buildings.

### Key Phase 3

#### Site Closure

- Transfer material to the GDF.
- Close and decommission the Treated Radwaste Store (TRS) and Winfrith ILW Store.
- Delicense the site.
- De-designate the site (NDA).

Figure 16-03 – Total cost distribution by key phase for Lifetime Plan (£k)



### Key Phase 1

#### Care and Maintenance 2011 to 2023

SGHWR and Dragon reactors at Winfrith entered a period of care and maintenance in April 2008, which encompasses the tasks required to maintain the facilities in a safe and secure state for long-term storage.

#### Waste Operations

The Winfrith EAST Treatment Plant and External Active Sludge Tanks will be decommissioned and demolished. Operation and maintenance of the ALES and the TRS will continue during this period.

### Key Phase 2

#### Interim End State 2024 to 2038

#### Waste Operations

An Intermediate Level Waste (ILW) store will be constructed and the TRS will continue to operate. Equipment to process and package ILW will be built in SGHWR and Dragon and subsequently the packaged waste will be transferred to the newly built Winfrith ILW Store.

Decommissioning will generate Low Level Waste (LLW), Very Low Level Waste (VLLW) and exempt waste. LLW and VLLW will be packaged and disposed off-site. Exempt waste will be used as back-fill on site, or shipped off-site for disposal.

Waste operations will include packing and disposal of bulk sodium. The ALES will continue to operate.

#### Decommissioning and Land Remediation

The SGHWR and Dragon reactors will be subject to decommissioning during this phase.

Decommissioning of the remaining facilities and structures will also be carried out, including the ALES. Off-site facilities, which are the responsibility of RSRL include the Sea Discharge Pipeline and the Blacknoll Reservoir; these will also be decommissioned.

#### Delicensing

The NII will be requested to terminate its licence for areas of the site where decommissioning activities have been surveyed and verified complete.

### Key Phase 3

#### Site Closure 2039 to 2048

#### Waste Operations

The TRS and Winfrith ILW Store will be emptied and their contents transferred to the GDF.

#### Decommissioning and Land Remediation

The TRS and Winfrith ILW Store will be decommissioned and the associated land remediated during this phase.

#### Delicensing

The NII will be requested to terminate its license for the TRS and Winfrith ILW Store areas of the site when the decommissioning activities have been surveyed and verified complete.

#### Site End State

The site end state will be achieved incrementally on an area by area basis throughout all phases. Once the delicensing work is completed during Phase 3 the decommissioning programme for the Winfrith site will have been delivered.

## Detailed Volume Level

Detailed volumes for all projects contain:

Scope Statements

Schedules

Cost Estimate

Site Level Documents

# Key Phase 1- Care & Maintenance

In this key phase from 2011 to 2023, the focus is on carrying out those tasks required to keep the facilities safe and secure prior to decommissioning.

## Care and Maintenance

### SGHWR

The largest structure of the SGHWR complex comprises the Reactor Hall which houses the Primary and Secondary Containment areas and is supported by substantial concrete foundations in the form of a base mat. The North and South Annexes are an integral part of the Reactor Hall structure and provide access and support services for the Reactor Hall.

During the care and maintenance period, structural repairs will be required to enable long-term care and maintenance, including replacement of the roofs over the Turbine Hall and North Annex and the walls reclad. The objective of the work is to provide continued environmental protection and containment of plant and equipment and to provide a safe and controlled environment for workers involved with the maintenance activities.

### Dragon

The Dragon reactor building comprises the reactor core contained in a pressure vessel within the bio-shield, a steel inner containment shell and a concrete outer containment building. Following initial deplanting and decommissioning, the facility has gone into care and maintenance.

During this period, structural repairs will be required to enable the facility to enter long-term care and maintenance.

## Waste Operations

### LLW Operations

Waste arisings (historic and operational) will be processed for disposal by the appropriate route including Substances of Low Activity exemption order (SoLA), VLLW and LLW.

A requirement to process sludge arisings from the SGHWR resin beds has been completed and storage of the drums inside the TRS will continue. Although this waste form is low activity, it was not accepted for disposal at the Low Level Waste Repository (LLWR) hence it is stored in the TRS awaiting disposal in the GDF.

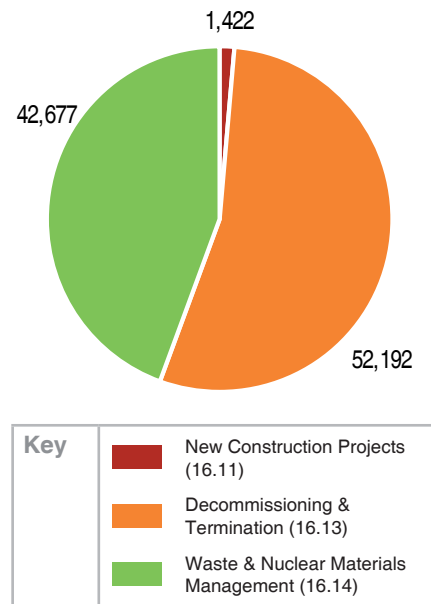
The ALES plant will continue operations throughout this period.

LLW operations covers all activities associated with the processing of; solid LLW generated on Winfrith Site from care and maintenance activities and processing of some LLW from Harwell.

Compactable LLW will be packed into 220-litre drums prior to compaction and disposal in ISO Containers. Smaller items of LLW that are non-compactable will either be packed into 220-litre drums or loaded directly into ISO Containers with other large bulk items of LLW. Mechanical decontamination of individual bulk items of LLW that have been generated from past decommissioning activities will be carried out. Contaminated surface coatings will

be removed using the Winfrith Abrasive Cleaning Machine and will permit the material to be disposed of as radiologically exempt material and hence significantly reduces waste disposal costs.

Figure 16-04 - Key phase cost distribution by category (£k)



Dragon Reactor Building and Offices

# Key Phase 2 - Interim End State

In this key phase from 2024 to 2038, the focus is on making arisings of radioactive waste passively safe and storing them prior to transferring them off site, and decommissioning the redundant facilities.

## Waste Operations

### ILW Operations

ILW will be produced as a result of decommissioning the SGHWR and Dragon reactors. In order for this waste to be stored safely, prior to its transfer to the GDF, facilities for processing and packing ILW will be constructed within the SGHWR and Dragon reactors, and a Winfrith ILW store will be constructed during this phase.

### LLW Operations

This work described in Key Phase 1 continues and includes LLW generated from the decommissioning activities during this phase. The ALES plant will continue to collect, treat and dispose of process and foul effluent, surface water and rainwater on the Winfrith site

### Hazardous Waste Operations

A Best Available Techniques (BAT) assessment will be carried out for the disposal of bulk quantities of sodium metal and the metal will be processed and disposed of, accordingly.

## Decommissioning and Land Remediation

The decommissioning of SGHWR and Dragon comprises all remaining decommissioning, demolition and land remediation activities in preparation for delicensing of the land occupied by the facilities.

The decommissioning of other redundant buildings will commence towards the latter part of this phase, as will the decommissioning of the ALES and Sea Discharge Pipeline.

A BAT assessment, with respect to the Blacknoll Reservoir, will be completed during this phase, and the reservoir decommissioned.

## Delicensing

The remaining 84 hectares, excluding the TRS and ILW store, will be delicensed during this phase. As each area of the site becomes available on completion of decommissioning and land remediation activities, a Delicensing Case will be prepared and submitted to the NII. This will be achieved by:

### Surveys

Surveys will be carried out to verify the adequacy of decommissioning/land remediation work and demonstrate the area can be closed out.

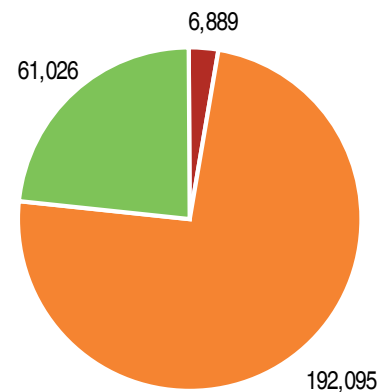
### Close-out

This involves assessing the results from the above surveys, preparing Land Condition Reports to record the status of the land and preparing Delicensing Cases for submission to the NII.

## Handover

Following approval of a Delicensing Case by the NII, changes to the licenced site boundary are marked and RSRL will request that the land area is de-designated by the NDA.

Figure 16-05 - Key phase cost distribution by category (£k)



Key	Category	Value (£k)
<span style="color: red;">■</span>	New Construction Projects	(16.11)
<span style="color: orange;">■</span>	Decommissioning & Termination	(16.13)
<span style="color: green;">■</span>	Waste & Nuclear Materials Management	(16.14)

Progress in the Demolition of Building A59



# Key Phase 3 - Site Closure

In the third and final key phase from 2039 to 2048, the remainder of the site environment will be restored to achieve the delicensing of the nuclear site.

## Waste Operations

The Treated Radwaste Store (TRS) will contain waste from WETP and Half Height ISO containers (HHISO) containing natural and depleted uranium. In the absence of any agreed transfer or re-use plans, the uranium is planned to be managed as waste and shipped to the GDF for disposal, when available. The Winfrith ILW Store will contain waste from the decommissioning of the SGHWR and Dragon reactors. The waste will be shipped to the GDF for disposal, when available.

## Decommissioning and Land Remediation

When the shipments of waste to the GDF have been completed the TRS and the Winfrith ILW Store will be decommissioned and demolished. The land associated with the two facilities will be remediated.

## Delicensing

The last areas, TRS, Winfrith ILW Store and adjacent land, are expected to be delicensed by the NII prior to completion of the programme in 2048. This will be achieved by:

## Surveys

Surveys will be carried out to verify the adequacy of the decommissioning/land remediation work in the above areas to demonstrate the area can be delicensed.

## Close-out

Close-out involves preparing Land Condition Reports to record the status of the land and preparing the Delicensing Case. The Delicensing Case for TRS and Winfrith ILW Store areas will then be submitted to the NII for approval.

## Site End State

To reach the Site End State the following activities will be required:

Approval of a Delicensing Case by the NII, removal of the existing licenced site boundary markers and termination of the Nuclear Site Licence. RSRL will request that these remaining areas of land are de-designated by the NDA.

The NDA will remove its designation that allows the final end state to be achieved and places the Winfrith site in a condition to allow the eastern area of the site being

transferred to the Science and Technology Park and the western area of the site being returned to open heathland.

The Treated Radwaste Store

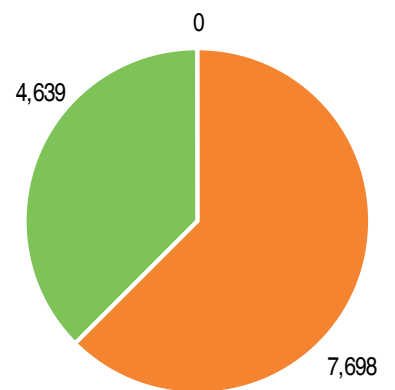


Technologies, both old and new, contribute to the successful decommissioning programme at Winfrith.



Safe transportation of materials on the site enables the successful progression of the decommissioning activities at Winfrith.

Figure 16-06 – Key activity cost distribution by category (£k)



Key	Category	Cost (£k)
<span style="color: orange;">■</span>	Decommissioning & Termination	16.13
<span style="color: green;">■</span>	Waste & Nuclear Materials Management	16.14



Safe drum handling using mechanical aids

# New Construction Projects (16.11)

The objective of the work in this category is to provide a fully operational interim store for storing Intermediate Level Waste (ILW) until the Geological Disposal Facility (GDF) is available.

## Winfrith ILW Store

In addition to the TRS, a new non-shielded ILW store is required on the Winfrith site for the storage of shielded boxes containing grouted ILW from the SGHWR and Dragon reactor decommissioning activities. The store design will be large enough to accommodate the total ILW volume expected to be generated during the course of decommissioning and demolition activities at Winfrith. It will provide for the safe import, retrieval, inspection and maintenance of the stored shielded boxes, as they await export to the GDF.

A number of regulatory interfaces will be involved to ensure that the building complies with the standards applicable to its intended use. The regulatory bodies include the following:

- The Nuclear Installations Inspectorate (NII).
- The Health and Safety Executive (HSE).
- The Environment Agency (EA).
- Dorset County Council and Purbeck District Council.
- NDA's Radioactive Waste Management Directorate's (RWMD).

Figure 16-07 – Budgeted cost of work scheduled (BCWS) profile curve

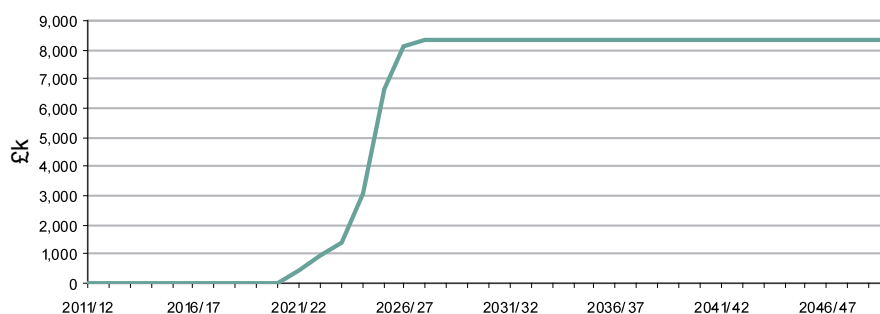


Figure 16-08 – Staffing profile curve against time for New Construction Projects

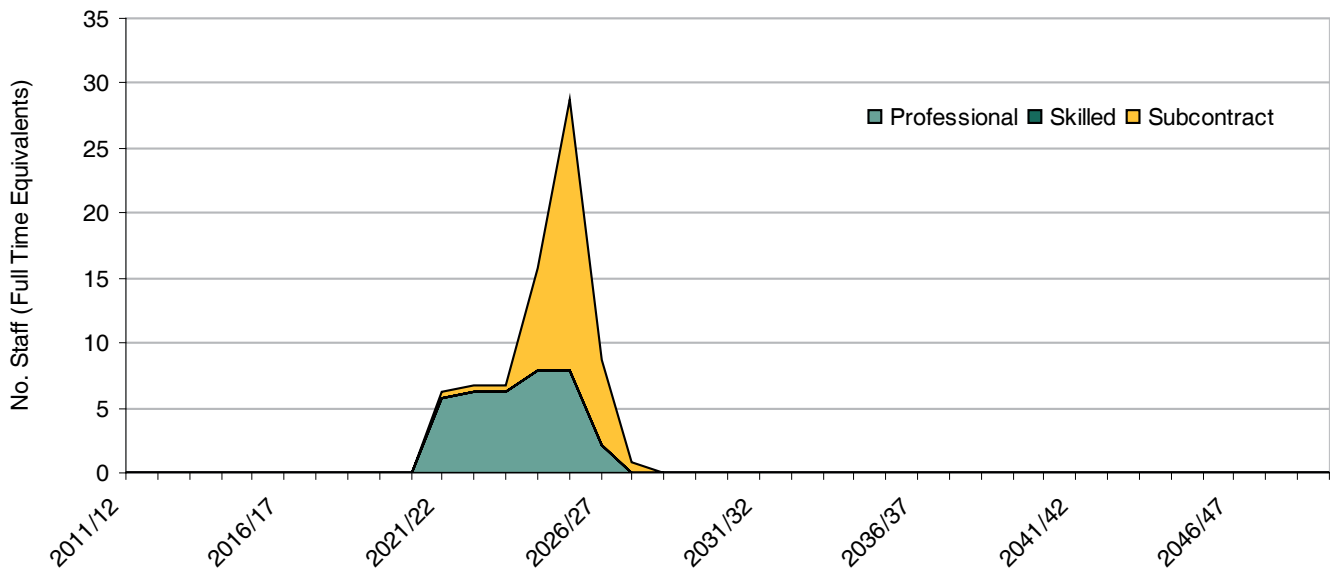
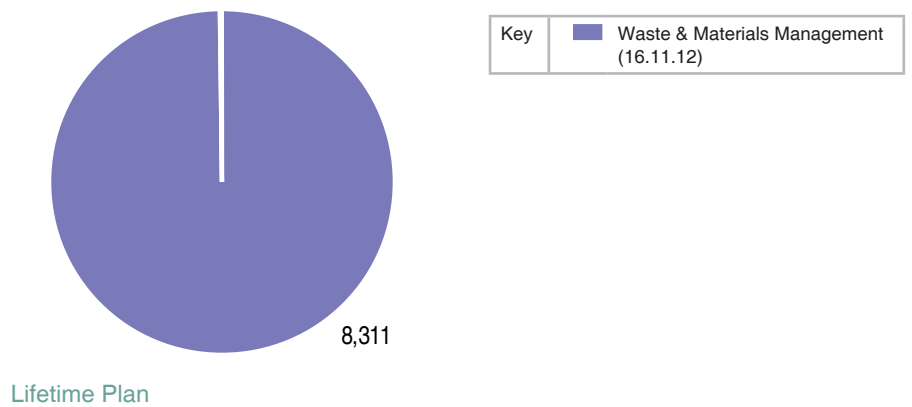


Figure 16-09 – Summary of costs for New Construction Projects

Type	FYs 2011 - 2015					Subtotal years 1-5 (£k)	Subtotal years 6-10 (£k)	Lifecycle Balance years 11+ (£k)	Total To Go Cost (£k)
	Year 1 (£k)	Year 2 (£k)	Year 3 (£k)	Year 4 (£k)	Year 5 (£k)				
Waste & Materials Management (16.11.12)	0	0	0	0	0	0	0	8,311	8,311
<b>Subtotal</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>8,311</b>	<b>8,311</b>
<b>Escalation Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>12,568</b>	<b>12,568</b>
<b>Discounting Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>6,196</b>	<b>6,196</b>

\* Values subject to rounding discrepancies

Figure 16-10 – Cost distribution by type (£k) for New Construction Projects



# Decommissioning & Termination (16.13)

The decommissioning of all nuclear facilities – including removal of waste from on-site stores will be complete by 2048. Delicensing and site closure are scheduled for completion by the end of 2048.



Turbine rotor removal at SGHWR



Site of B3 complex after restoration

### Introduction

The Winfrith site will remain in care and maintenance until 2023 in order to remain within funding guidelines.

### Steam Generating Heavy Water Reactor (SGHWR)

This reactor generated 100MW(e) of electricity; a novel design used heavy water as a moderator and light water for cooling, and featured vertical pressure tubes in preference to a pressure vessel. Following reactor shutdown in 1990 the fuel was removed, substantial decommissioning has been achieved and the reactor has been placed under a care and maintenance regime until 2023. Final decommissioning will then commence and is scheduled for completion in 2038.

### Dragon Reactor

Dragon was an experimental High Temperature gas-cooled Reactor (HTR). It featured a single pressure vessel utilising small fuel pellets housed in a helium-cooled graphite matrix. Following reactor shutdown in 1976, the fuel was removed and substantial decommissioning has already been achieved. The reactor was placed under a care and maintenance regime. Final decommissioning will commence in 2025 and will be completed in 2032.

### Balance of Site Structures

The Balance of Site Structures (BoSS) project encompasses the decommissioning of remaining facilities; this includes off-site plant and equipment e.g. Blacknoll Reservoir and the Sea Discharge Pipeline.

### Environmental Restoration

When all facilities have been decommissioned and demolished, the land will be remediated. The environmental restoration project is an on-going process that seeks to restore the site acceptable to stakeholders. Activities carried out in this project comprise surveying, sampling and analysis of soil and groundwater for radiological and chemical contaminants, appropriate remediation, preparation of land quality statements and the preparation of site delicensing cases. The end state objective for this work is the removal of all areas of the RSRL site from the nuclear site licence. The Winfrith site is scheduled to be fully delicensed and de-designated by 2048.

Figure 16-11 – Decommissioning & Termination budgeted cost of work scheduled (BCWS) profile curve

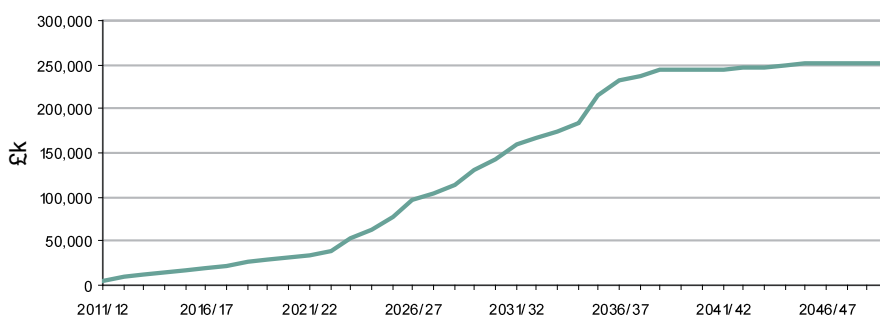


Figure 16-12 – Staffing profile curve against time for Decommissioning & Termination

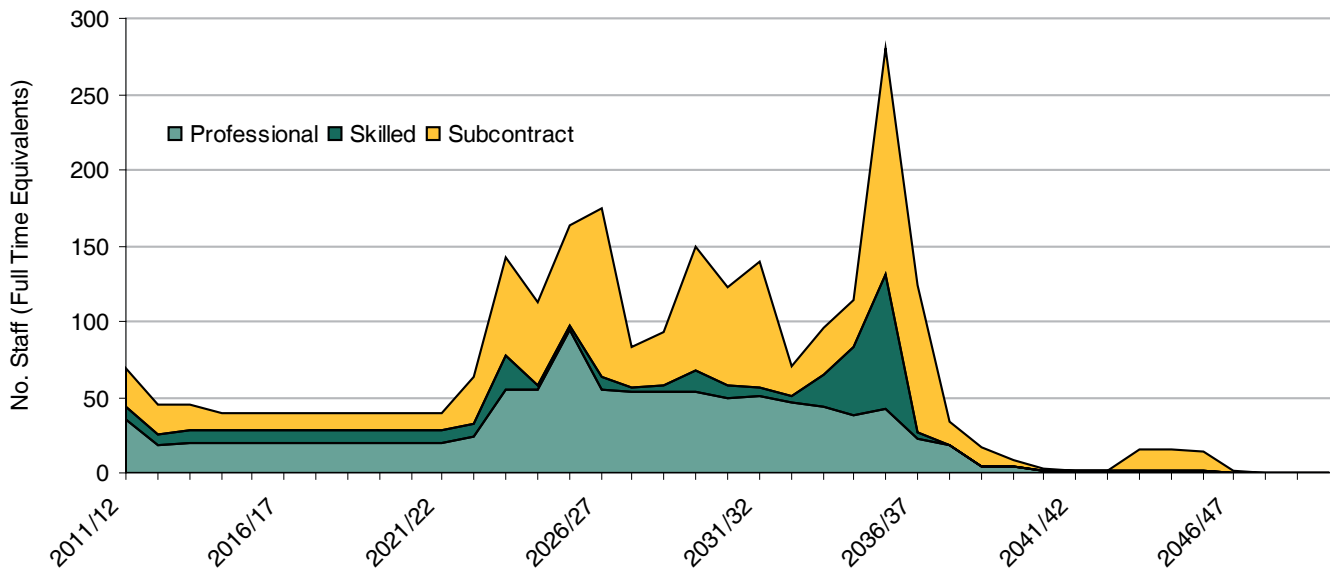


Figure 16-13 – Summary of costs for Decommissioning & Termination

Type	FYs 2011 - 2015					Subtotal years 1-5 (£k)	Subtotal years 6-10 (£k)	Lifecycle Balance years 11+ (£k)	Total To Go Cost (£k)
	Year 1 (£k)	Year 2 (£k)	Year 3 (£k)	Year 4 (£k)	Year 5 (£k)				
Surveillance & Maintenance (16.13.31)	2,232	2,001	1,567	1,237	1,242	8,279	6,181	2,474	16,934
Care & Maintenance (16.13.33)	855	806	1,240	864	865	4,630	4,429	4,075	13,134
Final Decommissioning (16.13.34)	1,791	395	424	423	423	3,455	2,114	198,445	204,014
Groundwater Remediation (16.13.35)	148	53	53	53	53	361	266	951	1,578
Contaminated Land Remediation (16.13.36)	298	257	101	101	101	858	505	12,564	13,927
Site Close-Out (16.13.37)	0	0	0	0	0	0	0	2,397	2,397
<b>Subtotal</b>	<b>5,324</b>	<b>3,512</b>	<b>3,385</b>	<b>2,678</b>	<b>2,684</b>	<b>17,584</b>	<b>13,495</b>	<b>220,907</b>	<b>251,985</b>
<b>Escalation Total</b>	<b>5,324</b>	<b>3,621</b>	<b>3,598</b>	<b>2,935</b>	<b>3,033</b>	<b>18,511</b>	<b>16,730</b>	<b>405,937</b>	<b>441,179</b>
<b>Discounting Total</b>	<b>5,324</b>	<b>3,437</b>	<b>3,241</b>	<b>2,509</b>	<b>2,460</b>	<b>16,971</b>	<b>11,591</b>	<b>145,427</b>	<b>173,990</b>

\* Values subject to rounding discrepancies

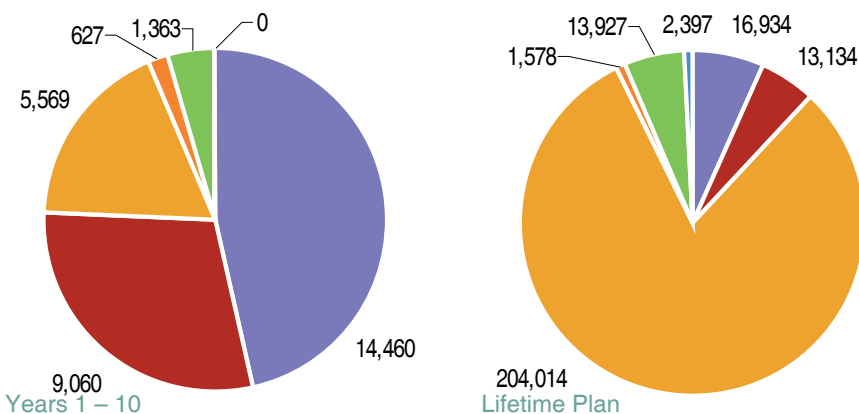


Figure 16-14 – Cost distribution by type (£k) for Decommissioning & Termination

Key	Type
Blue	Surveillance & Maintenance (16.13.31)
Red	Care & Maintenance (16.13.33)
Orange	Final Decommissioning (16.13.34)
Light Orange	Groundwater Remediation (16.13.35)
Green	Contaminated Land Remediation (16.13.36)
Light Blue	Site Close-Out (16.13.37)

# Waste & Nuclear Materials Management (16.14)

Successful delivery of the Winfrith Decommissioning Programme depends on the safe handling of the nuclear materials, radioactive waste and other hazardous wastes arising from decommissioning.



ISO container in transit across site



Placement of cemented waste in the TRS

## Waste and Nuclear Materials Management (W&NMM)

Waste and Nuclear Materials Management projects consist of five main operating groups, dealing with the following:

- Intermediate Level Waste Operations.
- Nuclear Materials Operations.
- Low Level Waste Operations.
- Very Low Level Waste Operations.
- Hazardous Waste Operations.

## ILW Operations

Intermediate Level Waste (ILW) will be produced as a result of decommissioning the SGHWR and Dragon reactors. This will be packaged into shielded boxes and stored on site in the Winfrith ILW Store until the GDF is available.

## Nuclear Materials Operations

Natural and depleted uranium and thorium metal are currently held on site. The uranium has been repacked and transferred to the TRS for storage. In the absence of any agreed transfer or re-use plans, the uranium is planned to be managed as waste and shipped to the GDF for disposal. The thorium will be encapsulated, when SGHWR is decommissioned, and stored in the Winfrith ILW Store.

## LLW Operations

Low Level Waste is generated from routine and tenant operations and the decommissioning of redundant nuclear facilities. The operations cover the collection, treatment, storage and disposal of radioactive solid LLW and the management of the disposal of Very Low Level Waste (VLLW) to an authorised

landfill facility. The ALES will continue to receive, treat and dispose of liquid waste arising from site operations until 2035.

## VLLW Operations

In 2006, the Environment Agency (EA) granted authorisation to dispose of Very Low Level Waste (VLLW) to a licensed landfill site. The process covers the consignment of material that meets license requirements, which addresses the acceptance criteria, demonstration of compliance, monitoring arrangements, packaging containers and the off-site transfer of VLLW.

## Hazardous Waste Operations

Sodium metal disposal is subject to a Best Available Techniques assessment. The current reference strategy is for disposal by commercial incineration.

Figure 16-15 – Budgeted cost of work scheduled (BCWS) profile curve for W&NMM

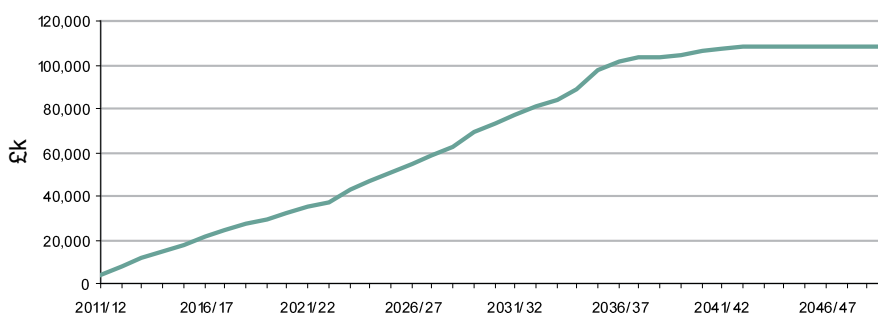


Figure 16-16 – Staffing profile curve against time for W&NMM

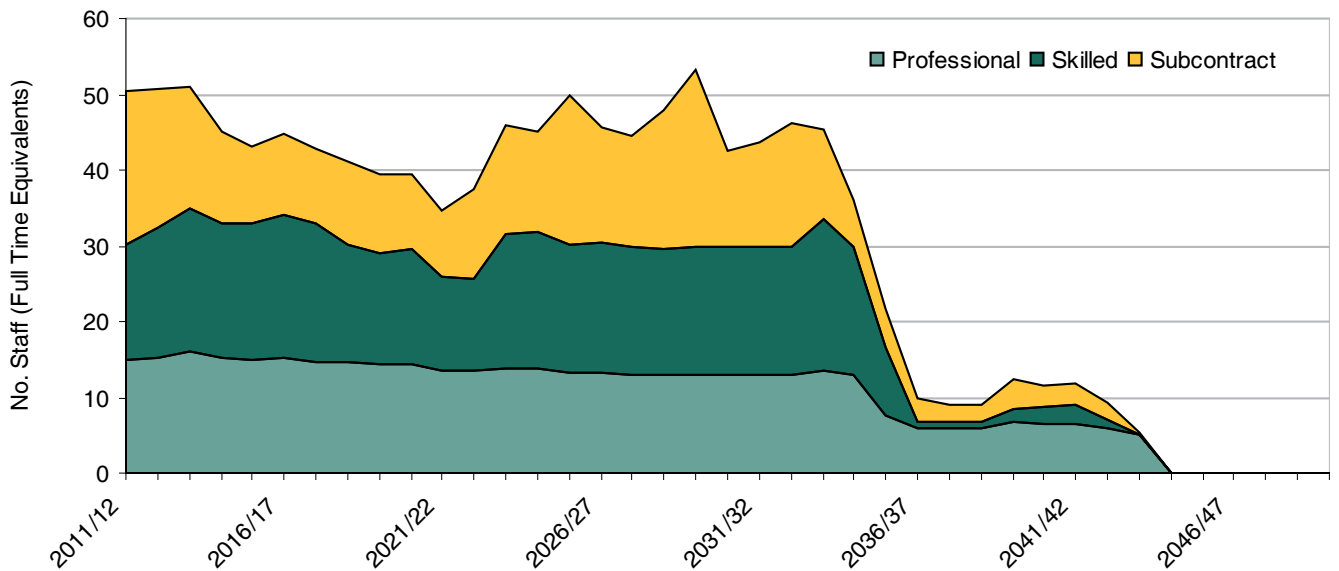
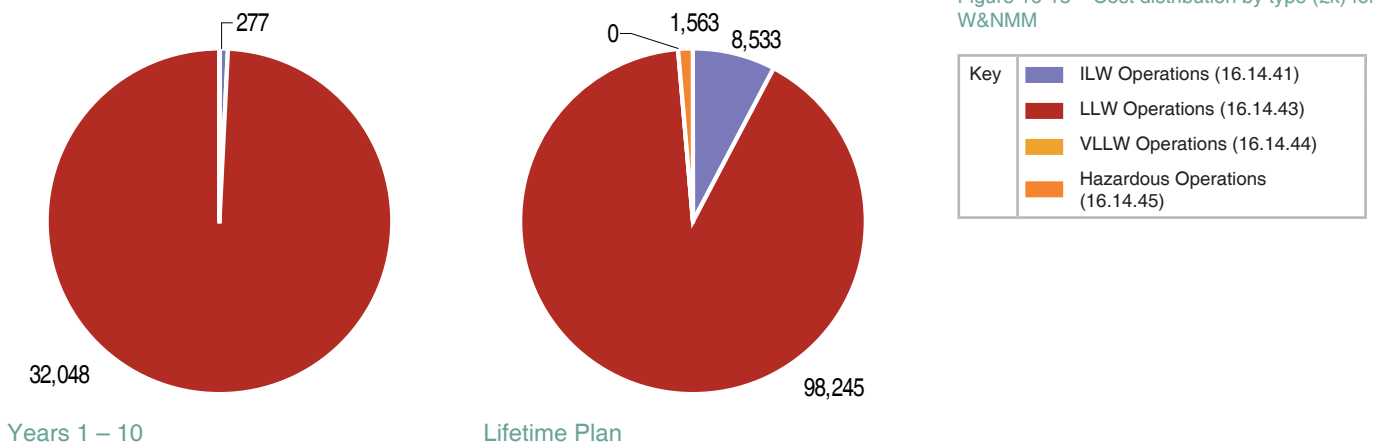


Figure 16-17 – Summary of costs for W&NMM

Type	FYs 2011 - 2015					Subtotal years 1-5 (£k)	Subtotal years 6-10 (£k)	Lifecycle Balance years 11+ (£k)	Total To Go Cost (£k)
	Year 1 (£k)	Year 2 (£k)	Year 3 (£k)	Year 4 (£k)	Year 5 (£k)				
ILW Operations (16.14.41)	55	166	56	0	0	277	0	8,257	8,533
LLW Operations (16.14.43)	3,909	3,618	3,898	3,386	2,954	17,764	14,284	66,197	98,245
VLLW Operations (16.14.44)	0	0	0	0	0	0	0	0	0
Hazardous Operations (16.14.45)	0	0	0	0	0	0	0	1,563	1,563
<b>Subtotal</b>	<b>3,964</b>	<b>3,783</b>	<b>3,954</b>	<b>3,386</b>	<b>2,954</b>	<b>18,041</b>	<b>14,284</b>	<b>76,016</b>	<b>108,341</b>
<b>Escalation Total</b>	<b>3,964</b>	<b>3,901</b>	<b>4,203</b>	<b>3,711</b>	<b>3,338</b>	<b>19,116</b>	<b>17,651</b>	<b>137,869</b>	<b>174,636</b>
<b>Discounting Total</b>	<b>3,964</b>	<b>3,702</b>	<b>3,785</b>	<b>3,172</b>	<b>2,708</b>	<b>17,331</b>	<b>12,298</b>	<b>50,528</b>	<b>80,156</b>

\* Values subject to rounding discrepancies

Figure 16-18 – Cost distribution by type (£k) for W&NMM



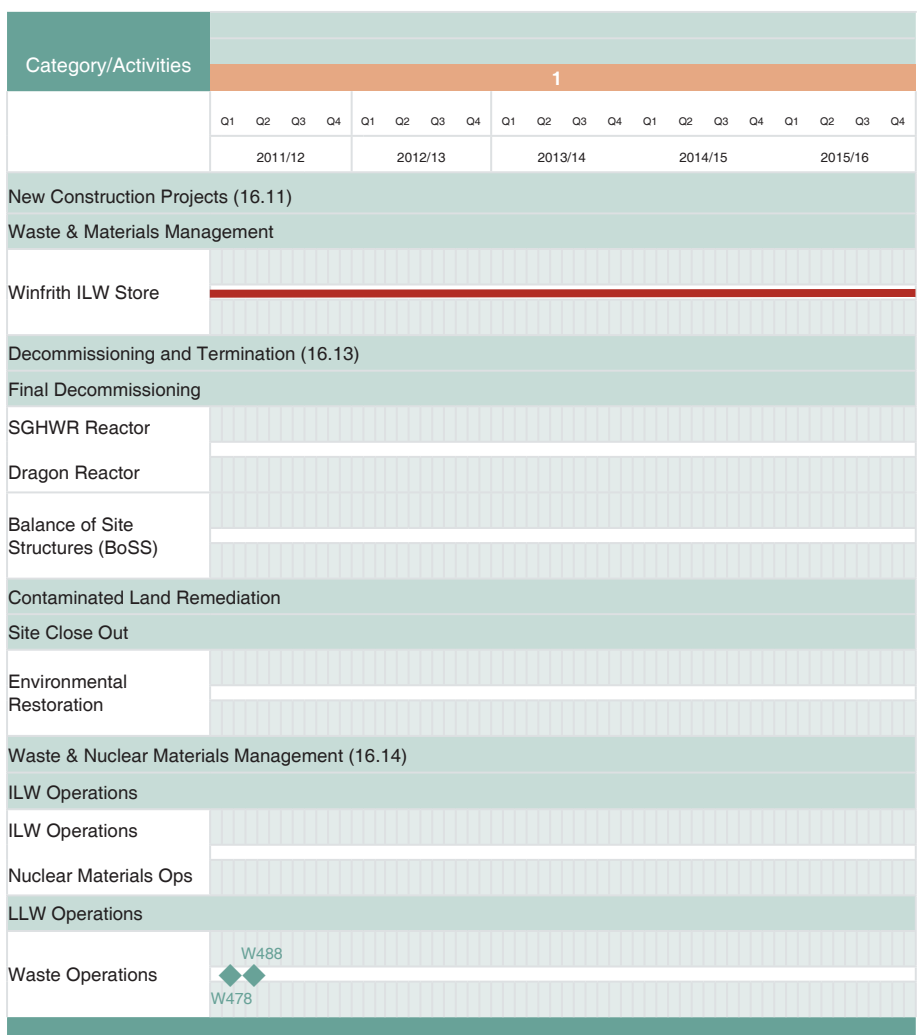
# Summary Milestone Schedule

RSRL staff are committed to completing the activities outlined in this summary in a timely, safe and cost-effective manner.

### Key milestones

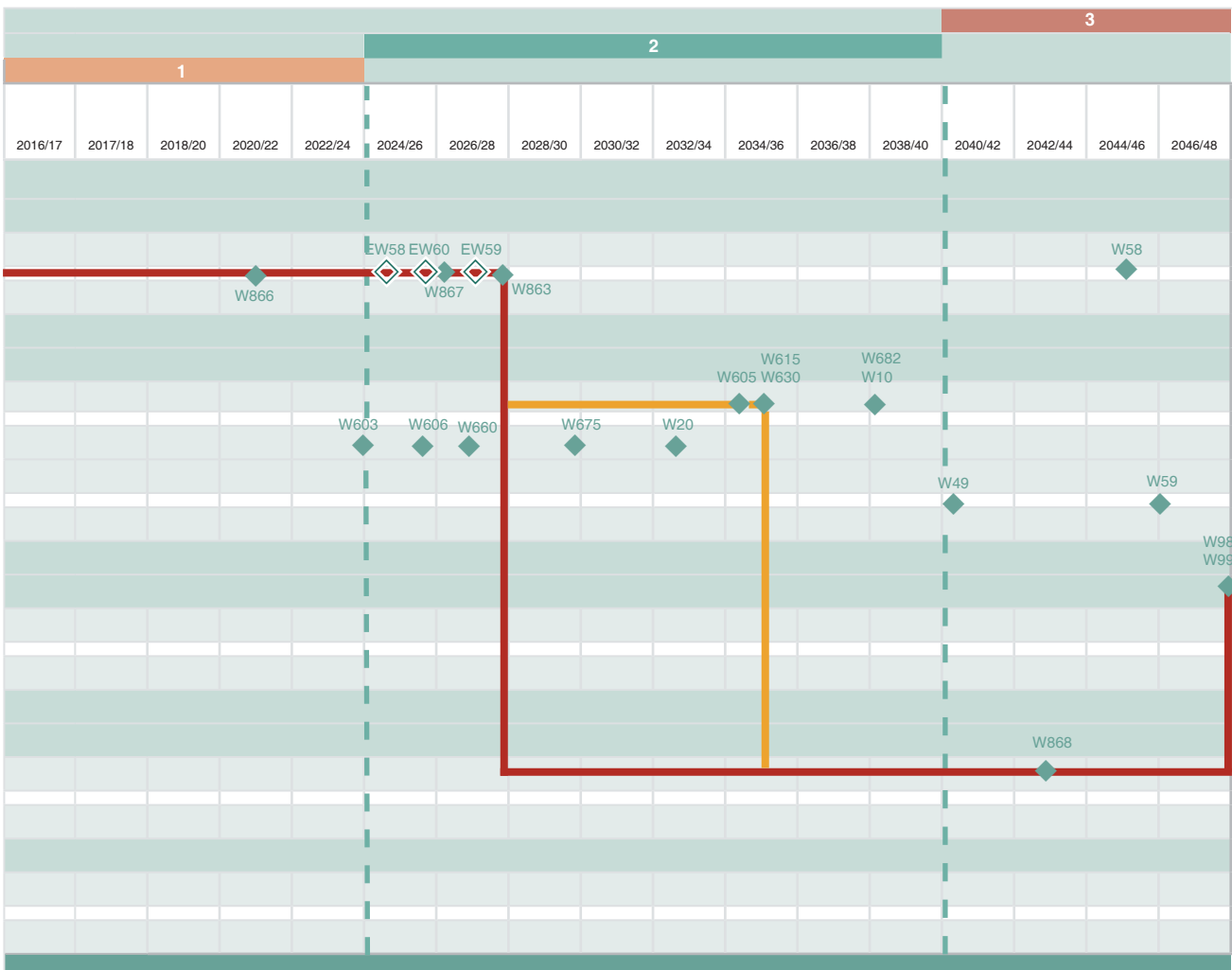
Item	Date	Description
◇	<b>Regulatory</b>	
EW58	Jul 2025	NII Issue License Instrument for PCSR for Winfrith ILW Store
EW60	May 2026	NII Issue License Instrument for PCmSR for Winfrith ILW Store
EW59	Apr 2027	NII Issue License Instrument for PCSR for Winfrith ILW Store
◆	<b>Other</b>	
W478	May 2011	WETP building demolished
W488	Jun 2011	EAST & associated buildings Demolished
W866	May 2021	Winfrith ILW Store Project Start
W603	May 2025	Dragon: start of Civils Design, Build and Preworks
W606	Jan 2026	Dragon: start of Civils Installation
W867	Jul 2026	Winfrith ILW Store Construction Complete
W660	Apr 2027	Start of Commissioning Operations – Dragon ILW Processing Equipment
W863	Mar 2028	Winfrith ILW Store Commissioned
W675	Mar 2030	Dragon ILW Removal Complete
W20	Dec 2032	Dragon Decommissioning Complete
W605	Sep 2034	Remote Handling Plant Constructed and Commissioned
W615	Jun 2035	SGHWR ILW Waste Processing Complete
W630	Jun 2035	SGHWR Reactor Core Removed
W682	Mar 2038	SGHWR Remediation Complete
W10	Jun 2038	SGHWR Project Complete
W49	Jun 2040	Sea Discharge Pipeline Decommissioning Complete
W868	Mar 2043	Winfrith ILW shipments to National Repository Complete
W58	Jun 2045	Winfrith ILW Store Demolition Complete
W59	May 2046	Minor Facilities Demolition Complete
W98	Apr 2048	Winfrith Site Delicensing Complete
W99	Apr 2048	Winfrith Site Closed Out

Figure 16-19 – Lifetime Plan Milestone Summary Schedule



Key	
	Critical Path
	Other Paths of Concern
	Regulatory Milestone
	Other Milestone
	External Constraints
	Technology Insertion Point (TIP)
	Key Decision Points

Figure 16-19 – Lifetime Plan Milestone Summary Schedule - continued



# Lifetime Plan Costs

RSRL is committed to delivering value for money in all its activities; all proposed expenditure is challenged using appropriate costing methods.

Figure 16-20 – Summary of Costs – present day, escalated and discounted values

Category	2005/09 cost (£k)	Prior years cost to date 2009/11 (£k)	FYs 2011 - 2015				
			Year 1 (£k)	Year 2 (£k)	Year 3 (£k)	Year 4 (£k)	Year 5 (£k)
New Construction Projects (12.11)	34	0	0	0	0	0	0
Decommissioning & Termination (12.13)	54,209	9,168	5,324	3,512	3,385	2,678	2,684
W&NMM (12.14)	34,265	11,357	3,964	3,783	3,954	3,386	2,954
<b>Subtotal</b>	<b>88,508</b>	<b>20,526</b>	<b>9,288</b>	<b>7,296</b>	<b>7,339</b>	<b>6,064</b>	<b>5,638</b>
<b>Escalation Total</b>			<b>9,288</b>	<b>7,522</b>	<b>7,801</b>	<b>6,646</b>	<b>6,370</b>
<b>Discounting Total</b>			<b>9,288</b>	<b>7,139</b>	<b>7,026</b>	<b>5,681</b>	<b>5,168</b>

\* Values subject to rounding discrepancies

The pricing of the work has been estimated using an appropriate costing method, which is set out in supporting Basis of Estimate documents. The cost of items and services provided by suppliers and subcontractors has been determined from existing contracts where possible and are based on experience of similar contracts. Such procurements are carried out in accordance with RSRL's Procurement Policy.

The cost of work undertaken by RSRL staff and contractors was derived from estimates of the time to undertake the work and the rate for the person undertaking the work. The resources determined the cost estimates and an appropriate level of uncertainty and risk was applied to the costs to determine the contingency which takes account of a Monte-Carlo type analysis. The escalation and discounting of costs was achieved by the application of NDA specified index factors.

Figure 16-21 – Years 1 to 5 category cost distribution (£k)

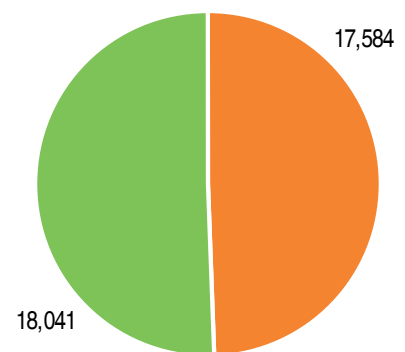
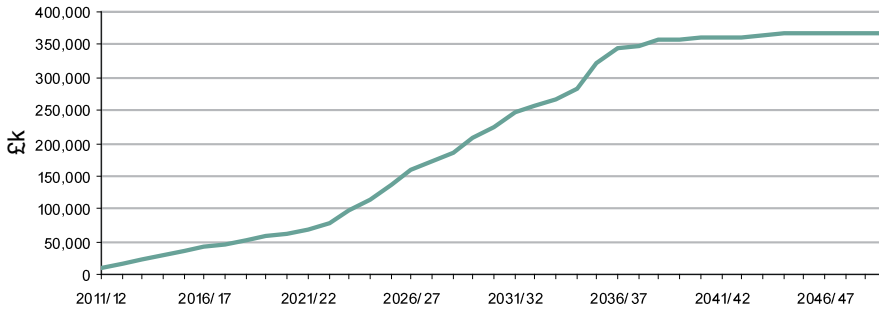


Figure 16-22 – Budgeted cost of work scheduled (BCWS) profile curve (cumulative)



Following a care and maintenance period, the decommissioning programme resumes in 2024

Figure 16-20 – Summary of Costs – present day, escalated and discounted values (continued)

Subtotal years 1-5 (£k)	FYs 2016 - 2020					Subtotal years 6-10 (£k)	Lifecycle Balance years 11+ (£k)	Total To Go Cost (£k)
	Year 6 (£k)	Year 7 (£k)	Year 8 (£k)	Year 9 (£k)	Year 10 (£k)			
0	0	0	0	0	0	0	8,311	8,311
17,584	2,679	2,673	2,709	2,720	2,714	13,495	220,907	251,985
18,041	3,131	2,974	2,911	2,688	2,579	14,284	76,016	108,341
<b>35,625</b>	<b>5,810</b>	<b>5,646</b>	<b>5,620</b>	<b>5,408</b>	<b>5,294</b>	<b>27,779</b>	<b>305,235</b>	<b>368,638</b>
<b>37,627</b>	<b>6,768</b>	<b>6,781</b>	<b>6,959</b>	<b>6,905</b>	<b>6,968</b>	<b>34,381</b>	<b>556,375</b>	<b>628,383</b>
<b>34,302</b>	<b>5,211</b>	<b>4,955</b>	<b>4,826</b>	<b>4,544</b>	<b>4,352</b>	<b>23,889</b>	<b>202,151</b>	<b>260,342</b>

Figure 16-23 – Years 6 to 10 category cost distribution (£k)

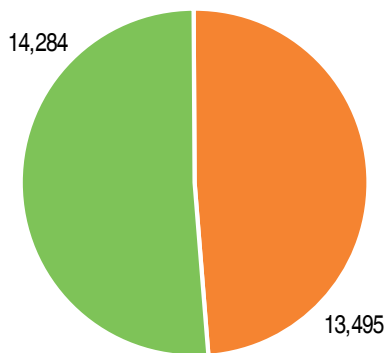
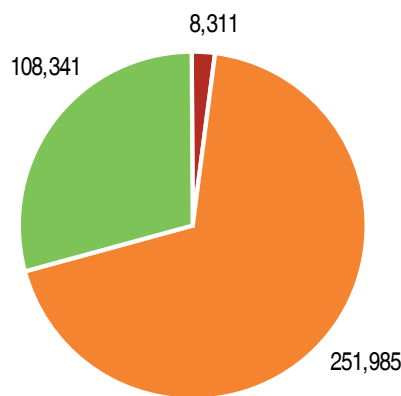


Figure 16-24 – Lifecycle category cost distribution (£k)



Key	Category	Value (£k)
Red	New Construction Projects (12.11)	8,311
Orange	Decommissioning & Termination (12.13)	251,985
Green	Waste & Nuclear Materials Management (12.14)	108,341

# Reconciliation of Costs

The overall impact of the changes that have been made to the Lifetime Plan since Lifetime Plan Baseline March 2010 Issue 2 is shown below:

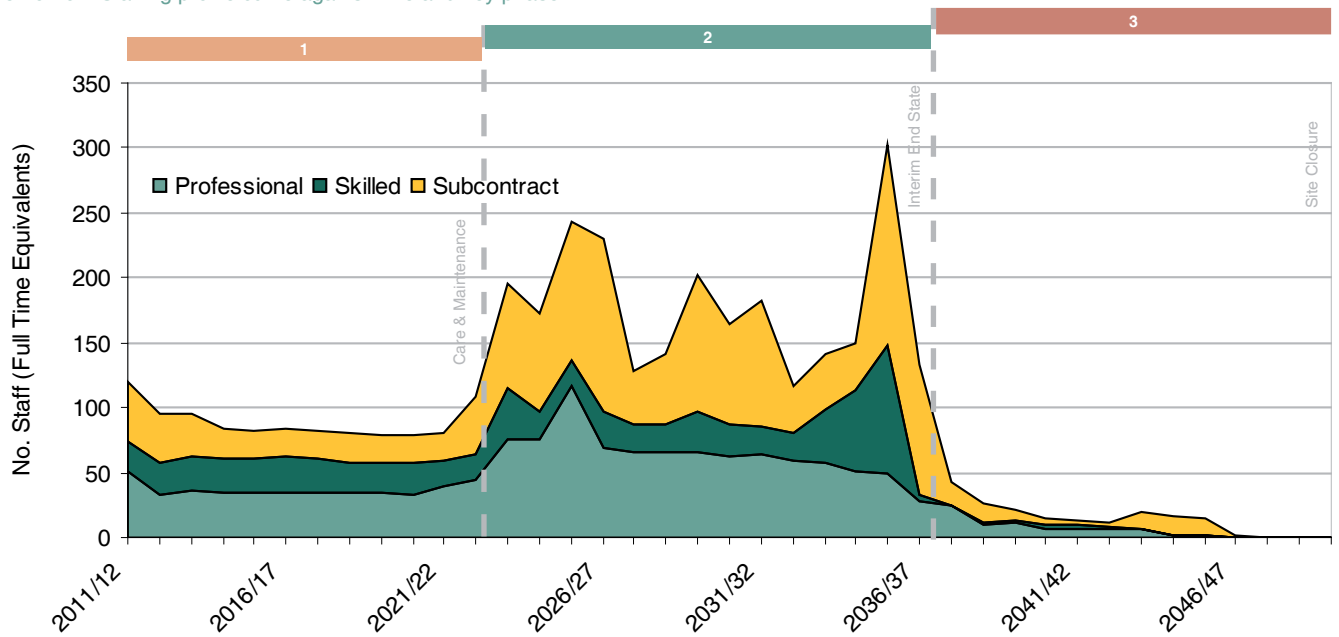
Figure 16-25 – Reconciliation of costs

Category	Lifetime Plan Baseline March 2011 Issue 1 (£k)	Lifetime Plan Baseline March 2010 Issue 2 (£k)	Variance (£k)	Description
New Construction Projects (16.11)	8,311	8,311	0	<ul style="list-style-type: none"> <li>No change</li> </ul>
Decommissioning & Termination (16.13)	251,985	249,667	2,319	<ul style="list-style-type: none"> <li>SGHWR option study and building assessment (+£800k)</li> <li>A59 settlement (+£400k)</li> <li>Reprofiling WETP contract payment schedule (+£1,200k)</li> </ul>
Waste & Nuclear Materials Management (16.14)	108,341	99,444	8,897	<ul style="list-style-type: none"> <li>Review of maintenance requirements for ALES (+£9,000k)</li> </ul>

# Staffing Curve

The staffing levels required to carry out the New Construction Projects, Decommissioning & Termination and Waste & Nuclear Materials Management categories are shown in the staffing curve below.

Figure 16-26 – Staffing profile curve against time and key phase



## Staffing Profile

The decline in the early years reflects the completion of the waste treatment programme in WETP, which is then followed by a long period of care and maintenance. The significant increase in staffing profile reflects the resumption of the decommissioning programme.

# Major Assumptions

The decommissioning programme is planned on the basis of certain assumptions. The principal assumptions associated with the programme are outlined below.

Figure 16-27 – Major assumptions by category

Category	Assumption	Justification
<b>Decommissioning &amp; Termination (16.13)</b>		
	The end state of the property is acceptable for the eastern part being transferred to the science and technology park and the western part being returned to open heathland. This is defined as termination of the NII licence and free from any EA authorisations or permits.	The end state for the site is consistent with the NDA strategy.
	The extent of contaminated land on site is based on historic records and characterisation data.	Historic records and characterisation are sufficient to estimate the cost of remediation when combined with appropriate risk and contingency assumptions.
	The Ministry of Defence (MoD) will allow access to the Lulworth firing range to decommission the Sea Discharge Pipeline.	The MoD is aware that pipeline decommissioning is required and has not objected to its removal assuming the establishment of appropriate arrangements.
	Decommissioning of the Electrical Substations is not required.	The electrical Substations are leased to Scottish & Southern Electric for 99 years.
	No significant work, beyond the work required to meet regulatory requirements, is needed to remove the NDA designation of the site.	The NDA have confirmed that no significant work is required to remove the NDA designation of the site after achievement of the necessary regulatory approvals.
<b>Waste &amp; Nuclear Materials Management (16.14)</b>		
	Decommissioning Intermediate Level Waste (ILW) will be packaged, stored, and disposed of in 2-metre boxes.	The 2-metre box is an accepted ILW disposal package, and is suitable for loading and interim storage at Winfrith.
	All Intermediate Level Waste (ILW) will be stored on site, in passively safe states, in appropriately engineered storage facilities, until it is shipped to the Geological Disposal Facility (GDF) starting in 2040.	Alternatives for ILW disposal or offsite storage are unlikely to be available before ILW is shipped to the GDF. Availability of the GDF and the ILW shipping schedule is based on information provided by the NDA.
	Material from the demolition of major buildings, including SGHWR and Dragon reactor containments, will be used to back-fill the below ground voids created by the demolition of the structures.	Discussions with the NII and EA are ongoing with the purpose of agreeing the optimum solution for the management of this waste.
	Sufficient Low Level Waste (LLW) disposal routes are available to support planned waste processing and decommissioning activities.	The NDA is responsible for providing adequate LLW routes to support its programmes.
	Disposal routes will be available for contaminated oils and solvents and for hazardous and non-hazardous waste with their acceptance criteria taking into account the requirement for OSPAR.	RSRL is not aware of any proposals to terminate these disposal routes.
	Radioactive material which is currently being stored on behalf of or by tenants or other organisations will be removed from the Winfrith site by the owner in a timescale that does not impact on the decommissioning programme.	The waste owners hold the obligation for their waste removal and disposal. Agreements are in place documenting the owners' obligations.
<b>General</b>		
	Radioactive material processing and decommissioning will occur as soon as practicable within the constraints of a decreasing NDA funding projection.	The NDA sets the annual site funding limit (ASFL) profile for each site based on the total available funding and national priorities.
	The site will transition to a secure storage mode of operations after all decommissioning (with the exception of the storage area) is completed.	ILW must be stored securely on site until it is shipped to the GDF.

# Risk Management

RSRL will make every effort to ensure that activities are completed safely and effectively, using the best available risk management techniques. The main threats and opportunities associated with the Winfrith site are outlined below.

Figure 16-28 – Risk summary

Threats	Description
Description	Delicensing criteria cannot be met without removing residual sub-surface structures.
Possible Impact	Increased costs resulting from additional excavation requirements.
Mitigation Activities	Liaise with Regulators to develop appropriate interpretation of the delicensing criteria.
Description	Significant contamination identified in land areas (open and under buildings) previously assumed to be unaffected or minimally contaminated.
Possible Impact	Significant amount of additional funds would be required to remove and dispose of contaminated soils.
Mitigation Activities	Continue to review historical records and perform characterisation of site land areas in time to meet the schedule.
Description	Sufficient waste disposal routes are not available to support the decommissioning programme.
Possible Impact	Project end dates would extend increasing programme costs. Waste disposal costs would increase for the next best available alternative.
Mitigation Activities	Continue to assist the NDA and third parties in maintaining existing and identifying new waste disposal routes.
Description	Facilities become structurally unsound before the end of the extended care and maintenance period.
Possible Impact	Significant amount of additional funds would be required to maintain structural integrity before decommissioning or early decommissioning is required.
Mitigation Activities	Perform engineering analyses of the facilities to identify potential issues. Implement maintenance programmes to preserve structural integrity. Prioritise work to allow earlier decommissioning of failing structures.
Description	RSRL loses site knowledge and expertise through staff attrition.
Possible Impact	Greater reliance on documentation to plan and execute decommissioning activities resulting in increasing execution costs.
Mitigation Activities	Maintain effective knowledge management process.
Opportunities	Description
Description	Relocate ILW to an alternative site before disposal in GDF and accelerated decommissioning.
Possible Benefit	Reduces ILW storage and care & maintenance costs while allowing accelerated decommissioning.
Delivery Activities	Develop a final business case for consolidation of ILW with that of other Site Licence Companies, which will facilitate site closure.
Description	Decontaminate the overland section of the sea discharge pipeline, grout and leave in situ.
Possible Benefit	Reduced programme costs and potential environmental advantages from not disturbing large sections of land.
Delivery Activities	Evaluate the Best Available Techniques for disposal of the sea discharge pipeline as part of the future decommissioning strategy.
Description	Increase the annual authorised VLLW disposal volume allowance.
Possible Benefit	Programme schedule reduced.
Delivery Activities	Liaise with the Environment Agency to increase the authorisation.

The risks relating to prevention of safety, security and environmental incidents will continue to be a major priority on the site. Risk handling strategies are implemented via Project Level Mitigation Plans.

# Metrics & Key Quantity Curves

Defined metrics and key quantities provide a standard against which the NDA can measure RSRL's performance, outputs and deliverables. The key metrics that can be used to measure performance and deliverables for the work are given below.

### Lifetime Plan key metrics

The key metrics associated with delivering this programme are:

- ILW remaining to be transferred to the Geological Disposal Facility.
- LLW remaining to be disposed of at the national LLW repository.
- The number of buildings remaining to be demolished.
- The area (Ha) of the designated site remaining to be delicensed.
- Safety & Environmental Detriment (SED) Scores.

Figure 16-29 – Raw LLW and Packaged ILW Remaining on Site (m³)

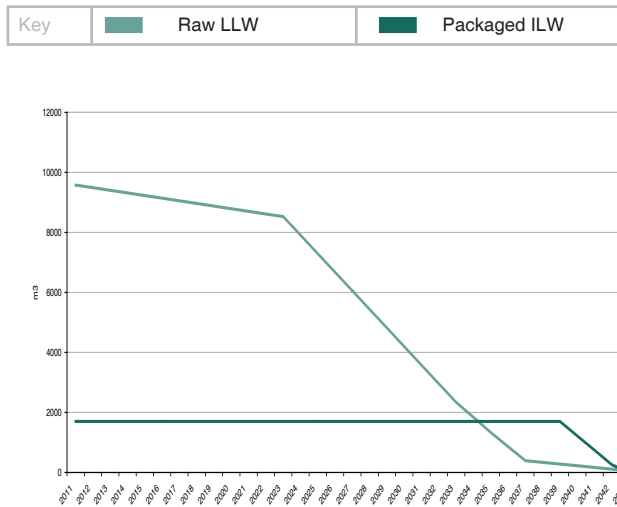


Figure 16-30 – Number of Buildings Remaining on Site

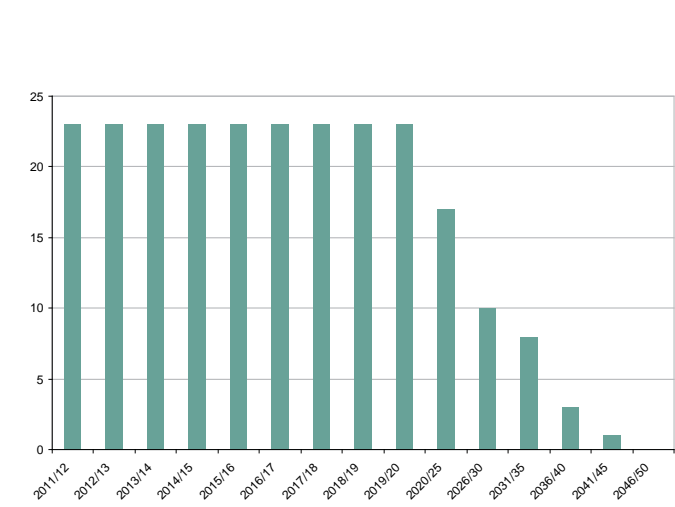


Figure 16-31 – Area of land to be Delicensed

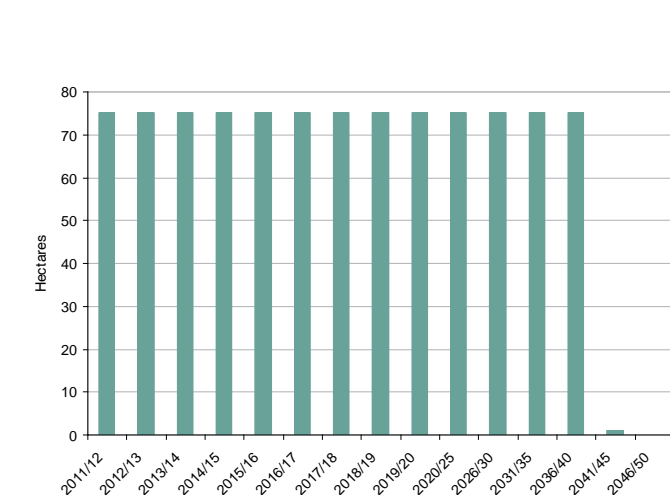
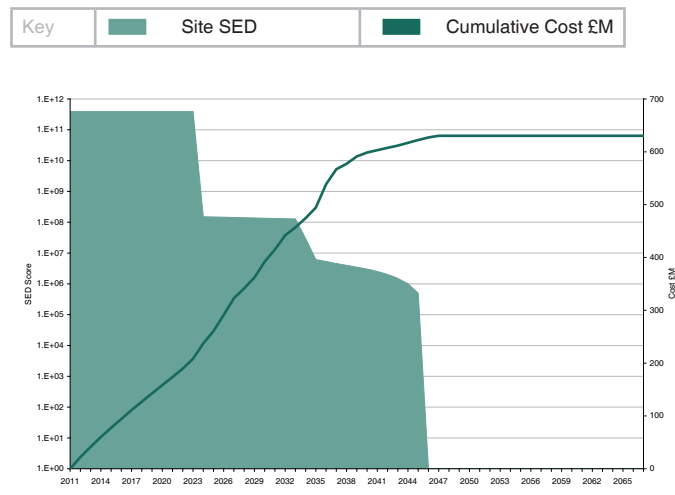


Figure 16-32 – Site Total SED and Cumulative Cost



# Conclusion

The Winfrith Site Summary provides an overview of the current status and future decommissioning programme at Winfrith.

The purpose of the decommissioning programme is to clean-up the site to allow de-licensing. A significant part of the programme is processing of historic radioactive materials to prepare it for disposal as ILW, followed by decommissioning of site facilities and remediation of land areas and groundwater. ILW will be stored on site until the national Geological Disposal Facility becomes available after which it will be shipped to the facility and final decommissioning completed.



The RSRL Lifetime Plan provides for progressive reduction of the site hazards. The decommissioning programme will be delivered cost effectively by implementing innovative approaches to working: eliminating activities that are not required, using existing resources efficiently, applying new technologies appropriately, and working effectively with RSRL's supply chain. RSRL will work with its stakeholders to ensure that they are kept up to date with the progress of work activities. RSRL will also consult with its stakeholders and ensure that their views are considered on key decisions.



Finally, RSRL's aim is to deliver the work safely and efficiently and to become the first NDA site licence company to release its sites.





Herdus House,  
Westlakes Science and Technology Park,  
Moor Row  
Cumbria  
CA24 3HU  
T+44 (0)1946 785800  
F+44 (0) 1946 785801  
[www.nda.gov.uk](http://www.nda.gov.uk)

B392.7 Rutherford Avenue  
Harwell Oxford Campus  
Didcot  
Oxon  
OX11 0DF  
T+44 (0) 1235 820220  
[www.research-sites.com](http://www.research-sites.com)