

The logo for the Nuclear Decommissioning Authority (NDA) features the letters 'NDA' in a stylized, green, sans-serif font. The 'N' and 'D' are connected, and the 'A' has a unique shape with a horizontal bar extending to the right.

Nuclear
Decommissioning
Authority



Research Sites
Restoration Ltd



Research Sites Restoration Ltd is owned by Babcock International Group and operates on behalf of the Nuclear Decommissioning Authority

Agenda

- Part One
 - Is about Harwell, Delicensing, Delicensing Experiences at Harwell and the Importance of Record Keeping
- Part Two
 - Is about Site End States and Other Perspectives around Delicensing and Site end states
- **The overall focus of this seminar is Site End States for nuclear sites and how regulatory controls are terminated in order to return land for another use.**

Why does Site End State Matter?

- Decommissioners...
 - Every stage of decommissioning is informed by the end goal.
- The NDA...
 - Delivery of land suitable for next use. Costs. Wastes. Socio-Economic Benefits.
- Regulators
 - Control of pollution, protection from harm, sustainability, compliance with regulation.
- People...
 - Land is forever. Land quality is passed onto future generations. Wastes have to be managed somewhere. Returning land to other uses may deliver benefits. We are taxpayers!

Harwell is somewhat the exception. Here land has high value, clear next uses and can be returned in a condition suitable for all foreseeable future uses.

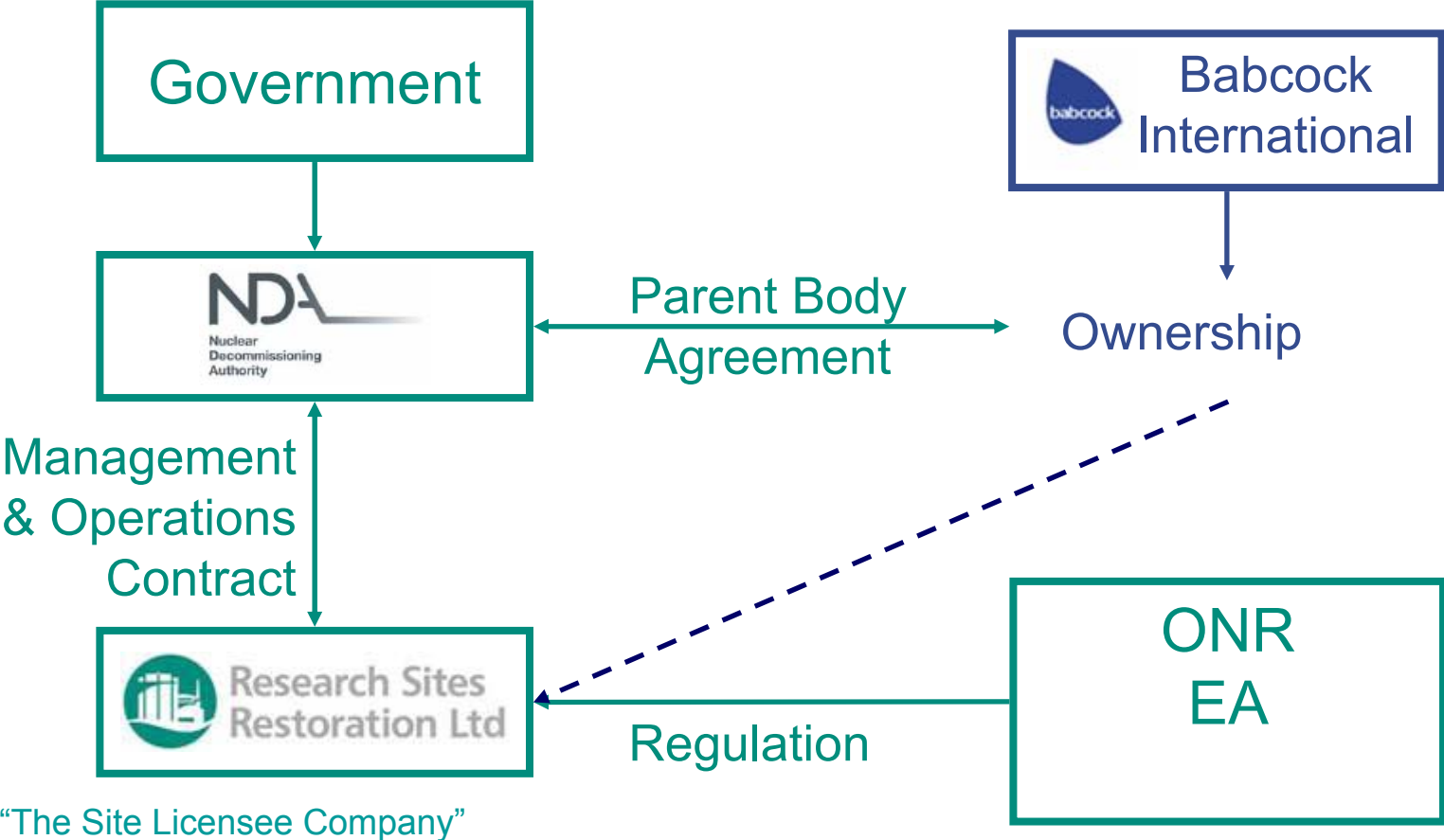
WHAT IS THE SUSTAINABLE END STATE FOR NUCLEAR SITES?

Overview of Harwell Decommissioning

Paul Atyeo CENG, CENV, FIMECHE

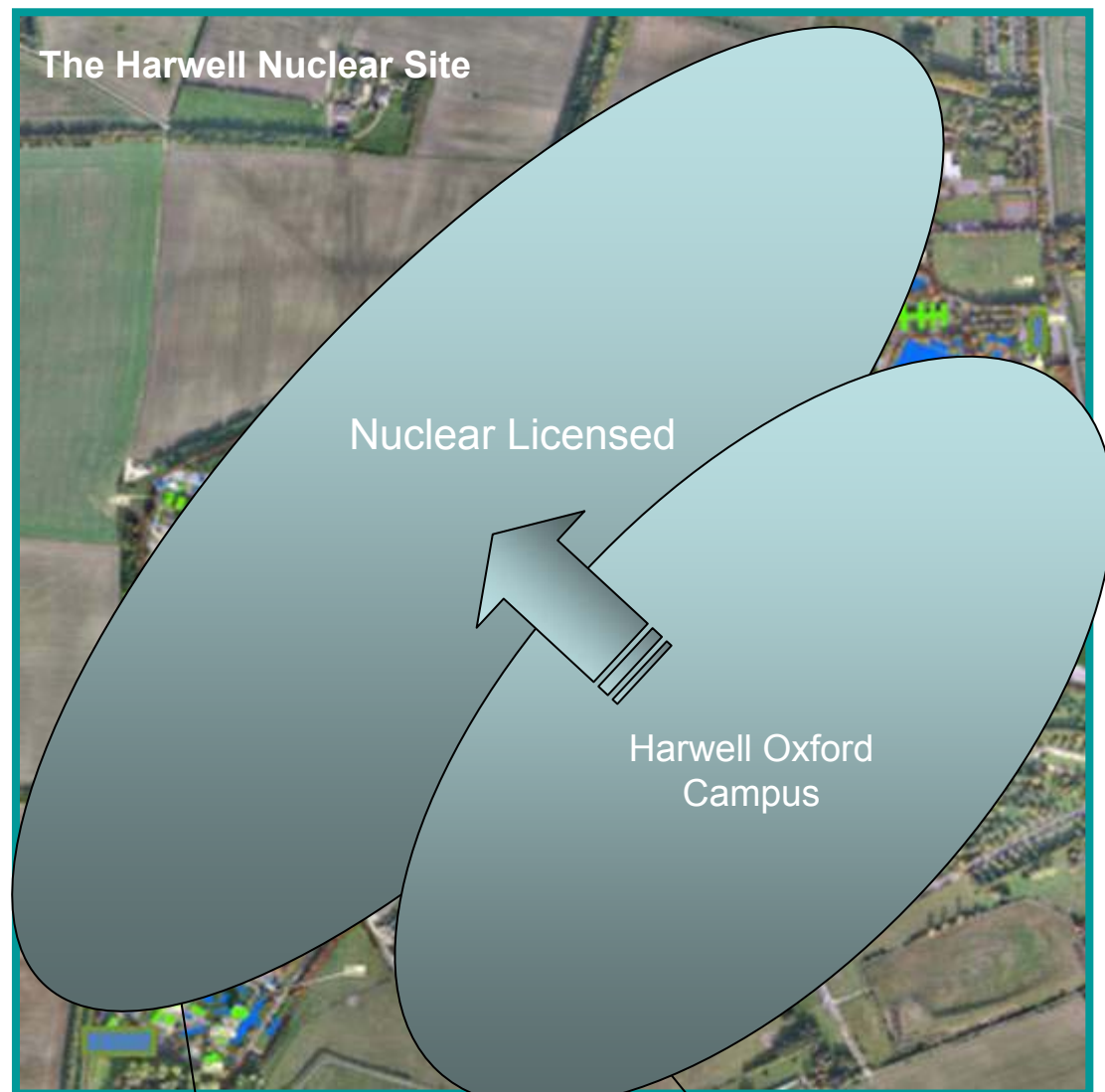


Who's Who?



Introduction

- Harwell is a 113 hectare nuclear site located on a larger science campus in rural Oxfordshire
- The site was an RAF airfield in WWII and became the first significant nuclear site in 1946
- Much of the nuclear industry spun out of the site
- UKAEA operated until early 1990's and then decommissioning commenced
- Site was licensed in 1990
- Now decommissioning under NDA programme



Blue – Decommissioned to Clean Ground

Green – Yet to be decommissioned

What does RSRL do?

- ✓ Our mission is to clear the current nuclear licensed sites at Harwell and Winfrith so that the **land can be used again safely**
- ✓ At Harwell this means removing the nuclear licence from the whole site in stages over several decades
- ✓ We **process and repack** historic radioactive wastes on the site.
- ✓ We **store** certain radioactive wastes on the site – awaiting the geological disposal facility to be built elsewhere.
- ✓ We **decommission and demolish** our facilities when they are no longer required.
- ✓ (Rarely) we **build** new facilities to support our work – but in the end these will be removed as well.
- ✓ We clean-up or remove our drainage systems and other **underground liabilities**.
- ✓ We clean-up the **land**.
- ✓ We **ship off** radioactive wastes and materials to facilities in the UK that can accept them.
- ✓ In stages we **delicense** the land after thorough checking by the regulator and release it for its next planned use as a **science campus**.



Some of the Major Liabilities Left to be Decommissioned

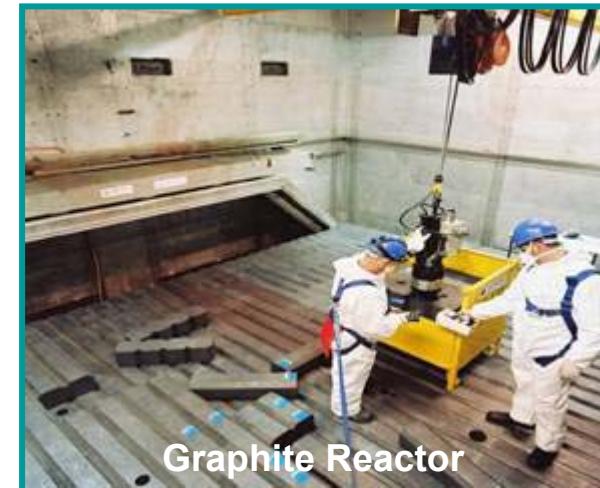


Highlights

- All major facilities including major radiochemical laboratories, hot-cell facilities and reactors are shutdown - decommissioned or under decommissioning

Highlights:

- Of 14 research reactors – 3 remain under shutdown
- Entire site drainage system shutdown and largely cleaned up or removed
- 11 hectare contaminated land site cleaned-up and returned for housing use
- Significant hazardous waste disposal area remediated
- 100 research facilities returned to delicensable land
- 20% of site area delicensed



“Experimental” Facilities Decommissioning

- Hundreds of experimental facilities existed
- Since the mid 1990’s decommissioning to a condition where the land is clean
- 100 out of 160 facilities decommissioned
- ~1 million square feet of facility footprint removed
- Laboratories, offices, workshops, experimental areas, waste treatment facilities etc.



Active Drains Decommissioning



- 12km of Trade Level Active Drain network decommissioned by in-situ cleaning and survey
- 700m of a 4000m historical main active drain decommissioned by excavation
- 7500m offsite discharge pipeline shutdown, awaiting decommissioning
- Part of an effluent strategy to reduce liquid discharges, utilise foul sewers, and replace our effluent plant with a smaller plant

Main Active Drain Decommissioning

- 4000m of double contained main active drain decommissioned
- Completed in 7 months
- Worked with suppliers to enable alternative method to that originally envisaged by the system designers
- All works completed underground
- UKAEA designed crawler probe “DRover” re-engineered to survey outer sleeve as clean enough to leave in-situ

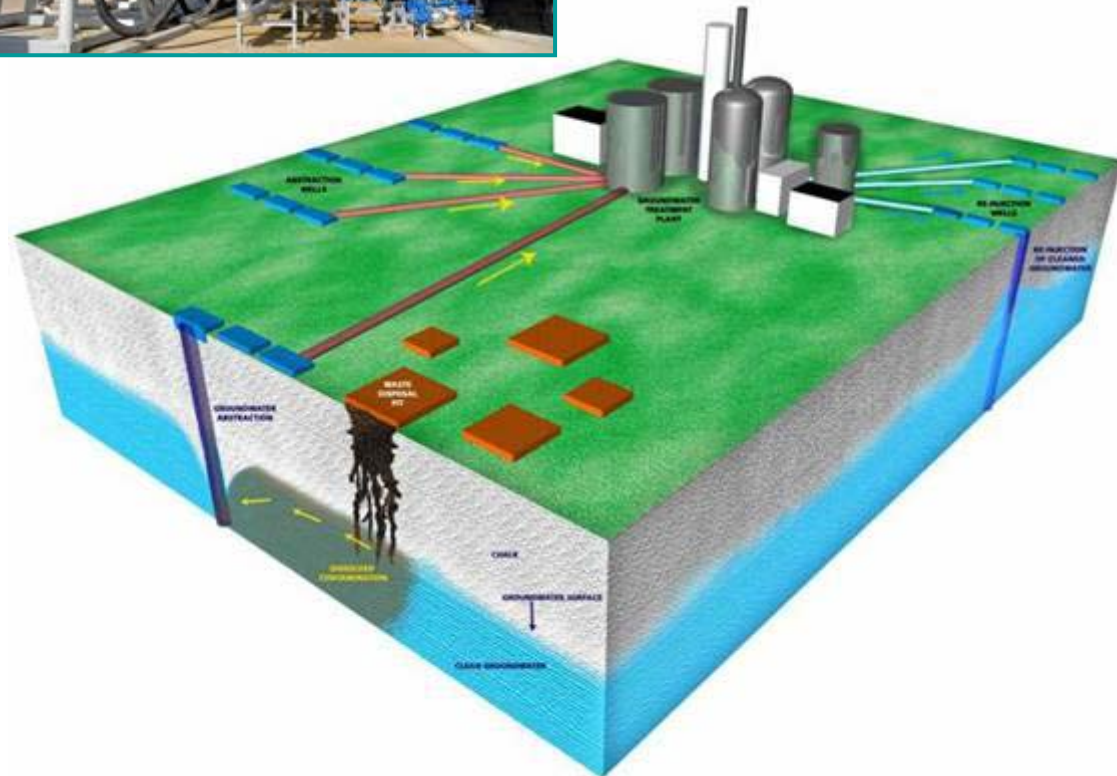




RSRL "Drover" Drain Probe System Used to Show Some Drains Can be Left In-Situ Clean

Groundwater and Unsaturated Zone Remediation

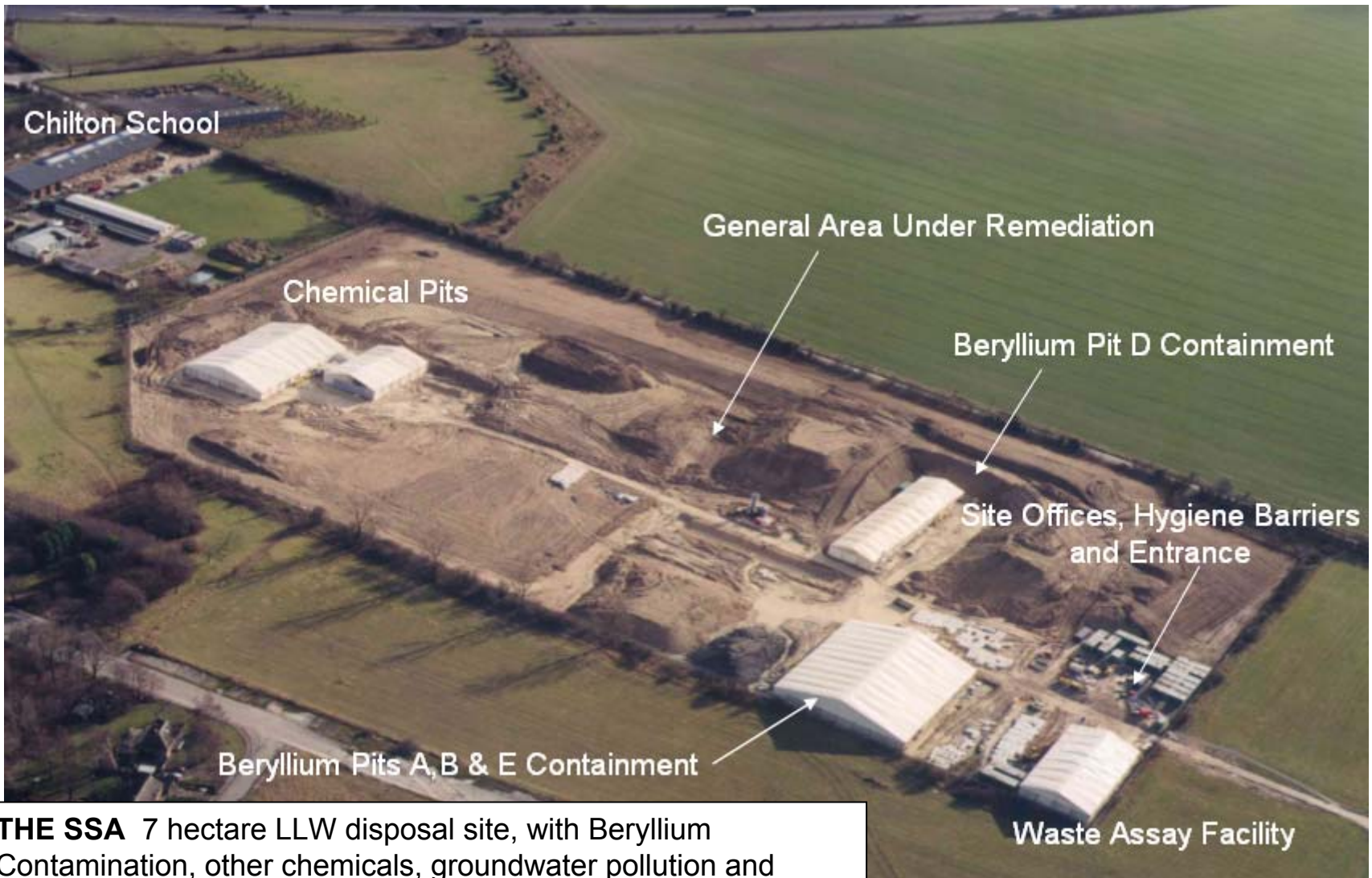
- Groundwater pollution by chemicals discovered in early 1990's
- Source removed
- Groundwater pump and treat system contains and removes the problem – continue to operate for several years
- Unsaturated zone treated using novel thermally enhanced vapour extraction method – now complete





The WSA 20 disposal pits containing hazardous chemical wastes (the cause of groundwater pollution) Removed in 2005. 12,000 drums of hazwastes and some LLW.

Work involved exclusion zones and live plume management systems to cope with highly reactive and explosive materials/dense gas release events.



THE SSA 7 hectare LLW disposal site, with Beryllium Contamination, other chemicals, groundwater pollution and extensive munitions.... next to a Primary School.

Remediated 2000-2002, (10 years of groundwater clean-up before then)

Sold and being redeveloped for housing

The SSA Oct 2012 – New Housing...



Radioactive Wastes

- Decommissioning produces radioactive waste.
- We seek to avoid this.
- The majority of the wastes are “Low Level”.
 - We dispatch Low Level wastes offsite to permitted disposal or treatment facilities.
- Some wastes are “Intermediate Level”.
 - Some of these exist and are stored on site
 - The rest are an integral part of the existing buildings and will arise during decommissioning
 - We have to store these wastes on site pending a national facility being built in the future

Lower Activity LLW Wastes

- RSRL worked to develop feasibility of alternative landfill based routes for LLW disposal
- Acted as a representative nuclear industry waste producer during public consultations for the ENRMF private sector proposal
- RSRL have disposed of the first nuclear industry decommissioning wastes to this new route
- Worked with a US supplier to develop an IP1 certified soft-sided package for these new routes
- Avoids filling up LLWR repository and improves cost effectiveness
- Enables decommissioning





First Load Disposed to ENRMF on 29 March 2012



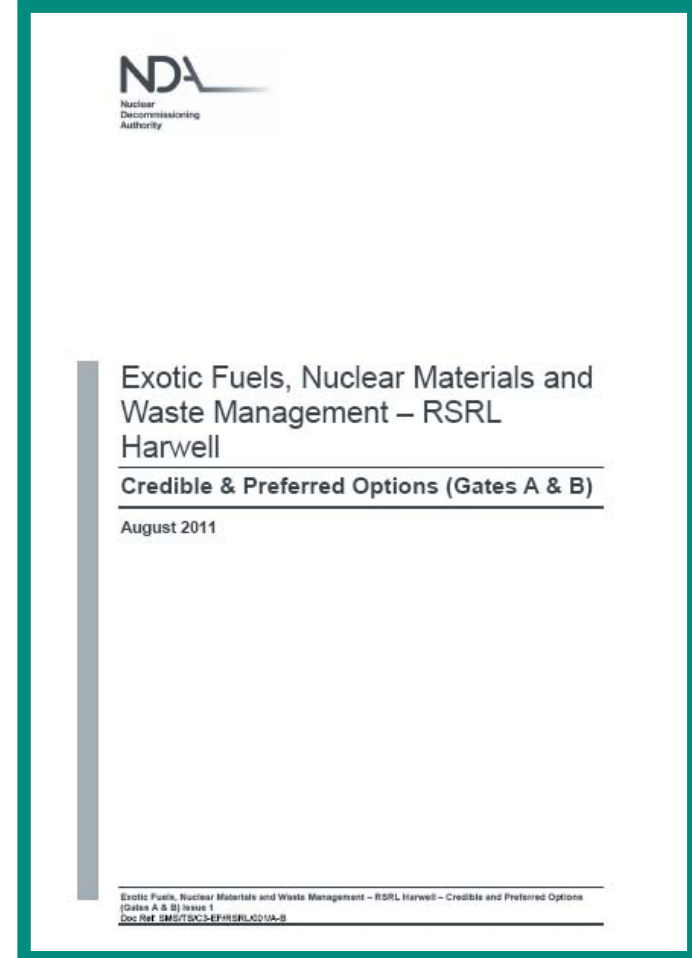
ILW Waste Recovery and Repacking – Solid Waste Complex

- Waste recovered from the retrieval process is transferred to Harwell's Head End Cell suite in the Solid Waste Complex, where it is processed – assayed, decanted and examined.
- From there, it is put into 500-litre drums, approved by the NDA's Radioactive Waste Management Directorate, for storage in the Vault Store.
- 5000+ cans processed.
- A further 6,000+ cans will be processed through the facility.
- Retrieval Machine 2 (RM2) – the 240-tonne, fully shielded and contained moveable cell, used to recover intermediate waste, stored in underground storage tubes on site since the late 1950s.



Nuclear Material to Sellafield

- NDA option study recommended transfer of Harwell nuclear material to Sellafield
 - Hazard reduced
 - Security improved
 - Costs reduced
- NDA approved joint business case
- Two years preparations followed by about 5 year operation
 - Safety cases
 - Flask licensing
 - B462 minor modifications



RSRL Plans Include a New ILW Store

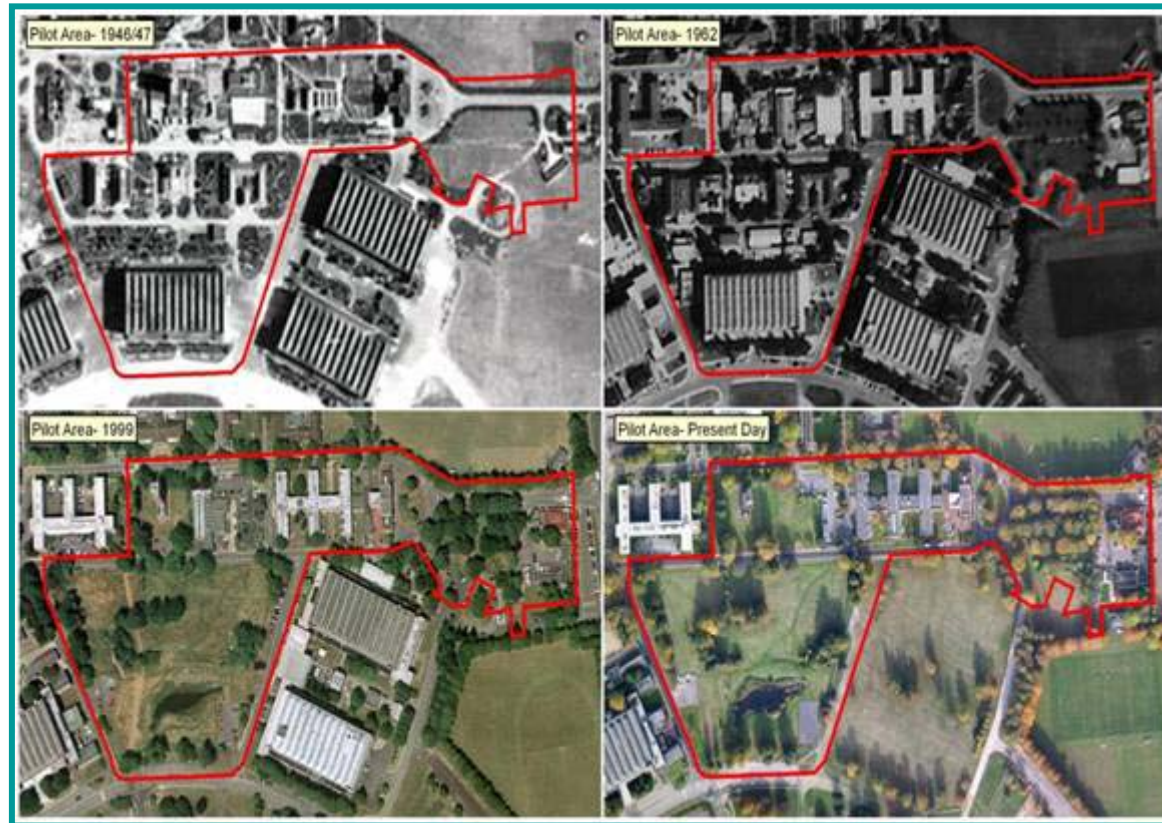
- ILW produced through Harwell, Winfrith and Culham work
 - B462 tube store removals to Vault Store
 - BEPO, DIDO, PLUTO reactor decommissioning
- Storage needed until geological disposal facility (GDF) available
 - GDF currently planned to receive ILW after 2040
- Makes more of the Harwell site available for campus development



Typical ILW Container for Decommissioning Waste

The End Game: Delicensing/Land Release

- Phased Programme
- Land returned for reuse as a science campus and some housing/recreational
- Involves extensive surveys to demonstrate the land is clean to the ONR
- 22 hectares out of 113 hectares completed
- 20% of site completed



Eastern Area Now Ready to be Released for Re-Use



Harwell Way Ahead...



Near term focus:

- Legacy waste processing
- Groundwater clean-up
- Decommissioning for Campus development facilitation

Long term focus:

- Complete decommissioning
- Store intermediate level waste until national facility ready on a small part of the site



Conclusions

- 11 out of 14 reactors decommissioned
- 100 out of 160 facilities decommissioned to greenfield
- 20% of the land area delicensed
- 16.7km of the 20km of active drains decommissioned to a delicensable standard
- 1 million square feet of facility footprint removed



Thank You

