

## SPSPUR Event: 11 May 2011

Harwell's Journey Towards Alternative Disposal  
Solutions for Lower Activity Wastes



# Research Sites Restoration Ltd

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## Introduction

- Harwell 2011,
  - Research Site
  - 200,000 sq.m. of floor area decommissioned, 50 facilities
  - 9 significant con-land areas remediated,
  - 12 ha delicensed, 10 ha underway
- Decommissioning results in the production of solid lower activity wastes.
- There has never been a good option for such waste for Harwell – national issue.
- This is a summary of our journey towards such an option.
- Mostly from a Harwell SLC perspective, with a contribution from our Harwell SSG.



## Early 'Solutions'

- Early decommissioning 1940's to 1980's
- Waste stored on site in un-engineered areas
- These are now legacy issues



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## Decommissioning in the 1990's Reveals the Problem...

- Larger scale decommissioning began in the 1990's at Harwell.
- Several of the projects generated lower activity wastes in notable volumes.
- In particular the SSA remediation that finished in 2002.
- We began to think about alternative options for the remainder of our programme, but govt. policy was not helpful...



## Command 2919 – Govt Policy 1995 to 2007

'There are sound economic and radiological reasons for encouraging greater use of controlled burial.'

'...not to encourage greater use of controlled burial by the nuclear industry.'



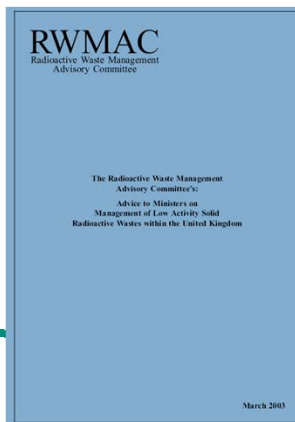
Cm2919, 1995

117. There are sound economic and radiological grounds for encouraging greater use of controlled burial. However, the Government recognises the genuine anxieties that its proposal has aroused among local residents. For that reason, it has decided not to encourage greater use of controlled burial by the nuclear industry. Nevertheless, controlled burial should continue to be available as a disposal route, particularly for “small users”—such as hospitals, universities, research laboratories and non-nuclear industries—subject to the agreement of the site operators and to the necessary regulatory requirements being met.



## The RWMAC Report, 2003

6.25 This would appear to pose an intractable problem. Most nuclear facilities will inevitably be left with large volumes of VLRM category waste, irrespective of whether there is any new build. Many local people would undoubtedly wish to see the radioactivity removed. Many (elsewhere) would not wish to see it dug up and buried near them, while the majority of the public would probably be alarmed by the prospect of large volumes of radioactive waste being transported over long distances, especially if it passed near their homes. The most obvious destination for any such waste movements, given concern over landfill, is Drigg. This would serve to fill up Drigg with waste arguably of such low activity that it should not be there. Long before Drigg is full, there will be a need to find a replacement, or indeed replacements, elsewhere. These considerations clearly indicate that not everyone can be satisfied, and the aim, therefore, should be to find the “least-bad” solution.



## Why Generate Decommissioning Wastes?

- **Hazard Reduction** – we produce wastes as part of decommissioning in order to bring about a long term safe condition.
- **Sustainability** – we produce wastes as part of not passing on decommissioning legacies to future generations.
- **Site End State** – we produce wastes to achieve the Site End State.
  - Site End State for Harwell was largely set in 1990's through spatial planning processes
  - Consulted through an NDA process with stakeholders in 2006 to 2009.
  - Does not rule out on or off site disposal of lower activity wastes – tends to rule against in-situ disposal



The Site End State for Harwell is 100% delicensing (to enable release for use as a major science campus)



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## What do We Call This Stuff?

- **Clean or Exempt** – not subject to specific regulatory control
  - **Low Volume – VLLW** - to an unspecified destination (“dustbin” disposal), each 0.1m<sup>3</sup> <less than 400 kilobecquerels (kBq) of total activity or single items containing less than 40 kBq of total activity. (Higher for H-3 and C-14)
  - **High Volume – VLLW** - four megabecquerels per tonne (MBq/te) of total activity which can be disposed of to specified landfill (Higher for H-3)
  - **Low Level Waste (LLW)** - radioactive waste having a radioactive content not exceeding four gigabecquerels per tonne (GBq/te) of alpha or 12 GBq/te of beta/gamma activity
- 
- Solid LLW for disposal - not at LLWR (Low Level Waste Repository)
  - Very Low Level Radioactive Material (VLRM)
  - High Volume Low Level Activity Waste (HVLA) (Harwell used this)
  - Controlled Burial Waste
  - Special Precautions Burial Waste



Lower Activity Waste?



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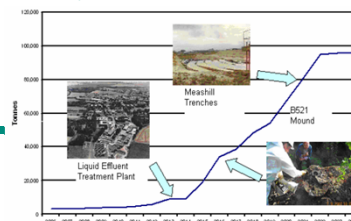
## What is this Waste?

- Typically bulk form
- Soils, rubbles, crushed concrete
- Up to a few ten's Bq/g specific activity, bottom few % of LLW range
- Wide range of nuclides possible – for Harwell H-3, Cs-137 and Co-60 dominate
- Typically legacy materials from decommissioning and land remediation
- Not amenable to treatment, reuse or recycling – best opportunity to apply waste hierarchy is at point of recovery by segregation
- Not particularly hazardous to handle
- Smaller amount of “others”

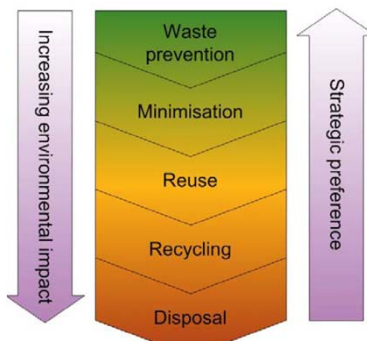


## How Much and When?

- Estimates of waste amounts have inherent uncertainty:
  - The degree to which application of waste hierarchy measures will reduce waste is uncertain on a case by case basis.
  - Much of the waste is currently tied up in relatively inaccessible legacies such as building structures, under floor slabs and in the land.
  - Pre-work characterisation is not a certain process and has not been completed in all cases.
- In the case of Harwell we estimate between 50,000 and 100,000 te over the whole closure programme.
- Closure timescales are subject to changes in assumptions and currently for Harwell extend to 2060, but most of this waste is dealt with by 2024.
- Compared to conventional waste flows in the UK (4 M te/yr?) the amounts are very small and the rate of movement is low.



## The Waste Hierarchy



- Not new but new emphasis given recently
- EA permit obligation to use **Best Available Techniques** within the hierarchy
- For bulk type lower activity wastes the best opportunity is **segregation** at the point of production with recycling/reuse of the clean fraction
- Reuse and recycling of bulk type lower activity wastes is not generally available
- A waste for which disposal is the only option will result in many cases
- Treatment options have been trialled, for example, dry soil separation and soil washing. Limited applicability currently.



## Harwell: Where We Were in 2006

- Harwell was decommissioning steadily in 2006
- Lower activity wastes were being stored and we could see a bottleneck on the horizon
- Govt. policy was under review
- To support our decommissioning planning we began a **public consultation** using the **Best Practicable Environmental Option (BPEO)** concept to look at options for lower activity wastes.



## The 2006 Harwell BPEO Process

- Stakeholder Notification
- Constraints & Decision Criteria
- Developing Options
- Screening Options
- First Written Consultation (6 weeks)
- Options Evaluation
- Weighting
- Sensitivity Analysis
- Preliminary Report
- Second Written Consultation (12 weeks)
- Final Report
- Subsequent Updates



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## The 2006 Harwell BPEO Process

A1. Radiological Risks – Routine to Public	A13. Feasibility
A2. Radiological Risks – Routine to Workers	A14. Flexibility
A3. Radiological Risks – Accident to Public	A15. Retrievability
A4. Radiological Risks – Accident to Workers	A16. Security
A5. Industrial Risks – Routine to Public or Workers	A17. Site End Point
A6. Industrial Risks – Accident to Public or Workers	A18. Long Term Passive Stewardship
A7. Air Quality	A19. Economic Impacts on Local Community
A8. Water Quality	A20. Cultural and Heritage Impact on Local Community
A9. Land Quality	A21. Inter-Generational Equity
A10. Transport	A22. Capital Financial Cost
A11. Nuisance	A23. Operating Financial Cost
A12. Ecosystem Impacts	A24. Post-closure Cost

### Attributes



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## The 2006 Harwell BPEO Process



- 72 stakeholders/groups registered an interest.
- Two presentations to the Harwell Local Stakeholder Group.
- 24 attributes against which each option can be compared.
- 24 options in the long list.
- Used the objective and constraints to screen out options which did not appear to be feasible. This resulted in **16 credible options**.
- Consulted on the above - **First Consultation Document - six week period** - published responses.
- Took into account the responses to the First Consultation – scored the short-listed options.
- The attribute preferences expressed by stakeholders - used to provide weighted scores for the options and to examine the relative sensitivity.
- Resulting in a recommended Best Practicable Environmental Option (BPEO) - a **Second Stakeholder Consultation** document -subject to a **12 week** public consultation.
- The final recommendation - three top ranked options are potential BPEO approaches:
  - New Engineered Disposal Onsite – Near Surface
  - New Engineered Disposal Onsite – Near Surface – Preceded by Storage Period
  - Landfill Disposal Offsite to Existing Landfill



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We are required to have a plan - no offsite routes were available in 2006 we put an on-site disposal scheme in our plan - did not pursue it actively – awaiting policy developments.

## East Hendred Parish Council

- Long time representative on Local Stakeholder Group
- One-third of Harwell site in parish, including two partially decommissioned reactors and the intermediate level waste store
- Parish Council has relevant expertise on nuclear decommissioning (two doctoral physicists)



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## East Hendred Parish Council

- The Parish Council is aware of the low-level activity of the waste, but recognises that it has a very long half-life (many '000 years) and the waste is in very large quantities
- The most likely site at Harwell for a HVLA store would be in the East Hendred parish
- Parish Council contributed to all stages of the consultation of the future of the HVLA waste, being one of the few consultees directly affected by the waste store. The Council felt that the level of consultation was limited.
- Because of its special position regarding a potential store it was felt that its views should have been given more weight



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## East Hendred Parish Council

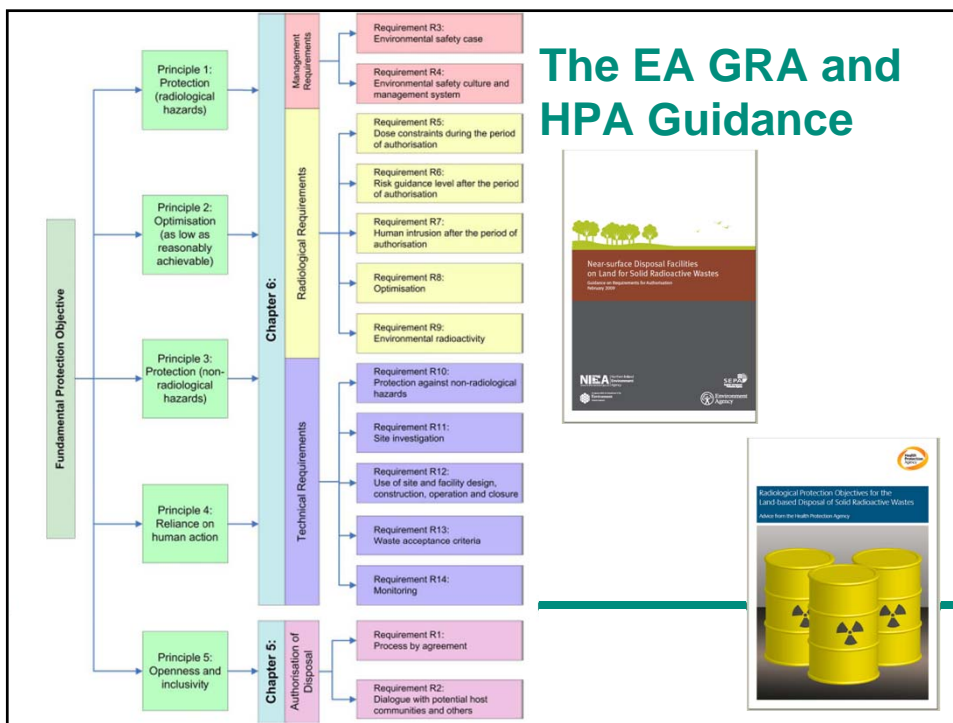
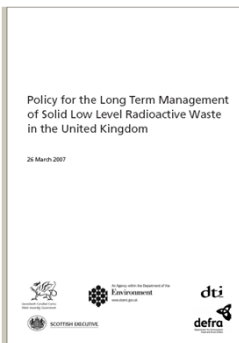
- **END STATE:** The proposal to store High Volume Low-level Waste on site is against the recommended end-state recommended by the LSG of a 100% de-licensed site.
- **GROUNDWATER:** The Parish Council is concerned that a store would be built on the chalk base underlying the Harwell site. Accepting that it would need to be built to high standards, but given the very long timescales involved it is likely that any protection would be breached, thus contaminating the local water sources.
- **RESPONSIBILITY:** Given the very long timescales involved in storage the Parish Council believes that at some point in the distant future it (or its local equivalent) may have to take some level of responsibility for the store
- **OFFSITE:** The parish Council considers that a better option would be to dispose of the waste in an existing landfill site which is located on a more satisfactory sub-structure



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# The 2007 Govt LLW Policy

- Clarifies the definitions of LLW and VLLW
- Requires producers to develop LLW mgmt plans
- Provides overall risk basis for disposal
- Use of waste hierarchy
- Presumption towards early solutions
- Role of the NDA
- *'With regard to LLW and VLLW disposal to landfill, Government sees no reason to preclude controlled burial of radioactive waste from nuclear sites from the list of options to be considered in any options' assessment, provided the necessary safety assessments can be carried out to the satisfaction of the environmental regulators This supersedes paragraph 117 of Cm2919'*



## The SLC/Market Response to the 2007 LLW Policy (Lower Activity Disposal)

- About 50 landfills have taken lower activity wastes historically.
- A few continue under historical arrangements to take mainly VLLW type “dustbin disposals” on local and limited scales.
- There are some on-site disposals on nuclear sites and some SLCs continue to look at this option.
- Currently there are a small number of commercial landfill sites looking to gain authorisation, article 37 approval and (if needed) planning approval for VLLW or LLW.



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## Personal Observations from the Northamptonshire Public Inquiry, 2010 (Drawn from closing statements)

- Perception of Harm
  - Material Consideration
  - Perception Exists
  - Inadequate Consultation
  - No Consultation by Nuclear Industry, just Operator/Planning Authority
  - Use of a Local Liaison Group
  - Use of newsletters, leaflets, helpline, meetings, public exhibition, parish meetings, local press, website etc – no opportunity for proper debate
  - Erroneous and ambiguous information.
  - Unanswered questions.
  - Design differs between different sites
  - Potential for groundwater impact
  - Operators record and motivation
  - The conduct of the inquiry
  - The ICRP approach
  - Site practices proposed, transport
  - The use of scientific models
- Need
  - No immediate need
  - On site disposal would be more acceptable to public
- Economic Sustainability
  - No advantage to local economy
  - National benefits would be felt by locals if disposed elsewhere
- Proximity
  - On site disposal would be better



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Local Campaign  
Group

### Personal Observations from the Northamptonshire Public Inquiry, 2010 (Drawn from closing statements)

- The local development plan has no specific policies for LLW.
- LLW disposal does not require specialised facilities.
- There is no national planning policy for LLW.
- Regional self-sufficiency.
- Proximity principle – no nuclear sites in the county.
- There is no immediate need.
- The waste forecasts are unreliable.
- Other sites may enter the market that are closer to producers.
- Lack of waste routes will not hold up decommissioning.
- Inadequate community engagement.
- SLCs must have a Plan B – they should use that instead.
- Some local residents have a perception of harm.
- Sites near to or on nuclear sites would be familiar with radioactivity and would be more welcoming of disposal.

The County Council



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### Personal Observations from the Northamptonshire Public Inquiry, 2010 (Drawn from closing statements)

- In accordance with policy.
- All regulators/experts/advisors had agreed with safety of proposal.
- The reasons for refusing planning were not supported by evidence.
- The proposal accords with planning policy.
- There is an immediate need.
- LLW disposal is a specialised activity.
- Community engagement was extensive.
- The operator's team are suitable and experienced.
- The site has existing suitable engineered containment.
- The site would be a nearest appropriate installation.
- The site has capacity.
- Perception of harm is not objectively held in this case.
- Consistent with NDA Strategy.
- The proposal would represent an appropriate sustainable form of waste management in locational, transportational, technical, environmental and policy terms.

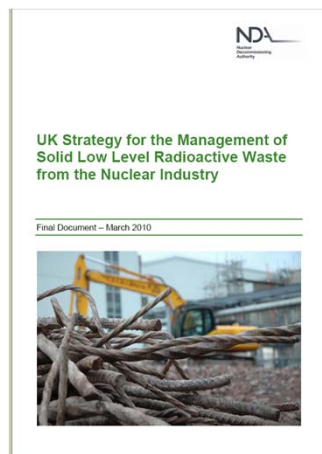
The Site Operator



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## The NDA LLW Strategy 2010

- Issued in March 2010
  - The waste hierarchy;
  - The best use of existing LLW management assets;
  - And the need for new fit-for-purpose waste management routes.



## The Current Harwell BPEO Position

- We updated our 2006 BPEO throughout - on our website.
- Currently the BPEO favours off-site disposal of lower activity waste:
- We do not have enough waste to justify on-site disposal economically.
- The rate of production is slow, over several decades, leading to long periods during which the facility would be open, but not in use.
- An on-site facility would require importation, from some distance, of a large amount of protective layering materials.
- The Harwell Site End State and potential for reuse of the land is established and inconsistent with on-site disposal for the area of the facility.
- The practicability of using an existing off-site route has improved with the change in govt policy and the market response.
- On-site disposal remains a potential if other options do not arise.



## Harwell: The Current Situation

- Some decommissioning cannot proceed without a solution for lower activity wastes.
- Storage facilities on the site are full.
- We await the outcome of ongoing initiatives in this area....



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