

# Higher Activity Waste At Dounreay

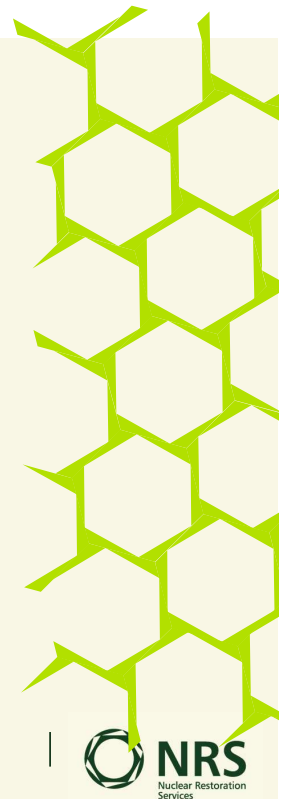


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Presented by:

Alan Mowat Waste Optimisation  
Manager and Julian Ginniver Higher  
Activity Waste Strategy Officer



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# 01

**Our HAW Strategy**

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# Our HAW Strategy - 1

- Existing ILW package routes will remain available for smaller waste producers
- Use of standard Nuclear Waste Services (NWS) formerly Radioactive Waste Management (RWM) approved waste containers.
  - Two Types of Container – 500 Litre drums and 6m<sup>3</sup> Concrete Boxes
- Follow the NWS Letter of Compliance (LoC) process for waste packaging
- Our strategy already has identified which waste streams can be loaded directly into these “at source”
- We will continue to work with the NDA estate to assess the viability of other or new waste package types for use here
- Construction of 2 new final stores for final waste packages nearing completion
  - Shielded Store for 500 litre drums
  - Unshielded Waste Store for 6m<sup>3</sup> Concrete Boxes and HHISOs for Decay Storage
- Some decommissioning strategies and waste package selection remain to be underpinned



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# Our HAW Strategy - 2

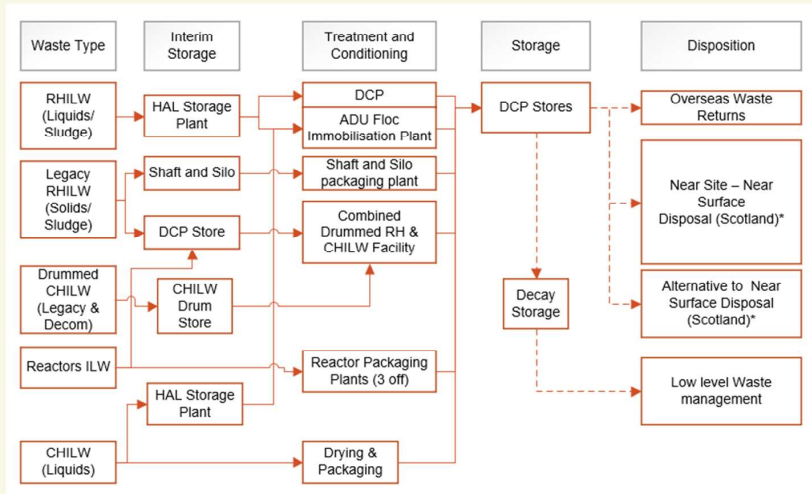
- All HAW will be packaged and in storage by the Interim End Point
  - Consolidated at DCP
  - Assumption is no more stores before IEP
- After IEP – assumption is storage for up to 300 years with store rebuilt every 100 years
- No activities in our plan for the construction of an NSNSD facility nor alternative disposal solution.



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# HAW – Wiring Diagram



- Routes are planned as a baseline strategy
- HAW is >99.9% of the Total Activity of Radioactive Waste at Dounreay in <11,000m<sup>3</sup> packaged volume

# Future Waste packaging plants

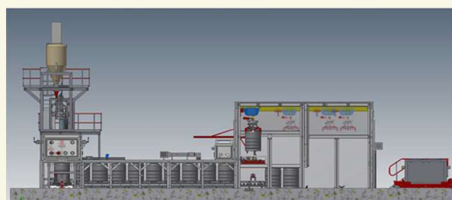
## Centralised

- Dounreay Cementation Plant
- Drummed Remote Handled and Contact handled ILW repackaging Facility

## At Facility:

- Ammonium Diuranate Immobilisation Plant
- Shaft and Silo Waste Packaging Plant
- PFR ILW Size Reduction Facility
- DFR Reactor & Circuits dismantling plant
- DMTR waste packaging
- High Active Waste Liquor Storage Facility
- Decommissioning Waste packaging Plant
- Thorium Nitrate drying and packaging plant(s)

- These reflect the baseline position waste strategies for HAW at the Dounreay Site in Lifetime Plan
- Most plant remain to be constructed
- Further investigation of opportunities and optimisation will be undertaken

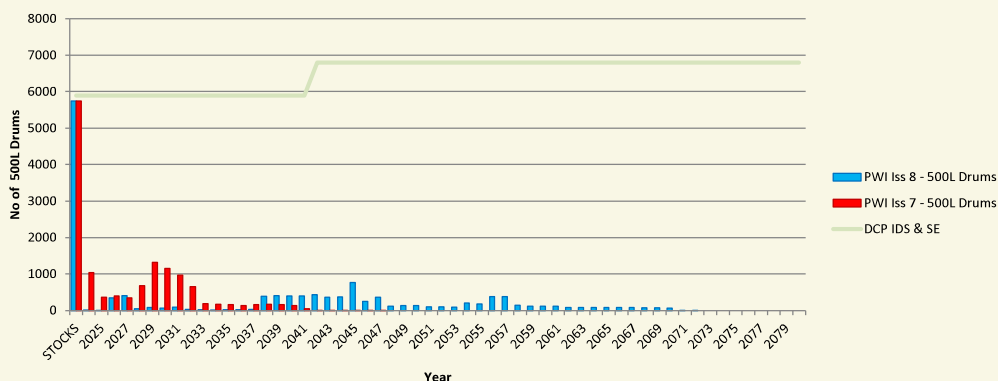


Schematic of ADU Floc Immobilisation Line

# HAW Packages

- Inventory
  - Already around 6,000 x 500 litre drums in storage (>40%)
  - Estimated around 14,000 x 500 litre drums in total to be produced
  - Estimated 170 6m<sup>3</sup> Concrete boxes in total to be produced
  - Graph below is example showing difference in waste packaging timelines now.

Forecast of 500L drums for storage within DCP

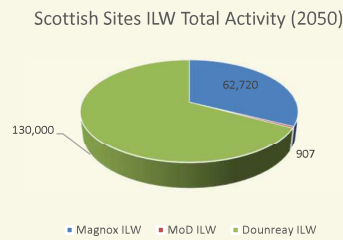
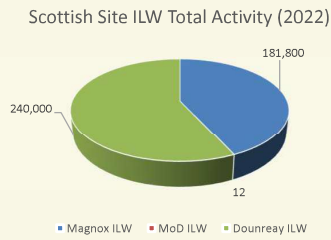
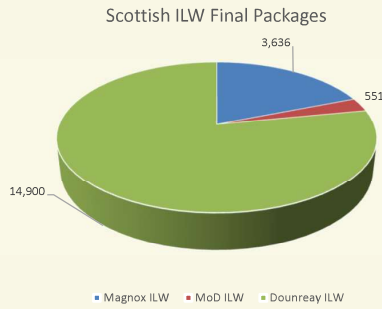


# 02

## Scottish Government & NDA HAW Work

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# Dounreay ILW in Context (Scotland only):



Website: [UK Radioactive Waste Inventory \(UKRWI\) \(nda.gov.uk\)](https://ukradiowasteinventory.gov.uk)

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## SG/NDA Work – Concepts

- All agreed the work is focussed on a sustainable **DISPOSAL** solution not a STORAGE solution; Does not identify a preferred design or site combination to be implemented.
- Dounreay has supported the work to date
- Key Assumptions:
  - Near-Surface – down to 200m depth
  - Near Site – assumption of up to 2km from source site
  - Monitored
  - \*retrieval – exact requirements under review
  - Maximise the inventory that can be disposed of to any facility matching this criteria
- Concepts considered (the locations are only for examples only)

<b>Chapelcross</b>	1. A single toroidal silo
	2. Underground caverns below the water table at a depth of up to 200 m
<b>Dounreay</b>	3. Warehouse at-surface vault
	4. Modular at-surface disposal cells
<b>Hunterston</b>	5. Multi-floor silos
	6. Single-floor silos
<b>Torness</b>	7. Undersea tunnel with the potential for targeted or bulk retrievability during operation.
	8. Undersea tunnel without the potential for targeted retrievability and with limited bulk retrievability during operation (i.e backfilling as the tunnel is filled).

- Location studies – have confirmed that there are viable concepts for disposal
  - Key will be making a business case for 4, 2 or 1 disposal facilities – large costs vs benefits vs hazard
  - Recognises that site selection and consultation are key

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## SG/NDA Work – Inventory Analysis

- Used the UKRWI 2019 as the base dataset;
- Used Environmental Safety Case analysis to confirm limiting factor – Human Intrusion & C14 pathway
  - At Surface – Designs 3 and 4
  - Silos – Designs 1, 5 and 6
  - Caverns at depth – Design 2
  - Tunnel under the Sea – Designs 7 and 8
- Inventory Suitable for disposal by site and concept:

Site	Total Packaged volume at site (m <sup>3</sup> )	Proportion of packaged volume passing specific activity constraints for each design							
		1 Toroidal silo	2 Caverns	3 Warehouse vault	4 Modular cells	5 Multi-floor silos	6 Single floor silos	7 Undersea tunnel (targeted)	8 Undersea tunnel (bulk)
Chapelcross	6771	97%	98%	93%	93%	25%	97%	98%	97%
Dounreay	12411	39%	39%	35%	35%	29%	39%	39%	39%
Hunterston A	9598	97%	97%	83%	83%	97%	97%	97%	97%
Hunterston B	6065	78%	78%	78%	78%	19%	78%	78%	78%
Torness	5316	88%	88%	88%	88%	21%	88%	88%	88%

- Inventory review has confirmed our own assessment of the likely proportion of Dounreay HAW **not suitable** for NSNSD is between 60 and 70% of the final packaged volume
  - Not just Dounreay that may have streams not suitable for NSD
  - The >6000 drums already produced are likely be not suitable for NSNSD.
- Dounreay remains committed to maximising the amounts that will be suitable for NSNSD.

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## Another view of the Inventory

Design	1	2	3	4	5	6	7	8
Total packaged vol (m <sup>3</sup> )	27960	30141	18411	18411	14123	30116	30141	30116
Proportion total packaged vol of interest in case	70%	75%	46%	46%	35%	75%	75%	75%
Size of facility	Three 57.8 mID silos	10 caverns	95 x 60 m quadruple bay	13 17.5m x 18m modules	Three 12.5m ID, one 14.5m ID silos	49 14.2 mID silos	800 m disposal length	550 m disposal length

- Concepts can only dispose of up to 75% of the HAW in Scotland
- Would still be subject to Site and Waste Acceptance
- Unclear what this means in terms of the total Scottish radioactivity to be disposed of

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## What does the SG/NDA work mean for Dounreay?

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- No immediate (potentially years) changes
- There is a wide range of options related to storage and disposal within Scotland
- Assume SG/NDA will consider how NSD is implemented in England and its applicability to Scotland
- Will continue to manage HAW in accordance Strategy including LoCs
- Lobby SG/NDA on strategic planning assumptions including outline Waste Acceptance/Screening Criteria to confirm any decisions on suitability or not for NSD;
- Formal SG HAW policy review in 2026 – could there be amendments to consider previously discarded options?
  - Recognise that the last 10 years has seen lot of progress related to a range of disposal facilities around the world at various depths
- Dounreay now have rep on the HAWSSIG (restarted in Feb 24) – to engage on the development of both the HAW Policy update and also the future work programme
- No visibility as yet on ScotPulse survey on HAW disposal in Scotland

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## Summary:

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- Dounreay has reference strategies to treat and package its waste into a passively safe form
- The waste will be packaged into 500 litre drums and 6m<sup>3</sup> Concrete boxes and stored on site
- The treatment and packaging will require the construction of new facilities on-site
- The timeline for the treatment and packaging has changed through the release of the new LTP
  
- The Scottish Government/NDA work has reconfirmed that between 60 and 70% of Dounreay HAW would require an alternative disposal solution
- There are viable concepts for NSNSD
- However, no decision has been made on changing the NDA strategic assumption from 300 years storage at the waste generating site at this time
- Dounreay will support the development of the SG Policy review due for 2026

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# Disposal Solutions – Concepts (1-4)

**Design 1: Toroidal Silos**

**SURFACE STRUCTURES OMITTED**  
(Steel frame over building with electric overhead travelling crane, supported from central concrete support column)

**Design 2: Caverns**

**SURFACE STRUCTURES OMITTED**  
(Headframes, Winders, Fan houses, Buffer stores)

**Design 3: Warehouse Surface Vault**

**Design 4: Modular Surface Vault**

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# Disposal Solutions – Concepts (5-8)

**Design 5: Multi-floor Silos**

**SURFACE STRUCTURES OMITTED**  
(Steel frame over building with electric overhead travelling crane and buffer store)

**Design 6: Single-floor Silos**

**SURFACE STRUCTURES OMITTED**  
(Steel frame over building with electric overhead travelling crane)

**Design 7: targeted retrievability**

**Design 8: bulk retrievability**

**Undersea Disposal Tunnel Designs**

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