OPTIONS ASSESSMENT REVIEW / REQUIREMENTS FORM

SUMMARY *To be completed once all other applicable parts of this form have been completed (including appendices as appropriate).*	
Title:	*Options assessment for management of radioactive gaseous discharges from encapsulated waste packages processed through the Solid Intermediate Level Waste Encapsulation facility (SILWE) and stored within the Intermediate Level Waste Store (ILWS).*
Site(s):	*Hunterston A site*
Document reference:	HNA/2865/PJ/PR/1072 Issue 2
Issue date:	06/09/2023
What is the decision to be made?	Is the current ILWS vault ventilation grille on the west elevation of the store suitable and sufficient to be authorised under the site EASR permit for the discharge of radioactive gaseous waste originating from encapsulated ILW packages.
Why is the decision required now?	This decision is required to allow the EASR permit variation to be progressed, which will need to include addition of a new authorised gaseous outlet for the ILWS.
Is a new study required?	Yes ☐
	No ☒ **What is the Preferred Option?** Authorisation and utilization of the current ILWS vault ventilation grille.
Who has been consulted in completing this form?	[redacted] (HORPE) (Site Options Assessment Coordinator)

SEND A COPY OF THE FULLY SIGNED FORM TO ANY OPTIONS ASSESSMENT OVERSIGHT MANAGER.

NEW STUDY NOT REQUIRED: SIGNATURES *To be completed once all other applicable parts of this form have been completed (Summary, Part A, relevant appendices).*		
Form Prepared by: Signed: [redacted] Name: [redacted]	Date: Role:	06/09/23 *Environmental Coordinator*
Form checked (as correctly and fully completed) by: Signed: [redacted] Name: [redacted]	Date: Role:	06/09/23 *Site Options Assessment Coordinator[1] / Relevant Programme Options Assessment Coordinator[2] / Options Assessment Oversight Manager[2].*

[1] For matters of local significance only.

[2] For matters of more than local significance.

PART A: DETERMINING WHETHER THERE IS A NEED FOR A NEW STUDY			
A1.	**Site(s):**	HNA	
A2.	**a. What is the decision to be made?**	Is the current ILWS vault ventilation grille on the west elevation of the store suitable and sufficient to be authorised under the site EASR permit for the discharge of radioactive gaseous waste originating from encapsulated ILW packages.	
	b. Why is the decision required now?	This decision is required to allow the EASR permit variation to be progressed, which will need to include addition of a new authorised gaseous outlet for the ILWS.	
A3.	**Scope:**	Encapsulated ILW packages from the site, primarily from the SILWE facility, will be stored within the ILWS after encapsulation, during which time residual radioactive gaseous waste will be off-gassed from the packages within the store and subsequently discharged from the store to the environment. The scope of this assessment is to determine whether the radioactive gaseous waste can be discharged from the current ILWS west elevation ventilation grille, utilising the current vault ventilation system setup, or is there a requirement to install a new bespoke discharge stack. Estimates of the gaseous waste discharges from the ILWS from encapsulated boxes originating from the SILWE facility during the period 2025 to 2031 are detailed in report HNA/2981/PG/REP/1223, "Assessment of Hunterston A SILWE Gaseous Radioactive Discharges in relation to the Best Practicable Means requirement." (Ref.2). In summary, annual gaseous discharge activities attributable to off-gassing from SILWE packages within the ILWS equate to 2.19 GBq H-3 and 0.32 GBq C-14. Magnox report HNA/2981/PG/REP/1223, (Ref.2) determines that gaseous releases from encapsulated ILW packages will tail off to negligible levels after around 384 hours after capping. Therefore, gaseous discharges from the ILWS will need to be accounted for from the commencement of storage of ILW packages from the PPSREP project up until at least 2 weeks after completion of the SILWE project (roughly 6 years). Following completion of this project, radioactive gaseous discharges (off gassing, the source of the activity) from ILW packages within the store would cease to occur. It is an assumption of this assessment that the sites 'SILWE' permit variation application has been successful, and the sites gaseous discharge limits and subsidiary limits have been amended as detailed in HNA/3800/TC/CS/1534. (Ref.6)	
A4.		Yes ☐ **Summarise below.**	No ☒ **Go to Box A5.**

	Are there any existing relevant options assessments addressing the decision in Box A2a? **DO NOT INCLUDE DOCUMENTS WHICH ARE NOT RELEVANT TO THE DECISION IN BOX A2a.** **DO NOT INCLUDE DOCUMENTS WHICH ARE NOT OPTIONS ASSESSMENTS.** **DO NOT INCLUDE SUPERSEDED DOCUMENTS.**	**Title and reference for existing assessment(s):** **Outcome of existing assessment(s):** *Provide succinct summary of each options assessment referenced above, specifically relating to the decision to be made (Box A2a).* **Are the existing assessments valid and sufficient now to address the decision and scope in Box A2a and Box A3?** • Do they address the decision and scope described in Box A2a and Box A3 above? • Are additional options available now? • Were all the relevant attributes (issues) considered? • If produced today, would the arguments and conclusions remain the same? AND • Do they represent a BAT / BPM case? • Do they ensure that doses and risks are ALARP?	
		Yes ☐ *Provide further details / explanation as required.* **New study NOT required. Go to Box A8.**	No ☐ *Provide summary reasons why not sufficient / no longer valid.* **Go to Box A5.**

PART A: DETERMINING WHETHER THERE IS A NEED FOR A NEW STUDY			
A5.	Are there existing Company or site procedures which: • apply to the decision and scope described in Box A2a and Box A3 above; and • ensure that BAT/BPM is applied; and • ensure that doses and risks are ALARP?	Yes ☐ Title(s) and reference(s) for the existing procedure(s): In brief, what are the requirements of existing procedure(s): New study NOT required. Go to Box A8.	No ☒ Go to Box A6.
A6.	Is the issue fully covered by existing external best practice or compelling regulatory guidance?	Yes ☐ Title(s) and reference(s) for best practice / compelling guidance: In brief, what are the requirements of existing best practice or guidance: New study NOT required. Go to Box A8.	No ☒ Go to Box A7.
A7.	Is there only a single option or is there one clearly preferable option?	Yes ☒ Complete Appendix A. New study NOT required. Go to Box A8.	No ☐ New study IS required. Go to Box A9.
A8.	Tick here to confirm that a NEW STUDY IS NOT REQUIRED UNDER S-391. Based on answers above, this is because: There is an existing and adequate assessment that remains valid [Box A4]. ☐ Scope/decision is covered by existing procedures [Box A5]. ☐ Best practice or compelling regulatory guidance applies [Box A6]. ☐ Only one option is available or one option is clearly preferable [Box A7]. ☒		☐
	NOW COMPLETE: • FRONT PAGE SUMMARY; THEN • SIGN-OFF OF THIS FORM.		
A9.	Tick here to confirm that a NEW STUDY IS REQUIRED UNDER S-391.		☐
	NOW COMPLETE PART B.		

PART B: A NEW STUDY IS REQUIRED, FRAMING THE STUDY.				
B1.	What is the decision to be made?		*Copy from Box A2a.*	
B2.	☐ The study is of a type listed in Appendix C.		☐ The study is not of a type listed in Appendix C.	
	☐ The study has been "called in"[3]. Called in by whom?: Reference e.g. email:		☐ The study has not been "called in".	
	The study is of more than local significance	☐ If one or both boxes directly above are ticked.	The study is of local significance only	☐ If both boxes directly above are ticked.
B3.	What are the options to be considered?	*This is the initial options list. Options may change during the study (be added to, or some screened out).* *Use the form in Appendix B (high level strategy screening form) for radioactive waste management (excluding aqueous and gaseous effluent) where relevant to the decision to be addressed in Box A2a / Box B1.*		
B4.	Which specialists are to be consulted during the study?	*For example, subject matter experts in packaged ILW disposability, LLW waste acceptance criteria, site end-state management, radioactive land quality management, radioactive aqueous effluent dispersion.*		
B5.	Who is the proposed author?	Name: _____ Position / Role:		
B6.	What is the proposed documentation?	F-226 (options assessment form) ☐ F-227 (options assessment report template) ☐		
B7.	Is Management Analysis proposed?	Yes / No (Delete as applicable) *This decision can be amended later in the process if appropriate.* *Management Analysis is mandatory for assessments of more than local significance.* *Management Analysis may be appropriate for assessments of local significance if an option with one or more significant detriments (cost; worker dose etc.) could be proposed.* *Consult Options Assessment Oversight Manager for advice if needed.*		

NOW COMPLETE:

- FRONT PAGE SUMMARY; THEN
- SIGN-OFF OF THIS FORM.

[3] Studies may be "called in" by:

- the Waste Strategy & Permissioning Manager;
- the Decommissioning Director;
- the Environment, Health, Safety, Security and Quality (EHSS&Q) Director; or
- an Options Assessment Oversight Manager.

APPENDIX A: JUSTIFICATION FOR THERE BEING A CLEARLY PREFERABLE OPTION

JUSTIFICATION FOR THERE BEING A CLEARLY PREFERABLE OPTION

The process design throughput of encapsulation of ILW packages through SILWE requires packages to be transferred to the ILWS prior to off-gassing being completed, as there is no capacity within the SILWE facility itself to store the required amount of packages for completion of off-gassing whilst continuing with the grouting process. Discussion with SEPA on the proposed use of EASR Standard condition H.2.1 to allow the discharge of gaseous waste from outwith an authorised gaseous outlet have discounted this as being an option, therefore the only two options for consideration are installation of a new authorised discharge stack on the ILWS (Option A), or discharging the gaseous waste from the existing ventilated grille on the west end of the ILWS, utilising the vault ventilation system in its current form (Option B). In either case, the chosen discharge point from the ILWS will need to be authorised and included in the site EASR permit, and be included in the SILWE / ILWS permit variation.

Table One - Relative Risk Between Options:

Option a) Installation and authorisation of a new radioactive gaseous waste discharge stack on the ILWS.				Option b) Authorisation of the current vault ventilation grille for radioactive gaseous waste discharges from the ILWS.			
RELATIVE RISK	H	M	L	RELATIVE RISK	H	M	L
Public Dose			x	Public Dose			x
Operator Safety		x		Operator Safety			x
Operator Dose			x	Operator Dose			x
Impact on EPR/RSA			x	Impact on EPR/RSA			x
Non-rad Environ. Impact			x	Non-rad Environ. Impact			x
Cost		x		Cost			x
Other – generation of rad waste		x		Other – generation of rad waste			x

In line with the site EASR permit, gaseous radioactive discharges are only authorised from specified authorised discharge routes, as detailed in Table 2 of the permit. In adherence with this, any gaseous outlet identified on the ILWS which serves to ventilate radiologically controlled areas requires to be designated as an authorised discharge outlet within Table 2 of the site EASR permit. The purpose of this BPM assessment is to determine whether a discharge stack would need to be erected, in line with industry standard Ventilation Systems for Radiological Facilities Design Guide, EG_0_1738_1 (Ref.3), or is there sufficient justification to allow the current ILWS ventilated grille to be designated as an authorised gaseous outlet, against recommendations of the industry standard design guide.

<u>Reasoned Arguments</u>

EG_0_1738_1, section 16.1.2 states "wall or other vertical surfaces are subjected to a wide variation of positive and negative pressures depending on the direction and strength of the wind. Therefore, wall or other horizontal discharges from ventilation systems serving radiological controlled areas should be avoided *wherever possible*".

In addition, section 16.3 relating to minimum stack heights states "The Environmental Protection Act 1990 Technical Guidance Note (Dispersion) D1 states that no discharge stack should be less than 3m above the ground or any adjacent area to which there is general access." The discharge grille on the west elevation

of the ILWS is at a height of 5.3m above ground level, so would fall within the parameters of what would be considered acceptable if it were a discharge stack.

Installation of a new ILWS discharge stack to replace the current extract grille has been assessed as costing approximately £300k for design and installation (*Ref 5*). Installation of a discharge stack would also require re-design of the vault ventilation system to take into account stack flowrates and discharge dispersal modelling.

The current ILWS ventilation system within the vault has been optimised for the management of hydrogen evolution and maintaining stable humidity and temperature conditions. The store ventilation system has been determined to be suitable and sufficient for the maintenance of a safe environment on the grounds of health & Safety and package integrity.

Public exposure in relation to radioactive discharges from the ILWS have been assessed as negligible, see assessment below, giving weight to the argument that the current extraction system and ventilation outlet from the ILWS are considered suitable and sufficient to control the build-up and extraction of radioactive gaseous effluents.

Public Dose:

Estimated gaseous discharges from the ILWS equate to a total annual dose of 0.024 µSv to a member of the public. This is based on using Stage 1 – Initial radiological assessment DPUR values using the atmospheric release scenario, which are based on default data assuming a ground-level release. As per Environment Agency guidance Initial radiological assessment methodology – part 1 user Report SC030162/SR1 (Ref.4). If assessed dose is < 20 µSv/y, then there is no requirement to proceed to Stage 2 for further assessment.

This estimate in dose uptake to the public supports the conclusion that the installation of a new gaseous discharge stack, including redesign of the store ventilation system, and any abatement technology for tritium and carbon-14 discharges would not represent BPM, based on the costs of design, installation, maintenance, and future disposal of abatement plant far outweighing the benefits to the public through further minimising dose uptake. This demonstrates that EASR standard condition G.1.4 'you must use the best practicable means to minimise the quantity of radionuclides that are discharged' has been met.

The discharge activity remains the same whether option A or option B is selected, and any reduction to the resultant dose to members of the public from installation of a discharge stack would be negligible.

Dose Calculations for gaseous discharges at the ILWS (SILWE packages only)

Dose per unit release factors for local resident family – atmospheric release scenario.

C-14: 0.32 GBq - Total DPUR is 6.8 E-11 µSv/y per Bq/y of discharge to the atmosphere.

0.32 E9 x 6.8 E-11 = 0.022 µSv of dose.

H-3: 2.19 GBq - Total DPUR is 9.6 E-13 µSv/y per Bq/y of discharge to the atmosphere.

2.19 E9 x 9.6 E-13 = 0.002 µSv of dose.

Accounting for SILWE encapsulated packages only, combined annual dose to a member of the public = 0.024 µSv.

Operator safety:

If Option A were selected, erection and eventual dismantling of an authorised discharge stack, would pose an additional industrial safety risk to operators (i.e. working at a height / manual handling) which Option B would not as the in-situ ventilation plant and extract grille is suitable and sufficient.

Operator Dose:

The ILWS building is shielded so construction and operating/maintenance activities would not be expected to impact operator dose. The waste storage vault area of the ILWS is heavily shielded and the stack would be sited in an area with low ambient background radiation. The area is designated as a Radiation Controlled Area (R2 / C0) so negligible dose to the operator would be accrued during construction and any stack maintenance activities.

There would be no additional dose to personnel if option B were selected as construction and maintenance activities would not be required.

Impact on EA(S)R Permit:

The annual discharge activity estimates from the ILWS from SILWE packages are 2.19 GBq of Tritium and 0.32 GBq of Carbon-14, this is based on 22.31% of the total tritium activity, and 13.81% of total Carbon-14 activity from off-gassing from the SILWE encapsulated packages occurring within the ILWS. (*Ref.2*).

Neither Option A or Option B would have any impact on the total activity being discharged to the environment.

Non-rad Environment Impact:

Option A, erecting and eventual disposal of an authorised discharge stack potentially generates a small volume of non-rad waste which would require disposal.

Option B does not impact non-rad environment as the in-situ ventilation plant and extract grill is suitable and sufficient.

Cost:

The ILWS ventilation system is predominately a recirculatory system (only 10% of the air change is drawn from outside the building). Through circulation the system is designed to achieve 0.5 air changes per hour. This store undergoes a complete fresh air change once every 20 hours or for simplicity, once per day. Air is discharged from the ILWS via an extract grille on the west end of the facility. This grille is not currently designated as an authorised gaseous discharge outlet under the site EASR Permit. The industry standard for ventilation systems for radiological facilities design guide states that ducts should be avoided whenever possible, and instead stacks should be utilised (*Ref.3*).

If Option A, installation of a discharge stack, were required to allow designation as an authorised discharge outlet to replace the current extract grille, it has been assessed the cost of installation at approximately £300k (*Ref 5*). Maintenance and operational activities would incur an additional resource and associated financial cost. In addition work would need to be undertaken to review the ventilation system arrangements as a greater number of air changes per hour would be required to ensure gaseous waste was discharged via the stack. Disposal of the stack at the end of its lifespan would generate additional radioactive waste, against EASR Standard condition B.2.1, as well as incurring the additional cost of disposals.

Option B would not incur any of these wastes or costs as the existing ventilation plant and discharge outlet is suitable and sufficient for the radiological gaseous discharges associated with venting from the encapsulated packages.

Other – Generation of Rad Waste:

Option A will likely generate solid radioactive waste requiring disposal (discharge stack will be contaminated) at the end of its useful life. The duration of gaseous discharges from the ILWS is estimated at 6 years, from the initial packages from active commissioning of SILWE in 2025 to completion of the project in 2031, following which discharges will cease and the stack would no longer be required. As it would likely be contaminated it would require decommissioning and further treatment or disposal as radioactive waste.

Option B does not generate any additional active waste.

Conclusion

Option A, including stack installation, operation, maintenance and disposal costs are grossly disproportionate to any further reduction in the estimated annual public dose of 0.024 µSv. The estimated activity and corresponding public dose have shown additional treatment to avert public dose would not represent BPM. In addition, this option potentially generates additional radioactive waste (the stack) which goes against EASR Standard condition B.2.1 which states 'you must use BPM to ensure that no unnecessary radioactive waste is generated'.

Option B demonstrates compliance with the following EASR standard conditions:

B.2.1 'you must use BPM to ensure that no unnecessary radioactive wate is generated'.

G.1.3 'you must ensure that the quantity of radioactive waste you dispose of does not exceed any limits set out in your authorisation'.

G.1.4 'you must use the best practicable means to minimise the quantity of radionuclides that are discharged'.

It has been argued that the current ventilation plant configuration, including the extract grille on the West elevation of the store, is suitable and sufficient for control of both the evolution and build-up of Hydrogen gas and for the discharge of radioactive gaseous tritium and Carbon-14 wastes from the store. The ventilation system in its current position and configuration would not expose any members of the public to any excessive dose uptake which would require further mitigation.

Therefore, through the arguments presented within this report, it is proposed that Option B, the utilisation of the ILWS ventilation system in its current configuration, including authorisation and use of the ventilation outlet grille on the west elevation of the facility, represents BPM and that the benefits of installation of a bespoke discharge stack would be grossly disproportionate to the costs and effort involved. This is under the assumption that variation to the current site EASR permit gaseous discharge limits is successful to allow operation of the SILWE facility and authorisation of the ILWS vault ventilation grille as an authorised gaseous outlet.

This report also demonstrates compliance with EASR standard condition G.2.1 which requires that all radionuclides discharged into the environment must be evaluated. The activities detailed in the report are estimates, the author therefore recommends that these estimates are reviewed during active

commissioning of SILWE to confirm the accuracy of any standard reporting values. This action will ensure that EASR standard conditions A.7.1 'You must take samples and conduct measurements, tests, surveys, analyses and calculations necessary in order to ensure compliance with your authorisation', and A.4.1 'you must make, as soon as reasonably practicable, true, accurate and legible records that ensure and demonstrate compliance with the requirements of your authorisation', are adequately demonstrated.

Review Requirement: This report should be reviewed following active commissioning of SILWE to confirm that the assumptions these conclusions are based on remain accurate.

Forward Action Plan:

Forward Action 1

Waste Manager to confirm that the ILWS Standard Reporting Value recorded in HNA/1002/TC/REP/157 'F-016 Part D - Application of Standard Reporting Value – Intermediate Waste Store (ILWS)' has been reviewed and amended as required during SILWE Active Commissioning and the Outcome has been reported to the EHSS&Q Environment Advisor (Rad).

Forward Action 2

EHSS&Q Environment Advisor (Rad) to review this report 'HNA/2865/PJ/PR/1072 – "Options assessment for management of radioactive gaseous discharges from encapsulated waste packages processed through the Solid Intermediate Level Waste Encapsulation facility (SILWE) and stored within the Intermediate Level Waste Store (ILWS)." following SILWE Active Commissioning and Amend as Required.

This data should be used to inform the standard reporting value for inclusion in the monthly SEPA reported gaseous discharges as required by EASR standard condition A.4.1.

References:

1. *SEPA, Environment Authorisations (Scotland) Regulations 2018, EAS/P/1173609, March 2019.*
2. HNA/2981/PG/REP/1223 Issue 3, "Assessment of Hunterston A SILWE Gaseous Radioactive Discharges in relation to the Best Practicable Means requirement, May 2023.
3. Sellafield Limited, EG_0_1738_1, Ventilation Systems for Radiological Facilities Design Guide, Issue 1, December 2018.
4. Environment Agency, Initial Radiological Assessment Methodology – part 1 user report, SC030162/SR1, May 2006.
5. HNA/2982/WD/UN/29842, Email from Cameron Robertson to Reuben Philips 08 August 2022; 09:33 Titled 'ILWS Vent System'
6. HNA/3800/TC/CS/1534, Issue 2, "Impact of SILWE gaseous Discharges on Site Permit Limits", April 2023.