



6.0 HUMAN HEALTH EFFECTS ARISING FROM LOCATION WITHIN THE DETAILED EMERGENCY PLANNING ZONE (DEPZ)

6.1 Introduction

- 6.1.1 This chapter assesses the likely effects on human health arising from the location of the proposed development within the Atomic Weapons Establishment Detailed Emergency Planning Zone (AWE DEPZ).
- 6.1.2 AWE Burghfield is where nuclear warheads for the UK's Continuous at Sea Deterrent (CASD) programme are assembled and maintained while in service and decommissioned when out of service. AWE Burghfield is the only site in the UK which has all required permissions to undertake the authorised activities associated with the assembly, disassembly, handling and storage of nuclear warheads.
- 6.1.3 The Radiation (Emergency Preparedness and Public Information) Regulations 2019 (REPPPIR) requires AWE to assess the likelihood and impact of a radiation emergency to the public and provide West Berkshire Council with the required information to establish the Detailed Emergency Planning Zone (DEPZ) around Aldermaston and Burghfield. This is the area where West Berkshire Council needs to have planned, in detail, how they, the emergency services and other organisations would respond in the unlikely event of a radiation emergency arising from AWE.
- 6.1.4 The site of the proposed development is located approximately 4km south east from AWE Burghfield, within the facility's Detailed Emergency Planning Zone (DEPZ) but outside the urgent protective action zone (UPAZ) of 3,160 m.
- 6.1.5 It is known that AWE plc is building and commissioning a new facility to assemble and disassemble warheads and it is expected that this will greatly reduce the risks posed by the AWE site. There is the prospect that the proposed development site may be removed from the DEPZ, however for the purposes of this assessment this has not been considered.

6.1.6 This chapter (and associated figures, tables and appendices) form part of the Environmental Impact Assessment related to the application at Land off Basingstoke Road, Spencers Wood, and has been prepared by K.I. Pearce, PhD, MSc, FEPS, M.C. Thorne, PhD, FInstP CRadP and I. Murphy MSc.

6.1.7 The chapter refers to the following appendices:

Table 6.1 – Appendices	
ES Appendix	Title
Appendix 1.2	Screening Opinion received June 2024
Appendix 1.4	Scoping Opinion received July 2024
Appendix 6.1	Request to engage with JEPU
Appendix 6.2	WBC Emergency Planning Manager Pre-application Advice
Appendix 6.3	Off-Site Emergency Plan
Appendix 6.4	Freedom of Information Request
Appendix 6.5	RMU/Rest Centre Conversion Plan
Appendix 6.6	On site Emergency Plan – To Follow

6.2 Scoping, Consultation and Overview of Potential Effects

6.2.1 A Screening Opinion Request was submitted to Wokingham Borough Council in May 2024, and a formal Screening Opinion was received in June 2024 (Appendix 1.2). The Opinion stated:

The site is located within Atomic Weapons Establishment (AWE) Burghfield Detailed Emergency Planning Zone (DEPZ). The construction process would increase the population within the DEPZ as would post occupation for the development, which will see residential accommodation, employment land and a primary school. This would significantly increase the population within the DEPZ which could have an impact on the 'blue light' response in the unlikely event that there was an incident at Burghfield. AWE operates at as low as reasonably practicable (ALARP), so the risk of a radiation emergency is very low. However, the consequences of a radiation emergency are significant.



6.2.2 AWE was consulted on the screening request. Their response notes Policy TB04 of the Managing Development Delivery Plan 2014, as well as Section 8 and Section 15 of the NPPF. These policies will be considered in the Legislative Policy and Guidance section of this chapter. The Wokingham Borough Emergency Planning Consultee response stated: *'The DEPZ and Off-Site Emergency Plan is in place to protect individuals living, working and visiting within this boundary, as legislated by REPPIR 2019. Any increase would have a detrimental impact on the Council's ability to implement the Off-Site Emergency Plan.'*

6.2.3 The impact on the 'blue-light response' and the Off-Site Emergency Plan (OSEP) is assessed further in this chapter.

6.2.4 An EIA Scoping Request was submitted to Wokingham Borough Council (WDC) in June 2024, a formal Scoping Opinion was received in July 2024 (Appendix 1.4). The Opinion stated:

Complete floor plans and anticipated population increase to the DEPZ for all proposed uses should be provided within the Environmental Statement to help assess the extent of consequential impact on the Off-Site Emergency Plan, albeit Emergency Planning Officers are already of the view that the proposal cannot be accommodated within the Emergency Off-Site Plan. Hence, Planning Officers are not able to advise of any technical reports or submissions within the Environmental Statement that would be beneficial when reviewing the proposal in relation to this matter.

Regardless, it appears unlikely that there could be any information presented (even if scoped into an Environmental Statement) that would presently alter the view of technical experts for which Planning Officers rely upon for this specialist subject matter.

6.2.5 Engagement with the Joint Emergency Planning Unit (JEPU) was also sought during the design of the proposals, to better understand potential implications on the Detailed Emergency Planning Zone (DEPZ) of AWE (Burghfield) and discuss an approach to mitigation. A letter requesting a discussion was sent to Emergency Planning at West Berkshire Council on the 8th May 2024, who required a pre-application request to be submitted at WBC before they could engage in discussion (Appendix 6.1).



6.2.6 As part of the pre-application advice request, specific engagement with the JEPU was sought in the form of written advice and a bespoke meeting to discuss the intricacies of the DEPZ. Whilst written advice was received as part of the pre-application advice on 21st February 2025, it consisted of a standard response to policy requirements. Due to JEPU capacity issues, no meeting could be scheduled prior to this submission, with the earliest meeting set for the 29th of April 2025.

6.2.7 Richborough's intention with the pre-application request was to be able to engage with the JEPU directly, as had been indicated to us in early 2024, to better understand their position and offer support, along with a potential solution. Richborough do however remain committed to working alongside the JEPU and look forward to the meeting on the 29th of April 2025. The WBC Emergency Planning Manager's formal pre-application written advice is included at Appendix 6.2.

6.3 Legislative Policy and Guidance

6.3.1 The relevant legislative policy framework related to the proposed development inside the DEPZ is as follows:

- Policy TB04 of the WBC Managing Development Delivery Framework.
- Section 8 of the National Planning Policy Framework.
- Section 15 of the National Planning Policy Framework.
- The Radiation (Emergency Preparedness and Public Information) Regulations 2019 (REPPIR) Statutory Instrument 2019 No.703.
- REPPIR 2019 Approved Code of Practice (ACOP) and Guidance.
- Council Directive 2013/59/Euratom of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom
- Atomic Weapons Establishment Off-Site Contingency Arrangements (Public Document Version)
- Atomic Weapons Establishment Off-Site Emergency Plan – Public Version
- Nuclear Installations Act 1965 (NIA65).



- Environmental Protection Act 1990.
- Ionising Radiation Regulations 1999.
- Radioactive Substances Act 1993.
- Civil Contingencies Act 2004.

6.3.2 Policy TB04 of the Managing Development Delivery Framework relates to development within the vicinity of AWE Burghfield. The policy states:

1. Development will only be permitted where the applicant demonstrates that the increase in the number of people living, working, shopping and/or visiting the proposal (including at different times of the day) can be safely accommodated having regard to the needs of “Blue light” services and the emergency off-site plan for the Atomic Weapons Establishment site at Burghfield.
2. The applicant will need to provide this information where the proposal exceeds the scale of development detailed below for the consultation zone as defined on the Policies Map.

6.3.3 The scale of development relevant to the proposed development site is all residential or non-residential applications where 500 or more additional people may live, work, shop and/or visit (the DEPZ).

6.3.4 Radiation (Emergency Preparedness and Public Information) Regulations 2019 (REPPPIR) sets out that there is a requirement for off-site emergency arrangements to be established by the local authority for the AWE Burghfield site. To comply with this requirement, an OSEP has been produced, which sets out the emergency arrangements for a multi-agency response to any onsite emergency with actual or potential off-site consequences at the AWE Aldermaston or Burghfield sites. The Off-Site Emergency Plan (FOI Version 1.0, August 2022) is provided at Appendix 6.3.

6.3.5 The Plan is prepared by the AWE Off-site Group, chaired by West Berkshire Council, consisting of Emergency Planning Officers and professionals drawn from the following organisations:

- AWE PLC
- Basingstoke & Deane Borough Council



- Integrated Care Partnership (Berkshire West)
- Environment Agency
- Food Standards Agency
- Department for Levelling Up, Housing and Communities Resilience and Emergency Division (RED)
- Government Decontamination Service
- Hampshire County Council
- Hampshire Constabulary
- National Highways
- Office for Nuclear Regulation (ONR)
- Met Office
- Ministry of Defence (MOD)
- National Health Service (NHS) England
- Network Rail
- UK Health Security Agency
- Reading Borough Council
- Royal Berkshire Fire and Rescue Service
- Royal Berkshire Hospital
- South Central Ambulance NHS Foundation Trust
- Thames Valley Police
- Thames Water
- West Berkshire Council
- Wokingham Borough Council

6.4 Assessment Methodology

- 6.4.1 This chapter considers the human health effects arising from the proposals location within the Detailed Emergency Planning Zone (DEPZ). The assessment of likely significant human health impacts has involved the following staged process:



- Identifying potentially sensitive existing and future receptors on and within the surrounding area of the site.
- Establishing the baseline radioactive levels currently existing at the Site and at existing receptors surrounding the site using appropriate surveys and modelling (to take account of any potential release of material from AWE Burghfield).
- Assessing the suitability of the Site for the proposed uses in terms of the prevailing baseline radioactivity levels (including if a release of material occurred from AWE Burghfield).
- Assessing the likely levels of radioactivity during ground preparation and construction works associated with the development.
- Assessing the likely levels of radioactivity in the completed and operational development.
- Formulating proposals for mitigation (where appropriate); and
- Assessing the likely significant of any residual health impacts arising from location in the DEPZ around AWE Burghfield.

6.4.2 This assessment has been conducted using the Parameter Plans and the maximum number of units outlined in Chapter 4: Proposed Development. This approach is regarded as representing both the reasonable worst-case scenario and the most likely outcome for the Proposed Development. Any changes at later stages of the application process would require further evaluation.

Determining Effects

6.4.3 In determining effects, reference is made to existing guidance including the OSEP and the AWE Consequence Report [AWE 2019], as well as guidance on development in vicinity of AWE Burghfield provided in the Wokingham Borough Council Managing Development Delivery Local Plan (2014).

Sensitivity

- 6.4.4 The significance of the effect on any human health outcome, is related to the sensitivity of that outcome and the magnitude of its impact, as detailed in Table 6.1, based on section 2.5 of this ES. Whether or not this is significant in EIA terms is articulated in Table 6.2.

Table 6.1 - Effect Significance Matrix					
		Nature of Receptor (Sensitivity)			
		High	Medium	Low	Negligible
Nature of Impact (Magnitude / Probability / Reversibility etc)	High	Substantial	Substantial	Moderate	Negligible
	Medium	Substantial	Moderate	Minor	Negligible
	Low	Moderate	Minor	Minor	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

Table 6.2 - Effect Significance Categories and Typical Description	
Scale	Definition
Substantial	Effects at this level are material in the decision-making process.
Moderate	Effects at this level can be considered to be material decision-making factors.
Minor	Effects at this level are not usually material in the decision-making process but may be material in the context of specific guidance/legislation.
Negligible	Not usually material in the decision-making process but may be material in the context of specific guidance/legislation.

- 6.4.5 The significance of the effect may be adverse or beneficial. Substantial effects are significant in EIA terms. Moderate effects may be significant in EIA terms, based on professional judgement. Minor and negligible effects are not usually significant in EIA terms but may be material in the decision-making process in the context of specific guidance and legislation.



Assumptions and Limitations

- 6.4.6 It is assumed that the likelihood of a Radiation Emergency occurring at AWE Burghfield is low¹ and, if one does occur, the people on the development site will only be exposed to an additional radiation dose if the wind is blowing from AWE Burghfield towards the development site.
- 6.4.7 The consequences in terms of first pass inhalation dose resulting from a radiation emergency at AWE Burghfield while the wind was blowing towards the proposed development site were taken from the AWE Consequence Report [AWE 2019]. These predict a radiation dose of 7.5 mSv at 3,160 m from a centre point within the AWE site. However, the dose will only be this high during low-dispersion weather conditions. It would therefore be more common for the downwind doses to be lower. The dose at the development site (over 3,500m from the centre point) would be lower than the dose on the UPAZ boundary, i.e. below 7.5 mSv.
- 6.4.8 These doses will only be delivered when the radiation plume is overhead. After the radiation plume has passed there will be a very low contribution from resuspension dose, at levels which are likely to be below levels of concern, and no protective actions, other than precautionary actions prior to quantification of the issue, will be required.
- 6.4.9 It is assumed that the AWE assessment is compliant with the regulations and guidance and is accurate.
- 6.4.10 The dose has been assessed as the largest of the doses to an adult, child or infant at the dose point.

¹An expectation for site risk is given in HMG's Nuclear Emergency Planning and Response Guidance [CD Hollies 12.19] Paragraph 2.3.4 on page 9 "*if the goals set by ONR are met in full for a nuclear site, the likelihood of a radiation emergency occurring that could justify any short term or urgent offsite actions to protect the public would be around 1 chance in 100,000 per year, or even less. For perspective, emergencies of this low likelihood fall at the lower limit of events considered to be worthwhile including within the UK National Risk Register*".



6.4.11 The doses received are between 1 mSv and 10 mSv (lower under different weather conditions) and therefore considered to be “minor” in REPPIR-19 [REPPIR-19]² with no potential for deterministic effects as they are below the threshold of dose. There are minimal health effects which are unlikely to have life changing consequences; as well as a limited impact on quality of life insofar as there is the potential for self-imposed restrictive changes in normal life activities.

6.4.12 It is also assumed there is the continued safe operation of the AWE(B) site, and that the local authority lead OSEP which is intended to provide protection to the local population in the event of a radiation emergency are maintained. These are mandated by regulation overseen by the ONR so can be taken as a given.

6.5 Baseline Conditions

6.5.1 The baseline was established using the modelled release of radioactive material as outlined in the assessments conducted by AWE under the Radiation (Emergency Preparedness and Public Information) Regulations (REPPIR).

6.5.2 To determine the significance criteria, it is essential to consider the sensitivity of the receptors along with the anticipated radiation levels in the event of a release from AWE Burghfield. The table below outlines the criteria used to define receptor sensitivity concerning radiation exposure.

Table 6.3 - Criteria Used to Describe Sensitivity of Receptors		
Sensitivity	Description	Sensitivity Report
High	Receptors where people or operations are particularly sensitive to radiation.	All uses
Medium	Receptors where people or operations are moderately sensitive to radiation.	None
Low	Receptors where people or operations with a low sensitivity to radiation.	None
Negligible	Receptors where people or operations with minimum sensitivity to radiation.	None

² The Radiation (Emergency Preparedness and Public Information) Regulations 2019 Approved Code of Practice and guidance



6.5.3 To determine when radiation levels are not acceptable in health terms, the Applicant refers to the analysis of comparison doses from different sources of exposure. Shown in Table 6.2.

Table 6.4 - Comparison of Doses from Sources of Exposure	
Sources of Exposure	Dose (mSv)
Dental x-ray	0.005
Chest x-ray	0.02
Transatlantic flight	0.07
Nuclear power station worker average annual occupational exposure	0.2
UK annual average radon dose	1
CT scan of head	1.4
UK annual average radiation dose	2.7
USA average annual radiation dose	6.2
CT scan of chest	6.6
Average annual radon dose to people in Cornwall	7.8
Whole body CT scan	10
Annual exposure limit for nuclear industry employees	20
Acute radiation effects including nausea and a reduction in white blood cell count	1,000
Doses of radiation which would kill about half of those receiving in a month	5,000

6.5.4 The significance of radiation dose levels corresponds to the dose limits recommended by the International Commission of Radiological Protection (ICRP) and regulated in the UK by the Office for Nuclear Regulation, which governs exposure levels:

- For occupational exposures: 20 mSv per year averaged over 5 years, with a maximum of 50 mSv in any single year.
- For the general public, 1 mSv per year.

6.5.5 This guidance, along with varying dose levels, informs the assessment of the significance of radiation exposure for receptors shown in Table 6.5.

Table 6.5 Magnitude of Impact Applicable to Radiation		
Dose (mSv)	Effect	Magnitude of Impact
<1 mSv	None	Negligible
20 mSv	None	Low
50 mSv	None	Medium
>50 mSv	Limited. Impact of health above 1,000 mSv	High

6.5.6 Alongside consideration of radiation levels, the baseline has regard to the Urgent Protective Action Zone (UPAZ) and The Detailed Emergency Planning Zone (DEPZ), as considered below.

6.5.7 The 3,160m Urgent Protective Action Zone (UPAZ) is mainly rural farmland with a few settlements, the eastern end of Burghfield Common, and the western end of Three Mile Cross, sections of the M4 and the A33 and the Green Park Business Park, a stadium and other commercial properties north of the M4.

6.5.8 The Detailed Emergency Planning Zone (DEPZ) extends a variable distance beyond the UPAZ (from about 0 m to about 2,200 m). It includes a significant amount of rural land but also sections of Three Mile Cross and Spencers Wood to the east and Burghfield Common to the west.

6.5.9 A summary of all committed development within the DEPZ is referenced in Chapter 2 of this ES, and the request for information to support the preparation of the Environmental Statement has been evidenced and detailed in Appendix 6.4.



6.6 Mitigation of Environmental Effects

- 6.6.1 The development of mitigation measures is an integral part of EIA. Mitigation measures are proposed where significant effects are identified, with the aim of avoiding, reducing, or compensating for potential adverse effects and maximising potential beneficial effects. The proposed mitigations are classified under the mitigation hierarchy as per the Table 6.6 below³:

Table 6.6 - Mitigation Classification Descriptions	
Mitigation	Description
Inherent	Modifications to the location or design of the development made during the pre-application phase that are an inherent part of the project, and do not require additional action to be taken.
Standard	Actions that will require further activity in order to achieve the anticipated outcome. These may be imposed as part of the planning consent, or through inclusion in the Environmental Statement.
Actionable	Actions that would occur with or without input from the EIA feeding into the design process. These include actions that will be undertaken to meet other existing legislative requirements, or actions that are considered to be standard practices used to manage commonly occurring environmental effects.

- 6.6.2 For human health effects, the concern arises from the location of the proposed site within the Detailed Emergency Planning Zone (DEPZ) for AWE Burghfield, and from the possibility of an explosive distribution of plutonium oxides due to the accidental detonation of high explosives near to a plutonium component during the assembly or disassembly of nuclear weapons.

Inherent Mitigation Measures

- 6.6.3 The proposed development includes community buildings such as the primary school, which can have suitable posters displayed in public areas and on the Health and Safety Board. These will stress the “go in, stay in, tune in” message but clearly show the DEPZ and UPAZ.

³ [iema-mitigation-in-eia-guidance-final.pdf](#) Annex A – Page 74



- 6.6.4 Consideration has been given to designing the community buildings with a secondary resilience role in mind. Therefore, the school hall can be purposefully designed as a dual facility to be used as a Radiation Monitoring Unit (RMU) or community Rest Centre. Indeed, consideration has been given to its indicative design and how it could be isolated from the school, how entrances could be laid out, and where toilets and showers could be placed to optimise it for the conversion to an RMU/Rest Centre (see Plan at Appendix 6.5). Note that the nature of the accident means that the standard RMU, which are based on gamma monitoring portal detectors, would not be suitable.
- 6.6.5 Modifications to the heating and ventilating systems within the community buildings may also provide a heating system that can remain on during any period of shelter. This could greatly enhance the comfort of those sheltering, particularly if it is for 48 hours during a cold snap.
- 6.6.6 A ventilation system that filters air on inlet or cleans particulate activity out of the internal environment would provide dose reduction benefits during any shelter period with a radioactive plume overhead and possible health benefits in normal operation.
- 6.6.7 These systems are recommended to reduce the transmission of airborne diseases and improving indoor air quality to the benefit of all, particularly those with asthma and allergies. (See “[How to use air cleaning units in education and care settings](#)” [DOE 2023] which recommends a clean air delivery rate (CADR) of 22.5 m³.hr⁻¹ per person). There would be advantages (such as reducing noise and clutter) to building these into the building fabric rather than using free standing models within rooms.

Standard Mitigation Measures

- 6.6.8 Standard mitigation includes building the houses to modern specifications for air exchange and thereby producing a building that is probably more effective as a shelter than the default buildings implicitly assumed in the dose assessment methodology employed by AWE.
- 6.6.9 Further mitigation is provided by the establishment of a local On-Site Emergency Plan intended to reduce demand on the OSEP and provide resource and assistance to the local population, the Local Authority and Emergency Services as



appropriate.

- 6.6.10 To support this plan, each home will be provided with a landline phone in order to be able to hear the initial alert. This plan would include a community engagement programme that seeks to recruit “community ambassadors” or “community resilience champions”. These people could be given enhanced prior information about the reference accident, OSEP, and training in basic radiation protection (and, ideally, the other hazards on the local risk register). Such people could take on the role of reassuring the worried in the unaffected areas around the site and providing practical advice to people affected by any emergency, as well as being a conduit to members of the emergency services. The community buildings in the proposed development could provide a notice board for this effort.
- 6.6.11 The concept of operation of the plan is that if AWE plc recognise that an event has occurred that satisfies the criteria to be a radiation emergency, it will formally declare such an emergency and promulgate a message to the local authority and a message to all landlines in the area.
- 6.6.12 The message to the local authority triggers a callout of the responding organisations and a message to public landlines which reports the event and advises that the public take shelter urgently.
- 6.6.13 If the message arrives in time to stop people who were indoors but planning to go out from going out into the path of the plume, or in time to allow people who were outside and in the plume path to take shelter in a building before the plume passes by, then it will reduce the amount of plutonium that they are exposed to. This will reduce their inhalation radiation dose and reduce the (already minimal) contamination on their clothes and skin.
- 6.6.14 After the initial warning message the public messaging provides more bespoke messages to different groups – those already indoors should be advised to stay there until their area can be derestricted, those outside the zone asked to stay away for the duration, and those with care duties within the affected area given a contact number where they can discuss the needs of the cared for person and how best to meet them. The areas subject to continuing protective action advice must be very clearly identified.



- 6.6.15 Emergency messaging and public communications should be designed to cater for human behaviour in emergencies as per recent developments in human behaviour in emergencies research. This research demonstrates how people do not panic as historically assumed but seek information above all else⁴ to make empowered decisions on whether to flight, stay put or take other action. Therefore, providing more information than previously assumed can enlist trust and desired action by residents. For example, if residents and public are informed of the reasons for requested action, they are more likely to adhere to instructions by emergency services⁵. Modern technology can support this strategy by assisting with disseminating and receiving timely and accurate information to residents, businesses and public.
- 6.6.16 Although the site is beyond the range where it is estimated that shelter may prove beneficial it would be possible to cause concern to the people living and working in the area if they are told that they need to shelter to protect themselves from radioactive dust. This concern could lead to mental health issues after the event. Care should be taken to ensure that these people have the information they need to understand the situation that their near neighbours (those within the areas where shelter may be beneficial) are in. Giving people just outside the UPAZ the prior information leaflet makes a lot of sense provided that they are clearly told the implications of them being outside the UPAZ. They must realise that the potential doses where they live and work do not merit action, that their area cannot be significantly contaminated and that the duration of the release is such that they can soon go outdoors anyway if they wish.
- 6.6.17 Since the estimated radiation doses to people on the proposed development site are below the action level for sheltering (the 3mSv lower ERL of averted dose for sheltering corresponding to a 7.5 mSv projected dose) sheltering is not strictly necessary.

⁴ Drury, J., Arias, S., Au-Yeung, T., Barr, D., Bell, L., Butler, T., Carter, H., Choudhury, S., Eriksson, J., Neville, F., Philpot, R., Radburn, M., Reicher, S., Ronchi, E., Scott, C., Telga, M. and Templeton, A. (2023) 'Public behaviour in response to perceived hostile threats: an evidence base and guide for practitioners and policymakers,' September.

⁵ Long, F., Majumdar, A. and Carter, H. (2023) 'Understanding levels of compliance with emergency responder instructions for members of the Public involved in emergencies: Evidence from the Grenfell Tower fire.' *International Journal of Disaster Risk Reduction*, 84 p. 103374.



Actionable Mitigation Measures

- 6.6.18 No actionable mitigation measures are identified with regard to human health effects arising from the location within the DEPZ for AWE Burghfield.

6.7 Assessment of Environmental Effects

- 6.7.1 The purpose of the EIA is to identify and evaluate the potentially significant environmental effects associated with the proposed development. The determination of impact significance should be undertaken against the environmental baseline and be based on the methodology included in Section 4.

Impact Assessment

- 6.7.2 The potential impact of a radiation emergency and the steps to take should one occur are detailed in the AWE Consequence Report. It also gives a brief description of the methodology used.
- 6.7.3 If a Radiation Emergency of the type identified in the Consequence Report were to occur at AWE Burghfield there may be a release of plutonium in gases and dusts released from the site in an explosive distribution. These would be expected to drift with the wind, spreading out both horizontally and vertically, depositing on the ground and other surfaces as it goes. As a result of the spreading and deposition of the airborne activity, the inhalation dose to people downwind will reduce as the distance from the site increases. There comes a distance when the doses received cease to be of medical concern and a distance where they do not match or exceed the agreed thresholds for taking remedial action. These distances will depend on the quantity of radioactivity released, its chemical and physical form and the weather conditions at the time. For emergency planning purposes reasonable assumptions are made about these behaviours which are used to predict the maximum distance at which protective actions may be beneficial for reasonably foreseeable faults.
- 6.7.4 The radiation doses at the proposed development are estimated to be below the levels at which protective actions provide more benefit than costs. This is because the development is beyond the Urgent Protective Action Zone where the opposite can be true for parts of the Zone, with the extent of those parts determined by meteorological conditions at the time of the release.



- 6.7.5 Based on the current UK advice, the Emergency Reference Level System, described in PHE-CRCE-049 Public Health Protection in Radiation Emergencies by AF Nisbet, no protective actions are necessary at this distance. However, the local authority has extended the distance for protective actions beyond the recommended range so residents of the development will receive Prior Information giving advice on actions to take should one occur.
- 6.7.6 The combination of prior information and the initial alert is sufficient to avert almost all of the radiation dose that is avertable.

Construction Phase

- 6.7.7 The risks to the workforce and site visitors posed by the operations at AWE Burghfield are somewhat mitigated by the usual limits placed on building and demolition work to reduce the noise nuisance which ensure no work will be undertaken on cold winter nights when the Category F(2) can occur. In other weather categories the radiation doses will be lower.
- 6.7.8 Construction is not without risks. HSE [HSE 2023] report 45 fatal injuries to construction workers and 3 to members of the public in 2022/23 compared to the longer-term average of 37 and 4 respectively in 2018/19 – 2022/23 with 51% of worker deaths over the five years being from falls.
- 6.7.9 The fatal injury rate in construction is 1.72 per 100,000 (1 in 58,000) workers, around 4.2 times the all-industry rate.
- 6.7.10 Over 2020/21 – 2022/23 there were an estimated 53,000 reports of construction workers sustaining a non-fatal workplace injury. 28% of these workplace non-fatal injuries resulted in absence from work of over 7 days.
- 6.7.11 Around 3.3% of workers in the sector suffered from work-related ill health (new or long-standing). This rate is statistically significantly lower than that for workers across all industries (4.1%).
- 6.7.12 In comparison it has been estimated the annual risk of death as a result of AWE(B) for a resident (and therefore a construction worker on the site 24 hours a day for



a year) would probably be less than $8.5 \times 10^{-10} \text{ yr}^{-1}$ (0.00009 per 100,000)⁶. This is about 1 in a thousand million years.

6.7.13 The risk of fatality owing to the presence of AWE(B) adds $(8.5 \times 10^{-10} / (1.72/100,000)) \times 100 = 0.005\%$ to the construction worker's annual risk of death. Working one hour overtime in a 2000 hour working year would have an impact of about 10 times this.

6.7.14 It is safe to conclude that the presence of AWE Burghfield would not feature on the risk analysis of a building site unless it was imposed by an external authority.

6.7.15 As for any building site, the health and safety of the workforce and site visitors will be taken very seriously. The principal contractor will Plan, manage, monitor and coordinate health and safety in the construction phase of a project. This includes⁷:

- *liaising with the client and principal designer*
- *preparing the construction phase plan (PDF)*
- *organising cooperation between contractors and coordinating their work*

Make sure:

- *suitable site inductions are provided*
- *reasonable steps are taken to prevent unauthorised access*
- *workers are consulted and engaged in securing their health and safety*
- *welfare facilities are provided*

6.7.16 Other contractors will "Plan, manage and monitor construction work under their control so it is carried out without risks to health and safety" and workers will be expected to "take care of their own health and safety, and of others who might be affected by their actions".

6.7.17 The construction phase plan will identify the main dangers on site (these often

⁶ This is estimated by assuming a likelihood of accident of 1×10^{-5} per year (taken as 1×10^{-4} for conservatism), the wind blowing towards the development 2% of the time, the dose being less than 7.5 mSv and the risk coefficient of 5.7×10^{-5} per mSv.

⁷ <https://www.hse.gov.uk/construction/cdm/2015/summary.htm>



include for example, working at height, collapse of excavations, collapse of structures, exposure to building dusts, exposure to asbestos, electricity) and name the person responsible for ensuring the job runs safely.

- 6.7.18 The operations at AWE Burghfield will be listed in the “other dangers on site” and marked as a present hazard over which the contractors have no control.
- 6.7.19 The plan to mitigate the danger from AWE Burghfield will be to have a landline phone in the site office with an external ringer. If the alert is received all persons on site will be required to don a face mask⁸, seek shelter either in the site office, welfare block, any weather tight building on site or near neighbours and listen to local news for updates.
- 6.7.20 The danger and the plan will be the subject of posters on the health and safety notice board, discussed in any site inductions and mentioned in toolbox safety talks at least once a month. In this way the workforce and visitors will be well placed to benefit from the warning given by AWE.
- 6.7.21 It is to be hoped that the local authority will soon signal that work can commence on site to reduce the loss of building time and the costs that that entails.
- 6.7.22 For accidents that occur outside working hours the workforce will almost certainly hear if the area is subject to shelter advice and that they will be unable to work from broadcast and social media. It is also to be expected that their managers will contact their workforce.

⁸ The off-site emergency plan states that “Off-site - a simple dust mask will provide worthwhile protection for plutonium and uranium but NOT for tritium”. These are FFP3 masks (Covid type) Page 37 FOI version August 2022.



Table 6.7 - Summary of Impact Assessment – Construction Phase						
Receptor	Sensitivity/ Importance/ Value	Description of Impact	Inherent & Standard Mitigation Measures	Nature of Effect	Type of Effect	Significance of Effect
Inhalation dose to anyone downwind of a radiation emergency.	Low - at the range of the development site because outside the UPAZ.	Construction of new homes and facilities increases the number of people in the area and therefore the number of people potentially exposed.	The likelihood of the radiation emergency is very low, the site is beyond the UPAZ.	Low adverse (small additional radiation dose)	Exposure would be short term, no health effects are likely. Some concerns may remain causing stress related impacts (but full and accurate public information about the low level of risk will mitigate these).	Minor adverse



Occupation Phase

- 6.7.23 There will be a minor/ negligible impact from the AWE Burghfield site to people living and working in the proposed development during the occupation phase. The probability of the radiation emergency, combined with the probability of the wind blowing towards the proposed development site and the health consequences of the potential exposure yield an individual risk of death of 1 in 1,200 million years, well below the levels of risk considered acceptable by HSE of 1 in a million years [HSE 2001]⁹
- 6.7.24 Should a radiation emergency occur the people living and working in the proposed development will be protected by both the OSEP and On-Site Emergency Plan. This will provide them with prior information and provide an alert to a landline and recommend suitable protective actions for as long as required but ideally no longer than strictly necessary.
- 6.7.25 The On-Site Emergency Plan will be reinforced and delivered by a Management Company to support the community of Spencers Wood in managing response to a radiation emergency at AWE Burghfield, including in the event of a shelter advisory lasting up to 48 hours. It is intended that the Management Company will be trained to respond to an alert and provide all the information and support that they can within the limits of the Authorities advice to them, themselves to shelter.
- 6.7.26 This On-Site Emergency Plan is intended to support the OSEP by making shelter more effective than it would otherwise, and by ensuring that the population does not pose a material burden on the OSEP responders through encouraging resilience at family, business and setting level and supporting community resilience and self-reliance where practical. This plan also sets out numerous respects in which it will provide a material safety improvement over the existing situation for residents / visitors affected by a radiation emergency elsewhere in the AWE(B) DEPZ. Due to the relevance of wind direction, this will be well over 90% of such radiation emergencies. The On-Site Emergency Plan assumes advance discussion with and input from the LA and ES to ensure effective interoperability

⁹ In "the case of most housing developments, for example, HSE advises against granting planning permission for any significant development where individual risk of death for the hypothetical person is more than 10 in a million per year, and does not advise against granting planning permission on safety grounds for developments where such individual risk is less than 1 in a million per year".



and integration with the wider OSEP.

- 6.7.27 The proposed development accommodates community buildings which have been designed to support community resilience and perform better than an average radiation emergency shelter. The design of these community buildings can be further enhanced with the advice of the Local Authority about how they can be optimised for public protection duties.
- 6.7.28 In addition to place information posters in public places and buildings and providing a landline to all households, the On-Site Emergency Plan offers to assist the Local Authority by ensuring that the proposed development does not pose a material burden on the existing OSEP.
- 6.7.29 Specifically, the On-Site Emergency Plan offers to provide briefings to the community on the (lack of) risks of living near AWE Burghfield, how to respond to the alert and the potential consequences of the expected range of doses and contamination. Indeed, provision is also made to offer radiation protection briefings to the staff at both the proposed GP surgery and care home. The Management Company will coordinate annual training exercises/briefings with staff, the community, and Community Emergency Volunteers (CEV).
- 6.7.30 In addition, the Applicant has offered to install and manage weather monitoring and reporting equipment as that would help the authorities determine if the development is within the plume footprint. This would give real time information on, and in particular, the wind speed and direction to support rapid determination of the likelihood of any local contamination, The On-Site Emergency Plan also offers the provision for the installation and maintenance of two alpha particulate-in-air monitors to allow the radiation dose over the area to be better estimated. This will be supported by the provision of a local PA system to ensure that the alert can be promulgated more effectively, particularly to people outdoors when the alarm sounds. Emphasis is given to maintaining stocks of PPE, RPE and food that may be useful when providing support to vulnerable people under shelter advice.



Table 6.8 - Summary of Impact Assessment – Occupation Phase						
Receptor	Sensitivity/Importance/Value	Description of Impact	Inherent & Standard Mitigation Measures	Nature of Effect	Type of Effect	Significance of Effect
Inhalation dose to anyone downwind of a radiation emergency.	Low at the range of the development site because outside the UPAZ.	Adding new homes and facilities increases the number of people in the area and therefore the number of people potentially exposed.	The likelihood of the radiation emergency is very low, the site is beyond the UPAZ. The On Site Emergency Plan and efforts of the management company are intended to reduce radiation dose in the event of a radiation emergency and to provide appropriate reassurance in the event and after it.	Low adverse (small additional radiation dose)	Exposure would be short term, no health effects are likely, some concerns may remain causing stress related impacts (but full and accurate public information about the low level of risk will mitigate these).	Minor adverse



6.8 Cumulative Impact Assessment

- 6.8.1 This section should describe the cumulative effects of the proposed development and with other 'reasonably foreseeable' developments.
- 6.8.2 A benefit of recruiting "community ambassadors" in day to day residential and working activities is their potential role in the development, testing and execution of the OSEP. As previously stated, research shows how recruiting public in emergencies¹⁰ can improve accuracy and speed of response. In addition, community ambassadors can reiterate instructions, for example, reminding community members of the importance of staying home and the risks of self-evacuating. This can be particularly impactful as people are more likely to adhere to instructions by peers rather than authorities and sharing of information can help to build shared identity. Similarly, modern technology can assist with disseminating and receiving relevant information between residents, businesses and public affected by an emergency. In this context, new developments in expert systems, based on the concepts of artificial intelligence (AI) and large language models (LLM), are likely to provide much speedier means of assimilating information during an incident and presenting that information in appropriate form to different stakeholder groups.
- 6.8.3 The proposed development is well beyond the range that the OSEP suggests that evacuation may be required. This means that the site adds no more people with the potential need for evacuation. There is no radiological need for subsequent relocation, nor for destructive decontamination.
- 6.8.4 The emergency services would be able to attend to a medical emergency or provide support to a vulnerable individual present at the proposed development with minimal support from their Radiation Protection Advisor service because (a) the dose uptake rate is expected to drop rapidly after the initial explosive distribution and (b) at the distance between AWE Burghfield and the proposed development the total dose would not trigger the need to apply shelter advice to this area so they should be free to move in the area as they require.

¹⁰ Au-Yeung, T., Philpot, R., Stott, C., Radburn, M. and Drury, J. (2024) "Spontaneous public response to a marauding knife attack on the London underground: Sociality, coordination and a repertoire of actions evidenced by CCTV footage." *British Journal of Social Psychology*, 63(2) pp. 767–791.



REPIR 2019 requires the emergency services to participate in the preparation and testing of the emergency plan and to be adequately resourced with trained personnel and equipment to be able to respond to any emergency. This includes preparing personnel to work safely in areas subject to external radiation and to contaminated surfaces.

Their contribution includes:

- Implementing off-site emergency plans prepared by the local authority.
- Providing initial incident command and control.
- Liaising with the operator and other responding organisations.
- Assisting with evacuation, sheltering, and access control within the detailed emergency planning zone (DEPZ) or extended areas as required.
- Managing public communication and warning systems.
- Supporting decontamination efforts and medical treatment.
- Deploying specialist officers (such as HazMat officers in fire services) for radiation detection and assessment.
- Advising on hazardous area zoning and personal protective measures.
- The ambulance service provides triage, medical support, and transport for affected individuals.
- Fire and rescue may assist with rescue operations and decontamination.
- The police enforce cordons and exclusion zones to protect the public and prevent unauthorised access.
- They also manage traffic control to assist with emergency access and evacuation.

6.8.5 The Civil Contingencies Act 2004 broadens and generalises these responsibilities and introduces involvement in risk assessment, risk reduction and preparation ensuring long-term resilience, recovery, and inter-agency coordination.



6.9 Residual Significance

- 6.9.1 In the event of a radiation emergency, the people living and working in the proposed development will receive doses of less than 7.5 mSv. This remains the case even if people are located exactly downwind and within the open during low-dispersion weather conditions. In such circumstances, the timely achievement of shelter would be able to avert approximately 40% of this radiation dose (less than 3 mSv), leaving a residual dose of less than 4.5 mSv.
- 6.9.2 The overall health impact of this dose, and in particular the difference between the two doses, would be minor. This is provided that an individual received and accepted suitable reassurance, although this would likely have no impact if this were not the case. There is a residual concern that a minority of individuals may be stressed by the thought that they have received a radiation dose which would have been less if they had been indoors. Other individuals may be concerned about their radiation dose regardless, despite the fact they remained indoors. Indeed, it is possible that those not affected may be concerned about the radiation doses that their relatives may have received. It is this stress that may negatively impact upon on an individual's own immediate health and wellbeing.
- 6.9.3 The impact of stress is largely unquantifiable, and when the probability of an accident at AWE Burghfield is taken into account, any such psychological impact is substantially, if not entirely, addressed by providing complete and comprehensive information to the public about the health effects of dosage levels of less than 4.5 mSv, and how the public need not be concerned. To such effect, the residual effect is not significant. Indeed, given the low numbers of people involved at this distance away from AWE Burghfield, the proposed development will not result in significantly more traumatised people than if the development were not to be approved.
- 6.9.4 It should also be noted that unnecessary stress can be caused by an overreaction to an event; involving more people in protective actions than strictly needed and maintaining those protective actions for longer than needed.
- 6.9.5 Post accident, both the Local Authority and health officials would consider if a programme of reassurance is to be required. In the event it is required, such a programme will be instigated and would be likely to involve circulation of printed



material, display of such material on websites, public information presentations and indeed, one-to-one counselling should it be deemed appropriate.

- 6.9.6 One intent of the management company is to ensure that the residents are better prepared, respond better and recover quicker and more completely from a radiation emergency at AWE(B).

6.10 Summary

- 6.10.1 The concern is that a radiation emergency at AWE Burghfield will lead to inhalation radiation dose to any person downwind of the release.

- 6.10.2 However, the radiation emergency has a very low likelihood and the radiation doses that could be received are in the range considered to be “minor” in UK legislation (REPPiR-19).

- 6.10.3 The proposed mitigations are:

- Supporting the OSEP through the On-Site Emergency Plan by:
 - Placing information posters in public places and buildings;
 - Providing landlines in all households;
 - Designing community buildings and the care home to support community resilience efforts and to perform better than average as radiation emergency shelters.
 - Offering to assist the local authority by;
 - Providing briefings to the community on the (lack of) risks of living near AWE Burghfield, how to respond to the alert and the potential consequences of the expected range of doses and contamination.
 - Offering radiation protection briefings and training to the staff at the proposed GP surgery and care home.
 - Providing provision for a weather station to give real time information on, in particular, the wind speed and direction to support rapid determination of the likelihood of local contamination.
 - Providing provision for the installation and maintenance of two alpha particulate-in-air monitors to allow the radiation dose over the area to be better estimated.
 - Providing a local PA system to ensure that the alert can be promulgated more effectively, particularly to people outdoors when



the alarm sounds.

- Maintaining stocks of PPE, RPE and food that may be useful when providing support to vulnerable people under shelter advice.

6.10.4 The combination of both a low likelihood of event of low consequence, and the protection of the local authority off-site plan means that the impact of AWE Burghfield on the wellbeing of those who live and work in the area will be negligible in effect. For the avoidance of doubt and as described in Section 6.4, negligible effects are not usually material in the decision-making process.



6.11 References

Au-Yeung, T., Philpot, R., Stott, C., Radburn, M. and Drury, J. (2024) 'Spontaneous public response to a marauding knife attack on the London underground: Sociality, coordination and a repertoire of actions evidenced by CCTV footage.' *British Journal of Social Psychology*, 63(2) pp. 767–791.

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6.12 Note on Appendices

6.12.1 Please Note – On Site Emergency Plan (OSEP) to follow submission of the ES.