De-licensing of the Harwell site

A case study prepared for SAFEGROUNDS+

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1 Introduction

SAFEGROUNDS+

SAFEGROUNDS+ is a forum for developing and disseminating good practice guidance on the management of radioactively and chemically contaminated land on nuclear and defence sites in the UK. SAFEGROUNDS+ commissions independent case studies to:

- Provide real examples of the application of SAFEGROUNDS+ guidance [1] and its “key” or underpinning principles and such as proportionality and community stakeholder engagement
- Identify and disseminate examples of evolving good practice across a broad range of management and remediation contexts
- Help maintain and broaden the engagement of community groups and other organisations in the SAFEGROUNDS+ network.

This case study

This case study covers the final site clearance and delicensing of parts of the Harwell nuclear site. Harwell is further advanced with delicensing than any of the other NDA sites, so SAFEGROUNDS+ members judged that a case study would help other licensees and communities who will be going through the process in due course.

This case study report covers the site and its decommissioning status (Section 2), development of the final clearance and delicensing strategy (Section 3), and issues of interest relating to application of the ONR guidance, stakeholder engagement, and other key SAFEEGROUNDS+ principles.

This is an independently-compiled case study. It draws heavily (and sometimes verbatim) on material kindly provided by Research Sites Restoration Limited (RSRL) and on interviews with RSRL staff about the lessons learned, but the views expressed are those of the author alone. They should not be taken as necessarily representing the views of CIRIA (the network managers), or any contributor to the study, or any SAFEGROUNDS+ member organisation.

2 Delicensing

In practice, delicensing means the ending of the period of responsibility under the Nuclear Installations Act 1965 (as amended). As the guidance [2] makes clear, this can only happen when the HSE (now ONR) gives notice in writing to the licensee that, in its opinion, there has ceased to be any danger from ionising radiation from anything on the part of the site being delicensed.

Assessment of what constitutes “no danger” from ionising radiations is not straightforward, because there is no threshold below which low doses are harmless. ONR policy is that following rigorous decontamination and clean up, the residual risk from any radiological hazard remaining on site should be in-line with ONR’s views on broadly acceptable risks and the concept of reducing risks as low as reasonably practicable (ALARP). All radioactive waste must also be removed.

ONR believes that the annual risk of a fatality of 1 in a million to an individual is regarded by society as “broadly acceptable” and has adopted it as the criterion for deciding whether the “no danger” test has been met. There is general agreement in the radiological protection community that a dose of about 10 to 20 micro Sieverts equates to a risk of 1 in a million per year. All risks are in addition to those arising from exposure to natural background. However ONR will expect the operator to demonstrate that it has also considered overarching ALARP requirements.

If the residual risk of death is less than 1 in a million, ONR guidance is that in practice demonstrating ALARP may amount to no more than justifying that there are no further low-cost clean-up activities that could be carried out. However, if areas of contamination are known that represent a risk of less than this but can be removed easily, cheaply and without generating unnecessary radioactive waste for disposal, the licensee should do this. The main steps reported by the licensee in the Harwell case are:

- Historical survey of records and maps/drawings
- Planning of a staged investigation
- Radiological (and chemical) surveys/sampling of the land
- Building/drains/surveys/sampling
- Investigation/remediation of anomalies
- Prepare Delicensing Safety Case
- Formal submission to ONR
- ONR verification surveys
- Clarifications/discussions
- ONR Approval
- Mark the new boundary
- Issue of Licence Variation.

The submissions to the ONR have to demonstrate that that residual, isotope specific, activity levels are below levels set in IAEA guidance [3] or meet the criteria through carrying out a case specific risk assessment. In principle, this means carrying out intensive surface and subsurface surveys [4]. Levels around background are taken as meeting the criteria. Where levels exceed background, then more detailed characterisation is carried out, and ALARP arguments assembled as necessary.

De-designation is the end of the NDA’s responsibilities under the Energy Act 2011 and is entirely independent of delicensing, although a delicensing case may be used to support de-designation. Contaminated land can be de-designated so long as the liability has been properly transferred, otherwise it has to be cleaned up, delicensed and then de-designated.

3 Site and strategy

The Harwell Site

Harwell Oxford is a major science, innovation and business campus based in South Oxfordshire. It occupies a major part of what was formerly the Harwell Atomic Energy Research Establishment site. The remainder of the nuclear licensed site passed to RSRL in February 2009, who are now decommissioning the designated site on behalf of the Nuclear Decommissioning Authority (NDA).

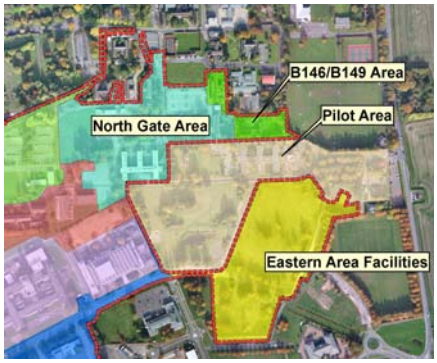
Work to deliver this decommissioning site programme and achieve the site end-point is covered by two key phases: interim state and site closure. See the *Lifetime Plan Baseline* [5] for more details.

- Interim state, 2008 to 2031: the interim state phase includes the management of wastes from historic operations and new decommissioning arisings, decommissioning activities (including the experimental reactors), the delicensing of the majority of the site, subject to approval by ONR, and the remediation of areas of contaminated land
- Site closure, 2032 to 2064: the site closure phase includes the end of waste operations in the Vault Store and ILW Store, the decommissioning of remaining facilities in the Solid Waste Complex and the remediation of associated land, the termination of the Western Storage Area (WSA) groundwater containment plant, and the submission of final delicensing cases for the Solid Waste Complex. The end-point of the site will be achieved when all redundant buildings on the site have been demolished and base slabs removed, all contaminated land remediated and all areas of the site delicensed.

Decommissioning strategy

The main decommissioning driver for Harwell is the desire to release more of the site for redevelopment for facilities for major science projects, and in doing so reduce costs and generate income from the land. The overall vision was established in the 1990s, but the NDA end state analysis and strong stakeholder/local authority support gave the site a mandate to aim for complete clean-up and delicensing because of the potential for high-value reuse, which may not be the case on other sites.

The end state is a fully delicensed site but in the absence of unlimited funds a staged approach makes best economic sense and also allows the site to apply the lessons from early phases to reduce the cost of later work. The areas delicensed to date are:



- ETSU Area, 5 hectares, delicensed 1992
- Pilot Area, 7 hectares, delicensed 2006
- Eastern Area Facilities, 5 hectares, delicensed 2010
- North Gate/B146 Area, 5 hectares, delicensed 2012.

The order in which areas are being delicensed was determined in part by the relative value and opportunities for re-use, but also had to be devised to align with budgetary constraints and to gain practical and regulatory experience on the less demanding areas (in terms of radioactive contamination) before moving onto the more complex ones.

The Pilot Area was chosen to be the first area for delicensing since the 1992 delicensing of the ETSU area. It had some history but was not too challenging. It enabled the licensee to develop its technical approach, give its teams experience, and (importantly) develop its record keeping and other supporting systems. It allowed it to demonstrate to the NDA and the community that it *could* delicense land, and thus gave confidence that the desired end state could in time be delivered.

There were presumably some comparable benefits for the ONR in tackling a relatively straightforward area first. The current safety case approach is perhaps more structured and predictable, but regulatory processes still take time to work through, and full allowance needs to be made for this in planning.

4 Issues arising

The delicensing process

The work may be technical and a passively safe site is obviously a desirable objective but delicensing is a legal/regulatory process intended to achieve an economic goal.

It is not necessary to remove all radioactivity, but the 1 in a million annualised residual risk criterion has to be met. For some sites this will be costly to achieve and may not represent good value for money for the taxpayer given the risk reduction achieved, in which case how will these sites be managed in the long term? Some people have suggested that an option would be to develop a “restricted release” within the ONR policy framework which could be used on some sites to achieve delicensing but with restrictions on future use of the land that do not conflict with the planned economic uses.

The option of restricted release is not available within the UK regulatory framework, although it is in other countries (eg USA) and is covered by IAEA guidance [6]. This guidance suggests an upper dose limit for the released site of 300 microsieverts per year, and a lower level of approximately 10 microsieverts, below which further dose reduction measures are unlikely to be warranted and the site can be delicensed. A site with dose rates in between these two levels can be considered for “restricted release”, which means that it can be released but with restrictions on future use to ensure the effective dose will not exceed 300 microsieverts/yr. There is a further proviso that if the restrictions were to fail in the future, the effective dose should not exceed 1000 microsieverts in a year.

Record keeping

Accurate and reliable records make delicensing easier but delicensing may take place years after decommissioning works and it is not realistic to rely on the memory of those involved. It may not always be clear what activities have actually gone on in any particular area over the years, and what has been there in the past (eg drains) and whether they have really been removed. often, it will be necessary to demonstrate negatives, and this may not be straightforward.

A good records management system is crucial – something emphasised throughout the SAFEGROUNDS+ guidance –record keeping is one of its key principles. Good records and record management are important to giving ONR, other regulators, and also the community confidence. The important thing is to be able to tell a convincing and comprehensive story, supported by clear evidence; it is not enough just to point to large quantities of data without an underpinning narrative. Providing confidence is as important as the numbers.

For Harwell, the important data was consolidated into an integrated record management system, to support the delicensing process and also to provide the records that will be needed by future site users. However, with such a long site history and records of many different formats (and perhaps levels of accuracy), reassembling a coherent dataset is very labour intensive and it may simply be impractical to transfer everything onto digital media.

Keeping and maintaining access to records after site clearance has been a concern for all nuclear sites, and for SAFEGROUNDS+ network members. However, the forthcoming National Nuclear Archive should provide a central facility for their consolidation and long-term care.

Mixed contamination

The site used to be a World War 2 airfield and there was conventional contamination from that time and later. There is also a possibility of unearthing live ordinance. Decommissioning is not just a matter of managing radioactive contamination. Non-radiological hazards must be reduced and relevant regulatory frameworks met [7]. Consideration also needs to be given to the risks associated with the remediation process stemming from the presence of the non-radioactive contaminants.

Other regulatory regimes and other regulators (including local authorities) are involved where radioactive contamination is co-located with non-radioactive contamination. Procedures for sharing of information etc between regulatory agencies on delicensing matters are reportedly still evolving but ONR guidance [2] refers inspectors to Memorandums of Understanding governing essential liaison with the EA/SEPA and the local authority regulators on issues relating to chemo-toxic contamination. Any solely non-radioactive contamination remaining on the site would, however, not preclude delicensing.

Stakeholder engagement

Decisions on the appropriate criteria for delicensing have at their core decisions about “how safe is safe enough?” and “what is the actual risk from this level of contamination?” They are nationally set criteria necessarily involving a national level societal engagement process involving a wide range of stakeholders. Most would argue that this societal input was made during the HSE’s 2004 consultation on criteria for delicensing nuclear sites, although not all SAFEGROUNDS+ member organisations are satisfied with the current interpretation, eg of risk from low levels of contaminants [8].

The criteria are therefore for most people not a matter for site-level engagement. However, SAFEGROUNDS+ good practice guidance [8] specifies that community-level consultation should be a fundamental component of planning and decision making for the restoration and safe management of residual contamination. This is generally taken to mean input to end state, interim state, restoration programme planning, and (where justified) technical option assessment.

The site is unusual amongst the NDA's portfolio, in that its site stakeholder group - as its name, the Harwell-Chilton Campus Local Stakeholders Group, suggests – takes a view of activities across the whole campus, not just the licensed site. It has been strongly behind end state and delicensing initiatives aimed at releasing the whole site, and argues that all radioactive waste needs to be removed from the site, so as not to compromise its role as a nationally important science campus or use of the land for housing.

Structured stakeholder engagement outside the LSG forum has been much lower profile, on the basis of "proportionality"[1]. The licensee's perspective is that it is a "good news story" and the pressure has generally been to proceed faster. However, it has been necessary to demonstrate exhaustive checks on anything left *in situ*. The results would presumably be publically available on request. The fact that ONR carries out its own checks is seen as a valuable safeguard and gives the community (and prospective tenants etc) added confidence.

5 Summary

When work on decommissioning Harwell started, the criteria and process for delicensing had yet to be fully defined, but they have evolved with the benefit of experience and are now much clearer. They will presumably continue to evolve as new challenges emerge, perhaps in respect of restricted release.

The practice of decontamination and of demonstrating to a high degree of confidence that no hazards have been overlooked has also developed over time. By applying a phased approach, lessons have been learned and applied in record keeping, site characterisation, and safety case approach and content. The confidence of both regulators and the community has been achieved through having, and being able to clearly demonstrate, both a comprehensive process and rigorous application.

Stakeholder engagement has been a consistent feature, but now that the aim of moving all wastes off site has been adopted there is relatively little local concern and application of the SAFEGROUNDS+ approach to proportionality. This takes into account both the technical importance of decisions and the level of local concern, and has resulted in a process focused on transparency and the provision of information rather than deeper engagement.

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[1] Section 2.1.2 of the SAFEGROUNDS+ land management guidance [1] states explains that: "Adherence to Key Principle 2 does not mean that all stakeholders have to be involved in all decision making steps for every contaminated land issue on every site, ie there should be a proportionate level of involvement."

References

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