ISM

SUBMARINE DISMANTLING PROJECT

Strategic Environmental Assessment

Post-Adoption Report

Issue 1.0

March 2013

de&S
SUBMARINES

Document Information

Project Name:	Submarine Dismantling Project		
Document Title:	Strategic Environmental Assessment – Post-Adoption Report		
Issue Status:	Issue 1.0	Deliverable Reference:	
Produced By:	ISM Ash 1b Defence Equipment & Support MOD Abbey Wood Bristol, BS34 8JH	Level of Control	This Document is controlled to Level 1 iaw SDP PMP Document Quality Management Procedure. At each level the Document must be Approved and Authorised.

Document Authorisation

Owner:	[redacted]	Peer Reviewer	If applicable
Author:	[redacted]	Committee Endorsement:	If applicable
Editorial Checker:	[redacted]	Technical Checker:	
Document Approver:	[redacted]	Approver's Signature:	Signature reqd before distribution
Document Authoriser:	[redacted]	Authoriser's Signature:	Signature reqd before distribution

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Amendment History

Issue	Date	Details of Amendment	DCCF
0.1	08/10/12	1st draft	
0.2	25/11/12	Development draft	
0.3	10/01/13	Review draft	
0.4	13/02/13	Review draft	
0.5	05/03/13	Alignment with Response to Consultation Report	
0.6	08/03/13	Updated draft	
0.7	11/03/13	Updated draft	
0.8	13/03/13	Updated draft	
1.0	21/03/13	Final draft for web publication	

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1. INTRODUCTION

1.1. Purpose and Structure of the Post-Adoption Report

1.1.1. This Post-Adoption Report fulfils the requirements of EU Directive 2001/42/EC 'on the Assessment of the Effects of Certain Plans and Programmes on the Environment' and the transposing UK 'Environmental Assessment of Plans and Programmes Regulations 2004.[1] These are generally referred to as the Strategic Environmental Assessment (SEA) Directive and Regulations.

1.1.2. The SEA Directive requires that "*the environmental report…the opinions expressed…and the results of any trans-boundary consultations…shall be taken into account during the preparation of the plan or programme and before its adoption."* To demonstrate that this has occurred, the Directive then requires that "*a statement summarising how environmental considerations have been taken integrated into the plan or programme…including the reasons for choosing (it) in light of other reasonable alternatives dealt with*" is made as soon as possible after the plan or programme is adopted and the way forward announced.

1.1.3. The purpose of the Post-Adoption Report (PAR) is to provide the specific information outlined on the following:

- How environmental considerations are integrated into the proposals for submarine dismantling (Section 1)
- How the Environmental Report and the comments received during public consultation have been taken into account (Sections 2 and 3)
- The MOD's reasons for choosing the options that it has, in preference to the other options put forward for public consultation (Sections 2 and 3).
- The areas in which measures to monitor the environmental effects of submarine dismantling will be developed (Section 4).

1.1.4. The Annexes detail the following:

- A list of abbreviations.
- Current and future SEA activities, subsequent environmental assessments and associated consultation opportunities.
- Monitoring measures.
- Additional information on radiological doses and discharges.

[1] The Environmental Assessment of Plans and Programmes Regulations 2004 apply where plans/ programmes involve more than one country in the UK (in this case, England and Scotland).

1.1.5. This Report necessarily focuses on the 'initial dismantling' element of submarine dismantling, as this is the area that the MOD has made decisions on. It is published alongside the MOD's 'Response to Consultation Report,'[2] which explains how the comments made during consultation (including those on the Environmental Report) have been taken into account in the decisions now announced, and how they will be taken into account in future decision making.

1.2. The Submarine Dismantling Project

1.2.1. The aim of the Submarine Dismantling Project (SDP) is to deliver a safe, secure, environmentally responsible and cost-effective solution for dismantling 27 of the UK's defuelled nuclear powered submarines after they have left service with the Royal Navy.

1.2.2. The MOD recognises that there is keen interest in the project from the public and local communities and that the public should have confidence in the decisions taken. For this reason it held a public consultation to seek the public's views on the key issues.

1.2.3. The Submarine Dismantling Consultation ('SDC') ran for 16 weeks from 28 October 2011 to 17 February 2012, seeking the views of local people in the areas around candidate sites for submarine dismantling, the wider public and national level stakeholders, on three key questions.

- How should the radioactive material be removed from the submarines?
- Where should the radioactive material be removed from the submarines?
- Which type of site should be used to store the Intermediate Level Waste (ILW) awaiting disposal?

1.2.4. The three 'technical' options under consideration for removing the radioactive material from the submarines (termed 'initial dismantling') were:

i) separation and storage of Reactor Compartments (RCs)

ii) removal and storage of Reactor Pressure Vessels (RPVs)

iii) removal of RPVs and size reduction for storage as packaged waste (PW).

1.2.5. The three options considered for where to remove radioactive waste from the submarines were:

i) Devonport Dockyard

ii) Rosyth Dockyard

iii) a combination of both sites.

1.2.6. The SDC did not consider *specific* ILW storage sites, but proposed four generic options:

i) Point of generation sites

ii) Three types of site 'remote' from the point of generation - those owned by MOD, the Nuclear Decommissioning Authority (NDA) and industry.

[2] SDP: MOD's Response to Consultation. Issue 1.0, March 2013.

1.2.7. The public consultation also sought views on the environmental effects of submarine dismantling, detailed in the SEA Environmental Report[3].

1.2.8. After consultation, the MOD then revisited its analysis of the strategic options for dismantling. New workshops were run for MOD and other experts, during which the proposals and the conclusions of the SEA were reviewed to take account of the comments received.

1.2.9. The MOD has now selected the option of removing the RPVs intact at both Rosyth and Devonport (subject to regulatory approval). No clear advantage was found overall for any particular category of ILW storage site, so the next round of assessment and public consultation will consider all potential ILW storage sites on an equal basis, irrespective of location or ownership.

1.3. The Structure of the SDP Strategic Environmental Assessment

1.3.1. The nature of the SDP meant that the SEA had to be necessarily complex. The seven generic end-to-end stages of dismantling - from developing the dismantling facilities to removing them at the end of the project - were firstly assessed for their likely effects on the environment. The results of the generic assessment can be found in Chapter 5 of the SEA Environmental Report

1.3.2. Twenty-four integrated options, combining the credible combinations of the technical options for removing radioactive material, specific locations for doing this and the type of ILW storage site, were then grouped into five broad categories, each with three dismantling site combinations.

1.3.3. Assessment was then conducted on these fifteen integrated options, plus the 'do minimum' option of continuing and indefinite afloat storage. The results of the integrated options assessment can be found in Chapter 6 of the SEA Environmental Report.

1.3.4. Finally, a cumulative effects assessment was undertaken to assess whether the SDP would have any significant environmental effects when considered in combination with other major projects planned or taking place in and around Rosyth and Devonport.

1.3.5. The SEA will be updated in due course to assess the potentially significant impacts and benefits of the short-listed ILW storage sites. The updated SEA will be subject to further consultation. Once decisions have been made about the location of the interim ILW store, a further Post-Adoption Report will be published.

[3] MOD Submarine Dismantling Project – Strategic Environmental Assessment (SEA): Environmental Report. Issue 1.0, October 2011.

2. HOW ENVIRONMENTAL CONSIDERATIONS HAVE BEEN INTEGRATED INTO THE PROGRAMME

2.1.1. Environmental considerations have been integral to the SDP. It is essentially a responsible waste management initiative, the aim of which is to deal safely with end-of-life military equipment by dismantling the submarines and managing the resulting radioactive and non-radioactive wastes in accordance with the waste hierarchy. This includes maximising recycling and providing safe ILW storage until the UK's Geological Disposal Facility (GDF) becomes available.

2.1.2. These considerations are implicit in the overall objective of the SDP, which is "to deliver a timely and cost-effective solution for the dismantling of the UK's defuelled nuclear-powered submarines which is safe, environmentally responsible, secure, cost-effective and inspires confidence."

2.1.3. The SDP options have also been considered against the principle of inter-generational equity. Previous and current generations built and used the submarines, so it is arguably the responsibility of the current generation to dispose of them in the safest way, rather than leave later generations to deal with them. To do otherwise could be seen to run counter to the principles of sustainable development.

2.1.4. During its development, the SDP (which was formerly known as Project ISOLUS) has already been subject to two earlier consultations. These earlier consultations highlighted the key environmental aspects of interest and concern to stakeholders, helping the MOD to ensure that these issues were given appropriate consideration in the SEA.

3. HOW THE ENVIRONMENTAL REPORT HAS BEEN TAKEN INTO ACCOUNT

3.1. Introduction

3.1.1. The findings of the SEA (as laid out in the SDP Environmental Report) were incorporated into the MOD's internal decision-making process, the results of which determined MOD's proposed way forward.

3.1.2. Where environmental effects could be given a monetary value (e.g. amount of recyclable metals), they were factored into the Investment Appraisal. Where they affected the ability of an option to meet the project's aims, they were considered as 'Operational Effectiveness' factors in the Multi-Criteria Decision Analysis (MCDA) process. Those issues that fell into neither category but which were still important factors to project success (e.g. public confidence) were assessed as Other Contributory Factors (OCF). How this process worked is detailed in the SDP Operational Analysis Supporting Paper (OASP)[4].

3.2. The Technical Option for Removing Radioactive Materials

3.2.1. The significant environmental effects of initial dismantling were found to be related to the size of the ILW storage facility, and to transportation. These in turn were determined by the technical option for removing the radioactive waste. Storing intact RCs would require a very large facility and, as a result, RC separation was found to have greater environmental effects than either the RPV or PW options, which were similar to each other in their effects. By contrast, the environmental effects of developing the initial dismantling facility were found to be similarly minor for all the technical options.

3.2.2. Although no obvious differences were found between the very low expected radioactive discharges and likely dose to critical groups, this was based on limited data and so was registered in the SEA Environmental Report as an uncertainty. Small differences were noted in the expected worker doses, with the RC option entailing slightly lower expected occupational doses overall than the RPV or PW options. However, all the occupational dose estimates were very low and well within the limits of tolerability.

[4] SDP Operational Analysis Support Paper (OASP), Issue 1.0, October 2012 (updated to reflect the post-consultation analysis results).

3.2.3. Taking the SEA data into consideration, the MOD has concluded that:

- None of the technical options has any significant advantages on environmental, safety or discharge grounds, although RC removal could have significant environmental effects related to the size of storage facility.
- The consultation document proposed the removal and storage of intact RPVs, as this would allow the maximum time for natural radioactive decay to occur, whilst offering transport flexibility and providing value for money.
- Irrespective of the technical option, routine worker doses and discharges could be effectively monitored and managed to ensure that risks to workers, the environment and communities remain very low and below the limits of regulatory concern.

3.3. Initial Dismantling Location

3.3.1. The SEA firstly compared the generic effects of developing initial dismantling facilities on undeveloped, 'Greenfield' coastal sites, previously-developed, 'Brownfield' sites and those with an existing nuclear sites. It found that the magnitude of effect was directly linked to the scale of development, so developing new facilities – especially on 'Greenfield' sites - would be likely to have unacceptably large environmental effects and should not be pursued. It followed that using 'existing' sites (with licensed infrastructure already in place) would have the fewest effects overall - an opinion echoed by the Environment Agency (EA) in their consultation response. The potential for dismantling to affect the attractiveness of the area to the community, potential residents and inward investors was noted.

3.3.2. When the effects of undertaking initial dismantling at Devonport and/or Rosyth were assessed, the only significant effects identified were those on biodiversity at Devonport from RC separation, due to the likely need to undertake additional dredging to move the separated hull sections.

3.3.3. For the RPV removal and PW options, none of the effects were found to be significant at either location, assuming that large-scale construction would not be needed and maximum use would be made of existing facilities (subject to maintaining safety and environmental protection standards).

3.3.4. Of the two sites, Devonport was found to have a slighter greater level of environmental and population sensitivity than Rosyth; nevertheless the effects of the RPV and PW options were found to be similarly minor in nature.

3.3.5. The SEA found that developing an initial facility at each site (the 'dual site' option) would double the development effort, lead to minor construction-related effects across both sites and necessarily involve two communities instead of one. However, removing the radioactive materials in situ would avoid having to transport the submarines, until such time as the radiologically-cleared hulls are ready to be sent off-site for recycling.

3.3.6. Taking the SEA into consideration, the MOD has concluded that:

- Although development of a new site for initial dismantling should not be discounted, this option will not be pursued unless the possibilities of using an existing licensed or authorised site are exhausted. The same principle holds true for the ILW storage site.
- Both Rosyth and Devonport would be suitable for initial dismantling, adopting either the RPV or Packaged Waste option. The MOD proposed the dual-site option in the consultation document and has now selected this option.

3.4. Interim ILW Storage Location

3.4.1. As for the initial dismantling site, the SEA firstly compared the effects of developing an ILW storage facility on 'Greenfield', 'Brownfield' and 'existing' nuclear sites. Since the scale of environmental effects is directly related to the amount of new development, it was determined that this facility should be sited on an 'existing' site where supporting infrastructure and safety mechanisms are already in place.

3.4.2. The generic effects of developing and operating an RPV or PW storage facility on an 'existing' nuclear site were not found to be significant. By contrast, developing an RC storage facility was found to have potentially significant effects if chosen, due to it's large size.

3.4.3. The SEA was unable to assess the ILW storage location beyond a general consideration of the effects of developing facilities at the 'point of waste generation' (ie. Rosyth and/ or Devonport) versus an 'existing' nuclear site elsewhere in the country. No potentially significant effects were found for either site type, although the assessments had numerous uncertainties due to a lack of any specific location.

3.4.4. Taking the SEA data into consideration, the consultation document did not make specific proposals about the type of storage site, but asked for people's views on the generic site types.

3.5. Recommendations

3.5.1. The MOD's selected option of RPV removal at Devonport and Rosyth with further public consultation the on ILW storage site was not found to have any potentially significant environmental effects, although a wide range of more minor potential effects and uncertainties were identified.

3.5.2. Chapter 7 of the SEA Environmental Report includes a number of recommendations for avoiding or (if not possible) minimising the adverse effects of submarine dismantling, whether classed as significant or not. It also includes recommendations to enhance the positive effects identified.

3.5.3. The recommendations will be taken forward into the statutory site-specific environmental assessments that will be required to start work, and into contracts for specific activities such as initial dismantling and ILW storage.

4. HOW CONSULTATION RESPONSES HAVE BEEN TAKEN INTO ACCOUNT

4.1. Introduction

4.1.1. Public consultation on the SDP, including the SEA Environmental Report, took place between October 2011 and February 2012, with public and stakeholder events across the UK. Respondents were asked four questions on the SEA, covering five areas:

- Whether the significant environmental effects had been properly captured
- Whether any baseline information was inaccurate or missing
- Whether the monitoring arrangements were robust;
- Whether the avoidance and mitigation measures were sufficient
- Whether people agreed with the overall conclusions of the Environmental Report.

4.1.2. Around 500 comments were received on the SEA. The detailed consultation feedback is listed in the SDP Post-Consultation Report[5], and a summary of the feedback received can be found in the MOD's Response to Consultation Report [2]. This section highlights how the consultation responses were taken into account in decision-making.

4.2. Key Areas of Feedback

Structure of the SEA

4.2.1. The MOD's approach to SEA and the structure of the Environmental Report were largely accepted by statutory and public consultees.

4.2.2. A few responses suggested that, by only considering the two 'existing' nuclear sites at Devonport and Rosyth, the SEA had restricted the reasonable alternatives put forward. The reasons for not developing new sites has already been explained, and MOD's judgment remains that all reasonable alternatives were identified and screened using valid criteria as set out in the SDP Site criteria and Screening paper.[6]

4.2.3. Feedback from Statutory Bodies and some organisations accepted that uncertainties are an inevitable part of SEA, and that more site-specific detail will follow when detailed assessment is undertaken on individual proposals in support of EIA and applications for Environmental Permits.

4.2.4. By contrast, the public response highlighted a strong desire for as much robust information as possible ahead of the strategic decisions being made. The SEA was carried out on the basis of a limited amount of 'best estimate' data, and this was noted as an area of uncertainty. That such detailed information was not available at the time affected some respondents' confidence in the SEA findings, even though at this early stage, such detailed information would not generally be available. There was also some doubt cast on the true independence (and hence reliability) of the environmental monitoring regimes.

[5] Submarine Dismantling Project (SDP) – Post Consultation Report, July 2012.
[6] Submarine Dismantling Project (SDP) – Site Criteria and Screening Paper. Issue 2.1, May 2011.

Radiological discharges and subsequent effects

4.2.5. Although baseline data was available on worker dose, radiological discharges and subsequent dose to (non-occupational) critical groups, there was at the time only one source of quantitative information on the occupational dose implications of the three technical options, and no quantitative information on estimated environmental discharges. The SEA could therefore only consider the limited amount of data available, and noted this as an area of uncertainty.

4.2.6. Pessimistic bounding assumptions however provide an appropriate degree of confidence at SEA level, and with this qualification, the likely effects of radioactivity on the environment, health and population (both for workers and others) were not assessed as being potentially significant. The MOD's view was, and remains, that doses and discharges associated with all options could be reduced to similarly low levels, such that environmental factors did not discriminate between the options. RPV removal and storage therefore offers comparable levels of safety and environmental protection to the other options.

4.2.7. This position was accepted by some consultees; however many were concerned that the risks to people's health (directly and through the wider environment) may have been underestimated – especially given limited data to the contrary. The need to adopt the solution with the least risk to health and the environment was strongly expressed; however judgements varied as to which option this might be.

4.2.8. Consultation respondents who did not accept, or were not fully aware of, the information available (including the regulatory requirement for ALARP/ALARA[7]) were more likely to assess the options on the basis that the degree of 'intrusion' into the reactor should be a major factor in decision making. They tended to prefer the RC option or - if they also took into account the problems of moving and storing RCs - the RPV option.

4.2.9. The MOD had already published data to support its arguments, although it was not as easy to locate on the project website as it could have been. Annex D has therefore been added to provide further information on likely radiological doses and discharges. Further and more detailed information will be made available as part of the regulatory approval process for initial dismantling.

Socio-Economic Effects

4.2.10. Despite a wealth of baseline data available (e.g. from Local Plans) for both Fife and Plymouth, the only data available to assess the actual socio-economic effects of SDP on the Population objective was an estimate of the jobs that it would directly support. As a result, only the direct and cumulative effects of employment could be assessed; the indirect effects of the SDP on the wider economy could not be estimated. The SEA Environmental Report noted this as an area of uncertainty.

4.2.11. The socio-economic effect of the jobs supported (either alone or in combination with other local projects) were not found to be significant. The SDP's compatibility with the aims of Local Plans was tested in the SEA, and during consultation, a further internal assessment was undertaken on the regional effects of the employment benefit. Although necessarily limited in nature, the assessment also concluded that the jobs supported would be unlikely to be significant to the wider economy.

[7] As Low As Reasonably Practicable / As Low As Reasonably Achievable

4.2.12. Some respondents, however, were concerned that, because the indirect socio-economic effects were not assessed, it was not possible for the SEA to conclude that the SDP (or a more general association with nuclear activities) would not have significant adverse effects on the local population or the wider economy. They cited, for example, adverse effects on tourism, the education sector, economic diversity or inward investment.

4.2.13. MOD recognises that wider socio-economic assessments can be valuable, and accepts that although the SEA could not fully consider these effects at this early stage, this should be kept under review as the site-specific projects are further developed. However, it believes that Local Authorities are best placed to decide what information they need. The MOD will co-operate with Local Authorities and share any information it has relevant to socio-economic considerations, and in due course will provide any such submissions formally required as part of development consent (which allows for further public input).

Transport Effects

4.2.14. The SEA assessed the generic effects of transporting both submarines and radioactive materials. The findings supported the principles of dual-site dismantling to minimise submarine movement, and of avoiding RC removal to prevent any need for additional dredging. However because the ILW storage site is not yet known, it was not possible to assess site-specific transport issues. The SEA Environmental Report registered this as an uncertainty.

4.2.15. Some respondents considered that the costs and risks incurred in moving the submarines to a new dismantling facility elsewhere would be preferable to dismantling them where they currently are, but most agreed with the MOD's view that transport of whole submarines is something it would prefer to avoid. There are significant costs and barriers to transporting submarines and minimal compensating advantages in doing so.

4.2.16. Although many respondents acknowledged that storage local to a dismantling site has attractions in respect of the 'proximity principle' and minimising waste movement, a significant number responded that ILW storage could have a detrimental effect on their community. These respondents tended to favour storage remote from their community and preferably away from population centres.

4.2.17. Some respondents also felt that the transport risks and health effects of moving radioactive waste were under-estimated in the SEA. MOD believes that the number of waste movements will be small and that the transport risks are extremely low; however it acknowledges that future assessments must take into account the particular circumstances of each site as well as associated transport implications. ILW storage site proposals will need to show that the national and local benefits have been systematically weighed against any negative effects.

Cumulative Effects

4.2.18. Chapter 6 of the SEA Environmental Report assessed the interactions of SDP with other major local developments, through the assessment of cumulative environmental effects. None of these were found to be significant, with the exception of a potentially significant combined economic benefit from SDP and the Devonport Area Action Plan.

4.2.19. Feedback from Devonport indicated particular concerns about the combined effects on the health objective from SDP and the MVV Energy from Waste plant at North Yard. The SEA Environmental Report acknowledged that the incinerator and SDP could, in combination, add minor additional stresses to the Devonport local community (which is already a relatively disadvantaged area). This interaction was incorrectly scored as 'no effect' on the health objective, when it should have been scored as a minor negative to reflect the accompanying text. Recommendations were made in the Environmental Report to minimise the effects of dismantling on this issue.

4.2.20. Feedback from Rosyth indicated concerns about the combined effects of SDP with the proposed container port development. The SEA Environmental Report acknowledged that SDP could add slightly to the disturbance and traffic impacts that would be expected from developing of the container port. Recommendations were again made in the Environmental Report to minimise the effects of dismantling on this issue.

4.3. Incorporation of Consultation Feedback into Decision-Making

4.3.1. The MOD's revised position has been influenced by the changes made to the options analysis and decision making as a result of the comments received in consultation. Summaries of these changes are included in the Response to Consultation Report, as are comments that have not been accepted (e.g. because the MOD believes they are based on misunderstandings or because it does not accept the conclusions that have been drawn).

4.3.2. MOD does not consider that the conclusions of the SEA have been changed by the issues raised in consultation, but feedback did help improve the post-consultation analysis of the options and, by highlighting the key areas of stakeholder concern, helped prioritise further assessment work and monitoring. In particular:

- Insufficient data was available at the time of SEA issue to quantitatively estimate the likely radiological discharges associated with the three technical options. Further information has increased confidence that the estimate of worker dose in the SEA Environmental Report was realistic, as was the assessment that the likely environmental discharges and dose to critical groups would be below regulatory levels of concern (further details can be found in Annex D). Further, more detailed assessments will be undertaken as part of the statutory Environmental Impact Assessment for Decommissioning Regulations (EIADR) application to ONR (Office for Nuclear Regulation) for initial dismantling.
- Insufficient data was available at the time of SEA issue to assess the indirect socio-economic effects of undertaking initial dismantling. Further assessment was undertaken on the indirect effects of the jobs supported, but it is acknowledged that the wider socio-economic effects on the area are as yet uncertain.
- Little information on ILW storage options was available at the time of the SEA issue to assess site-specific transport effects. This will be addressed in the next iteration of the SEA, which will assess specific ILW storage locations.

4.3.3. After the public consultation ended, the Investment Appraisal, MCDA and OCF processes were re-run to incorporate the feedback received and the new data on estimated worker dose and environmental discharges. The Response to Consultation Report provides details about how the post-consultation analyses influenced the decisions that have now been made.

4.3.4. Public consultation has provided valuable feedback which will help the MOD refine the forthcoming SEA update on ILW storage. Annex B shows where the public has had, and will have, the opportunity to comment on the proposals as they develop. Information on consultations that predate the start of the current round of decision making is available on the SDP web pages.[8]

[8] Further details of the previous public consultations held on ISOLUS can be found via the SDP consultation web page: https://www.gov.uk/government/consultations/consultation-on-the-submarine-dismantling-project

5. REASONS FOR CHOOSING THE APPROACH TO INITIAL DISMANTLING, IN LIGHT OF ALTERNATIVES CONSIDERED

5.1.1. The SDP is a responsible waste management initiative which will enable both radiological and conventional wastes to be managed effectively through application of the waste hierarchy. The 'do minimum' option has been unambiguously confirmed by MOD's post-consultation analysis as not being an acceptable way forward.

5.1.2. The SDP options have been assessed against the principle of inter-generational equity. Current generations built and used the submarines, so it is arguably the responsibility of the current generation to dispose of them in the safest way, rather than leave later generations to deal with them. To do otherwise could be seen to run counter to the principles of sustainable development.

5.1.3. The SEA Environmental Report provided an assessment of the SDP's reasonable alternatives, and the assessment remains valid in light of consultation. The adopted approach does not have significant environmental effects, although on a generic basis, the SDP could be judged as bringing a significant benefit to the waste objective by responsibly removing the legacy of laid-up submarines.

5.1.4. The proposed approach for removing the radioactive materials from the submarines - RPV removal and storage - remains unchanged in light of consultation. Both the RPV and packaged waste options were judged to perform similarly well from an environmental perspective, but of the two, the RPV option allows additional natural decay to take place, reducing worker dose and environmental risk still further. By contrast, the RC separation option had potentially significant environmental implications related to the size of the required storage facility and the potential need to undertake additional dredging at Devonport, as well as practicality and cost implications.

5.1.5. The post-consultation studies have confirmed the advantages of the dual-site option. OCF analysis, based on consultation responses, strengthens the case further. Perceptions of public risk, inter-generational equity and fairness, and 'local political positions' all favour dual-site dismantling over Devonport-only dismantling. This has therefore been selected as the MOD's intended option.

5.1.6. The approach to ILW storage has been revised in light of consultation. All credible 'existing' nuclear sites will be assessed on an equal basis, with the SEA being updated to assess the environmental effects of development at each proposed location. Local stakeholders will be engaged throughout the selection process and there will be public consultation before the storage site is selected. No ILW will be removed from any submarine until the ILW storage solution has been agreed and the necessary planning approvals obtained.

5.1.7. Other issues assessed in the SEA which have not yet been decided upon (for example transport and recycling of the radiologically-cleared hulls) will be revisited to confirm whether the SEA findings are still valid.

6. MONITORING

6.1.1. The SEA Regulations require that potentially significant environmental effects of a Plan or Programme are monitored, alongside areas of uncertainty where monitoring would provide more information.

6.1.2. The SEA established that the proposed option of RPV removal at Devonport and Rosyth is not associated with any potentially significant environmental effects. Nevertheless, the Environmental Report listed a range of possible monitoring measures that could be used to ensure that the effects identified do not become significant and that any unforeseen effects can be identified early, and so properly managed. Consultation feedback has allowed the MOD to focus on the key areas of concern to consultees.

6.1.3. Around half of those responding to this topic in the consultation were generally content with current and proposed future monitoring arrangements, but there were a significant number of comments, particularly in respect of discharge monitoring. The feedback indicated a clear appetite for more targeted, open, timely (and preferably independent) monitoring to build and maintain trust that dismantling does not pose any additional or unexpected risk to local communities or the environment.

6.1.4. It appears, however, that the extent of existing monitoring around the dockyards is not widely appreciated. These regimes include the Radioactivity in Food and the Environment (RIFE) programme, existing Licensee and Regulator discharge monitoring, and Local Authority health surveillance. The MOD recognises the importance of public confidence in both site licensee and external monitoring arrangements, and the project's ability and commitment to respond if anything unexpected is revealed. It will therefore work with site Licensees and Regulatory authorities to publicise and make accessible those existing environmental monitoring regimes that are already well placed to supply timely and independent information.

6.1.5. The MOD recognises that more detailed monitoring may be required by the Regulators to support Statutory site-level consents to start dismantling, including EIADR, Environmental Permitting / Authorisations and (if required) EIA for development consent.

6.1.6. Given that further project-level monitoring may be required, it is not proposed to commit the site Licensee to undertake any additional monitoring at this stage. The site-specific assessments will define the detailed monitoring requirements in due course; work on the first submarine then will produce valuable worker dose and environmental discharge data. This will be used to optimise the initial dismantling process for the further submarines and demonstrate to the Regulators and stakeholders that risks to people and the environment are being minimised effectively.

6.1.7. Work on some other suggested long term indicators, for instance those related to indirect socio-economic effects, is more appropriately led by local authorities, with support from MOD.

ANNEX A: LIST OF ABBREVIATIONS

Abbreviation	Meaning
ALARP	As Low as Reasonably Practical
BSO	Basic Safety Objective
DE&S	Defence Equipment & Support
EA	Environment Agency
EH	English Heritage
EIA	Environmental Impact Assessment
EIADR	Environmental Impact Assessment for Decommissioning Regulations
EPR 10	Environmental Permitting Regulations 2010
EU	European Union
FSA	Food Standards Agency
GDF	Geological Disposal Facility
HRA	Habituated Regulations Assessment
HSE	Health & Safety Executive
ILW	Intermediate Level Waste
LLW	Low Level Waste
MCDA	Multi Criteria Decision Making Analysis
NDA	Nuclear Decommissioning Authority
NIEA	Northern Ireland Environment Agency
OASP	Operational Analysis Support Paper
OCF	Other Contributory Factors
ONR	Office for Nuclear Regulation
PAR	(SEA) Post-Adoption Report
PSE	Public & Stakeholder Engagement
PW	Packaged Waste
PWR	Pressurised Water Reactor
RC	Reactor Compartment
RIDDOR	Reporting of Diseases Dangers & Dangerous Occurrences Regulations
RIFE	Radioactivity in Food and the Environment (report)
RPV	Reactor Pressure Vessel
RSA 93	Radioactive Substances Act 1993
SDC	Submarine Dismantling Consultation
SDP	Submarine Dismantling Project
SEA	Strategic Environmental Assessment
SEPA	Scottish Environment Protection Agency
SNH	Scottish Natural Heritage
TRIR	Total Recordable Incident Rate
UK	United Kingdom

ANNEX B: CONSULTATION TIMELINE

The aim of the Table is to demonstrate how the SDP has consulted on environmental issues and where stakeholders (including the public) have had, and will have, the opportunity to comment on the proposals as they develop.

Past publication/ event	Consultees	Date(s)
Publication of Initial SEA Scoping Reports	Statutory Consultees and other key stakeholders	June 2010 – January 2011
SEA Scoping Workshop	Statutory Consultees and other key stakeholders	January 2011
Publication of final SEA Scoping Report	Statutory Consultees and other key stakeholders	March 2011
Publication of SDP Public Consultation and Environmental Report	Published on the SDP website in October 2011, with documents sent to Statutory Consultees, other key stakeholders and Local Authorities. A targeted programme of stakeholder events took place around Devonport and Rosyth, and two national stakeholder workshops were held in Birmingham and Glasgow.	Oct 2011 – Feb 2012
Publication of (this) Post-Adoption Report	No formal consultation required	March 2013

Future Publication/ event	Consultees	Estimated date
Updated SEA Scoping Report (for ILW sites) (PSE Stage 1)	Statutory Consultees and other key stakeholders	2013
SEA Scoping Workshop (PSE Stage 1)	Statutory Consultees and other key stakeholders	2013
Publication of Public Consultation on ILW and SEA Environmental Report (PSE Stage 2)	To be published www.gov.uk website. A targeted programme of stakeholder events will take place around candidate storage sites, with National events being held as required. Relevant documents will again be sent to UK Statutory Consultees, other key stakeholders and Local Authorities.	2014
SEA final Post-Adoption Report	No formal consultation required	TBD
Environmental Statement for Nuclear Decommissioning EIA (submarines at Rosyth)	ONR and SEPA. The Statement will be published by ONR for comment by Local Authorities, the public and other interested groups.	2013

Environmental Statement for Nuclear Decommissioning EIA (submarines at Devonport)	ONR and EA. The Statement will be published by ONR for comment by Local Authorities, the public and other interested groups. Further EIAs may be required at the discretion of the Regulator (e.g. for different classes of boat)	TBD
Environmental Statement for Town & Country Planning EIA.	The Local Planning Authority, appropriate Statutory Bodies, the public and other interested groups. EIA will be needed **if** the Local Planning Authority decides that a development requires Planning permission, and it falls within scope of the EIA Regulations. EIA may apply to initial dismantling and/or ILW storage facilities.	TBD (if required)
Habitats Regulations Assessment	Scottish Natural Heritage/ Natural England. HRA will be required if the Statutory Bodies believe that a development has the potential to directly or indirectly affect the integrity of a European protected wildlife site. An HRA was undertaken by the MOD for the SDP at Plan level; this has been published alongside this Report. It concludes that the SDP is unlikely to have adverse effects on any European protected wildlife sites.	TBD (if required)

ANNEX C: MONITORING MEASURES

The adopted approach to initial dismantling was not found to have any significant environmental effects. Table below highlights the environmental issues (including those of human health and population) that were found through consultation to be of greatest interest and concern to stakeholders.

These monitoring measures will be developed further with the Regulatory authorities as part of EIADR applications, and/or as part of any required Planning applications for initial dismantling. Monitoring will be implemented through site-specific agreements (e.g. Environmental Permitting or Planning conditions).

Key Issue	Monitoring measure	Sources
Waste	Proportion of each submarine recycled, stored and disposed of *Monitoring of individual waste streams will be agreed with EA/ SEPA at site level.*	• MOD Disposal Services Agency
Radiological discharges into the environment	By volume or activity as appropriate, with reference to current permitted/ consented levels: • Discharges of radioactive material to water from dockyards • Discharges of gaseous/ particulate radioactivity to air from dockyards • Records of any accidental or unauthorised off-site discharge from dockyards • *Any further discharge monitoring requirements will be agreed with EA/ SEPA at site level.*	• Published in the Radioactivity in Food and the Environment (RIFE) Annual Report • Published in routine site Licensee monitoring reports • Published by the EA and SEPA
Other pollutant discharges	With reference to current permitted levels: • Discharge of permitted gasses/ particulates to air from dockyards • Discharges of permitted materials to sewer from dockyards • Discharges of permitted materials into the Forth Estuary/ Hamoaze from dockyards • Water body status in the Forth Estuary, Hamoaze and Plymouth Sound • Records of air quality around the dockyards *Any further discharge monitoring requirements will be agreed with EA/ SEPA at site level.*	• Published in routine site monitoring reports • Published by the EA, SEPA and Local Authorities
Community health	• Radiological dose levels for critical group(s) around dockyards, with reference to appropriate dose limits • Health indicators for communities around the dockyards *Any further monitoring requirements for community health will be agreed with EA/ SEPA and/ or the Local Authority at site level.*	• Published in the RIFE Annual Report • Published in routine site Licensee monitoring reports • Published by local NHS Trusts/ ONS
Worker health & safety	• TRIR/ RIDDOR rates • *Monitoring of worker dose will be agreed with ONR at site level*	• Published in site health & safety reports

Socio-economic effects	*Any monitoring of socio-economic factors will be agreed with the Local Authority at site level.*	-
Coastal change and flood risk	*Any monitoring of flooding and coastal change will be agreed with the EA/ SEPA at site level.*	-
Biodiversity & Nature Conservation	• Condition Reports for Designated Sites • Ecological status of the Forth Estuary, Hamoaze and Plymouth Sound *Any further biodiversity monitoring requirements will be agreed with the NE/ SNH at site level.*	• MOD • Published by Natural England & Scottish Natural Heritage
Cultural Heritage	• Condition of historic assets in and around the dockyards *Any further heritage monitoring requirements will be agreed with EH/ HS and/or Local Authority at site level.*	• MOD • Published by Local Authorities, English Heritage and Historic Scotland
Energy and Climate	*Any monitoring of energy and climatic factors will be agreed with the EA/ SEPA at site level.*	-
Water use and discharge	*Any monitoring of water and waste-water will be agreed with the EA/ SEPA at site level.*	-
Noise and vibration	*Any monitoring of noise and vibration will be agreed with the EA/ SEPA and/or Local Authorities at site level.*	-
Traffic and transport	*Monitoring of traffic levels related to SDP will be agreed with the EA/ SEPA and/or the Local Authorityat site level.*	-
Landscape and townscape	*Any monitoring of visual impact will be agreed with the Local Authority at site level.*	-
Land use and quality	*Any monitoring of land quality will be agreed with the EA/ SEPA at site level.*	-
Built Environment Quality	*Any requirements for built environment assessment will be agreed with the Local Authority at site level.*	-

ANNEX D: ADDITIONAL INFORMATION ON DOSE AND DISCHARGE ASSUMPTIONS

This Annex has been included in response to comments asking for more detailed technical information on dose and discharge assumptions. To fulfil this function, it inevitably includes technical terminology relating to radiological dose and discharge assessments which it is not practical to define and explain here. Useful background information has been issued by the Office of Nuclear Regulation (ONR), the Environment Agency (EA), and the Scottish Environment Protection Agency (SEPA).

D.1. ESTIMATED WORKER DOSE

D.1.1 Introduction

No additional studies have been conducted on worker dose since the 2011 Public Consultation. The discussion below is based on 2010 estimates of the dose to workers during submarine dismantling.

D.1.2 Discussion

An assessment was carried out during 2010 to investigate the radiation doses which would be accrued by the work force during operations to dismantle Conqueror, a defuelled submarine berthed at Devonport.

The input data was realistic (i.e. it included information from operational refits of other submarines, scaled for Conqueror) and the ambient radiation dose rates were worse case (i.e. the reactor compartment of Conqueror was amongst the highest of all of the defueled submarines). Hence the study can be described as a best estimate of worker dose from one of the worst-case submarines under normal, i.e. non-accident, conditions.

Doses were assessed for each of the following three options:

- RC separation, storage, deferred size reduction and packaging and disposal of packaged waste.
- RPV removal, storage, deferred size reduction and packaging and disposal of packaged waste.
- RPV removal, immediate size reduction, packaging, storage and disposal of packaged waste.

It was assumed that one submarine would be dismantled per year, and that 50 radiation workers would be involved.

The legal limit for employees working with radiation is 20 mSv per year and as a further management control employers set their own targets which are well below the legal limit. For example, MOD sets a Basic Safety Objective (BSO) for its employees of 1 mSv per year, i.e. a factor of 20 lower. In addition, the safety case for any activity involving radiation must demonstrate that worker dose will be As Low As Reasonably Practicable (ALARP).

The assessment calculated the average total amount of radiation received by workers for each of the three options shown above. These are discussed further below.

The average occupational radiation dose received by a worker during the RC separation option was estimated at 0.18 mSv per annum. This consisted of two sets of doses, incurred at different times. During initial dismantling, the estimated worker dose was 0.06 mSv per annum. This was calculated taking into account operations such as preparation works, separating the RC from the rest of the submarine and preparing the RC for transport and care and maintenance during interim storage. During the deferred activities, the average worker dose was estimated at 0.12 mSv per annum. This was calculated taking into account operations such as removal of the lagging, removal of the steam generators, main coolant pumps and associated pipework and other similar work. These estimates also included allowances for doses received during interim storage and emplacement in the GDF.

The average radiation dose received by a worker during the RPV removal and deferred RPV size reduction option was estimated at 0.94 mSv per annum. This was calculated taking into account operations such as removal of the lagging, removal of the steam generators, main coolant pumps and associated pipe-work and other similar work. These estimates also included allowances for doses received during interim storage, size reduction and emplacement in the GDF.

The average radiation dose received by a worker during the RPV removal and immediate size reduction and packaging option was estimated at 1 mSv per annum. This was calculated taking into account operations such as removal of the lagging, removal of the steam generators, main coolant pumps and associated pipework and other similar work. The estimates also included allowances for doses received during interim storage, size reduction and emplacement in the GDF.

It is worth noting that very little dose was associated with RPV size reduction and packaging. The requirement to achieve ALARP would mean that immediate size reduction of the RPV would be conducted by remote handling inside shielded facilities to limit exposure. For deferred size reduction and packaging associated with the RC option, natural decay would reduce occupational doses to a relatively low level, such that remote working would probably not be needed.

The assessment indicated that, for all three options, the average dose to individual workers were as low as reasonably practicable (ALARP) and did not exceed the MOD's basic safety objective of 1 mSv per annum.

Note that these estimates will be reviewed as improved data become available.

D.1.3 Summary

There have been no significant additional studies on worker dose since the 2011 Public Consultation.

A 2010 assessment concluded that the estimated average radiation dose received by a worker was 0.18 mSv per annum for the RC separation option; 0.94 mSv per annum for the RPV removal and deferred RPV size reduction option; and 1 mSv per annum for the RPV removal and immediate size reduction option. In all cases, worker doses were ALARP and did not exceed the MOD's basic safety objective of 1 mSv per annum. This is a worst case estimate and will be reviewed when improved data become available.

D.2. IMPACT OF LIKELY DISCHARGES INTO THE ENVIRONMENT

D.2.1 Introduction

At the time of the 2011 Public Consultation, there was no quantitative information available at that time on likely discharges, and the SEA relied on routine and scheduled radioactivity monitoring of the environment around Devonport and Rosyth. The public consultation demonstrated a clear appetite for additional information to be made available on likely discharges and public dose from the technical options, and for that information to inform the decision making process. The discussion below is based on three sources:

- An historical study (2001) on estimated radiological discharges associated with dismantling a submarine at Rosyth[9]
- Preliminary internal work on environmental impact assessments for the initial dismantling
- The 2011 SEPA Radioactivity in Food and the Environment report (RIFE-17)[10]

D.2.2 Discussion

The 2001 study (not included in the public consultation material) assessed the likely discharges associated with dismantling the defueled submarine Renown at Rosyth Royal Dockyard. This study identified a typical dismantling process, identified the wastes produced during the process, described how the activity of the discharges would be minimised, quantified the radiological discharges to the environment and then calculated the impact on the environment and to members of the public arising from these discharges.

The postulated dismantling process was very similar though not identical to current concepts. Liquids would be treated prior to discharge. The volumes and radionuclide content of the discharged liquids were modelled using historical sampling and analysis data.

The transport pathways included ingestion of fish, molluscs, crustaceans, inhalation of sea spray, external gamma and external beta radiation from activity in beach sediments, external exposure to gamma radiation and beta radiation in fishing equipment.

The 'critical group' at Rosyth (i.e. those members of the public likely to receive the maximum dose) was assessed as people who consumed locally-harvested seafood and were exposed to sediments and sea spray.

A specialised software package (PC Cream) was used to calculate the radiation doses to individuals in the critical group. The calculations indicated that most significant radionuclide was Carbon-14 and the pathway of greatest significance was the consumption of locally-caught fish. The calculated total radiation dose from the discharged liquids to a member of the critical group was 0.000046 micro Sieverts[11].

A similar exercise was carried out for gaseous emissions from the initial dismantling process, this time using different sources terms, abatement technologies and radiation pathways. The radiation dose to members of the critical group from gaseous discharges was assessed at 0.023 micro Sieverts per year. The most significant radionuclide was Carbon-14 and the pathway of greatest significance was the consumption of grain and milk products from the local area.

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[9] Key extracts are presented in the SDP COEIA MCDA Data Report. Issue 6.0, Jan 13.
[10] Radioactivity in Food and the Environment, Oct 2012 (RIFE-17). Published jointly by EA, FSA, NIEA and SEPA.
[11] 1 micro Sievert is equal to 0.001 milli Sieverts (mSv)

These doses are considerably less than both the 10 micro Sieverts per year dose threshold which has widespread international agreement for being sufficiently low to be of no regulatory concern, and the 20 micro Sieverts dose threshold used by both the Environment Agency and SEPA.

The latest Radioactivity in Food and the Environment Report ('RIFE 17') states that the total dose (to the Rosyth critical groups) from all pathways and sources at Rosyth was less than 5 micro Sieverts in 2011, which is less than 0.5 per cent of the (1 milli Sievert per year) dose limit. However, the RIFE results are relevant to historical and/or recent discharges, but not to future discharges being considered under SDP.

SEPA has indicated that a changed Authorisation under RSA-93 will be required to allow SDP activities to proceed at Rosyth. Because SEPA has progressively reduced discharge limits as submarine refit work has ceased, and as the site has been partially decommissioned, the site licensee may need to apply for an increase in the current gaseous and liquid effluent discharge limits as part of the changed Authorisation. This will be subject to statutory consultation.

If there is an increase required on existing limits at Rosyth, there will be a requirement for the site licensee's application to demonstrate that the impacts on human health and the environment will not be significant. Furthermore, because all doses (no matter how small) remain subject to ALARA, the applicant will have to be show that Best Practicable Environmental Option / Best Practical Means have been used to minimise the activity of any discharged liquid and gaseous wastes.

The 2001 study is based on dismantling a defueled submarine at Rosyth. Equivalent discharge and public dose data for dismantling at Devonport are not yet available. The discussion below explores to what extent the Rosyth data described above can applied to Devonport.

The application of applicable abatement technologies/techniques (e.g. filtration, ion exchange) and the types and quantities of radioactivity discharged to the environment from both sites will not vary significantly between sites.

The transport mechanisms by which radioactivity is carried from the point of discharge to the critical groups will be similar, but there will be variations in the specific pathways depending on local factors.

The 'critical groups' at Rosyth and Devonport are broadly similar. These include local anglers, beach users and seafood consumers. RIFE reported that the most exposed group at both Rosyth and Devonport were adults who consume fish at high rates. It found that doses to the critical groups were below 5 micro Sieverts per year, which is less than 0.5% of the dose limit.

So, although it is not possible at this stage to quantify in any more detail the doses arising from similar environmental discharges from both Rosyth and Devonport, they are both expected to be very small and any differences re unlikely to be significant.

D.2.3 Summary

An assessment was carried out in 2000 to calculate the likely discharges of radiological liquids and gases produced during the dismantling of Renown at Rosyth Royal Dockyard. The assessment indicated that the doses to the critical groups would be considerably less than the 10 micro Sieverts per year low dose threshold which has widespread international agreement for being sufficiently low to be of no regulatory concern.

A changed Authorisation under RSA-93 will be required from SEPA to allow SDP activities to proceed at Rosyth. This may include an application for an increase in the current gaseous and liquid effluent discharge limits.

Equivalent dose data for dismantling at Devonport is not yet available, and there may be a need to revise the Devonport EPR10 Authorisation, which will also be subject to statutory consultation.

D.3. FUTURE WORK

Future work includes the tasks shown below. Note that this list is not exhaustive.

- Delivery of the concept design of the initial dismantling process.
- Commencement of the detailed design of the initial dismantling process.
- Work is continuing to increase the level of confidence in the inventory of radioactive materials inside the SDP submarines. The radiological inventories of PWR1 and PWR2 pressure vessels have been calculated and the results are currently being compared with those obtained from analyses of samples taken from the RPV of a submarine in maintenance. It is intended to take additional samples from other submarines for further analysis, and also to establish a more detailed protocol for monitoring.

The results from the above and similar studies will be used to determine parameters such as the concentrations, categories, masses and volumes of radioactive waste arisings, which will inform downstream planning and regulatory processes, some of which are outlined below.

- Engagement with the environmental Regulatory authorities (SEPA and EA) will review the RSA 93 and EPR10 Authorisations for radiological discharges, and also to address the management, accumulation and disposal of solid radioactive waste arisings from the Submarine Dismantling Project. At Rosyth, this will lead to an application for a changed RSA93 Authorisation to cover SDP activities, which may include a request to increase liquid and gaseous discharge limits.
- Under the Nuclear Decommissioning (Environmental Impact Assessment for Decommissioning) Regulations (EIADR), consent must be obtained from the Office of Nuclear Regulation (ONR) before initial dismantling can begin at Rosyth.
- To obtain this consent, the site licensee will scope and submit an Environmental Statement which presents a detailed Environmental Impact Assessment for the proposals and the measures that will be used to avoid or minimise any significant adverse impacts. This will then be considered by ONR in consultation with relevant regulatory and planning authorities.[12] This EIADR process involves consultation and stakeholder engagement.

Additional studies may be required in support of activities currently not in the project baseline programme, but which are being considered as opportunities.

[12] The EIADR process requires the site licensee to prepare and submit an Environmental Statement to the HSE through ONR. If the project is considered acceptable, ONR grants consent for the decommissioning project. The decision is published in the form of a decision report. Consents generally have conditions attached, for instance requiring regular reports on progress through environmental management plans.