



Office for
Nuclear Regulation

**Determination of the Off-Site Emergency Planning and Prior
Information Areas for the Loch Goil Operational Berth**

**Radiation (Emergency Preparedness and Public Information)
Regulations 2001**

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EXECUTIVE SUMMARY

Determination of the Off-site Emergency Planning and Prior Information Areas for the Loch Goil Operational Berth: Radiation (Emergency Preparedness and Public Information) Regulations 2001

The Office for Nuclear Regulation (ONR) is responsible for regulating the GB nuclear industry in order to protect the health and safety of employees and the public against risks of harm arising from ionising radiations. ONR is the regulatory authority for Radiation (Emergency Preparedness and Public Information) Regulations (REPPiR) 2001 on nuclear licensed sites, Ministry of Defence (MOD) Authorised nuclear sites and nuclear warship sites.

ONR's responsibilities include legal duties, where it is concluded that there is a potential for a reasonably foreseeable radiation emergency (as defined in REPPiR), to determine an off-site emergency planning area (i.e. the area within which, in ONR's opinion, any member of the public is likely to be affected by such an emergency). In these cases, there is also a legal duty, under the same Regulations, for ONR to determine an area within which prior information is to be distributed to the public. A radiation emergency is defined in REPPiR as an event where a person off-site is likely to receive a radiation dose in excess of the thresholds in REPPiR (typically an effective dose in excess of 5 milliSieverts (mSv)) in the 12 months following. It therefore constitutes an important component of the UK's overall emergency response framework.

This ONR Project Assessment Report describes and explains the basis for its re-determination, in accordance with REPPiR, of the off-site emergency planning area and the area within which prior information is to be distributed around the Loch Goil Operational Berth.

In relation to the off-site emergency planning area, the responsible local authority, in this case Argyll and Bute Council, is required to prepare an off-site emergency plan with the purpose of minimising, so far as is reasonably practicable, radiation exposures to those likely to be affected by a reasonably foreseeable radiation emergency. This plan will reflect the potential need to implement appropriate protection measures such as sheltering and evacuation in order to reduce radiation doses to members of the public within all or parts of this area.

REPPiR requires operators who carry out work involving quantities of radioactive materials at or beyond those specified by REPPiR, in this case the MOD, to undertake a Hazard Identification and Risk Evaluation (HIRE) in relation to their work with ionising radiations. The HIRE must identify all hazards with the potential to cause a radiation accident, and evaluate the nature and magnitude of the risks to employees and other persons (e.g. those who live or work nearby) arising from those hazards. REPPiR also requires that operators must assess their HIRE and to send a Report of Assessment (RoA) to ONR either prior to commencement of the work with ionising radiation, following any relevant material change in this work. The operator is required to undertake a review within three years of the last assessment if there has been no relevant material change. If there has been no change of circumstance, the operator may submit a declaration of no change. MOD RoAs relate to the radiological hazard presented by a berthed nuclear powered submarine at the relevant berth.

The off-site local authority emergency planning and prior information areas around the Loch Goil Operational Berth, as provided for in REPPiR regulations 9(1) and 16(1), were first determined in 2002 - a short while after REPPiR came into force in 2001. In 2002 the area was determined by ONR as being a circular area radius 2 km from the submarine. In 2008 ONR re-determined the area as having a radius of 1.5 km.

Although, the risk from the naval reactor plant has not increased, in order to provide further improvements in protection of the public, a change to what populations are included within the emergency planning area is required by REPPiR as a result of the application of ONR's revised principles for the determination of such areas.

ONR's re-determination of the REPPiR off-site emergency planning area and the REPPiR prior information area around the Loch Goil Operational Berth has been undertaken in accordance with ONR's regulatory processes, guidance associated with REPPiR itself, and the relevant ONR Technical Assessment Guide (TAG). In particular, the TAG includes ONR's determination principles published in 2014 and associated guidance for the determination of such areas. These principles recognise the learning that has emerged from global events such as occurred at Fukushima and the need to review the scope of off-site emergency planning. They also reflect ONR's commitment to high standards of nuclear safety at nuclear installations, and its continual efforts to seek improvements to measures to secure public safety and to the consistency and transparency of its decision-making.

ONR's determination process requires that:

- ONR undertakes a technical assessment of the MOD HIRE and RoA.
- In accordance with the relevant ONR TAG, ONR also gives appropriate consideration to practical and strategic factors relating to the planning and potential implementation of a credible off-site emergency plan, and other pragmatic factors appropriate to secure confidence as regards protection of the public. This aspect of the process includes dialogue with the relevant local authorities, in this case, Argyll and Bute Council, as the dutyholder within REPPiR as regards the off-site plan, and considers, amongst other factors, local population (including vulnerable groups), geographical considerations, and existing good practice where the local authority emergency plan already extends beyond the minimum required distance.. This informs ONR's determination so as to define more practical emergency planning and prior public information areas than would be the case from purely technical considerations.

The outcome of ONR's technical assessments concludes that an area with a radius of at least 1.5 km from the berth point should continue to be used as the foundation for defining the extent of the need for local authority off-site emergency planning under regulation 9 of REPPiR in relation to the Loch Goil Operational Berth.

ONR's regulatory principles emphasise the importance of ensuring that an appropriate balance is achieved between the assessment of technical submissions provided by the operator and other practical and strategic considerations judged to be appropriate in the interests of public safety. As a consequence, the ultimate determination of the REPPiR off-site emergency planning area represents ONR's regulatory judgement, and is not formed solely on the basis of technical considerations or criteria.

The outcome of ONR's review, taking into account the relevant practical and strategic considerations relating specifically to the Loch Goil Operational Berth, is that:

- both the REPPiR off-site emergency planning area and the REPPiR prior information area for the Loch Goil Operational Berth have been re-defined to be the enhanced area shown within the red line on map contained in annex B to this report, and described as a circular area of a minimum 1.5km radius extending to include those properties lying adjacent to the minimum boundary.

The enhancement of the planning area (from a 1.5 km circle to the shape indicated at annex B) reflect factors which ONR judges to be relevant in securing confidence as regards protection of the public during a reasonably foreseeable radiation emergency, the learning that has emerged from global events such as occurred at Fukushima, and the need to review the scope of off-site emergency planning, noting the risk from the naval reactor plant has not increased.

The recommendations of this report are that ONR write to:

- Argyll and Bute Council, being the responsible local authority to advise that the REPPIR off-site emergency planning area has been determined as the area within the red line on map at annex B. This information should be copied to Navy Command acting as the MOD Operational Berth duty holder.
- Argyll and Bute Council, being the responsible local authority confirming the need to update, as required, its detailed off-site emergency plan to adequately cover the area defined in annex B.
- Navy Command acting as the MOD Operational Berth duty holder confirming the requirement to ensure the appropriate provision of prior information to the public within the area defined in annex B. This should also be copied to Argyll and Bute Council.
- Inform by copy of its letter to, Naval Base Commander (Clyde), The Defence Nuclear Safety Regulator, Queens Harbour Master Faslane, Maritime and Coastguard Agency, Environment Agency, Food Standards Agency, Food Standards Scotland, Department of Business, Energy and Industrial Strategy and the Scottish Government to inform them of the revised REPPIR off-site emergency planning and information areas.

LIST OF ABBREVIATIONS

ACPO	Association of Chief Police Officers
BSS	Berth Safety Statement
DEPZ	Detailed Emergency Planning Zone (Ref: REPPIR regulation 9(1))
DNSR	Defence Nuclear Safety Regulator
EURATOM	European Atomic Energy Community
FEPA	Food and Environment Protection Act 1985
FSA	Food Standards Agency
GB	Great Britain
HIRE	Hazard Identification and Risk Evaluation
HMNB	H.M. Naval Base
HSL	Health and Safety Laboratories
IAEA	The International Atomic Energy Agency
MCA	Maritime and Coastguard Agency
MHWM	Mean High Water Mark
MLWM	Mean Low Water Mark
MOD	Ministry of Defence
mSv	milliSievert
NIA	Nuclear Installations Act 1965
NII	Nuclear Installations Inspectorate
NRP	Naval Reactor Plant
ONR	Office for Nuclear Regulation
PAR	Project Assessment Report
QHM	Queens Harbour Master Clyde
REPPIR	Radiation (Emergency Preparedness and Public Information) Regulations 2001
RoA	Report of Assessment
RPC	Representative Patrol Cycle
SAPs	(ONR) Safety Assessment Principles
TAG	(ONR) Technical Assessment Guide

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1 REGULATORY CONTEXT

The UK Energy Act (reference 1) requires the Office for Nuclear Regulation (ONR) to do whatever it considers appropriate for the purposes of protecting persons against risks of harm arising from ionising radiations from GB nuclear sites, including through:

- securing the health, safety and welfare of persons at work on GB nuclear sites; and
- protecting persons, other than persons at work on GB nuclear sites, against risks to health or safety arising out of or in connection with the activities of persons at work on GB nuclear sites.

ONR does this by providing efficient and effective regulation of the nuclear industry, holding it to account on behalf of the public, and, in particular, ensuring that appropriate arrangements are put in place to deal with a nuclear emergency.

Ministry of Defence (MOD) nuclear sites and facilities are Crown exempt from licensing requirements under the Nuclear Installations Act 1965 (NIA) (reference 2). These sites are referred to as Authorised sites and Nuclear Warship sites (referred to by the MOD as Operational Berths and Anchorages).

The NIA additionally explicitly exempts a reactor 'comprised in a means of transport' from its requirements (i.e. submarines are not licenced by ONR under the NIA).

The MOD internal regulator, the Defence Nuclear Safety Regulator (DNSR), authorises and regulates the Authorised sites through the use of authorisation conditions, which are closely aligned to ONR Licence Conditions. Similar conditions are placed on Operational Berths.

However, the MOD is not exempt from the Radiation (Emergency Preparedness and Public Information) Regulations 2001 (REPPIR) (reference 3), and ONR are the enforcing authority for REPPIR on their authorised sites and Nuclear Warship sites (reference 4).

The term Operational Berth is defined as a berth or anchorage outside of Authorised and Licenced sites and not covered by Authorisation or Licence conditions, at which a Nuclear Powered Warship may be berthed or anchored.

The MOD / ONR General Agreement and Letter of Understanding (references 5 and 6) describe the overall regulatory working relationship between the MOD and ONR. DNSR works closely with ONR in a process of joint regulation of relevant areas to minimise the impact on operators and ensure, so far as is practicable, that they are not subject to differing requirements or processes. ONR looks to DNSR as the "Competent Authority" in respect of Naval Reactor Plant (NRP) design and DNSR provides ONR with any clarification it requires on hazards arising therefrom.

In relation to REPPIR, DNSR acts as the Competent Authority in providing assurance to ONR that the detailed Naval Nuclear Propulsion Programme design information contained within the MOD REPPIR Hazard Identification and Risk Evaluation (HIRE) is valid and has been used appropriately.

ONR's responsibilities include legal duties, where it is concluded that there is a potential for a reasonably foreseeable radiation emergency (as defined in REPPIR) to determine an off-site emergency planning area. This is the area within which, in ONR's opinion, any member of the public is likely to be affected by such an emergency¹. In these cases, there is also a legal duty under the same regulations, for ONR to determine an area within which prior information is to

¹ ONR has historically used the term detailed emergency planning zone (DEPZ) to refer to the area it defined under REPPIR regulation 9 as requiring an off-site emergency plan. (The term is still used this way in some ONR guidance.) As the term is not used within REPPIR itself (although referred to in the related guidance), and to ensure legal clarity and avoid misunderstanding amongst stakeholders, this report refers to the 'REPPIR off-site emergency planning area' under regulation 9 rather than to 'detailed emergency planning zone' or 'DEPZ'.

be distributed to the public². A radiation emergency is defined in REPPiR as an event where a person off-site is likely to receive a radiation dose in excess of the thresholds in REPPiR (typically an effective dose in excess of 5 milliSieverts (mSv)) in the 12 months following. It therefore constitutes an important component of the UK's overall emergency response framework.

This report sets out the outcome and justification for the determination of the revised off-site emergency planning and prior information areas for the Loch Goil Operational Berth in accordance with the requirements of REPPiR regulations 9(1) and 16(1) respectively (reference 3).

ONR is of the opinion that the extent of areas for local authority off-site planning and for the provision of prior information by the operator should usually be the same. This is a reflection of the fact that the factors considered by ONR for determination of these areas are the same. As a consequence, and for simplicity, where the term 'REPPiR off-site emergency planning area' is used in this report, it should be assumed to refer equally to the off-site emergency planning and prior information areas.

2 BACKGROUND

The UK regulatory system requires that every duty holder demonstrates to the regulator that it fully understands and manages the hazards and risks associated with its operations. The regulators assess the safety and security of the design and operation of nuclear plant to ensure that operator's provisions are adequate.

In the case of the Operational Berth at Loch Goil, the hazards and risks are associated with the NRP within the submarine. All references in this report to submarine are interchangeable with the definition of Nuclear Powered Warship.

In relation to emergency planning, REPPiR regulation 6 requires operators, and in the case of nuclear warship sites the dutyholder, to undertake a HIRE of hazards arising from their work with the potential to cause a radiation accident from the submarine. The duty holder for the nuclear warship sites is the MOD. The HIRE must be sufficient to demonstrate that all such hazards have been identified and the nature and magnitude of the risks to employees and other persons arising from those hazards have been evaluated. REPPiR also requires that operators must assess their HIRE and to send a Report of Assessment (RoA) to ONR either prior to commencement of the work with ionising radiation or, following any relevant material change in this work. The operator is required to undertake a review within three years of the last assessment if there has been no relevant material change.

REPPiR regulation 5(2) provides for the operator to make a declaration of no change if there is no change of circumstances which would affect the last report of the assessment required by regulation 6.

Where it is reasonably foreseeable that a radiation emergency (as defined in REPPiR) could arise, REPPiR requires ONR to determine areas within which, in its opinion, persons (including any member of the public) are likely to be affected by such emergencies. This then defines the area for which local authorities are required to prepare an adequate off-site emergency plan (regulation 9(1)) and for which operators are required to provide specified prior information (regulation 16(1)) to members of the public without them having to request it and also make that information publicly available.

The off-site emergency plan, in cases where one is required, may include urgent countermeasures in order to reduce radiation doses to members of the public, such as sheltering, evacuation, administering stable iodine tablets (in the case of operating nuclear

² This is sometimes, and has historically been, referred to as the Public Information Zone (PIZ) under regulation 16, but for the same reason as given above is not used in this report. This report refers to the 'REPPiR prior information area'.

reactors, including NRP), and other protection measures that are relevant, reasonably practicable, and proportionate to the radiological risk.

Following the determination by ONR, the relevant local authority, in this case Argyll and Bute Council, is required to prepare an adequate off-site emergency plan. In so doing, the local authority has a legal obligation to consult a range of persons, including the Operational Berth duty holder, ONR, the emergency services, the relevant health authority, and such other persons, bodies and authorities and members of the public as they consider appropriate. This plan must then be reviewed, revised where necessary, and tested at least every three years.

2.1 TIMELINE OF MOD HIRE / ROA SUBMISSIONS

In February 2008 the MOD submitted HIREs and associated RoAs (reference 7) covering operations at the following sites:

- HMNB Clyde (comprising Coulport and Faslane)
- HMNB Devonport (including Plymouth Sound buoys)
- Devonport Royal Dockyard
- UK Operational Berths (Portsmouth, Southampton, Portland, B4 Anchorage, Loch Goil, and Loch Ewe and Broadford Bay (no longer used, and not considered further))

ONR (then the Nuclear Installations Inspectorate (NII)) and DNSR put in place a regulatory strategy to assess the HIREs and RoAs, with DNSR providing the detailed technical assessment. NII completed the regulatory assessment requirements of REPIR with a joint regulatory position statement being issued in April 2009.

NII determined that it was more appropriate to consider the cliff edge fault event as the bounding fault, and that the area within which members of the public are likely to be affected by a reasonably foreseeable radiation emergency extended to a distance of 1.5 km from the berth in any direction (reference 8).

In 2011 the MOD REPIR submissions (through DNSR) (reference 9) were supported by significantly updated Berth Safety Statements (BSS) (reference 10) that considered site specific hazards. The 2011 submission constituted No Change Declarations (reference 9) for the Operational Berths, supported by revised BSS for:

- HMNB Clyde (including Faslane and Coulport Sites)
- HMNB Devonport (including Plymouth Sound buoys)
- UK Operational Berths (Portsmouth, Southampton, Portland, B4 Anchorage, Loch Goil, Loch Ewe and Ramsden Dock Basin)

The MOD REPIR submission (through DNSR) in January 2014 (reference 11) was again a Declaration of No Change of circumstance. The totality of the MOD submissions comprised of individual submissions from each Naval Base and Navy Command Headquarters, which covered the following:

- HMNB Clyde - Faslane and Coulport Sites
- HMNB Devonport (including Plymouth Sound buoys)
- UK Operational Berths (Portsmouth, Southampton, Portland, Ramsden Dock Basin, Loch Goil, and Loch Ewe)

DNSR, as the competent regulatory authority on the NRP, confirmed its support of the no-change submissions in 2011 and 2014 (references 9 & 11).

In January 2017, MOD (Naval Base Commander Clyde and Navy Command) submitted a further Declaration of No Change of circumstances (references 12 & 13). The submissions covered the following:

- HMNB Clyde – Faslane and Coulport sites

- UK Operational Berths (HMNB Portsmouth and Solent Anchorages, Loch Ewe Loch Goil, Portland Port, Ramsden Dock Basin and Southampton Eastern Docks)

3 SCOPE

The assessment described in this report sets out the basis for, and conclusions of, the re-determination of the REPPiR off-site emergency planning and prior information area relating to the Loch Goil Operational Berth. This has been undertaken in accordance with the guidance on REPPiR (reference 14) and the relevant ONR supporting Technical Assessment Guide (TAG) (reference 15), which incorporates ONR's principles for determination of REPPiR areas, and related guidance, as published in 2014.

ONR's principles recognise the learning that has emerged from global events such as occurred at Fukushima, and the subsequent need to review the scope of off-site emergency planning. They also reflect ONR's commitment to high standards of nuclear safety at nuclear installations, and its continual efforts to seek improvements to standards and to the consistency and transparency of its decision-making.

Provisions for the implementation of food restrictions are not relevant to the process of determining the REPPiR off-site emergency planning area on the basis that they are provided separately (Food and Environment Protection Act 1985 (FEPA) (reference 16)) and are under the legal jurisdiction of the Food Standards Agency (FSA). These provisions are therefore addressed by separate legislation other than REPPiR, may be exercised in a broader range of circumstances (i.e. not restricted to a radiological event), and are subject to existing planned implementation arrangements made by the FSA. They are therefore out with the scope of this report.

4 METHODOLOGY

4.1 ONR'S PROCESS FOR DETERMINING A REPPiR OFF-SITE EMERGENCY PLANNING AREA

This process requires that ONR:

- A. Conduct an initial independent technical assessment of the information provided by the operator in their HIRE and RoA seeking and using additional information as appropriate; and
- B. Where the potential for a REPPiR defined reasonably foreseeable radiation emergency exists, establish and consider any other relevant practical and strategic factors relating to the planning and practical implementation of measures to restrict public exposure so far as reasonably practicable (e.g. urgent countermeasures) for those persons who are likely to be affected by a radiation emergency.

Step A requires ONR to assess the operator's identification and characterisation of the likelihood, nature and magnitude of the radiation related risks that may result for a radiation accident. ONR also assess the operator's assessment of whether there is the potential for a radiation emergency to occur that is reasonably foreseeable. If this potential exists ONR will then consider the likely extent of any area within which the dose criteria contained within Schedule 1 of REPPiR may be met or exceeded. This indicates the minimum distance for further consideration in Step B, and is usually presented in the operator's HIRE reports as a circle with a specified radius centred at the source of the potential accident. In the case of the Operational Berths, the assessment of the HIRE and RoA is undertaken by DNSR, with the summary outcome being provided to ONR.

Step B applies additional pragmatic, population (including vulnerable groups), geographic and practical factors to the ONR determination and requires dialogue with the relevant local authority. The nature of these factors is set out in detail in the relevant ONR TAG (reference 15). Whilst the determined REPPIR off-site emergency planning area, as a result of considering these additional factors, need not be circular, it cannot be smaller than that arising from the technical assessment under Step A.

ONR's principles relating to practical and strategic considerations (reference 15) emphasise that, in the undertaking of the determination, it is important to ensure that a balance is achieved between the assessment of the technical report provided by the operator, and such additional practical and strategic considerations that, in ONR's opinion, are judged necessary in the interests of confidence in public safety. As a consequence, the extent of the REPPIR off-site emergency planning area represents a regulatory judgement of the significance of all of these factors, and is made on a case-by-case basis.

The factors that ONR's principles and associated guidance indicate should be considered are summarised as follows:

- local geographic, population and practical implementation factors;
- avoidance of bisection of local communities where sensible to do so;
- inclusion of immediately adjacent groups of vulnerable people;
- the need for the REPPIR off-site emergency planning area to provide for a credible emergency plan, for the purposes of public protection, in which the public will be confident;
- consideration of the implications of the extent of the REPPIR off-site emergency planning area in the context of an effective emergency response (e.g. adequacy of resources (i.e. police, fire and ambulance) and potential dis-benefits associated with immediate/urgent countermeasures);
- relevant international good practices; and
- other relevant site specific factors of which ONR are aware.

The starting point for determining the off-site emergency planning area is the most significant reasonably foreseeable event, referred to in ONR's TAG, reference 15, as the 'reference accident', and described in guidance as an event which is less than likely but realistically possible. Such an accident could be caused, for example, by possible plant and equipment failures, breakdown of administrative arrangements, external hazards such as earthquakes, and potential unauthorised behaviour of employees or the public.

For events that are judged not to be reasonably foreseeable (e.g. extremely low frequency but potentially higher consequence events), the guidance associated with REPPIR recommends, as a good practice, that local authorities should be capable of extending their emergency response beyond the REPPIR off-site emergency planning area should it be necessary to do so. However, extendibility arrangements are not considered further in this determination.

Although the local authority off-site emergency plans include many protection measures to reduce radiation doses to members of the public, the most commonly referenced are the urgent countermeasures available in the early stages of a nuclear emergency of sheltering, evacuation and, in the case of NRP, the administration of stable iodine.

In determining a REPPIR off-site emergency planning area, ONR acknowledges that the implementation of some protection measures can convey a risk of harm to individuals to whom they are applied. For example, following the Fukushima accident in Japan in March 2011, Koichi Tanigawa et al. report in the Lancet journal on the loss of life that occurred as a result of the implementation of evacuation (reference 17). Within a REPPIR off-site emergency

planning area, the local authority may expect some protection measures to be applied immediately or urgently across at least a part of the area and it is important that the area within which they may be applied, in the event of an emergency, is targeted and proportionate in order to ensure that overall risks to those affected are reduced so far as is reasonably practicable.

4.2 BASIS OF ASSESSMENT

The REPIR off-site emergency planning area must, as a minimum, include all of the area around the site, in this case the Loch Goil Operational Berth, within which a person (including members of the public) could receive an effective dose in excess of 5 mSv in the year following a reasonably foreseeable radiation emergency, or other dose criteria defined in REPIR Schedule 1. When assessing the extent of exposure, REPIR requires that operators assess the potential doses to members of the public from all exposure routes and, for this purpose, must disregard any health protection countermeasures that may have been taken by the local authority, emergency services or the exposed persons themselves, during the first 24 hours immediately following the event.

ONR undertook a review of the MOD's original 2008 REPIR submission along with the subsequent No Change submissions (reference 18) to ensure that they are considered appropriate in response to REPIR requirements and to provide an up to date assessment for the REPIR off-site emergency planning and prior information areas determination to be undertaken. This forms the basis of 'Step A' (see section 4.1) of the assessment and determination described in this report.

4.3 STANDARDS AND CRITERIA

4.3.1 ACTS, REGULATIONS AND GUIDANCE

The relevant standards and criteria considered within this assessment are those contained within REPIR (reference 3) and its associated guidance (reference 14). REPIR are regulations created under the Health and Safety at Work Act 1974 and implements the articles on intervention in cases of radiation emergencies contained in the European Council Directive 96/29/EURATOM (European Atomic Energy Committee) - Basic Safety Standards for the Protection of the Health of Workers and Members of the Public against the Dangers from Ionising Radiation (reference 19).

4.3.2 SAFETY ASSESSMENT PRINCIPLES

ONR's Safety Assessment Principles (SAPs) provide inspectors with a guiding framework for making consistent regulatory judgements on nuclear safety cases. Although the SAPs are not directly relevant to the assessment of REPIR submissions, the guidance within SAP: AM.1 - Accident management and emergency preparedness (reference 20) has been taken into account.

4.3.3 TECHNICAL ASSESSMENT GUIDES

The SAPs are supported by a suite of internal TAGs, with the following TAG being applied in this assessment:

- The technical assessment of REPIR submissions and the determination of detailed emergency planning zones, ONR NS-TAST-GD-082 Revision 3 2016 (reference 15). This TAG incorporates ONR's principles for determination of REPIR off-site emergency planning areas.

4.3.4 NATIONAL AND INTERNATIONAL STANDARDS AND GUIDANCE

The following national guidance has also been considered and, where appropriate, has informed the conduct of this assessment:

- A guide to the Radiation (Emergency Preparedness and Public Information) Regulations 2001 (reference 14).

ONR also notes the relevance of the following International Standards and Guidance:

- The International Atomic Energy Agency (IAEA) Safety Standard Series – Preparedness and Response for a Nuclear or Radiological Emergency GSR Part 7 (reference 21).
- IAEA Safety Standards – Arrangements for Preparedness for a Nuclear or Radiological Emergency GS-G-2.1 (reference 22).

5 ASSESSMENT OF TECHNICAL SUBMISSIONS

The HIREs and RoAs, in their current issue, for the NRP were submitted to ONR (then NII) in 2008. MOD has made declarations of no change in relation to the RoA's in 2011, 2014 and 2017 in line with REPIIR regulation 5(2).

A summary of the MOD 2014 submissions and ONR's technical assessment of them (references 10, 11 & 18) are detailed in sections 5.1 and 5.2 respectively.

5.1 MOD REPORT OF ASSESSMENT

MOD's 2008 submitted RoA is based on a generic HIRE carried out to evaluate the risks and hazards from the Nuclear Reactor Plant (NRP) fitted in each of the UK's three main types of nuclear powered submarines, all of which have the potential to be berthed at the Loch Goil Operational Berth. This generic HIRE contains classified information and as such any reference to the material it contains has been kept sufficiently high level in order to negate the need for similar classification of this document.

The Reference Accident in the generic RoA is defined as a leak in the primary cooling circuit of the NRP, which cannot be isolated and is beyond the capacity of coolant make-up systems. This primary coolant leak, coupled with engineering and other failures, leads to damage to the fuel within the reactor, which, in turn, releases radioactive material from the reactor. This release is largely contained within the submarine, although a fraction may be released to the environment.

In accordance with REPIIR regulation 5, MOD undertook a review of their HIRE in 2014 for the all UK Operational Berths (Portsmouth, Southampton, Portland, Ramsden Dock Basin, Loch Goil, and Loch Ewe).

The review of the extant HIREs for the NRP at the berths identified that there have been no material changes to the work with ionising radiation carried out by MOD since the last submission.

The review highlighted a minor change to the Representative Patrol Cycle (RPC) that supports the Reference Accident. The submission included a consideration of the amendment to the RPC, and confirmed that it does not affect the extant RoAs.

Additionally, the submission (reference 11) stated that any reasonably foreseeable malicious act would not result in consequences greater than those of the Reference Accident at any UK Operational Berth.

The 2014 MOD submission, supported by DNSR, constituted a Declaration of No Change for all the UK Operational Berths and HMNB Clyde (Faslane and Coulport) Authorised Sites, and stated that the 2008 RoA remained valid. MOD stated that all facets comprising the MOD REPIIR 2014 submission had been independently reviewed by an external contractor to

determine if the evidence supports a “no-change” submission. The contractor advised that a “no-change” position remains valid.

5.2 ONR TECHNICAL ASSESSMENT

ONR (then NII) conducted a technical assessment of the generic submarine HIRE when it was submitted in 2008, and in particular the adequacy of the chosen reference accident presented, and the sensitivity of the consequence analysis. Following this it concluded that the minimum distance for emergency planning should be 1.5 km from each submarine berth. This assessment did not involve an in-depth review of the site specific hazards at the Operational Berth site, but made the judgement that any site specific fault scenario would be bounded by fault relating to the NRP.

Given the time that had elapsed since the 2008 ONR assessment and the subsequent Declarations of No Change, it was deemed appropriate to review any other factors that may affect the conclusions of the 2008 assessment, such as changes in modelling techniques and assumptions in the intervening years. ONR has also sought to confirm that the NRP remains the bounding fault in relation to specific site activities at each Operational Berth.

As part of the assessment of the 2014 submission, DNSR as the competent authority on the NRP, confirmed that there has been no change in the basis for assessment and provided additional confirmation that:

- The current assessment bounds any variation in the positioning of the submarine (e.g. as a result of tidal movements) and hence the positioning of the reactor plant in relation to the stated berthing location.
- The sensitivity of the variations (modelling software differences, inventory and dose exposure) outlined in the Representative Patrol Cycle assessment do not affect the 5 mSv dose contour as determined by the original 2008 assessment.
- Modelling disregarded health protection measures in the first year with 2 exceptions (ingestion of foodstuffs over the first 24 hours and food restrictions under a FEPA order from 24 hours onwards). DNSR advice was that these exceptions would have no impact upon the conclusions of the assessment, particularly given inherent pessimisms in the modelling.
- The assessment included all dose accrued in the year following the event.
- Additional site hazards that could affect the overall REPPIR emergency planning area have been considered and are bounded by the current 5 mSv contour from the submarine.

The review noted that the detailed assessment includes a number of pessimistic assumptions. For example, dose assessment modelling was carried out using two separate modelling codes (PC COSYMA by the duty holder and CONDOR by DNSR/Nuclear Department), and the more pessimistic assessment (CONDOR) was taken forward. Assessment was based on the worst case Submarine Class (which is in fact the least frequent visitor to an Operational Berth); other classes are bounded by this worst case consequence. Additionally the modelling was based on pessimistic inventory and decay heat (end of life, high power) assumptions.

ONR’s Assessment (reference 18) concludes that the most significant reasonably foreseeable radiation emergency from the NRP has not changed from the 2008 assessment and that a distance of 1.5 km from each berth in all directions should continue to be the basis for off-site emergency planning.

ONR concurs with DNSR’s conclusions and based on its own assessment accepts that the 2014 Declarations of No Change for Operational Berths, and HMNB Clyde (Faslane and Coulport) Authorised Sites are an appropriate submission in response to REPPIR requirements.

ONR's technical assessor has reviewed the 2017 Declarations of No Change and advised (reference 23) that the extant assessment report (reference 18) remains valid for this determination.

5.3 CONCLUSIONS OF TECHNICAL ASSESSMENTS

ONR's technical assessor concludes (reference 18) that MOD's submissions adequately meet the requirements of REPPiR with respect to:

- the representation of a reasonably foreseeable radiation emergency; and
- the assessment of the distance from the relevant locations to the 5 mSv contour.

The ONR technical assessment recommends that the determination of the REPPiR off-site emergency planning area should continue to be based on the 1.5 km contour from the berth. ONR's technical assessor agreed this distance was supported by appropriate technical analysis. However, this distance is informed solely by the technical assessment and does not consider the application of strategic and practical factors which are considered section 6 below.

Conclusion 1: ONR is satisfied that the technical submissions made by MOD demonstrate that members of the public would not be likely (the legal test provided by REPPiR) to be exposed to effective doses in excess of 5 mSv (or other dose criteria defined in REPPiR Schedule 1), in the year following a reasonably foreseeable radiation emergency, beyond a radial distance of 1.5 km from the Operational Berth at Loch Goil.

6 ASSESSMENT OF PRACTICAL AND STRATEGIC CONSIDERATIONS FOR THE DETERMINATION OF THE REPPiR OFF-SITE EMERGENCY PLANNING AND PRIOR INFORMATION AREAS

The purpose of the REPPiR off-site emergency planning area is to define the area for which the local authority must prepare an off-site emergency plan which is adequate to restrict exposures to the public, so far as is reasonably practicable, in the event of a reasonably foreseeable radiation emergency.

In accordance with ONR's TAG (reference 15) and the principles incorporated within it, ONR must also give consideration to the practicality (in an emergency planning sense) of the REPPiR off-site emergency planning area, by considering a number of pragmatic factors considered to be relevant in securing its confidence regarding the effectiveness and credibility of the plans to deliver protection of the public.

In the course of considering these factors, ONR has consulted with Argyll and Bute Council as the lead organisation responsible under REPPiR for preparation of the off-site emergency plans for the Loch Goil Operational Berth, and with the MOD in relation to the prior information area (reference 24). ONR has also consulted the Queens Harbour Master Clyde (QHM) (reference 25) as they are affected by the off-site emergency planning and prior information area determined.

The initial stage in this determination process was the application of the 1.5 km radial distance to the Operational Berth to provide the initial area against, and beyond which, the practical and strategic factors should be considered. Details of the location (grid references) of each UK Operational Berth were obtained directly from the MOD. Where more than one operational berth exists with a geographical area, each 1.5 km radial distance is plotted and the overall boundary, where they intersect, is the extent of the minimum boundary that can form the off-site emergency planning area. If the distance between Operational Berths is such that there

are distinct areas, and it is not practical or proportionate to combine the areas, these individual areas will be defined as discrete off-site emergency planning areas.

The Operational Berth at Loch Goil is a single berth positioned in the loch. The area encompassed by the 1.5 km radial distance is extensively woodland and the marine environment of the loch. There are a small number of residential properties within the area.

To inform the application of the practical and strategic factors, which is discussed in sections 6.1 to 6.7 below, relevant information and significant features with respect to the Loch Goil Operational Berth area have been identified. These are described in annex A.

Conclusion 2: There is only one Operational Berth at Loch Goil, and therefore the Loch Goil Operational Berth will be considered to form the basis of a single emergency planning area of 1.5 km radius.

6.1 LOCAL GEOGRAPHIC, POPULATION AND PRACTICAL IMPLEMENTATION FACTORS

The ONR TAG (reference 15) states that:

“The relevant local authority is consulted on the basis that it has significant ‘local’ knowledge and has the responsibility for development and, in the highly unlikely event that it is ever necessary, implementation of the off-site emergency plan. (Note: The local authority also has the legal duty to undertake consultation in relation to the off-site emergency plan as provided for under REPPiR regulation 9(12).)”

Argyll and Bute Council have been consulted with regard to what features should be used to define the boundary of the area determined. The default is to use infrastructure or geographical features such as roads, railways, rivers and streams unless it is locally convenient to use other boundaries such as postcode or electoral ward boundaries. In the case of the Loch Goil Operational Berth, due to the nature of the geography of the surrounding countryside, there are no practical definable boundaries that could be used without creating an excessively large and disproportionate area.

Conclusion 3: For the area surrounding the Loch Goil Operational Berth there are no clear geographical features that can be used to define the boundary, and in this case, a radial distance of 1.5 km from the berth point will be used unless bounding specific areas or properties.

For the marine areas, the QHM was consulted as to the best way to define the boundary area. They were of the opinion that, for simplicity of radio communication with relevant marine vessels in the area during an emergency, definition of the boundary is best described as a distance from a single point (creating a radial boundary). This is consistent with other REPPiR off-site emergency planning area determinations where the area extends over the marine environment.

Conclusion 4: The extent of the marine area should preferably be described as radii from a defined point, this being the Loch Goil Operation Berth point.

Where the boundary of the defined area runs along a coast line or significant waterway, such as a loch, consideration needs to be given as to what aspect of the coast or shore is used as the defining feature. It is noted that the Association of Chief Police Officers/Maritime & Coastguard Agency (ACPO/MCA) national agreement uses the Mean High Water Mark

(MHW) as the demarcation for co-ordination of operational response to incidents i.e. if the incident is on the seaward side of the MHW the co-ordination is undertaken by the MCA (or the Queens Harbours Master in the case of the Faslane berths); conversely if it is landward side co-ordination is with the Police. However for the Faslane Berth, I consider that use of the Mean Low Water Mark (MLWM) is more appropriate for the definition of the boundary planning area where it meets the coast line (water line in this case) as it either fully includes, or excludes, those persons who may be in between the MHW and the MLWM and whose primary means of shelter or evacuation is likely to be via land rather than sea – i.e. people at the water's edge.

Conclusion 5: At the water's edge the REPIR off-site emergency planning area boundary should be defined, so far as is sensible, using the Mean Low Water Mark.

6.2 CREDIBILITY AND CONFIDENCE IN THE EXTENT OF THE REPIR OFF-SITE EMERGENCY PLANNING AREA

The ONR TAG (reference 15) states that:

“Although REPIR places the duty on the independent regulator to make an objective and unbiased regulatory determination of the extent of the REPIR off-site emergency planning area (formerly DEPZ), ONR considers that, in the interests of confidence in public safety (noting the assumptions and estimations used to determine the 5 mSv contour), the DEPZ should be of sufficient extent so as to provide for a meaningful off-site emergency plan. It should, therefore, incorporate an appropriate degree of conservatism and pragmatism, and provide for a credible and effective response in the event of a reasonably foreseeable radiation emergency.”

REPIR states that the safety objective of the planning undertaken by local authorities within the REPIR offsite emergency planning area is to ‘...secure, so far as is reasonably practicable, the restriction of exposure...’ to ‘...persons who may be affected...’ by a reasonably foreseeable radiation emergency, rather than simply to restrict public exposures in such an event to 5 mSv over the following year.

Therefore, although it has been concluded (section 5.3) that the limit of the extent to which members of the public are likely to be exposed to ‘5 mSv in the year following a reasonably foreseeable radiation emergency’ is a distance of 1.5 km from any Operational Berth point, a REPIR off-site emergency planning area based on a contour equating to that distance must also provide a sufficient off-site planning area for the purposes of satisfying this broader REPIR dose restriction intention, noting the proximity of any significant conurbations to the relevant berth or anchorage.

In this context, ONR is mindful that, whilst dutyholders are typically conservative in their approach to nuclear safety, complex technical assessments of potential emergency situations must inevitably rely on a range of assumptions, judgements and estimates.

Whilst ONR is satisfied that the REPIR submissions made by the MOD demonstrate the overall risk from the NRP has been conservatively estimated, ONR is of the opinion that it is appropriate, where public safety is at stake, that it acts with reasonable conservatism in its own right, in the interests of confidence in securing the public safety objective of REPIR.

The area surrounding the Loch Goil Operational Berth is sparsely populated, with a total night-time population of 21 within the 1.5 km radial area from the berth. The area contains a number of holiday properties and a small hotel (7 bedrooms, restaurant and wedding venue) which can accommodate up to 70 reception guests. Lochgoilhead (population of circa 500), is the closest populated village and is approximately 3 km from the berth point.

It is recognised that where a comprehensive plan covers only part of a densely populated area, it may be significantly challenged in the extremely unlikely event that the area required for public protection extends further than that determined as it would include a large number of additional residents. REPPIR³ and the National Nuclear Emergency Planning and Response Guidance state that it is good practice for the emergency plan to provide the basis for dealing with radiation emergencies that are not reasonably foreseeable through the concept of extendibility.

Argyll and Bute Council is also the lead local authority responsible for the off-site emergency plans relating to the HM Naval Base Clyde Faslane and Coulport sites. Although the emergency planning areas for these sites are sparsely populated, there are a number of vulnerable groups and properties within the emergency planning area for the HM Naval Base Clyde Faslane site. The night-time public residential population within the emergency planning area for the Faslane site is approximately 300, which is of a similar order to that of the village of Lochgoilhead.

In addition to the public residential population, the Faslane site contains a significant number of permanent staff quarters. The site has detailed plans (reference 26) that in the event of a significant accident on the site non-essential personnel can be evacuated to local reception centres managed through the off-site emergency response organisation (reference 27). This aspect of the plan was tested as part of the Level 2 emergency exercise Evening Star 15 (reference 28).

In the highly unlikely event that the current arrangements needed to be extended to include the population of Lochgoilhead, this could be accommodated within the existing off-site plan arrangements (reference 29 and 30).

Taking the above factors in to consideration, I am of the opinion that emergency planning for the Loch Goil Operational Berth does not need to be extended beyond 1.5 km from the berth for the provision of credibility and confidence in the off-site plan, and will form the basis for determining the REPPIR off-site emergency planning area following the ONR principles (reference 15).

Conclusion 6: A REPPIR off-site emergency planning area based on a minimum radial distance of 1.5 km from the Loch Goil Operational Berth will provide for a credible and effective plan to secure the protection of the public and restriction of exposures so far as is reasonably practicable, in the event of a reasonably foreseeable radiation emergency.

6.3 AVOIDANCE OF BISECTION OF LOCAL COMMUNITIES

The ONR TAG (reference 15) states that:

“Whilst accepting that it may sometimes be unavoidable, ONR’s preference is to avoid the bisection of small settlements or communities, on the basis that any REPPIR off-site emergency planning area (formerly DEPZ) determination is based on some unavoidable assumptions and estimates, and is therefore not precise. Bisection of small communities has raised concerns in terms of public perception, and also has the potential to affect the effectiveness of implementation of countermeasures.”

The minimum radial distance of 1.5 km from the Loch Goil Operational Berth bisects what can be considered a very small settlement of 3 residential dwellings to the north-east of the berth point on the eastern shore of Loch Goil. The next nearest dwelling is approximately 0.3 km further north towards Lochgoilhead.

³ Paragraph 138 of A guide to the Radiation (Emergency Preparedness and Public Information) Regulations 2001

The nearest dwellings to the north-west of the 1.5 km distance are approximately 0.4 km further north.

To the south-west, the 1.5 km radial boundary just touches the edges of a property which is part of a small settlement of 5 residential dwellings. The next nearest dwellings in this area are approximately 1 km further south.

Inclusion of the two very small settlements to the north-east and south-west results in an increase of the residential night-time population in the emergency planning area to 35.

Due to the sparsely populated area along the shores of Loch Goil, to include all the dwellings to the north of the berth point, including the only significant populated area within 5 km of the berth, the village of Lochgoilhead (population circa 500 and approximately 3 km away) would be overly excessive and disproportionate. Any safety benefits would, in my judgement be outweighed by the risks of implementing effective countermeasures to a much larger population along with the potential compromise of the effectiveness of the emergency arrangements. Focus would also be diverted from providing protection measures to those groups most at risk. Lochgoilhead is sufficiently far enough away that inclusion is not justified.

I consider it appropriate and proportionate to include the additional dwellings that lie adjacent to the 1.5 km radial boundary in the emergency planning and prior information areas so to avoid bisection or segregation of specific settlements.

Conclusion 7: So to avoid bisection or segregation of small community groups, I consider it appropriate to include the two small settlements located adjacent to the north-east and south-west 1.5 km radial boundary in the emergency planning and prior information areas

6.4 INCLUSION OF IMMEDIATELY ADJACENT VULNERABLE GROUPS

The ONR TAG (reference 15) states that:

“ONR recognises that groups of vulnerable people (e.g. care homes, schools, camping and caravan sites, itinerant populations, etc.) located close to the REPPIR off-site emergency planning area (formerly DEPZ) should be provided for in the same manner as those located within the zone.” (The definition of ‘vulnerable’ groups must be the definition adopted by the relevant local authority.)

To support determination of the required emergency planning area, additional information on vulnerable groups was provided by Argyll and Bute Council (reference 28) and summarised in annex A, Table 1. There had been discussion with the local authority over what constitutes a vulnerable group. When considering this factor, ONRs intent is to be consistent with other aspects of council arrangements for vulnerable groups, therefore, as a default, it will use the relevant local authorities’ definition of what constitutes a vulnerable group when considering the extent of the planning area. It should be noted that there is Cabinet Office guidance⁴ on this subject with a general definition of “vulnerability” to mean; “those that are less able to help themselves in the circumstances of the emergency” and include people with mobility difficulties, mental health issues, children/elderly, hearing and visual impaired.

I have also considered the inclusion of groups who would be at risk of greater exposure (so in a sense could be considered as “vulnerable”) to the effects of any radiation emergency – examples include pleasure craft on the water, residents of tents, caravans and beach huts, or sites where members of the public may have restricted access to information, shelter or egress.

4 <https://www.gov.uk/government/publications/emergency-preparedness> - chapter 5 & 7

Data provided by HSL indicates there are no vulnerable groups within or adjacent to the 1.5 km radial area boundary.

Within the current public issue of the Argyll and Bute off-site emergency plan (reference 29), one vulnerable group is listed located at Stuckbeg Farm. On further discussion with Argyll and Bute Council (reference 31), confirmation has been obtained that this was an error and Stuckbeg Farm is a residential dwelling. It was also confirmed that there are no vulnerable groups in or close to the area. This listing will be revised in the next revision of the off-site emergency plan.

For consideration of this practical and strategic factor it is necessary to consider those vulnerable groups beyond 1.5 km. How far beyond 1.5 km that should be considered is subjective as the term “immediately adjacent” (as defined in reference 15) does not have an additional distance associated with it. This is deliberate as what would be an appropriate distance for one nuclear site or Operational Berth may not be for another.

It is important to consider that when looking to incorporate an adjacent vulnerable group, resulting in possible extension of the boundary, this could result in additional vulnerable groups becoming adjacent to the extended boundary, which in turn could lead to boundary creep resulting in a disproportionate area.

The closest vulnerable groups are between approximately 2.5 and 3.5 km away from the berth point. These being:

- Lochgoilhead National Activity Centre (young person’s activity centre)
- Lochgoilhead Primary School
- Drimsynie Holiday Park (caravans and lodges)

There is the potential for pleasure craft to be on the water of the Loch, with Loch Goil Cruisers (day-boat hire only) located 1.7 km from the berth point. There are no permanent marinas in the area.

The Argyll and Bute Off-site Emergency Plan (reference 29) indicates that the QHM and the MCA are responsible for restricting movements on the Loch and closing it to shipping and sailing if requested to do so. Additional confirmation was obtained from QHM regarding the extent of their jurisdiction with regard to Loch Goil (reference 32).

I consider adopting an approach where individual vulnerable groups that are within a distance of 500 metres from the 1.5 km boundary are included as specifically defined geographical locations (i.e. defined as single building or address) without extending the boundary to encompass that group, to be appropriate where no other principle results in the inclusion of that vulnerable group.

Conclusion 8: I have considered the nature of the vulnerable groups, their size and distance from the boundary, and I consider that there are no vulnerable groups adjacent to the boundary that are required to be included in the emergency planning and prior information areas around the Loch Goil Operational Berth.

6.5 INTERNATIONAL GOOD PRACTICE

The ONR TAG (reference 15) states that:

“ONR is of the view that its decisions should be informed by accepted international good practice.”

Relevant international good practice relating to nuclear emergency planning is contained in International Atomic Energy Agency (IAEA) publications GSR Part 7 and GS-G-2.1

(references 21 and 22). The guidance document (GS-G-2.1) is non-binding, and provides one of many potential benchmarks for comparison.

In these documents, the IAEA identifies categories of reactor power output and potential 'threat', and advocates the adoption of two types of emergency planning zones: a Precautionary Action Zone (PAZ) and an Urgent Protective Action Planning Zone (UPZ). However, due to differences in the UK legal framework, and the assessment of reasonably foreseeable radiation emergencies on a case-by-case basis, neither of these zones are directly comparable with ONR's determination of a REPPIR off-site emergency planning area.

In the UK, the legal framework for local off-site emergency planning is set out in REPPIR and, although ONR's principles broadly align with (and meet the spirit of IAEA guidance), the IAEA guidance specifically allows for an approach based on case-by-case assessment (as happens in the UK). In addition, there are a number of similarities, but also important differences, between the UK legislative and IAEA regimes, which are summarised as follows:

- a) IAEA guidance document (GS-G-2.1) provides generic indicative radial distances around different categories of nuclear installations, but also states that 'a different distance should be used when this is substantiated by a detailed safety analysis'. UK legislation (i.e. REPPIR) requires the off-site emergency planning area be based on a robust site specific technical identification and evaluation of the hazards and risks presented by each individual site and, as such, these indicative generic distances are not applied in the UK (although they do provide a comparator, albeit of limited value).
- b) IAEA guidance is based on consideration of extreme accidents, whereas the UK legal framework, as set out in REPPIR, requires detailed planning areas to be based on reasonably foreseeable events.
- c) IAEA guidance is based on restricting severe deterministic doses (i.e. relatively high doses accrued over a shorter period), whereas REPPIR is based on restricting doses, so far as is reasonably practicable, to everyone who may be affected by a radiation emergency, where a radiation emergency is defined in the UK as an emergency with the potential for an accrued dose of 5 mSv or more in the year following the emergency (or other relatively low dose criteria). This is a far lower dose threshold in the range of stochastic (random or chance) effects only.
- d) The '5 mSv in the year following the emergency' criteria, relating to the definition of a '...reasonably foreseeable radiation emergency' in UK legislation (REPPIR), is based on European EURATOM Basic Safety Standards (reference 17) and is broadly supported (of the same order of magnitude) by Public Health England (PHE) (reference 33), which recommends that significant countermeasures '....should be offset by a correspondingly significant level of anticipated dose averted (i.e. at least 10 mSv in the first year). Less disruptive or resource intensive measures could be considered for averting lower levels of dose.'
- e) Both the IAEA guidance and ONR's principles for determination of the REPPIR off-site emergency planning area (and related guidance) (references 21, 22 and 15) indicate that areas should take account of a range of factors (e.g. geographical factors and electoral boundaries etc.).
- f) UK radiological emergency planning arrangements are complemented by arrangements available under the Civil Contingencies Act (2004) (reference 34), and the developing concept of extendibility (i.e. the concept of planning for emergencies beyond those that are reasonably foreseeable, with the possibility of outline planning to implement dose reduction measures beyond the REPPIR off-site emergency planning area where the likelihood is so remote). UK regulatory guidance states that off-site plans prepared under REPPIR should include a framework for such scalability

In summary, whilst UK legislation (in the form of REPPIR) does not seek to adopt the prescriptive aspects of GS-G-2.1, and noting its limited relevance given the legislative approach taken in the UK, it is of interest that the areas determined within this report falls within the international good practice ranges.

6.6 CONSIDERATION OF BENEFITS AND DIS-BENEFITS OF DOSE REDUCTION MEASURES (INCLUDING COUNTERMEASURES)

The ONR TAG (reference 15) states that:

“Countermeasures can, in some circumstances, convey risks as well as benefits to the individuals to whom they may be applied. ONR considers that the REPPIR off-site emergency planning area (formerly DEPZ) should consider an appropriate balance between the benefits of dose aversion and the potential dis-benefits associated with implementing immediate countermeasures in a radiation emergency across too wide an area.”

ONR acknowledges that there are benefits and dis-benefits associated with an increase or decrease in the size of the REPPIR off-site emergency planning area. These were identified and considered as follows.

Noting that REPPIR requires that the off-site emergency planning area must, as a minimum, include all of the area around the sites within which a person (including members of the public) could receive an effective dose in excess of 5 mSv in the year following a reasonably foreseeable radiation emergency (or other dose criteria defined in REPPIR Schedule 1) the considerations are:

- an area of the minimum size might be beneficial as emergency responders would be able to focus their efforts on delivering dose reduction measures (including countermeasures) in a concentrated manner across a smaller population and geographical area;
- a larger area (e.g. that, for instance, extended to avoid bisection of local communities or to include a vulnerable group) might be perceived as providing safety benefits to a larger population;
- however, a larger area would be judged to have the potential to compromise the effectiveness and timeliness of some of the emergency arrangements; and
- a larger area might be perceived as requiring the application of countermeasures across more people than may be necessary (with any risks that could be presented by such measures). This notwithstanding, REPPIR provides the local authority with the legal duty to determine, in consultation with others, exactly what countermeasures and dose restriction measures should be planned for in a proportionate and targeted manner. REPPIR does not require that identical measures be applied to everyone within the REPPIR off-site emergency planning area, and allows the targeting of specific dose reduction measures to specific sub-populations within the area.

The area around the Loch Goil Operational berth is woodland and water, and sparsely populated. To extend the area to include a larger number of residents would result in a significant increase in the area covered to some 3 km from the berth point. Extending this area, would result in around 1000 additional people being addressed in the off-site emergency plans.

Conclusion 9: Taking into account the benefits and dis-benefits of the application of emergency dose reduction measures it is judged that extension of the REPPIR off-site emergency planning area to include the adjacent residential dwellings only is appropriate. I consider in my opinion that any further extension of the area is not

appropriate and would result in an excessive and unnecessarily large area.

6.7 OTHER SITE SPECIFIC FACTORS OF WHICH ONR IS AWARE

The ONR TAG (reference 15) states that:

“ONR will also consider, in determining REPPIR off-site emergency planning areas (formerly DEPZs), any additional site-specific factors that it considers relevant on a case-by-case basis.”

ONR has not been advised, by Argyll and Bute Council or the Operational Berth duty holder (Navy Command) of any additional site specific factors that it considers relevant to the determination of the REPPIR off-site emergency planning area at this time.

Conclusion 10: There are no additional location specific factors at this time of which ONR is aware that require consideration when determining the REPPIR off-site emergency planning area for the Loch Goil Operational Berth.

7 CONCLUSIONS

This report sets out the main considerations that ONR has given to determining revised REPPIR off-site emergency planning and prior information areas for the Loch Goil Operational Berth. It takes due account of the findings of the latest MOD RoA/ HIRE for the NRP, DNSR's and ONR's detailed assessments of it, and of ONR's principles and guidance for undertaking such determinations.

The process of determination of a REPPIR off-site emergency planning area requires regulatory judgement to balance a broad range of technical, practical, and strategic factors (which may, of themselves, require that judgements, estimations, and assumptions be made).

In summary, the conclusions of this report are that:

- ONR is satisfied that the technical submissions made by MOD demonstrate that members of the public would not be likely (the legal test provided by REPPIR) to be exposed to effective doses in excess of 5 mSv (or other dose criteria defined in REPPIR Schedule 1), in the year following a reasonably foreseeable radiation emergency, beyond a radial distance of 1.5 km from the Operational Berth at Loch Goil.
- There is only one Operational Berth at Loch Goil, and therefore the Loch Goil Operational Berth will be considered to form the basis of a single emergency planning area of 1.5 km radius.
- For the area surrounding the Loch Goil Operational Berth there are no clear geographical features that can be used to define the boundary, and in this case, a radial distance of 1.5 km from the berth point will be used unless bounding specific areas or properties.
- The extent of the marine area should preferably be described as radii from a defined point, this being the Loch Goil Operation Berth point.
- At the water's edge the REPPIR off-site emergency planning area boundary should be defined, so far as is sensible, using the Mean Low Water Mark.
- A REPPIR off-site emergency planning area based on a minimum radial distance of 1.5 km from the Loch Goil Operational Berth will provide for a credible and effective plan to secure the protection of the public and restriction

of exposures so far as is reasonably practicable, in the event of a reasonably foreseeable radiation emergency.

- So to avoid bisection or segregation of small community groups, I consider it appropriate to include the two small settlements located adjacent to the north-east and south-west 1.5 km radial boundary in the emergency planning and prior information areas.
- I have considered the nature of the vulnerable groups, their size and distance from the boundary, and I consider that there are no vulnerable groups adjacent to the boundary that are required to be included in the emergency planning and prior information areas around the Loch Goil Operational Berth.
- Taking into account the benefits and dis-benefits of the application of emergency dose reduction measures it is judged that extension of the REPPiR off-site emergency planning area to include the adjacent residential dwellings only is appropriate. I consider in my opinion that any further extension of the area is not appropriate and would result in an excessive and unnecessarily large area.
- There are no additional location specific factors at this time of which ONR is aware that require consideration when determining the REPPiR off-site emergency planning area for the Loch Goil Operational Berth.

Consequently, for emergency planning purposes and in order to ensure appropriate conservatism as regards the protection of the public in the unlikely event of a reasonably foreseeable radiation emergency, the REPPiR off-site emergency planning areas (and the areas within which prior information must be distributed in accordance with REPPiR regulation 16(1)) are defined as:

The area determined by the red line on the map in annex B and generally described as:

Generally a circular area of 1.5 km radius from the Operational Berth over the marine and land environments, and extending to include those properties lying adjacent to the 1.5 km minimum boundary.

8 RECOMMENDATIONS

As a result of the conclusions of this report, the recommendations are that ONR write to:

- Recommendation 1: Argyll and Bute Council being the lead local authority to advise that the REPPiR off-site emergency planning area has been determined as the area within the red line on map at annex B. This information should be copied to Navy Command acting as the MOD Operational Berth duty holder.
- Recommendation 2: Argyll and Bute Council as the lead local authority confirming the need to update, as required, its detailed emergency plan to adequately cover the areas defined in annex B.
- Recommendation 3: Navy Command acting as the MOD Operational Berth duty holder confirming the requirement to ensure the appropriate provision of prior information to the public within the area defined in annex B. This information should also be copied to Argyll and Bute Council as the lead local authority.
- Recommendation 4: Inform by copy of its letter to, Naval Base Commander (Clyde), The Defence Nuclear Safety Regulator, Queens Harbour Master Faslane, Maritime and Coastguard Agency, Environment Agency, Food Standards Agency, Food Standards Scotland, Department of Business,

Energy and Industrial Strategy and the Scottish Government to inform them of the revised REPIR off-site emergency planning and information areas.

9 REFERENCES

1. The Energy Act 2013, Chapter 32.
Part 3, Chapter 1, 'The ONR purposes', paragraph 68(1).
Part 3, Chapter 4, 'Function of the ONR', paragraph 78, 'Principal function'.
The Stationery Office. December 2013. IBN 978-0-10-543213-5
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ANNEX A – RELEVANT INFORMATION AND SIGNIFICANT FEATURES

The Loch Goil Operation Berth is located within the marine environment of Loch Goil, within the area of the Loch Lomond & Trossachs National Park, Scotland. This is within the county boundaries of Argyll and Bute Council.

The area encompassed by the 1.5 km radial distance from the berth point is sparsely populated, with approximately 10 residential properties within the area. Approximately half of the area encompassed is over water of the Loch.

Local population, facilities and features surrounding the Loch Goil Operational Berth are detailed in the following tables.

Table 1 – Populations within 1.5 km of the Loch Goil Operational Berth Point

Within 1.5 km of the Loch Goil Berth point	
HSL supplied population data for the REPPiR emergency planning area of the Loch Goil Operational Berth. All figures are approximate values.	
Residential Population - night time	21
Workplace Population*	N/A
Other features and facilities (Local Authority and ONR compiled) All figures are approximate.	
The Lodge hotel and wedding venue	Hotel has 7 rooms, a restaurant and can accommodate up to 70 reception guests (day time only).

*workplace population is not quoted due to use of postcode based data which due to the area being very rural results in the inclusion of workplace population outside of the emergency planning area.

Table 2 - Populations within the area shown in annex B around the Loch Goil Operational Berth Point

Within the ONR determined area around the Loch Goil Berth Point	
HSL supplied population data for the REPPiR emergency planning area of the Loch Goil Operational Berth. All figures are approximate values.	
Residential population - night time	35

Table 3 – Information of other features or facilities of interest within the area shown in annex B around the Loch Goil Operational Berth Point

There are no additional features or facilities of interest not already mentioned within the area.

Table 4 – Information of other features or facilities of interest in the Loch Goil Area

Other features for note in the Loch Goil area.	
Population / Town / Feature / Facility of Interest	Comment
Drimsynie Estate Holiday Village	A large number of lodges and static caravans (in excess of 400) approximately 3 km from the berth point.
Loch Goil Cruisers	A small fleet of motorised day boats for hire located at Douglas Pier approximately 1.7 km from the berth point.
Lochgoilhead*	Approximately 3 km from the berth point with a population of circa 500.
Carrick*	Approximately 3.5 km from the berth point with a population of circa 60.
Garelochhead*	Approximately 7 km from the berth point with a population of circa 1300.
Portincaple*	Approximately 5.5 km from the berth point with a population of circa 300.

General information obtained from the internet. *data obtained from the Argyll and Bute Off-site Emergency Plan - March 2015

ANNEX B - MAP

Loch Goil Area

The area defined by this map may be generally described as:

The off-site emergency planning area is generally a circular area of 1.5 km radius from the Operational Berth over the marine and land environments, and extending to include those properties lying adjacent to the 1.5 km minimum boundary.

