



Office for
Nuclear Regulation

**Determination of the Off-Site Emergency Planning and Prior
Information Areas for the Southampton 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 Southampton 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 2001 (REPPiR) on nuclear licensed sites, Ministry of Defence (MOD) Authorised nuclear sites and nuclear warship sites.

ONR's responsibilities include a legal duty, 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 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 (PAR) 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 Southampton Operational Berth.

In relation to the off-site emergency planning area, the responsible lead local authority, in this case Southampton City Council, are 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 operators to 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, or within three years of the last assessment, whichever is the shorter. MOD HIREs and 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 Southampton 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 Southampton 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

recently published determination principles 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 the lead local authority, Southampton City 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 of 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 Southampton Operational Berth.

ONR's 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 best 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 Southampton Operational Berth, is that:

- both the REPPiR off-site emergency planning area and the REPPiR prior information area for the Southampton Operational Berth have been re-defined to be the enhanced area shown within the red line on map A contained in annex A to this report.

The enhancement of the planning area (from a 1.5 km circle to the shape indicated at annex A) 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:

- Southampton City Council as 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 A at annex A. This information should be copied to Navy Command acting as the MOD Operational Berth duty holder.

- Southampton City Council as the lead local authority confirming the need to update, as required, its detailed off-site emergency plan to adequately cover the area defined in annex A.
- 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 A. This information should also be copied to Southampton City Council as the lead local authority.
- The Defence Nuclear Safety Regulator, Southampton Harbour Master, Maritime and Coastguard Agency, Environment Agency, Food Standards Agency and Department of Energy & Climate Change (DECC), 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
CCA	Civil Contingencies Act (2004)
DECC	Department of Energy & Climate Change
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
LoU	Letter of Understanding
MCA	Maritime and Coastguard Agency
MHWM	Mean High Water Mark
MLWM	Mean Low Water Mark
MOD	Ministry of Defence
mSv	milliSievert
NCHQ	Navy Command Headquarters
NIA	Nuclear Installations Act 1965
NII	Nuclear Installations Inspectorate
NPW	Nuclear Powered Warship
NRP	Naval Reactor Plant
ONR	Office for Nuclear Regulation
PAR	Project Assessment Report
PITs	Potassium Iodate Tablets
PHE	Public Health England
QHM	Queens Harbour Master
RA	Reference Accident
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 appropriate arrangements are 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 the ONR Licence Conditions. Similar conditions are placed on Operational Berths.

The MOD is not however 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 (LoU) (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 Evaluations (HIREs) is valid and has been used appropriately.

ONR's responsibilities include a legal duty, 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 Southampton 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 demonstrate to the regulator that it fully understands the hazards and risks associated with its operations and controls them appropriately. The regulator assesses the safety and security of the design and operation of nuclear plant to ensure that licensees' provisions are robust, and that any risks are reduced so far as is reasonably practicable.

In the case of the Operational Berth at Southampton, 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 submit a Report of the Assessment (RoA) of their HIRE to the ONR prior to commencement of the work, following any material change, and at least every three years, whichever is the shorter.

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 lead local authority, in this case Southampton City Council, is required to prepare an adequate off-site emergency plan. In so doing, the local authorities have 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 (operated by Devonport Royal Dockyard Ltd)
- UK Operational Berths (Portsmouth, Southampton, Portland, B4 Anchorage, Loch Goil, Broadford Bay (no longer used, and not considered further) and Loch Ewe)

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 REPPiR with a joint regulatory position statement being issued in April 2009.

NII determined 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 REPPiR 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 Coulport)
- HMNB Devonport (including Plymouth Sound buoys)
- Devonport Royal Dockyard (operated by Devonport Royal Dockyard Ltd)
- UK Operational Berths (Portsmouth, Southampton, Portland, B4 Anchorage, Loch Goil, Loch Ewe and Ramsden Dock Basin)

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

- HMNB Clyde - Faslane Site, Coulport Site and Loch Goil Operational Berth
- HMNB Devonport (including Plymouth Sound buoys)
- Devonport Royal Dockyard (operated by Devonport Royal Dockyard Ltd)
- UK Operational Berths (Portsmouth, Southampton, Portland, Ramsden Dock Basin, Loch Goil, and Loch Ewe)

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

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 Southampton Operational Berth. This has been undertaken in accordance with the guidance on REPPIR (reference 12) and the relevant ONR supporting Technical Assessment Guide (TAG) (reference 13), which incorporates ONR's principles for determination of REPPIR areas, and related guidance, as revised in 2013.

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 13)) 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 licensee 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 13). 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 13) emphasise that, in the undertaking of the determination, it is important to ensure that a sensible balance is achieved between the assessment of the technical report provided by the licensee, 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. dilution 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 13, 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, as such extended zones are not statutorily required under REPPIR, such 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 (potassium iodate tablets (PITs)).

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 15). Within a REPPIR off-site emergency planning area, the local authority may expect some protections 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 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 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, in the case of the Southampton Operational Berth, the MOD, 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.

In 2014 the MOD submitted a Declaration of No Change, which was reviewed and supported by DNSR (reference 11).

ONR undertook a review of the original 2008 REPIR submission along with the subsequent No Change submissions (reference 16) 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 the REPIR (reference 3) and its associated guidance (reference 11). 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 17).

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 18) 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 2 2013 (reference 13). 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 11).

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 GS-R-2 (reference 19).
- IAEA Safety Standards – Arrangements for Preparedness for a Nuclear or Radiological Emergency GS-G-2.1 (reference 20).

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 and 2014, in line with REPPIR regulation 5(2).

A summary of the MOD 2014 submissions and ONR's technical assessment of them (references 10, 11 & 16) are detailed in sections 5.1 and 5.2 respectively.

5.1 MOD REPORT OF ASSESSMENT

The 2008 submitted RoA is 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 Southampton 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 (RA) in the generic RoA is defined as a leak in the primary cooling circuit of the naval reactor plant (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 some radioactive material from the reactor. This leak is largely contained within the submarine, although a small part of the release inventory may be released to the environment.

In accordance with REPPIR regulation 5, MOD has undertaken a review of their HIRE 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 (RA). The submission included a consideration of the amendment to the RPC, and confirmed that it does not affect the extant RoAs.

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

MOD stated that all facets comprising the MOD REPPIR 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.

The 2014 MOD submission, supported by DNSR, constituted a Declaration of No Change for all the UK Operational Berths and the 2008 RoA remained valid.

5.2 ONR TECHNICAL ASSESSMENT

ONR (then NII) conducted a technical assessment of the generic submarine HIRE when it was submitted in 2008. Following a detailed review of the various fault scenarios it concluded that a more significant event than that proposed by the MOD in their RoA was reasonably foreseeable and that as a result the minimum distance for emergency planning should be 1.5 km from each submarine berth. This assessment did not do 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). It 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.

The ONR Assessment (reference 15) 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.

It is therefore considered that the Declarations of No Change for Operational Berths are an appropriate submission in response to REPPIR requirements.

5.3 CONCLUSIONS OF TECHNICAL ASSESSMENTS

ONR's technical assessor concludes (reference 16) 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 (as described in 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 Southampton.

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 13) 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 Southampton City Council (reference 21) as the lead organisation responsible under REPPiR for preparation of the off-site emergency plans for the Southampton Operational Berth. In addition, ONR has also consulted with Hampshire County Council, who also represents New Forest District Council and the Southampton Harbour Master (SHM) as they are affected by the off-site emergency planning and prior information area determined. In relation to the public information, ONR has also consulted MOD (reference 22).

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 Southampton is a single berth (38/39 berth) positioned at the QEII Cruise Terminal of the Eastern docks complex. The area encompassed by the 1.5 km radial distance includes all of Eastern docks complex and a number of residential and commercial properties to the north, residential properties in Woolston to the east and residential properties and farm land in Hythe to the south. The majority of the area encompassed is over water.

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 Southampton Operational Berth area have been identified. These are described in Annex B.

Conclusion 2: There is only one Operational Berth at Southampton, located at the 38/39 berth of the QEII Cruise Terminal, Eastern Docks, and this will be considered as a single area of 1.5 km radius.

6.1 LOCAL GEOGRAPHIC, POPULATION AND PRACTICAL IMPLEMENTATION FACTORS

The ONR TAG (reference 13) 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).)”

Southampton City Council and Hampshire County Council (who also act on behalf of the New Forest District 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 this case it was agreed that the use of infrastructure and geographical features was appropriate. So as to avoid unnecessary inclusion of transport routes within the area determined the boundary of the area is taken to be the inner edge of any road, railway property, river or other such similar feature unless otherwise stated.

Southampton City Council and Hampshire County Council have expanded the previously ONR defined emergency planning area to enable practical application of relevant protection measures. This area is defined by walking routes, which use defined boundaries, such as footpaths, definable buildings and roads that extend to or beyond the 1.5 km boundary (reference 23).

Conclusion 3: The REPPiR off-site emergency planning area boundary should be defined on land, so far as is sensible, using physical infrastructure and geographical features, such as security boundaries, roads and rivers. It should also utilise the boundaries of the Council’s existing walking route area where they comply with ONR’s determination principles.

Where the boundary of the defined area runs along a coast line consideration needs to be given as to what aspect of the coast is used as the defining feature. It is noted that Association of Chief Police Officers/Maritime & Coastguard Agency (ACPO/MCA) national agreement uses the Mean High Water Mark (MHWM) as the demarcation for co-ordination of operational response to incidents i.e. if the incident is on the seaward side of the MHWM the co-ordination is undertaken by the MCA; conversely if it is landward side co-ordination is with the Police. However for the Southampton Operational 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 as it either fully includes, or excludes, those persons who may be in between the MHWM and the MLWM and whose primary means of shelter or evacuation is likely to be via land rather than sea – i.e. people on the beach or at the water’s edge.

Conclusion 4: 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.

For the marine areas, the Southampton Harbour Master (SHM) was consulted as to the best way to define the boundary area. SHM were of the opinion that, for simplicity of radio communication with relevant marine in the area vessels during an emergency, definition of the boundary is best described as a distance from a single point (creating a radial boundary).

Conclusion 5: The extent of the marine area should preferably be described as radii from a defined point.

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

The ONR TAG (reference 13) states that:

“Although REPPIR places the duty on the independent regulator to make an objective and unbiased regulatory determination of the extent of the REPPIR 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.”

REPPIR states that the safety objective of the planning undertaken by local authorities with the REPPIR off-site 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 REPPIR 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 REPPIR 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 REPPIR submissions made by the dutyholder 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 REPPIR.

As a consequence, ONR’s principles recognise that should an off-site emergency planning area demand very little by way of an emergency plan in practice (e.g. it contains a very small population), it may not be capable of providing sufficient flexibility in the (albeit extremely unlikely) event that the technical assumptions, judgements or estimates made by licensees are challenged in practice.

To examine the extent of the area necessary to provide for a meaningful off-site planning area, I have first considered the off-site emergency planning challenge that would be presented by the minimum area for the 38/39 berth. Information, provided by the Health and Safety Laboratories (HSL) and that is publicly available, on the population within the 1.5 km area (full details in annex B) indicates:

- a permanent night time residential population of 2798 and a working population up to 4647;
- a transient population through the Southampton port and ferry terminals of approximately 1.7 million passengers annually;
- one vulnerable group within this area (i.e. one nursery);

For the Southampton 38/39 berth, the 1.5 km area considered encompasses a moderate population, and significant commercial areas, (also noting that the current Southampton off-site emergency plan (reference 21) covers a slightly larger area) thus it is not necessary to extend the minimum area to “provide for a credible and effective response in the event of a reasonably foreseeable radiation emergency”.

Therefore, I am of the opinion that emergency planning for the Southampton area (including a small area of Hythe) 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 13).

However, it is recognised that a comprehensive plan covering only a part of a densely populated area, 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. The current Southampton off-site emergency plan (reference 21) does address this concept.

Conclusion 6: A REPPIR off-site emergency planning area based on a minimum radial distance of 1.5 km from the 38/39 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 13) 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 area of the 38/39 berth bisects Southampton from a point by the Red Funnel Ferry terminal off Town Quay road, and running north of the A33 across to the east to the Ocean Village Marina. The boundary then crosses the River Itchen and heading south bisecting Woolston, before heading west across the Southampton Water to join land at Hythe, bisecting the marina and additional properties from the rest of Hythe. The area then continues over farmland until reaching the River Test, then over water until it reaches land by the Red Funnel Ferry Terminal completing the radial area.

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

Inclusion of whole of Southampton and Hythe would extend the area far beyond 1.5 km and include a population in excess of 248000⁴. I consider an area of this magnitude would be both excessive and unnecessary.

It is possible to sub divide Southampton and the Hythe area (which is in the area covered by New Forest District Council) by use of electoral ward boundaries, with Southampton having 16 and Hythe having 2 wards. Following inspection of these boundaries, the estimated population within the boundary would be in excess of 40000⁴. I am of the opinion that use of such boundaries is not suitable for defining the REPIR off-site emergency planning area as the boundaries would create an area that was still excessive and disproportionate. Thus, in this case, bisection of the Southampton and Hythe area is unavoidable

Conclusion 7: It is not considered appropriate to include the whole of the large urban areas of Southampton or Hythe to enable the avoidance of bisection of small or local communities. Use of community boundaries within Southampton and Hythe has been considered and deemed not to be appropriate for determining the emergency planning area boundary.

6.4 INCLUSION OF IMMEDIATELY ADJACENT VULNERABLE GROUPS

The ONR TAG (reference 13) 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 REPIR 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 Southampton City Council (reference 24) and summarised in Annex B. 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 guidance⁵ 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.

For consistency with other determinations 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.

Data provided by HSL has already shown that there is one vulnerable group within the 1.5 km distance from the 38/39 berth area (one nursery), however this does not need to be considered further as it is already included as they reside within the minimum recommended area.

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” does not have an additional distance associated with it. This is deliberate as what would be an appropriate distance for one nuclear site or

4 Estimated population data taken from Hampshire County Council Open Data 2014 Small Area Population Forecasts – Ward Population Data. <http://www3.hants.gov.uk/factsandfigures/population-statistics/pop-estimates/small-area-pop-stats.htm>
5 <https://www.gov.uk/government/publications/emergency-preparedness> - chapter 5 & 7

operational berth may not be for another. For the purposes of determining the appropriate planning area for the Southampton 38/39 operational berth, I consider that an immediately adjacent vulnerable group is one that is close to the outer boundary of the to the 1.5 km radial area. Inclusion of vulnerable groups beyond this boundary will be considered on a balance of the nature of that vulnerable group, its size, its distance and the other practical strategic factors. I am of the opinion that beyond a radial distance of 2.0 km from the operational berth point (500 metres from the 1.5 km boundary) any vulnerable group should not be considered 'immediately adjacent' and inclusion of any group beyond this distance would be in exceptional circumstances and only as the direct result of the application of more than one of the practical strategic factors.

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.

Within Southampton waters there are a number of marinas which are within the 1.5 km radial area (details in Annex B). This leads to a potential for a large number of pleasure craft to be on the waters of the River Itchen, River Test and Southampton Water. Pleasure craft and other marine vessels should be considered for inclusion as vulnerable groups due to the sheltering protection they are afforded may be less than that of conventional homes and premises.

The Southampton City Council Off-site Emergency Plan (reference 23) indicates that the Southampton Harbour Master is responsible for restricting all movements in the harbour and closing it to shipping if requested to do so.

Two small vulnerable groups have been identified at approximately 100 m from the 1.5 km boundary; a care home in Hythe and a nursery in Southampton. To include the nursery would result in a large number of additional residential properties being included in the determined area. I consider this inclusion to be disproportionate and therefore conclude that the nursery should not be included. Inclusion of the care home however results in a very small number of residential properties being included and I consider this proportionate.

Conclusion 8:

There are few vulnerable groups located near the 1.5 km boundary. These have been considered on the balance of the nature of the vulnerable group, its size and its distance from the boundary. I consider that the care home in Hythe should be included in the determined area.

6.5 INTERNATIONAL GOOD PRACTICE

The ONR TAG (reference 13) 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 GS-R-2 and GS-G-2.1 (references 18 and 19). 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, REPPIR, requires the off-site emergency planning area to 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 (more frequent but less severe 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 25), 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 19, 20 and 13) indicate that areas should take account of a range of factors (e.g. geographical factors and electoral boundaries etc.).

UK radiological emergency planning arrangements are complemented by arrangements available under the Civil Contingencies Act (2004) (CCA) (reference 26), 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 in the highly improbable event of a more severe emergency). UK guidance recommends that off-site plans prepared under REPPIR should include a framework for such scalability.

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

The ONR TAG (reference 13) 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 REPIR off-site emergency planning area. These were identified and considered as follows.

Noting that REPIR 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 REPIR 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.
- 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, REPIR provides the local authority with the flexibility to determine (in consultation with others) exactly what countermeasures and dose restriction measures should be planned for in a proportionate and targeted manner. REPIR does not require that identical measures be applied to everyone within the REPIR off-site emergency planning area, and allows the targeting of specific dose reduction measures to specific sub-populations within the area.

For the Southampton and Hythe areas there is a moderate population within the 1.5 km radius area. Beyond the boundary, the population density increases in the Woolston and Hythe areas. A small increase in the extent of the area could lead to a substantial increase to the number of people it contains, and include additional significant infrastructure leading to complication of the emergency response. For this reason increases to the extent of the area beyond the recommended 1.5 km minimum should only be affected where, in my opinion, the benefits of doing so represent a net benefit to the planning area as a whole. The expected result of this is that the average distance of the planning area boundary to the source of potential hazard will not extend significantly beyond the minimum recommended distance for the urban portions of the area.

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 REPIR off-site emergency planning area, for the 38/39 berth based on the minimum 1.5 km radius from the operational submarine berths should be kept to a minimum when considering all practical and strategic factors in order to achieve an appropriate balance between public protection, the risks from the implementation of countermeasures, and retention of an effective emergency planning area.

6.7 OTHER SITE SPECIFIC FACTORS OF WHICH ONR IS AWARE

The ONR TAG (reference 13) states that:

“ONR will also consider, in determining REPIR 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 the relevant local authorities or the Operational Berth duty holders, of any additional site specific factors that it considers relevant to the determination of the REPPIR off-site emergency planning area.

Conclusion 10: There are no additional location specific factors of which ONR is aware that require consideration when determining the REPPIR off-site emergency planning area for the Southampton 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 Southampton Operational Berth, which comprises of the 38/39 Berth at the QEII Cruise Terminal, Eastern docks. It takes due account of the findings of the latest MOD RoA/ HIRE for the NRP 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 Southampton.
- There is only one Operational Berth at Southampton, located at the 38/39 berth of the QEII Cruise Terminal, Eastern Docks, and this will be considered as a single area of 1.5 km radius.
- The REPPIR off-site emergency planning area boundary should be defined on land, so far as is sensible, using physical infrastructure and geographical features, such as security boundaries, roads and rivers. It should also utilise the boundaries of the Council's existing walking route area where they comply with ONR's determination principles.
- 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.
- The extent of the marine area should preferably be described as radii from a defined point.
- A REPPIR off-site emergency planning area based on a minimum radial distance of 1.5 km from the 38/39 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.
- It is not considered appropriate to include the whole of the large urban areas of Southampton or Hythe to enable the avoidance of bisection of small or local communities. Use of community boundaries within Southampton and Hythe has been considered and deemed not to be appropriate for determining the emergency planning area boundary.
- There are few vulnerable groups located near the 1.5 km boundary. These have been considered on the balance of the nature of the vulnerable group, its

size and its distance from the boundary. I consider that the care home in Hythe should be included in the determined area.

- Taking into account the benefits and dis-benefits of the application of emergency dose reduction measures it is judged that extension of the REPIR off-site emergency planning area, for the 38/39 berth based on the minimum 1.5 km radius from the operational submarine berths should be kept to a minimum when considering all practical and strategic factors in order to achieve an appropriate balance between public protection, the risks from the implementation of countermeasures, and retention of an effective emergency planning area.
- There are no additional location specific factors of which ONR is aware that require consideration when determining the REPIR off-site emergency planning area for the Southampton 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 REPIR off-site emergency planning areas (and the areas within which prior information must be distributed in accordance with REPIR regulation 16(1)) are defined as:

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

An area extending beyond the minimum radial distance of 1.5 km from the centre point of the operational berth, with the boundary following in the main, the existing emergency plan boundary, , the inner edges of roads, property boundaries and distinctive pathways on land, and with a radius of 1.5 km across all marine areas. It includes parts of Southampton to the north, Woolston to the east and Hythe in the south-west.

8 RECOMMENDATIONS

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

- Recommendation 1: Southampton City Council as the lead local authority to advise that the REPIR off-site emergency planning area has been determined as the area within the red line on map A at annex A. This information should be copied to Navy Command acting as the MOD Operational Berth duty holder.
- Recommendation 2: Southampton City 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 A.
- 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 A. This information should also be copied to Southampton City Council as the lead local authority.
- Recommendation 4: DNSR, Southampton Harbour Master, Maritime and Coastguard Agency, Food Standards Agency, Environment Agency and DECC, to notify them of the revised REPIR off-site emergency planning and information areas.

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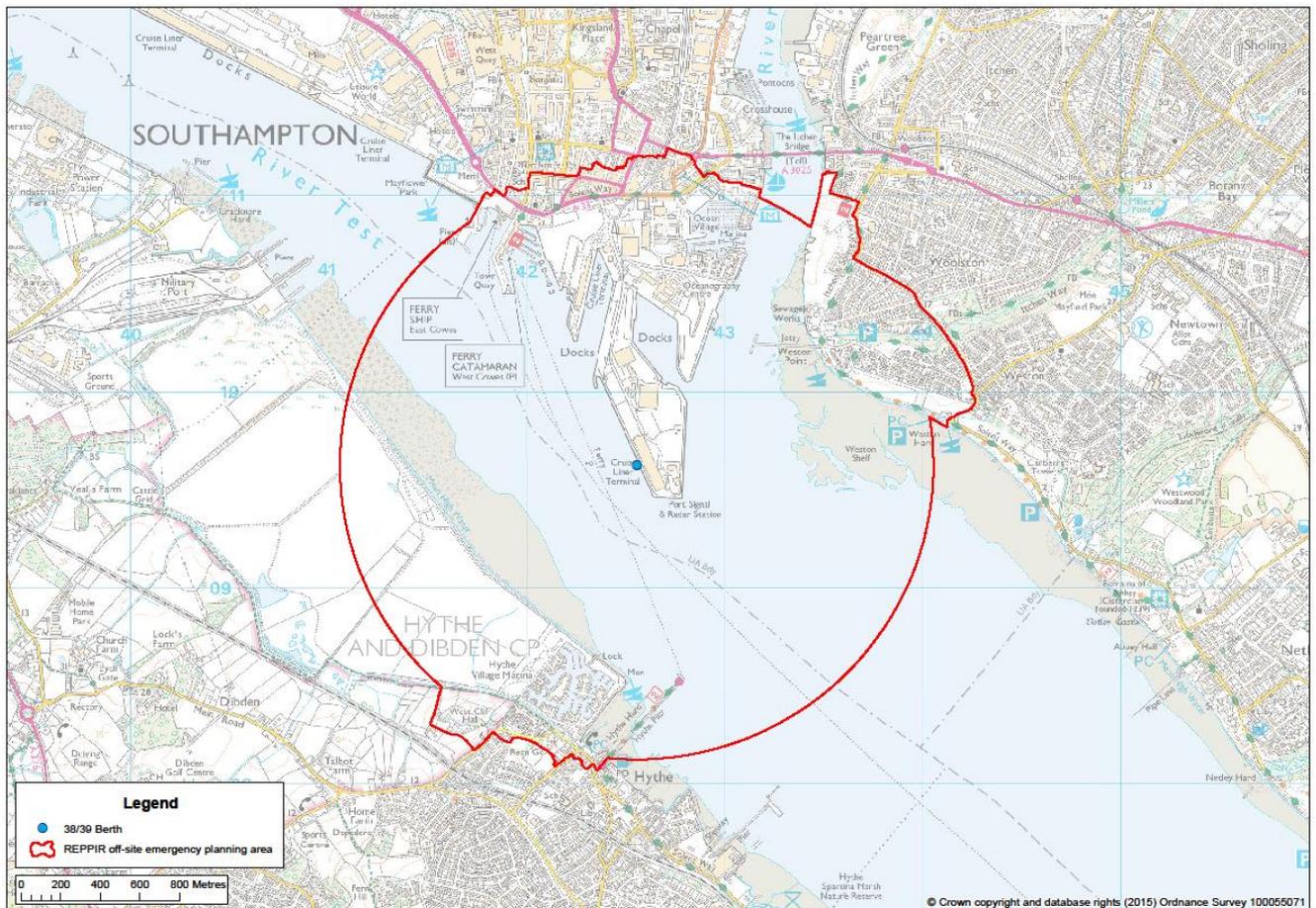
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ANNEX A - MAP

Map A - Southampton and Hythe Area – 38/39 Berth

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

An area extending beyond the minimum radial distance of 1.5 km from the centre point of the operational berth, with the boundary following in the main, the existing emergency plan boundary, the inner edges of roads, property boundaries and distinctive pathways on land, and with a radius of 1.5 km across all marine areas. It includes parts of Southampton to the north, Woolston to the east and Hythe in the south-west.



ANNEX B – RELEVANT INFORMATION AND SIGNIFICANT FEATURES

The 38/39 berth is situated within the Eastern Docks of the Southampton Dock complex, which is situated to the south of Southampton City centre.

The majority of the area directly surrounding the berth is of a commercial or industrial nature, including the Southampton Port, which provides freight and passenger services, including cruises and ferries.

Local population, facilities and features surrounding the Southampton Operational Berth are detailed in the following tables

Table 1 – Populations within 1.5 km of the 38/39 Berth Operational Berth Point

Within 1.5 km of the 38/39 Berth point	
HSL supplied population data for the REPIR emergency planning area of the 38/39 berth for the Southampton Operational Berth. All figures are approximate values.	
Residential Population - night time	2798
Workplace population	Up to 4647
Child care population (number of locations)	(1)
Port & ferry terminal annual passengers (number of ports)	1700000 (1)
Other features and facilities (ONR compiled) All figures are approximate.	
National Oceanography Centre	Approx. 0.8 km from the berth.
Southampton Sailing Club	Approx. 1.1 km from the berth. Twenty swing moorings available.
Red Funnel Ferries	Approx. 1.2 km from the berth. 3 million passengers carried annually
Additional Cruise Ship Berths	Between 0.2 and 0.9 km from the berth.

Table 2 - Populations within the area shown in annex A, Map A around the 38/39 Berth Operational Berth Point

Within the ONR determined area around 38/39 Berth Point	
HSL supplied population data for the REPIR emergency planning area of the 38/39 berth for the Southampton Operational Berth. All figures are approximate values.	
Residential population - night time	7427
Residential population – day time, term time	2543
Residential population – day time, non-term time	2955
Child care population (number of locations)	108 (1)
Care Home population (number of locations)	59 (1)

Table 3 – Information of other features or facilities of interest within the area shown in annex A, Map A around the 38/39 Berth Operational Berth Point

Within the ONR determined area around the 38/39 Operational Berth Point. Information of other features or facilities of interest (Compiled by ONR ⁶)	
Feature / Facility of Interest	Comment
Marinas / Berthing Facilities	At least three marinas (Town Quay, Ocean Village and Hythe) within 1.5 km. Total pleasure craft berths available are approx. 630.
Southampton International Port	RO-RO cargo facility with 820000 vehicles being loaded / unloaded each year.

Table 4 – Information of other features or facilities of interest in the Southampton and Hythe Area

Other features for note in the Southampton, Hythe and Southampton water area	
Population / Town / Feature / Facility of Interest	Comment
Southampton City Cruise Terminal	Approx. 2 km away.
Saint Mary's football stadium	Approx. 2.3 km away. Stadium capacity of 32500.
Marchwood Military Port	Approx. 3 km away.
Southampton Container Port	Approx. 4 km away, handling more than 1.5 million TEUs annually.
Fawley Oil Refinery Complex	Approx. 5 km away.

⁶ Information from internet searches and use of map viewing sites.