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COMMENTS

ON THE

Z BERTH OFF-SITE PLAN (SOTONSAFE) REPORT

OF THE

EMERGENCY PLANNING OFFICER

TO THE

FINANCE AND CORPORATE SERVICES STANDING SCRUTINY PANEL

(MEETING 6 MAY 2003, AGENDA ITEM N^{O} 7)

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Z BERTH OFF-SITE PLAN (SOTONSAFE) REPORT

SUMMARY OF THE EFFECTIVENESS OF SOTONSAFE

The Emergency Planning Officer's report introduces a number of revisions and amendments to the previous draft of the Off-Site Emergency Plan (SotonSafe).

Southampton City Council is required to provide the SotonSafe off-site emergency plan under the *Radiation (Emergency Preparedness and Public Information) Regulations* (REPPIR).

SotonSafe has to be capable of handling all reasonably foreseeable radiological emergencies and it must provide the basis to cover incidents that are not reasonably foreseeable by extendibility. A radiological emergency relates to a nuclear incident during or after which radioactivity is released into the environment, dispersing from the immediate vicinity of the Z-berth into the City, its suburbs and beyond.

The purpose of SotonSafe is to minimise the radiation exposure, and hence the health harm, to the public in the off-site area.

Obviously, to prepare the appropriate countermeasures to minimise the health harm (both short and long term) the radioactive release has to be defined in terms of its composition (radionuclide inventory), amount of radioactivity (release fraction), and the timing and duration of the release have to be established for a number of viable incident scenarios. Once a radioactive release is underway, it is necessary to trigger an assessment of the extent of the dispersion of the radioactive cloud, its deposition and concentration and, from evaluation of these, implement countermeasures to minimise the radiation exposure to members of the public. However:

- Under REPPIR, the operator (the Royal Navy) has to provide the Health & Safety Executive with a Report of Assessment of the hazards and risks specifically relating to the submarine at the Z-Berth. It has done so but its report contains very little information - there is nothing of any meaningful detail on the source term, release fraction, or timing and duration of viable incidents that could result in a radioactive release.

- The Ministry of Defence also commissioned one of its agencies, the Defence Radiological Protection Service (DRPS), to undertake an assessment of the dispersion, deposition and radiation exposure of members of public in the area of the City, for a number of radioactive releases from a nuclear powered submarine moored at the Z berth. However, this report, its results and findings remain Classified and unavailable to the public and the City Council

In the absence of this crucial information, SotonSafe cannot prepare in advance a proper and adequate response to realistic incidents and radioactive releases into the public domain: It has no information on the composition of the radioactivity, how much radioactivity could be released into the environment, if there will be any forewarning, how quickly it will happen and how long it will last, and once that radioactivity releases beyond the submarine containment how far it will spread and, importantly, it cannot quantify the potential radiation exposure to members of the public.

In other words, because the Royal Navy is not prepared to release crucial information for reasons of national security and military secrecy, SotonSafe cannot prepare in advance for specific types of incidents, amounts of radioactivity released and the ensuing radiological impact in the public sector.

SotonSafe fundamentally flawed by this lack of information, which leads to a number of logistical faults in its practical implementation:

- SotonSafe fails to identify the human and equipment resources required to implement the appropriate countermeasures, it has no radiation monitoring equipment and Council personnel have not been trained to work in a radiation environment.
    - For radiation monitoring in the critical early stages of a radioactive release, just one DRPS health physics monitor will be available with a vehicle and driver.
    - Given a moderate to stiff onshore breeze, a sizeable sector of the 2km detailed planning zone could be swamped with radioactivity within 10 minutes and, possibly, the radiation would extend out to 5km within 20 minutes from the onset of the accident.
    - It is most doubtful that even this very limited one-man monitoring resource could be put in place, together with its reporting back and assessment/analysis requirement, within the first hour or so of the incident, by which time a good proportion of the population of Southampton (upwards of 70,000) might require advice and specific countermeasures such as sheltering, evacuation and/or prophylactic actions to be implemented.
    - SotonSafe relies upon assistance from the University, claiming that it *"can provide independent monitoring equipment and teams to respond to any incident within the City."*, although nothing is proffered as to the availability (the university is most unlikely to provide all-year round, 24 hour cover) and expertise of these teams, and their experience especially when working under what might be highly stressed emergency conditions.
- SotonSafe has now extended its detailed planning zone (DPZ) to encompass the whole of the City Centre, including offices, retail trading areas and two shopping centres, yet no additional resources have been allocated to deal with what might be several thousands of public who are not attached to any specific location (for sheltering or mustering for evacuation).

SotonSafe has a serious shortfall in that there is no specific provision for an authoritative party to implement the emergency countermeasures on the ground. This is because the key players, Southampton City Council and Hampshire Police, consider that none of their employees will be subject to emergency radiation exposure (ie exposure received by emergency intervention personnel that is in addition to the public exposure). As a consequence of this *'zero radiation exposure'* policy:

- Council and police personnel have received no training whatsoever for working in a radiation environment.
- Since Council and Police personnel will be treated like any other member of the public caught in the radiation exposure zone, they too will be required to take the appropriate countermeasures, that is either sheltering and/or evacuating from the area – the anomaly here is that there will be nobody on the ground to direct members of the public into the appropriate actions to safeguard their health and safety.
    - For example, it is assumed that issue of potassium iodate tablets will commence, in line with national policy, once that the lower level of the Emergency Reference Level has been exceeded. If so, this means that those distributing the tablets will be working in a radiation environment from vehicles and in the open air with minimum shielding from sheltering, unlike the public recipients of the tablets who will be sheltered in buildings. So the *'zero radiation exposure'* policy would not permit City

Council employees to take part in the tablet distribution, but if the radioactive release was significant the need for the prophylactic measure could extent well beyond the 2km, requiring considerably more personnel than the Royal Navy alone could provide - in these circumstances SotonSafe would fail.

- In the early stages of a radioactive release, during which critical decisions have to be made and implemented, the remaining emergency services workers who are trained and personally monitored to work in a radiation environment (the firefighters and ambulance staff) would be insufficient in number and, most probably, preoccupied with their respective primary roles, and inexperienced in managing what may be very large numbers of public.

Essentially, Southampton City Council seems to consider its REPPIR duties to be mainly that of coordinating existing resources and facilities to act in the event of a radiation emergency:

- This approach assumes that the emergency services and the local authority itself, each already have in place adequately prepared actions and countermeasures to cover all possible radiation emergencies that could arise from a fully armed, nuclear powered submarine in the vicinity of the City.
- There is little in SotonSafe that is uniquely set against a radiation-based emergency as distinct from any other emergency and, other than their on-site response plans, the Fire Brigades and Police do not seem to have proven plans to implement in the public **off**-site domain.
- There are no levels of radiation dose exposure specified at which countermeasures would be triggered to protect members of the public (the ERLs) and even once these have been established by (it is assumed) the NRPB, there are no procedural arrangements of how the countermeasures are to be practicably and efficiently implemented.
- In the early stages of the incident, before the arrival of the NRPB and establishment of the *Health Physics Adviser* (perhaps 1, 2 or more hours into the incident), it is not at all clear who is to interpret any radiation readings being received from the in-field monitoring - this cross interpretation is required, first, to project the airborne plume and its fall-out footprint, and from these calculate the whole body and organ radiation exposures of individuals so that countermeasures may be implemented in the right areas and in a timely fashion.

The very sparse information available from the Royal Navy, perhaps not surprisingly, suggests that the nature and development of the radioactive release from any viable incident will be relatively minor and leisurely:

- SotonSafe does not address the occurrence of a severe incident, say provoked by terrorist act or from a serious malfunction of the nuclear plant, which releases significant amounts of radioactivity in the immediate aftermath of the initiating event.
- SotonSafe assumes that Government assistance will be available by the time (several hours at least, so it is assumed) that it is necessary to implement countermeasures in the public domain and, in the interim, local Royal Navy personnel will be sufficient in number and expertise to handle what may be a very complex and rapidly deteriorating radiological situation.
- Because of Southampton City Council's *'zero radiation exposure'* policy, Council employees will not be available (nor are they trained) for working in the radiation environment.

SotonSafe is not at all prepared to act in the phase immediately following the initiating event (which is acknowledged to be critical if public consequences are to be minimised). Moreover, SotonSafe assumes that there will be sufficient time to prepare in detail, that every contingency action will run like clockwork, and that resources (both equipment and human) will be more than sufficient. If, on

the other hand, these expectations are amiss then SotonSafe contains no contingency or reserves to make up the shortfalls and/or inadequacies.

So far as keeping the public informed during the emergency, a key requirement of these *'Public Information'* regulations, SotonSafe sets aside three meagre and very general paragraphs *(Go In – Stay In – Tune In)* and leave much of the information dissemination to the discretion of the media:

- Past nuclear incidents (Windscale, Three Mile Island, Chernobyl, Toka Mura) have demonstrated that far from remaining compliant, the public at large is more than likely to self-evacuate – such a disorganised mass movement from an urban area the size of Southampton could create chaos on the roads, impeding access for the emergency services and, with traffic jams, holding large numbers of public in the open with minimal shielding in possibly radioactively contaminated areas.

In Conclusion: In the event of a major radiation emergency SotonSafe is likely to fail to a greater or lesser extent, particularly in the phase immediately following the initiating event, and its lack of detailed preparation and prepared allocation of resources may result in greater rather than lesser consequences in the public domain.

THE EMERGENCY PLANNING OFFICER'S REPORT IN DETAIL

Referring to the Emergency Planning Officer's report in detail, seriatim:

Section 6, Item a) – Extending the DPZ to Include the City Centre, etc.:

Extending SotonSafe (the Plan) to include the shopping centres will likely introduce large numbers of individuals (1000s) who are not attached to any specific location and it may be necessary to introduce (and signpost) covered areas where shoppers can shelter or muster for evacuation.

- Providing areas for evacuation mustering and sheltering for large numbers of shoppers, etc., is not within the Plan.

Those responsible for managing the shopping centres need to be made aware of this requirement because it may be necessary to shut down air-conditioning and ventilation systems to minimise the introduction of airborne contamination into the covered areas. Similar difficulties may arise for those in occupation of commercial business offices.

- The Plan should include clear instructions and training for those (shop managers and employers) who have control over large numbers of individuals on what actions to take during the early and interim stages of a radiological emergency.

- Similar special measures will be required for the protection of those on board ships berthed or underway in Southampton Water – particular regard would be required to protect passengers on board cruise liners and similar, although this is covered to some extent by *Annex 2H* of the Plan.

Item b) – Passage To and From the Z Berth

There are a number of potential incidents that could disable the boat whilst it is in transit to and from the Z Berth, so the Royal Navy may not have the option to turn the boat round.

- The Plan should include for types of incident where the boat cannot be immediately removed from the Port area – the incident involving HMS *Tireless* at Gibraltar in 2000 is example of this.

Of course, certain incidents could result in an immediate release of radioactivity thus necessitating a prepared off-site emergency plan to cover those areas along the banks and inland from Southampton Water - simply, fixing the 2 km radius detailed planning zone (DPZ) from the berth does not cover this contingency.

- The DPZ of the Plan should include for radiological release incidents occurring at all points in the approaches of Southampton Water to the Z berth (ie it should be elongated along Southampton Water).

Item c) – Terrorist Attack and Security

Obviously, the Royal Navy will lay down such measures to protect its vessels from terrorist action, although it cannot completely safeguard against this (as shown by the terrorist action against the USS Cole in the Yemen).

- So far as the Plan requiring the Royal Navy to undertake a full risk assessment, there is some doubt as to which authority would ratify any design basis threat (DBT) analysis undertaken by the Royal Navy:

  - For civil nuclear facilities, the security assessment is completed by the DTi Office of Civil Nuclear Security (OCNS) but it has no involvement in military matters.

  - For Royal Navy nuclear powered submarines, the assessing authority is likely to be the Naval Nuclear Regulatory Panel (NNRP), which has no responsibility for reporting to a civilian local authority such as Southampton City Council.

The concern raised at the March Seminar related to the effectiveness of the Off-Site Emergency Plan itself, that is

i) does it take into account a multi-attribute terrorist attack, that is whereby there may occur a number of simultaneous terrorist actions at different local targets; and

ii) where the terrorist action intentionally harries the countermeasures of the plan itself, thereby impeding and reducing the effectiveness of the countermeasures.

Item e) – Response to Wind Changes, etc

In a townscape environment, particularly with sea breezes, it is very difficult to predict and reliably model wind and meteorological conditions. Simply assuming a general wind direction across a complex urban environment may result in misleading forecasts of dispersion and deposition of any airborne contaminant. Moreover, there are a number of other factors (atmospheric stability, plume lofting, and the type, volatility, size and chemistry of the releasing particles) that determine the dispersion and deposition and, hence, the internal and external radiation exposure.

Obviously, to conserve resources, evacuation, sheltering and PIT's prophylactic countermeasures should be implemented only when necessary. For this, the local radiation environment will have to be forecast in advance, or at least accurately monitored in real time. For forecasting via modelling, a series of monitoring points have to be established so that local radiation levels and spectrometry can be fed into a real time CAD model (such as the NOAA system).

- It is doubtful that Southampton City Council has the computing resources and expertise to establish and operate such a system, so it is not at all clear how the radiation exposure potential for all areas of the DPZ and beyond will be reliably determined sufficiently in advance of the time that the countermeasure needs to be implemented.

- If Royal Navy personnel and teams from Southampton University (see Items j & l) are to undertake the off-site monitoring then a consistent system for centrally receiving and deploying this information and data has to be in place – the Plan does not refer to such a system.

- If, as it seems, the Plan relies upon the NRPB systems of emergency reference levels (ERLs) to trigger the appropriate countermeasure then the absence of reliable location-exposure data may result in the specific ERLs being exceeded.

Item f) – City Council Employee Radiation Exposure

In effect, the City Council's policy that no employee shall be put at risk of radiation exposure (say, over that of any individual member of the public within the area of the radiation emergency) means

that all Council employees will be subject to the same countermeasures at the same time (evacuation and sheltering) as members of the public at the same locale. In other words, no Council employee will be required to take any such action that might expose him/her to any additional increment of radiation exposure over that of a member of the pubic.

The Council's *'zero radiation exposure'* policy seems to include employees under *Regulation 9(14)* of REPPIR, which implies that Council employees are not at all required to become involved and participate in the implementation of the off-site plan. However, it is *Regulation 14* that applies to Council employees and this regulation places a number of duties on employers such as the local authority where intervention personnel are likely to receive radiation exposure exceeding the normal dose limits.

- If the Council adheres to its *'zero radiation exposure'* policy then it could not practicably implement the Plan.
- If, on the other hand, it interprets this policy as *'seeking to avoid any exposure'* then it must incorporate the requirements of *Regulation 14* into the Plan as it is prepared now because there will not be sufficient time or opportunity to do so once that a radiological emergency has been declared. The measures that the Council has to undertake include:
    - Identify those intervention employees at risk of emergency radiation exposure;
    - Provide these employees with appropriate equipment to minimise the exposure;
    - Train and instruct these employees sufficiently for them to know the risks to health from radiation exposure;
    - Put in place a radiological surveillance regime, health checks and record keeping; and
    - Ensure that there is a knowledgeable employee authorised to permit these employees to be subject to additional exposure, thus
- Part 6.1 (Emergency Exposures) of the Plan is confused on this, particularly by referring to the Southampton Operators Emergency On-Site Plan which (if it is the Royal Navy on-site plan) is not a publicly available document.
- The Plan also states that the Hampshire Police have not sought the agreement of its staff to undergo emergency exposure, planning (somehow) to avoid such a necessity. In effect, the police *'no additional exposure'* policy means that individual officers cannot be involved in any aspect of the plan that would result in additional radiation exposure other than that received by any member of the public – with no police involvement it is unclear who is to direct members of the public to decontamination centres, etc..

Item h) – Extendibility

Concentrating the Plan response to a 45° sector downwind may not be sufficient to cover the dispersion characteristics discussed under Item e) foregoing. Of course, extending the plume and radiation exposure beyond the 2km DPZ will involve disproportionately larger numbers of public (increasing with the distance of the radius squared) over the City and its suburbs.

- The Plan includes no account of the increasing resource requirement necessary to implement and manage the appropriate countermeasures should the radiation exposure (ERLs) trigger countermeasure beyond the 2km DPZ.

- The resource requirements (both equipment and human) for release scenarios extending across the City should be calculated and tabulated within the Plan – crudely, adopting the 45° segment and extending the radiation exposure risk out to just 5km would involve about one-third of the population of the City (210,000÷3≈70,000) for each of the wind blown dispersions from the south-east, south and south-west.

Item i) – Rapid Radioactive Release

The capability of the Plan to deal with a rapid radioactive release immediately is confined to the Automatic Countermeasures Zone of 550m radius.

Thereafter, the countermeasures in the DPZ (Pre-Planned Countermeasures Zone) that extends to 2km radius have to be initiated by authorisation, although it is not clear from the Plan which party has this responsibility.

- Given a moderate to stiff onshore breeze of 5 to 10 knots, the plume carrying the radioactive release would cover the 2km DPZ within 10 minutes and extend to 5km in 20 minutes – it is doubtful that a command centre and decision making chain of command could be established within these timescales - in the event of a major radioactive release necessitating evacuation/sheltering countermeasures large numbers of public could be at high risk within 20 minutes of the incident onset.

- The only immediately available mobile monitoring unit comprises a single vehicle manned by a driver and a health physics monitor who transmits the gamma spectrometry air sample readings to a health physics advisor who, in turn sends these to the Chief Constable and local authority - again, it is doubtful that effective monitoring could be in place within the very tight timescales of an immediate release of radioactivity.

- Airborne and ground deposition radiation levels may be intolerably high, particularly during the initial hour or so from the incident onset until intensely radioactive short half-life emitters have decayed, and the implementation of effective countermeasures could be crucial to safeguarding the health of the public – the Plan gives no emphasis to the need for early decision-making in this respect.

- The monitoring data is to be expressed in terms Bq/m^3 airborne and Bq/m^2 ground for a number of 'signature' radionuclides. However, it is not clear from the Plan which party is to convert this data to an equivalent dose exposure in (m)Sv units for both the whole body and organ (thyroid), which is the form required for the implementation of countermeasures using the ERL triggers.

- How the Police and Southampton City Council will interpret the monitoring data, particularly the gamma spectrometry results, is not explained in the Plan.

Item j) – Monitoring Arrangements by Southampton City Council

As previously noted, the immediate radiation monitoring is limited to a single Defence Radiological Protection Scheme (DRPS) health physicist operating from a vehicle – it is not clear from the Plan if a health physicist is to be available at all times at the Z-berth while it is in use, or if this resource travels in from some other locality (Portsmouth, Plymouth or Alverstoke for example).

The statement that Southampton University is to provide equipment and teams to respond to any radiological incident in the City requires further substantiation because:

- The numbers and availability of University based health physicists sufficiently experienced in monitoring the urban environment under emergency conditions is unknown, although it is considered likely that the University could not provide sufficiently experienced resource for this task (particularly in the initial stages of any radioactive release).

- Unless the University teams adopt the same monitoring techniques and data units as the DRPS mobile team, considerable confusion could arise.

Item k) – Critical Group Identification

Nursing (breast-feeding) mothers should also be included in any critical group relating to radioiodine exposure.

Item l) – Personal Dosimetry and Decontamination

Other than film badges (which are not user readable having to be developed by a laboratory), users of personal dosimeters require specialised training if they are to act at the onset of specific dose rates or levels of accumulated radiation exposure.

- The Plan makes no provision for the training of those Council personnel who may be issued with dosimeters.

- If the Council's *'no additional exposure'* policy is to be adhered to, Council employees remaining nearby areas of radioactivity (or where the radioactive contamination is dispersing by wind drift and/or being spread by vehicles, evacuees, etc) will need to wear personal dosimetry in order that they may avert any significant additional exposure to radiation.

Item n) – Radiological Involvement

Refer to item f) foregoing.

Item p) – Emergency Services Radiological Anomalies

Of all of the parties likely to be involved in implementing countermeasures, the following radiological regimes apply:

ORGANISATION	EXPOSURE TOLERATED	EXPOSURE LIMITS
Royal Navy	Yes	Unspecified
Hampshire Police	No	as public
Hampshire Fire and Rescue Service	Yes	50mSv single incident 100mSv lifesaving no attendance females firefighters
Hampshire Ambulance Service	Yes	unspecified
Southampton City Council	No	as public
Southampton City & New Forest PCTs	unknown	-
New Forest District Councils	No	as public
Hampshire County Council	No	as public

- Two of organisations, the police and the City, both critical to the successful implementation of countermeasures during the early phases of the incident, plan for their employees not to

receive any additional radiation dose (ie these employees will be required to take the same countermeasures, such as sheltering and/or evacuation) as members of the public.

- The Plan fails to identify which other organisation(s) is to direct members of the public, particularly during the early stages of a developing radioactive release.

- It is doubtful that the Fire Brigade or the Royal Navy will have sufficient resources to undertake the role of directing the public, nor are these organisations trained and experienced in dealing with possibly very large numbers of public under stressful circumstances.

Item q) – Modelling of the Release and Dispersion

There is some confusion over the applicability of the Defence Radiological Protection Service (DRPS) studies – two such studies have been undertaken that specifically relate to Southampton.

Firstly, these are classified studies and would not have been released to the Emergency Planning Officer for use in the Plan.

Secondly, of the two DRPS reports the first was commissioned by the DRPS on *"behalf of a third party"* and it is not certain that this report actually relates to dispersion and radiation exposure analysis, although it was one of the reports referred to for the Royal Navy's *Report of Assessment* under REPPIR. The second of the DRPS reports was commissioned after the *Report of Assessment* had been completed and relates to some unspecified aspects of contingency planning at Southampton.

- It is not clear how these two DRPS reports are to be incorporated into the Plan – being available to the Incident Commanders during an incident is, it might be argued, somewhat late to be of any practicable use.

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