Australian Government

Department of Defence

VISITS BY NUCLEAR POWERED WARSHIPS TO AUSTRALIAN PORTS

Report on Radiation Monitoring During 2017

Canberra, Australia
2018

FOREWORD

1. This publication has been prepared for the Australian Department of Defence in consultation with the appropriate Commonwealth departments through the standing inter-departmental committee, the Visiting Ships' Panel (Nuclear).

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SUMMARY

Three Nuclear Powered Warship (NPW) visits were made to Australian ports in 2017. The visits were made by ships of the United States Navy. Details of the visits are as follows:

Port	**Ship**	**Visit Dates**
HMAS STIRLING	USS OKLAHOMA CITY	23 - 27 February 2017 07 – 13 March 2017
BRISBANE	USS RONALD REAGAN	25 – 28 July 2017
Total Visit Days	**15**	

The Commonwealth Government requires that a radiation-monitoring program be carried out in association with each visit to detect any release of radioactivity to the ports and their environs.

This report presents a summary of the objectives and requirements of the NPW radiation-monitoring program, describes the implementation of the program for the visit during 2017 and records the results of radiation measurements taken in the ports visited.

No releases of radioactive material were detected, nor were any radiation levels recorded in excess of normal background levels of ionising radiation, either during or subsequent to these visits.

PART I – GENERAL

INTRODUCTION

1. The Commonwealth Government requires that a radiation-monitoring program be carried out in association with such visits to detect any release of radioactivity to the ports or their environs or any increase in external radiation levels above those due to natural background radiation.

2. This report presents a summary of the objectives and requirements of the Nuclear Powered Warships (NPW) radiation monitoring program, describes the implementation of the program for the visits during 2017 and records the results of radiation measurements taken.

THE RADIATION MONITORING PROGRAM

3. The requirements for the monitoring program are laid down in 'Environmental Radiation Monitoring during Visits of Nuclear Powered Warships to Australian Ports - Requirements, Arrangements and Procedures', Department of Defence, September 2003.

4. The monitoring program has two main components:

(a) environmental monitoring, is designed to detect the release of any radioactive material (e.g. waste) to the environment; and

(b) direct radiation monitoring is designed to provide warning of any malfunction of the reactor of an NPW while in port, which might lead to a release of radioactivity.

Environmental Monitoring

5. The environmental radiation-monitoring program is intended to provide assurance that there has been no infringement of Australian public health standards attributable to the release of radioactive material from the waste control and retention systems of a visiting NPW.

6. The relevant Australian public health standards are those recommended by the Australian Radiation Protection and Nuclear Safety Agency, Fundamentals for Protection Against Ionising Radiation (2014) (RPS F-1), the Code for Radiation Protection in Planned Exposure Situations (2016) (RPS C-1), and Radiation Protection Series No.7, *Intervention Levels in Emergency Situations Involving Radiation Exposure*, published in 2004 by ARPANSA. These standards relate to permissible ionising radiation doses received by individuals from both external radiation sources and from the intake of radionuclides in air, water and foodstuffs.

7. A marine environmental monitoring program is implemented to determine the potential for exposure to people and the environment due to the release of radionuclides into the marine environment. The monitoring technique is used to extract, and quantify radiocaesium (caesium-137 and caesium-134), from the seawater in the vicinity of approved berths and anchorages. The radiocaesium is concentrated, onto chemically coated filter cartridges, using an in-situ caesium extraction unit.

8. These samples are analysed for evidence of radiocaesium known to characterise the radioactive waste likely to be held in a NPW. Low levels of caesium-137 are present in the marine environment as a result of global fallout. Background levels of caesium-137 in Australian waters range from 0.7 to 1.4 mBq/L.

Measurement Method

9. The coated cartridges, containing the extracted radiocaesium, undergo laboratory pre-treatment which includes drying, ashing and homogenisation, prior to measurement using high resolution gamma spectrometry.

Detection Capability

10. The detection limit for the radiocaesium (based on a 24 hour count time) is better than 0.2 mBq/L. This monitoring approach will provide the means to determine if there have been any releases from the NPW to the marine environment.

External radiation

11. When a NPW is at an alongside berth, gamma radiation surveys are undertaken at the wharf in those areas in the vicinity of the vessel designated as free for access by the public or by port employees. Surveys are made initially on the vessel's arrival and periodically thereafter for the duration of the visit using portable dose rate meters capable of measuring ionising radiation dose rates down to 0.01 μSv/h.

Passive dosimeters

12. In order to record the accumulated ionising radiation doses that might be received in the port environs following an accidental release of airborne radioactivity, a number of passive dosimeters (OSL) are placed at selected locations. The OSL remain in position during the period that an NPW is in port or, in the event of an accident, would remain in position until the termination of the accident. Control OSL are kept at the Australian Radiation Protection and Nuclear Safety Agency's (ARPANSA) laboratory in Melbourne and also in the port being visited, but remote from the NPW to provide a comparison with the OSL placed in the field. At the completion of a visit, field and control OSL are returned to ARPANSA for dose assessment.

Direct Radiation Monitoring

13. In order to provide early warning of an NPW reactor malfunction at an alongside berth, fixed radiation detectors are located in the vicinity of the vessel to provide continuous monitoring of gamma radiation levels. The detectors cover the range of 0.01 μSv/h to100 mSv/h with an audible alarm set to trigger at a level of 1 μSv/h. A significant release of radioactivity into the interior of the vessel from the reactor would be detected and initiate an alarm.

PROGRAM IMPLEMENTATION

The Monitoring Program

14. Groups, which consist of members from the Australian Nuclear Science and Technology Organisation (ANSTO), the Health and Environmental authorities of the host State or Territory and the Royal Australian Navy (RAN) undertake the external radiation-monitoring program.

The composition of the groups varies in different ports; however, the Leader of the Radiation Monitoring Group is always a radiation protection officer from ANSTO.

15. The marine environmental monitoring program is a joint undertaking by ARPANSA, Radiation Health Services Branch and either the State concerned or, where the berth is in a naval establishment, the RAN. The collection of samples is carried out by State authorities or by the RAN, at approved berths and anchorages. The analysis and measurement of samples is undertaken by ARPANSA. Details of the measurement method and detection capability are presented in Part III.

16. The routine sampling program may be discontinued at NPW berths and anchorages which are visited infrequently or where an adequate baseline has been established.

Contingency Arrangements

17. Port safety organisations have been established at all ports approved for NPW visits and arrangements made so that in the event of a reactor accident they would be activated immediately. Simultaneously, Commonwealth officers would initiate radiation surveys in order to identify any radiation hazards. Prior to each visit, the Port Safety Organisation is brought to a state of readiness and briefings are conducted to familiarise key participants with the operational procedures and the tasks required of them in the event of an accident. Normally, an exercise is conducted prior to an NPW visit involving key members of the Port Safety Organisation.

PART II - NUCLEAR POWERED WARSHIP VISITS IN 2017

HMAS STIRLING, WESTERN AUSTRALIA

Visits by USS OKLAHOMA CITY

18. USS OKLAHOMA CITY (SSN723) a nuclear powered Los Angeles class submarine of the US Navy visited HMAS STIRLING 23 – 27 February and 07 – 13 March 2017.

Radiation Monitoring

19. Throughout the visit, gamma radiation levels were monitored in the vicinity of the vessel using fixed radiation detectors. Operation of the detectors commenced before the vessel's arrival and continued until its departure. Measurements were displayed and recorded on equipment located in the Emergency Operations Centre which was manned continuously. In addition, measurements of gamma radiation levels were taken daily using hand-held dose rate meters in those areas around the vessel which were accessible to personnel on the base.

Results

20. The gamma radiation dose rates measured by both the fixed and portable monitoring equipment during the visit were between 0.1 and 0.3 μSv/h indicating that there was no observable increase in the external gamma radiation level above background. The caesium-137 activity concentration in the post-visit seawater sample was 1.3 mBq/L; caesium-134 was not detected in this sample. The caesium-137 activity concentration level and the absence of caesium-134 confirms that there had been no releases of radionuclides to the marine environment.

BRISBANE, QUEENSLAND

Visit by USS RONALD REAGON

21. USS RONALD REAGAN (CVN76), a nuclear powered Nimitz class aircraft carrier of the US Navy visited Brisbane 25 – 28 July 2017.

Radiation Monitoring

22. Throughout the visit, gamma radiation levels were monitored in the vicinity of the vessel using fixed radiation detectors. Operation of the detectors commenced before the vessel's arrival and continued until its departure. Measurements were displayed and recorded on equipment located in a caravan located on the wharf which was manned continuously.

Results

23. The gamma radiation dose rates measured by the monitoring equipment during the visit were between 0.1 and 0.3 μSv/h indicating that there was no observable increase in the external gamma radiation level above background. The caesium-137 activity concentration in the post-visit seawater sample was 0.75 mBq/L; caesium-134 was not detected in this sample. The caesium-137 activity concentration level and the absence of caesium-134 confirms that there had been no releases of radionuclides to the marine environment.