RADIATION MANAGEMENT PLAN

MONTEBELLO ISLANDS CONSERVATION PARK

Department of Conservation and Land Management
Dick Perry Drive, Kensington, Western Australia

2001

FOREWORD

This Radiation Management Plan (RMP) has been produced for the Montebello Islands. It has been prepared by the Radiation Health Section of the Department of Health (WA) in consultation with the Department of Conservation and Land Management. It incorporates a Radiation Monitoring Program (RMP) and working rules to be applied by Departmental workers at the islands.

This RMP is not meant to be a detailed radiological history of the Montebello Islands. If this is required, the Australian Radiation Laboratory (ARL – now the Australian Radiation Protection and Nuclear Safety Agency - ARPANSA) publications should be consulted.

The set of working rules addresses likely exposure pathways that the casual visitor may encounter when visiting the islands and illustrates methods to be employed to minimise possible radiation dose. The rules apply only to the "Elevated Radiation Zones" on Trimouille Island and Alpha Island. All other areas are considered as normal background areas in terms of radiation.

The basis for dose minimisation in the work rules is the public annual dose limit of 1 millisievert above normal background. If the rules are followed, it is most unlikely that a dose in excess of 1 millisievert above background will result.

Any suggestions for improving this RMP are welcome.

Radiation Health Section
August 2001

RADIATION MANAGEMENT PLAN - MONTEBELLO ISLANDS

Introduction

The Montebellos are a group of islands off the northwest coast of WA that were the site of British nuclear weapons testing in the 1950s. Since then the islands have been classified as a low-level radioactive hazard and only since 1992 have the Montebellos been open to the public. Several surveys have been undertaken, with the latest showing that the Montebello islands pose no significant health hazard to the occasional visitor.

In order to illustrate that all potential exposure pathways have been considered this Radiation Monitoring Plan is developed for areas where the potential for radiation dose exists.

Elevated Radiation Zones

There are areas where slightly elevated gamma radiation areas exist. For these areas there is a small possibility of a radiation dose (in excess of normal background) being delivered to those who visit. These areas are termed "Elevated Radiation Zones" (ERZ) in this report. "Elevated Radiation Zones" exist only on Trimouille and Alpha Islands.

There are three "Elevated Radiation Zones" on the Montebellos Islands.

1. The first is on the west coast of Trimouille Island, at 'Red Beacon', northeast of where the HMS Plym was moored off the coast,

2. The second is at Mosaic G1 on the northern tip of Trimouille Island, and

3. The third "Elevated Radiation Zone" is on Alpha Island, the point of detonation of Mosaic G2. These areas are indicated on the map (See Appendix 1).

All areas of the Montebellos may be visited by the general public; however, visits to the 'Elevated Radiation Zones' should be limited as provided by the current signs.

Sources/Pathways of radiation exposure

There are two possible internal exposure pathways, ingestion of radioactive particles and inhalation of radioactive particles. There is also direct exposure to gamma radiation.

Ingestion

If normal hygiene processes (such as washing hands before eating) are followed and given that the ingestion of any flora and or fauna is unlikely, this exposure pathway can be essentially ruled out.

Inhalation

There is a small likelihood that an exposure pathway could exist from inhalation. This could result from inhalation of fine particles of dust which is generated during some operations (e.g. landing of helicopters). It is thus advised that persons visiting or working in dusty conditions in "Elevated Radiation Zones" should take a prudent approach. The prudent approach includes wearing dust protection masks (complying with Australian Standard 1715/1716) if the area is visibly dusty and minimising the time spent at these locations. Also, as a general rule, helicopters should not land in "Elevated Radiation Zones" where they might generate dust.

The Radiation Health Section, in conjunction with the Department of Conservation and Land Management, plans to measure the dust levels at specified locations and hence assess possible radiation dose. After this study has been completed, the need for wearing any dust protection will be re-examined.

Direct gamma exposure

The areas identified as ERZs all contain some gamma radiation levels in excess of normal background. These can contribute to a radiation dose over a prolonged period of time. The doserate is measured relatively easily with a gamma-measuring instrument (Geiger counter or similar) and for given time-motion studies of occupancy a likely dose can be estimated. In addition, persons working in such areas must be monitored with thermoluminescent dosimeters (TLDs) and perhaps Integrating Electronic Dosimeters (IEDs) to verify the projected dose. Based on previous dose-rate measurements, Table 1.1 gives a guide as to the length of time that one can remain in a location before the public dose of 1 millisievert is reached.

	PUBLIC		**MAX DOSE RATES**	
	Hours	*Days (8 hours)*	*Total*	*Background*
Red Beacon (Trimouille)	1900	240	0.62 μGy h^{-1}	0.1 μGy h^{-1}
Mosaic G1 (Trimouille)	9000	1100	0.21 μGy h^{-1}	0.1 μGy h^{-1}
Mosaic G2 (Alpha)	300	40	3.01 μGy h^{-1}	0.1 μGy h^{-1}

Table 1.1 Time spent in "Elevated Radiation Zones" before a dose of 1 millisievert is reached

Although under the ALARA principle (see below) one should strive to achieve a dose which is less than 1 millisievert per year (or lower if possible), if there is a slight exceedance of this dose on some occasions there will be no obvious detrimental effects to health. From the data above, however, with the exception of the ERZ associated with G2 on Alpha Island, it is most unlikely that any person will exceed a dose of 1 millisievert over a year at the Montebello Islands.

Much of the metal that has remained on the islands will have been activated and become radioactive from the bomb blast. The major activation product is Cobalt 60. Cobalt 60 has a half-life of approximately 5 years and, as it is nearly 50 years since the explosions, the present day activity will be considerably reduced. A prudent approach is to consider *all* metal encountered on the islands (particularly Trimouille and Alpha Islands) as being potentially radioactive and not interfere with it (including collecting it).

Radiation Monitoring

For the Montebello islands it is considered prudent to implement a program to monitor the radiation doses of staff entering the three ERZs. When the full monitoring data become available, it may indicate that some of this monitoring is unnecessary. This is likely to lead to a revision of the monitoring of some areas in the future. Where no data are currently available, it is desirable to monitor.

Gamma radiation

All persons whose work requires them to spend time in the ERZs should wear TLD badges. A log of the personal doses recorded is to be presented to the Radiological Council for evaluation. For very short visits to ERZs dose assessment may be calculated either from dose-rate and time-motion studies and/or the use of IEDs.

Drinking water

If water is collected from rooftops on buildings erected on the islands, it will be necessary to check the radionuclide levels. It is expected that such levels will be low and that the monitoring will be necessary only as a "one-off" exercise to verify this.

Monitoring of drinking water samples initially on an annual basis is also recommended. Contamination is unlikely, although it would be prudent to take a few representative samples which can be send to ARPANSA, in conjunction with RHS, for monitoring. Results from this should also be reported to the Radiological Council. The sample collection of drinking water, and subsequent analysis, should be undertaken in accordance with the appropriate guidelines.

Dust monitoring
Annual dust monitoring is another consideration to maintain a prudent policy in evaluating possible radiation doses. Dust monitors should be attached to the chest/shoulder, within close proximity of the breathing zone. Inside the dust monitor there will be a sheet of filter paper that should be regularly changed. The filter paper can then be sent to Radiation Health for analysis and the results presented to the Radiological Council. Dust sampling and measurement shall be carried out in accordance with the appropriate protocols and guidelines.

Subject to results obtained in the monitoring programs, the requirement to undertake water and dust monitoring may need revision in future years.

The ALARA Principle
Even though radiation doses encountered on the islands of Trimouille and Alpha are likely to be low, the ALARA Principle states that ALL doses should be kept *As Low As Reasonably Achievable* (or Practical). This stems from the so-called linear hypothesis which assumes that all dose (even small amounts) carry a risk of cancer. Hence it is considered prudent to minimise all dose, even if the dose is likely to be small.

Details of Records
Officers of the Department of Conservation and Land Management will keep details of the radiation monitoring programs. These details will be discussed periodically with the Radiation Health Section who will provide assistance in data interpretation.

Protective Equipment
When working in an ERZ in dusty conditions, an approved (according to Australian Standard 1715/1716) dust mask shall be used. No other protective equipment is necessary.

Employee Training
There is no specific training employees need to undertake before working on the Montebello Islands. All employees should make sure they are familiar with the working rules and follow the policy of ALARA and prudent avoidance whenever possible. For any queries regarding safety issues, contact Radiation Health.

Institutional Controls and Education
Any person contemplating working on the Montebello Islands, should be made aware of the following:

- The working rules of Montebello Islands to be followed.
- The history of the islands with respect to the nuclear testing.
- The locations of the three ERZs.
- The need to ensure that all signs indicating a radiological hazard are kept in good condition.
- To understand what is meant by 'As Low As Reasonably Achievable' and hence the meaning of the ALARA principle and hence need for dose minimisation.

Working Rules

- When working in a ERZ, wear a TLD (or equivalent) badge. Film badges are not recommended due to difficulties with heat and humidity effects.
- A log of doses be kept for future reference.
- Don't touch or remove any metal from the islands – particularly Trimouille and Alpha Islands. Assume all metal is radioactive.
- The wording of the signs in the ERZs shall be as follows (telephone numbers should be updated when new signs are produced):

RADIATION RISK AREA

radiation symbol	*Elevated radiation levels exist here* *Radiation affects on health are accumulative over your lifetime.*
	Minimise your exposure: *Restrict your visits to 1 hour per day*
MAP	*Avoid causing dust as any particle may be radioactive*

Do not handle or remove objects as they may be radioactive
Camping is not allowed
For further information contact:
Department of CALM, Karratha (091) 43 1488 or
WA Health Department, Radiation Health Section (09) 346 2260

- If working in an ERZ in dusty conditions, wear an approved dust mask.
- Helicopters should land away from any of the three ERZs.
- Avoid any work that involves the removal of soil or scrap metal
- Restrict time spent in ERZs to a minimum.
- For queries contact Radiation Health Section (9346 2260).

These working rules apply to Alpha and Trimouille Islands. There are no data that suggest there is a radiological hazard elsewhere in the Montebello Islands.

Conclusion

If the working rules are followed, it is unlikely that any casual visitor to or worker at the islands will receive an annual radiation dose in excess of 1 millisievert. If there are any situations where prolonged exposure outside the working rule guidelines is envisaged, the Radiation Health Section must be consulted for guidance on dose minimisation and the implications for prolonged doses in excess of 1 millisievert per annum.

SUMMARY OF PRACTICAL WORK RULES

1. Be aware of the location of the ERZs (see the map in Appendix 1)

2. If the signs are damaged (or missing) please report this to the Department of Conservation and Land Management.

3. When working in an ERZ , all dose must be assessed. Usually a TLD badge is used for this purpose. Film badges are not recommended due to difficulties with heat and humidity effects.

4. Restrict time spent in ERZs to a minimum.

5. Keep a log of doses for future reference. Dose information is periodically given to the Radiological Council.

6. Do not remove any metal from the islands. Assume all metal is radioactive. This applies mainly to Trimouille and Alpha islands

7. Avoid any work that involves the removal of soil.

8. If working in an ERZ in dusty conditions, wear an *approved* dust mask.

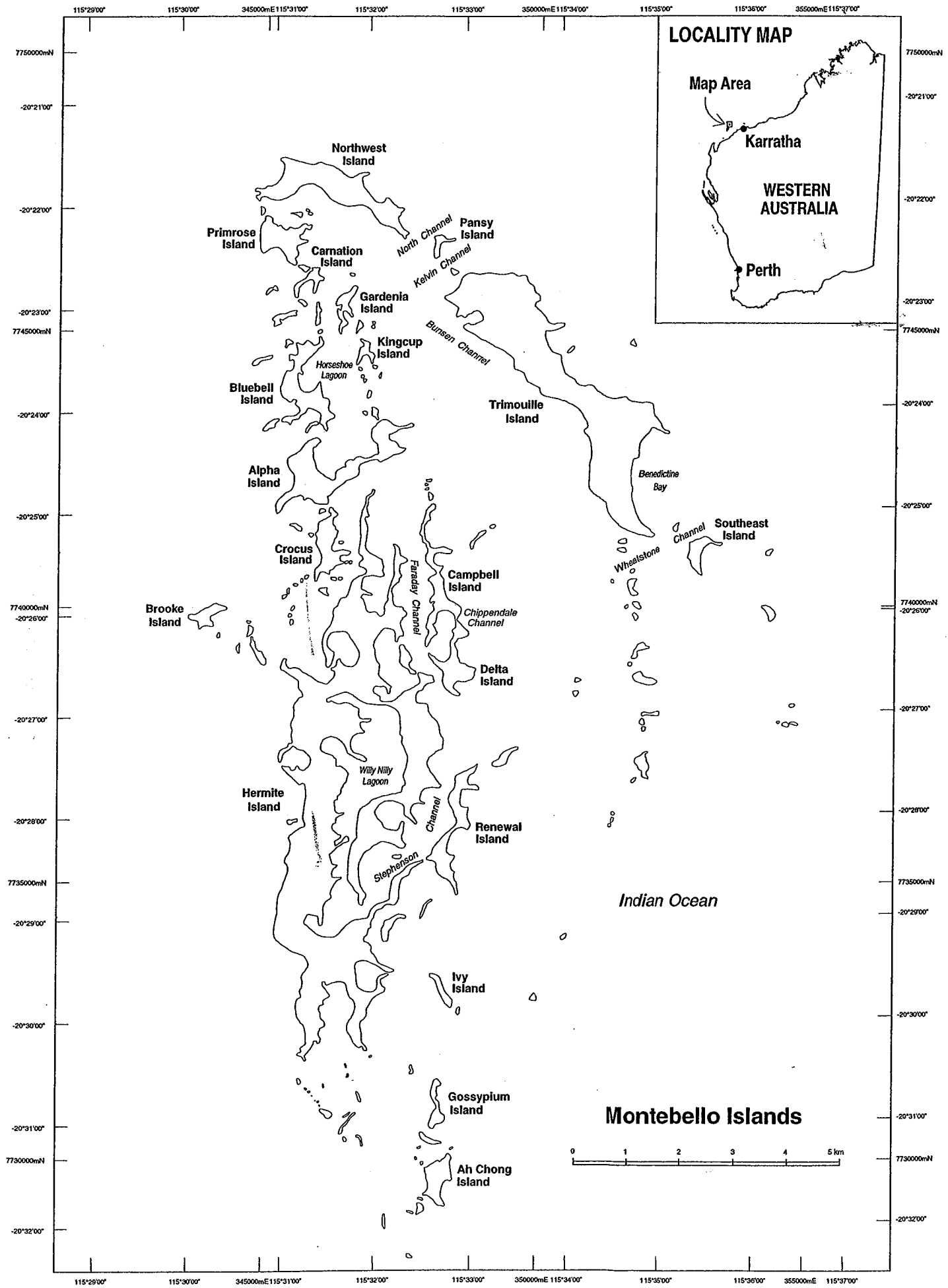
9. Helicopters should not land in any of the three ERZs.

10. For queries contact **Radiation Health Section (9346 2260).**

APPENDIX

Map 1 Montebello Islands Conservation Park

Map 2. Northern section of Montebello Islands showing 'Elevated radiation Zones'


LOCALITY MAP
Map Area
Karratha
WESTERN AUSTRALIA
Perth
Northwest Island
Primrose Island
Carnation Island
North Channel
Pansy Island
Kelvin Channel
Gardenia Island
Kingcup Island
Bunsen Channel
Horseshoe Lagoon
Bluebell Island
Trimouille Island
Alpha Island
Benedictine Bay
Crocus Island
Faraday Channel
Campbell Island
Chippendale Channel
Wheelstone Channel
Southeast Island
Brooke Island
Delta Island
Willy Nilly Lagoon
Hermite Island
Channel
Renewal Island
Stephenson
Indian Ocean
Ivy Island
Gossypium Island
Ah Chong Island
Montebello Islands
0 1 2 3 4 5 km
115°29'00"
115°30'00"
345000mE 115°31'00"
115°32'00"
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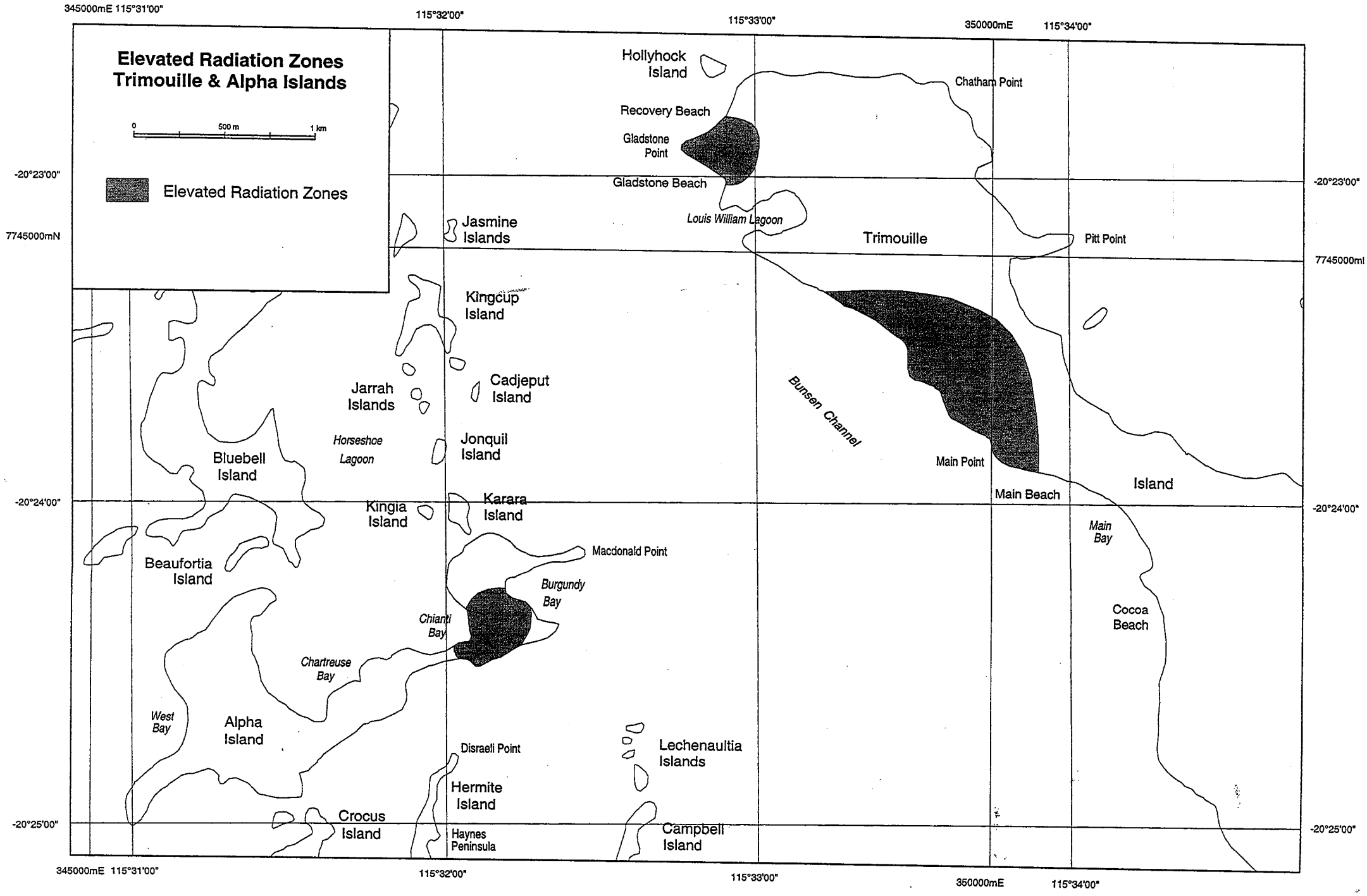
Elevated Radiation Zones
Trimouille & Alpha Islands
0
500 m
1 km
Elevated Radiation Zones
345000mE 115°31'00"
115°32'00"
115°33'00"
350000mE
115°34'00"
-20°23'00"
7745000mN
-20°24'00"
-20°25'00"
Hollyhock Island
Chatham Point
Recovery Beach
Gladstone Point
Gladstone Beach
Louis William Lagoon
Jasmine Islands
Trimouille
Pitt Point
Kingcup Island
Jarrah Islands
Cadjeput Island
Bunsen Channel
Horseshoe Lagoon
Jonquil Island
Bluebell Island
Main Point
Island
Main Beach
Kingia Island
Karara Island
Main Bay
Macdonald Point
Beaufortia Island
Burgundy Bay
Chianti Bay
Cocoa Beach
Chartreuse Bay
West Bay
Alpha Island
Disraeli Point
Lechenaultia Islands
Hermite Island
Crocus Island
Haynes Peninsula
Campbell Island