Attachment A

DECISION RECORD

Request Details
FOI Request FA 14/04/01092
File Number ADF2014/14115

Scope of request

> *The full report prepared by Sinclair Knight Merz outlining the potential key environmental risks associated with the establishment of the Nauru OPCs, and its Appendices and Attachments.*

Documents in scope

1. Nauru Regional Processing Centre – Environmental Due Diligence Report – containing 62 folios.

Authority to make decision
I am an officer authorised under section 23 of the FOI Act to make decisions in respect of requests to access documents or to amend or annotate departmental records.

Information considered
In reaching my decision, I have considered the following:

- The *Freedom of Information Act 1982;*
- Departmental document (identified above); and
- The Australian Information Commissioner's guidelines relating to access to documents held by government.

Reasons for decision
I have considered the document within the scope of your request and applied exemptions in part to the document as detailed in the Schedule of Documents. You should read the schedule in conjunction with the exemptions below.

Conditional exemption - certain operations of agencies - s.47E(d)

A document is 'conditionally exempt' under s.47E of the FOI Act if its release, amongst other things, would or could reasonably be expected to 'have a substantial adverse effect on the proper and efficient conduct of an agency.'

The material exempt under s.47E(d) is of the nature that it involved information around planned and actual the offshore processing centre's capabilities and capacities. The release of this material could adversely affect the current or future operations.

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I am satisfied that the release of the material could have a substantial adverse effect on the proper and efficient conduct of an agency. This information is conditionally exempt under s.47E(d). A conditionally exempt document **must** be released under the FOI Act unless the release would be 'contrary to the public interest'. I have considered and applied the public interest test in s.11B of the FOI Act below.

Factors favouring disclosure

I have considered the factors set out in s.11B(3) of the Act and while I consider the release of the exempt material would promote the objects of the Act and may add to debate on a matter of public importance. I do not consider that this material would promote effective oversight of public expenditure and would not facilitate you accessing your own personal information.

Factors weighing against disclosure

The Australian Information Commissioner has issued Guidelines that contain a list of factors weighing against disclosure which must be considered under s.11B(5) of the Act. However, I note that this list is not exhaustive and I may consider any other relevant factors.

I have considered the following factors are relevant to the exempt material in question:

- could reasonably be expected to prejudice security, law enforcement, public health or public safety;
- could reasonably be expected to harm the interests of an individual or group of individuals; and
- could reasonably be expected to prejudice the operations of the agency.

On balance, I am satisfied that release of the conditionally exempt material in the document would be contrary to the public interest and that the document is exempt in part under section 47E(d) of the FOI Act.

Having reached that view, s.22(2) of the FOI Act requires me to provide you with an edited copy of the document, with the exempt information deleted under s.22(1)(b).

Shannon Bevan
Authorised decision maker
FOI and Privacy Policy Section
Ministerial, Executive and External Accountability Branch
Department of Immigration and Border Protection
Telephone 02 6264 4667
Email foi@immi.gov.au

24 July 2014

Attachment B

SCHEDULE OF DOCUMENTS TO DECISION RECORD

FOI Request FA 14/04/01092
File Number ADF2014/14115

1. Nauru Regional Processing Centre – Environmental Due Diligence Report

Folio	Description	Decision	Legislation
1-5		Release in Full	
6-10	Pages 2 to 6 of the Environmental Due Diligence Report	Exempt in Part	s.47E(d)
11	Page 7 of the Environmental Due Diligence Report	Exempt in Full	s.47E(d)
12-62		Release in Full	

Attachment C – Extract of relevant legislation

47E Public interest conditional exemptions—certain operations of agencies

A document is conditionally exempt if its disclosure under this Act would, or could reasonably be expected to, do any of the following:

(a) prejudice the effectiveness of procedures or methods for the conduct of tests, examinations or audits by an agency;

(b) prejudice the attainment of the objects of particular tests, examinations or audits conducted or to be conducted by an agency;

(c) have a substantial adverse effect on the management or assessment of personnel by the Commonwealth, by Norfolk Island or by an agency;

(d) have a substantial adverse effect on the proper and efficient conduct of the operations of an agency.

Note: Access must generally be given to a conditionally exempt document unless it would be contrary to the public interest (see section 11A).

Department of Immigration and Citizenship

Nauru Regional Processing Centre

ENVIRONMENTAL DUE DILIGENCE REPORT

BA24413 | 15 November 2012

Revision 1

SINCLAIR KNIGHT MERZ

SKM

Nauru Regional Processing Centre
Environmental Due Diligence Report

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Contents

1. Introduction

1.1 Purpose

This Environmental Due Diligence Report has been prepared by Sinclair Knight Merz (SKM) on behalf of the Department of Immigration and Citizenship (DIAC) to outline the potential key environmental risks associated with the establishment and operation of the Nauru Regional Processing Centres (the project). An overview of applicable statutory requirements has also been provided along with recommended environmental controls and management strategies to be incorporated into the design, construction and operational phases of the project to mitigate key environmental risks.

1.2 Scope

This Environmental Due Diligence Report is based on details of the project and proposed site development contained in the 5% Master Plan Report prepared by SKM and dated 26 September 2012.

This Environmental Due Diligence Report considers only the following sites:

- Topside Site;
- Black Soil Site; and
- Staff Housing Site.

In addition to these sites, it is understood that ancillary infrastructure may be required in the vicinity of the existing desalination plant located on the western side of the island, including potentially within the adjacent harbour. The existing desalination plant site and adjacent harbour have not been assessed in detail in this due diligence report as insufficient detail is available in relation to the exact location of infrastructure proposed. Where possible, consideration has been given to the environmental risks associated with the type of infrastructure proposed.

The environmental risks identified in this report are based solely on the outcomes of desktop investigations and preliminary site observations. Detailed environmental site investigations have not been undertaken at the time of preparing this report.

An environmental risk matrix has been developed for this project separate to this due diligence report and will need to be continually updated as the design progresses and further information becomes available in relation to site characteristics and environmental risks associated with the project.

2. Project Overview

The Nauru Regional Processing Centre (the project) is proposed to comprise re-development and development of three sites, to accommodate:

- s. 47E(d) immigration processing centre for Adult Single Males at the existing 'Topside' site (upon which temporary facilities are now established and operating);
- s. 47E(d) immigration processing centre for Women, Children and Families and Unaccompanied Minors (UCM), at a site identified as 'Black Soil';
- Facilities for staff accommodation for s. 47E(d) at the 'Staff Housing' site; and
- Ancillary service infrastructure associated with the above facilities.

2.1 Topside Site

Facilities proposed for the Topside site include:

- Accommodation for Single Adult Males s. 47E(d), accommodated as follows:
  - o s. 47E(d) accommodated in double rooms (approximately 14 square metres (m^2));
  - o s. 47E(d) accommodated in single rooms (management units for non-compliant clients);
- Ablution facilities (1 WC per 10 persons, 1 shower per 10 persons, 1 tap per 10 persons) and laundry facilities co-located with accommodation;
- Central dining facility s. 47E(d). Servery direct from kitchen preparation facility;
- Kitchen and associated freezer, cool store and dry store facilities, design criteria s. 47E(d) meals per day covering two meals which are lunch and dinner at s. 47E(d) each and s. 47E(d) breakfast meals to the hospital and prison (hot-boxes), and s. 47E(d) provisioning;
- Gate house;
- Receiving, interview and properties facility;
- Medical and mental health centre; and
- Internal roads, vehicle parking and loading / unloading facilities for service vehicles.

Existing facilities will be reused where warranted based on condition and suitability for adaptation. Construction will be staged and will need to maintain client numbers currently accommodated at this site.

Some vegetation clearing and minor earthworks will be required at this site, particularly around the outer perimeter of the project site in close proximity to the escarpment. No upgrade to existing access roads is proposed for this site.

Rainwater harvesting from building roofs is proposed with reticulation for non-potable purposes in toilet flushing and washing machines. Potable water will be supplied to this site via water tankers from the new desalination plant. Approximately s. 47E(d) or the equivalent of s. 47E(d) of demand for potable water will be contained in storage tanks to be installed at this site, including s. 47E(d) existing tanks and s. 47E(d) tanks. It is proposed that MDPE pipework will be installed for water reticulation within the site.

An ABCO Water Systems – Sewage Treatment Plant (STP) with a design treatment capacity of s. 47E(d) has been installed at the Topside site to service the temporary facilities. However, it is anticipated that this STP will provide adequate capacity to service the ultimate development of the site. Raw sewage will be treated to Class C recycled water standard (Queensland Recycled Water Guidelines, 2008). Treated effluent will be stored in small buffer tanks prior to being disposed of via irrigation within adjacent vegetated areas. It is proposed that HDPE pipework will be installed for sewage reticulation within the site.

A grease trap will be installed adjacent to the production kitchen to separate fats, oils and grease from the waste stream prior to discharge to the STP in order to maintain effective functioning of the treatment plant. The grease trap will be emptied periodically for disposal off-site.

Power supply to this site will be achieved via the installation of three, generator sets, with provision for a fourth generator set to be installed should air conditioning be provided to the site accommodation. Two, s. 47E(d) diesel storage tanks complying with AS/NZS 1940: 2004 will be installed to provide storage for approximately s. 47E(d) of estimated usage for the s. 47E(d) initial generator sets. Provision has been made for an additional s. 47E(d) diesel storage tank should the fourth generator set be installed. One, s. 47E(d) self-bunded storage tank complying with AS/NZS 1940: 2004 will be provided for the storage of s. 47E(d) of lubricating oil required to service the generators.

2.2 Black Soil Site

Facilities proposed for the Black Soil site include:

- Accommodation for Women, Children, Families and Unaccompanied Minors (UCM), including provision for:
  - o s. 47E(d) - women/children/families;
  - o s. 47E(d) – UCM;
- Accommodation to consist of single level two/three bedroom en-suited accommodation (approximately 36 m^2) with separate living space. Self-contained cooking facilities included for all clients;
- Laundry facilities;
- Administration / gate house;
- Receiving, interview and properties facility;
- Warehousing for storage and despatch of food supplies;
- Medical and mental health centre (small);
- Internal roads and vehicle parking.

This site will require substantial earthworks to achieve suitable building platforms. Vegetation clearing will also be required on this site.

Access to this site is currently achieved via a gravel track, which runs through the operational phosphate mining area. This access road will require some upgrading and re-routing to connect directly onto the main island road and avoid the operational phosphate mining area. Further topographic survey and geotechnical investigations are required to finalise the preferred alignment of the access road.

Rainwater harvesting from building roofs is proposed with reticulation for non-potable purposes in toilet flushing and washing machines. Potable water will be supplied to this site via water tankers from the new desalination plant. Approximately s. 47E(d) or the equivalent of one day of demand for potable water will be contained in a single storage tank to be installed at this site. It is proposed that MDPE pipework will be installed for water reticulation within the site.

A package STP with a design treatment capacity of s. 47E(d) will be installed at this site to treat sewage generated by facilities at both the Black Soil site and Staff Housing site. Raw sewage will be treated to Class C recycled water standard (Queensland Recycled Water Guidelines, 2008). Treated effluent will be stored in small buffer tanks prior to being disposed of via irrigation within adjacent vegetated areas. It is proposed that HDPE pipework will be installed for sewage reticulation within the site.

Power supply to this site will be achieved via the installation of s. 47E(d), generator sets, with provision for a s. 47E(d) generator set to be installed should air conditioning be provided to the site accommodation. Two, s. 47E(d) diesel storage tanks complying with AS/NZS 1940: 2004 will be installed to provide storage for approximately eight weeks of estimated usage for the three initial generator sets. Provision has been made for an additional s. 47E(d) diesel storage tank should the s. 47E(d) generator set be installed. One, s. 47E(d) self-bunded storage tank

complying with AS/NZS 1940: 2004 will be provided for the storage of s. 47E(d) of lubricating oil required to service the generators.

2.3 Staff Housing Site

Facilities proposed for the Staff Housing site include:

- Staff accommodation for approximately s. 47E(d) persons consisting of one-person, bed-sit style accommodation (approximately 18 m^2) in two and three level accommodation blocks;
- Community kitchens and lounge; and
- Car parking.

Some vegetation clearing and minor earthworks will be required at this site. Given the low-lying nature of the site, it is anticipated that excavation for building foundations and installation of below ground tanks will occur below the water table and therefore dewatering of excavations may be required. No upgrade to existing access roads is proposed for this site.

Rainwater harvesting from building roofs is proposed with reticulation for non-potable purposes in toilet flushing and washing machines. Potable water will be supplied to this site via water tankers from the new desalination plant. Approximately s. 47E(d) or the equivalent of s. 47E(d) of demand for potable water will be contained in storage tanks to be installed at this site. It is proposed that MDPE pipework will be installed for water reticulation within this site.

Sewage generated at this site will be collected via gravity and stored in below ground, precast concrete storage tanks providing a minimum storage capacity of s. 47E(d). Stored sewage will be pumped out daily (approximately 3 trips per day) and transported to the STP at the Black Soil site for treatment and disposal. It is proposed that HDPE pipework will be installed for sewage reticulation within this site.

Power supply to this site will be delivered via connection to the existing Nauruan Electricity Network via an existing overhead power line running past the site. A pad-mounted transformer and underground cabling will be installed to distribute electricity on the site. A s. 47E(d) generator will be installed to provide back-up power supply. A s. 47E(d), self-bunded diesel storage tank complying with AS/NZS 1940: 2004 will be installed to provide storage for approximately s. 47E(d) of estimated usage. Small drums of lubricating oil may be stored on site to service the back-up generator.

2.4 Desalination Plant Site

As noted above, it is anticipated that significant ancillary infrastructure may be required in the vicinity of the existing desalination plant located on the western side of the island, including potentially within the adjacent harbour. Infrastructure proposed for these areas may include:

- A new s. 47E(d) package desalination plant;
- A new 150mm dia. HDPE raw seawater intake pipeline (approximately 100 metres length) with two submersible pumps;
- A new 110mm dia. HDPE brine and residuals discharge gravity pipeline (approximately 100 metres length);
- Approximately s. 47E(d) potable water storage tanks;
- A hardstand with localised bunding and controlled drainage system to enable filling of potable water tankers for delivery to project sites and unloading of diesel for refuelling generators providing power supply to the desalination plant;
- s. 47E(d), generator sets providing power supply to the desalination plant; and

- s. 47E(d) storage capacity for diesel fuel (approx. s. 47E(d)) and lubricating oil (approx. s. 47E(d)) for the desalination plant generators.

3. Site Overview

3.1 Site Description

Nauru is surrounded by a coral reef, exposed at low tide and dotted with pinnacles. The island has a fertile coastal strip ranging from 150-300 metres wide. Coral cliffs surround the central plateau. The highest point of the plateau is 65 metres above sea level (http://www.un.int/nauru/countryprofile.html).

Phosphate mining in the central plateau of Nauru has left a barren terrain of jagged coral pinnacles, up to 15 metres high. A century of mining has stripped eighty percent of the land area.

The location of the three project sites is shown on **Figure 3.1.** A general description of these three sites is provided below:

3.1.1 Topside Site

The Topside site is located approximately 1.5 km from Aiwo (the main island township) and just off the main mine access road. It is a plateau type area approximately 300 x 100 metres, surrounded by significant drop-offs into the previously mined area that has left limestone pinnacles.

The site contains a number of existing buildings that have been refurbished and converted to use as office/medical/administration area, kitchen and mess facilities, ablutions and recreational facilities for the temporary processing centre facility. The site also currently contains tented accommodation as a temporary facility to house some s. 47E(d).

3.1.2 Black Soil Site

The Black Soil site is an undulating plateau area comprising approximately six hectares, which is located approximately 1 km north of the main mine site area and some 4 km from the Topside site. The site has a good coverage of topsoil with scrubby vegetation and some trees. The central area of approximately 1,000 m^2 has been cleared and there are no visible pinnacles. It is accessed via a track that runs through the mine site crusher area.

The site rises approximately five metres in the south western corner and drops off approximately 10-15 metres to the north and north eastern corner. There are also large mounds of old soil stockpiles situated in the middle of the site.

3.1.3 Staff Housing Site

The Staff Housing site comprises a flat, vacant area of approximately 10,000 m^2 on the eastern side of the island. The site is separated from the beach by the main island circle road. The site is covered with scrubby vegetation and some trees at the eastern side of the site where it slopes sharply upwards to some pinnacles.

s. 47E(d)

3.2 Current Land Use

At present there is only limited use of land on Nauru for cultivation. Agricultural production is limited to some local gardens producing coconuts, papaya and vegetables along with pigs and chickens for local consumption (Morrison et al, 2005).

As nearly all settlement is located within the ribbon of housing and small businesses on the outer edge of the island, all of Nauru is officially designated 'urban' (Unicef, 2005).

Phosphate mining has recommenced and rehabilitation is progressing slowly. A four kilometre long, narrow-gauge rail system for transporting the mined phosphate links a tip head located near the middle of the Topside area to the phosphate refinery situated in Aiwo (Republic of Nauru, 2004).

About 60 per cent of the total surface of the island comprises jagged coral pinnacles that became in-filled with phosphate-bearing deposits over many thousands of years (refer to **Figure 3.2**).

The mining of these deposits has left a desolate 'moonscape' of pinnacles that is unsuitable for habitation or cultivation (Unicef, 2005). No utilisation of these areas is made apart from small areas flattened for a sports field, landfill, and temporary housing (Morrison et al, 2005).

Figure 3.2: Example of coral-limestone pinnacles at the Topside site (Source: http://cache.virtualtourist.com/4/3452340-Coral_pinnacles_of_the_interior_Nauru.jpg)

3.3 Historical Land Use

The Topside site was historically used for phosphate mining, which occurred from 1907 through to resource exhaustion in the early 1990s. In 2006, deeper phosphate reserves were found on the island and phosphate mining therefore remains an important part of Nauru's economy (refer to **Figure 3.3**) (About.com Geography, 2012).

Figure 3.3: Mining in Nauru (Source: http://www.raisethehammer.org/static/images/phosphate_mining.jpg)

A recent study indicated that Nauru's phosphate originated not from bird guano but rather from equatorial upwelling of nutrient-rich ocean water during periods of submergence of the island during repeated climate or eustatic cycles given that the magnesium contained in Nauru's dolomitic limestone could only have originated from deep sea upwelling (Nauru Rehabilitation Corporation (NRC), 2010).

During World War II, Nauru was almost continuously bombed. Beginning in 1940, five phosphate vessels were sunk off Nauru and the island shelled by German warships. Nauru was again bombed by Japanese planes in 1941 and 1942 prior to Japanese occupation of the island. After a Japanese military airstrip was completed in 1943, the island was bombed almost continuously by Allied planes for a period of 2 years (Republic of Nauru, 1996).

Diesel generators have been the traditional source of electrical energy for Nauru since the establishment of the mining activities. The whole population on Nauru has access to electricity and there are a number of standalone generators that are used for standby purpose (Republic of Nauru, 2004). The Travel Report – Nauru Site Visit – 2-5 September 2012 (SKM, 2012) indicates that Nauru currently has four generators and one containerised back-up generator.

The Nauru Phosphate Corporation (NPC) is wholly government-owned and is the sole power provider on Nauru. The NPC operates and maintains the power station. The power station itself runs on imported oil (Republic of Nauru, 2004).

3.4 Zoning

The NRC Land Use Plan identifies the designation of certain uses of rehabilitated mined out phosphate lands on Nauru. According to (NRC, 2012), the Land Use was presented to the Government on 18 December 2000 for

approval. On 12 February 2001 the Government approved the Land Use Plan for presentation to the community in order to obtain feedback from the landowners on the proposed Land Use Plan and to identify related issues. NRC's ultimate goal was to obtain the landowners' agreement on the Land Use Plan and access to the worked out phosphate lands for rehabilitation work. The current status of the Land Use Plan is unknown at this time, however it is not believed to have any statutory effect. Nevertheless, the Land Use Plan prepared by NRC does provide some indication of how land in the vicinity of the project sites may be used in the future and what land uses were considered appropriate by NRC for the project sites themselves.

The Land Use Plan identifies the following 11 zones as illustrated on **Figure 3.4**.

- Residential Zones ('orange')
- Agro-forestry Zones ('lime green')
- Conservation Areas ('lilac'), including:
    - Buada Lagoon
    - East Coast Escarpment (Anibare-Ijuw)
    - West Coast Escarpment (Nibok-Ewa)
    - Command Ridge and Railway
    - Restored Topside Tomano Forest
- Industrial Zone ('yellow')
- Water Reservoir ('purple')
- Cemetery ('pink')
- Sports and Recreation ('red')
- Government Complex ('light blue')
- Education Complex ('light green')
- Roads
- Uncommitted Use Lands

According to the proposed Land Use Plan provided by NRC:

- Topside site is within a sports and recreation area ('red');
- Staff Housing site is in a conservation area (east coast escarpment) ('lilac'); and
- Black soil site is in an uncommitted use area.

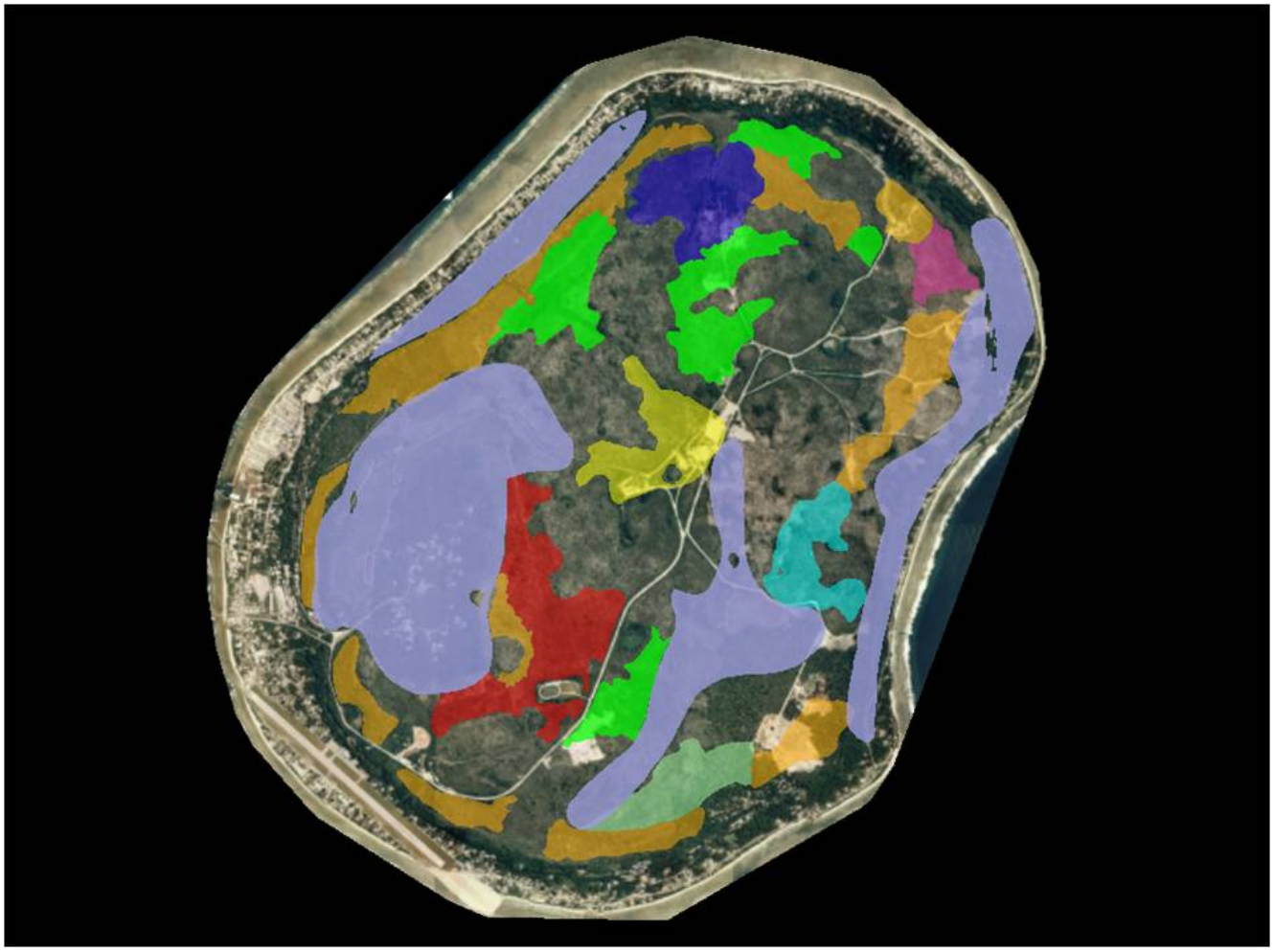

Figure 3.4: NRC Land Use Plan 2000 (Source: http://www.nrurehab.org/contact-us.php)

4. Statutory Frameworks

A detailed analysis of statutory and non-statutory requirements applicable to the project in relation to environmental and planning matters has not been completed. A preliminary review has however identified that a range of international and Pacific regional treaties and agreements, and a range of legislation administered by the Australian Government and Republic of Nauru are likely to have some applicability to the project. A brief summary of potentially relevant treaties, agreements and legislation identified to date is provided in the following sections.

4.1 International Agreements

According to the *National Environmental Management Strategy* (Republic of Nauru, 1996) there are at least twelve international treaties, agreements and conventions that relate to environmental issues to which the Republic of Nauru is signatory.

The following international and regional treaties and agreements have been identified as relevant to the project at this stage:

- *Convention to Ban the Importation into Forum Island Countries of Hazardous and Radioactive Wastes and to Control the Transboundary Movement and Management of Hazardous Wastes within the South Pacific Region* (the 'Waigani Convention') – both the Australian Government and the Republic of Nauru are parties to the Waigani Convention.
- *Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal* (the 'Basel Convention') - Nauru became an accession state to the Convention on 12 November 2001. Australia became a signatory to the Basel Convention in 1992.
- *Pacific Regional Solid Waste Management Strategy 2010-2015* - prescribes actions for the Secretariat of the Pacific Regional Environment Programme (SPREP) and SPREP member countries and territories including Nauru and Australia.

Each of these agreements is discussed below.

4.1.1 Waigani Convention

The *Convention to Ban the Importation into Forum Island Countries of Hazardous and Radioactive Wastes and to Control the Transboundary Movement and Management of Hazardous Wastes within the South Pacific Region* (the 'Waigani Convention') opened for signature in Waigani, Papua New Guinea in 1995 and came into force in 2001. SPREP (Secretariat of the Pacific Regional Environment Programme) serves as the Convention's Secretariat while the Secretary General of the Pacific Islands Forum Secretariat serves as Depositary.

There are 13 Parties to the Convention: Australia, Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Nauru, New Zealand, Niue, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu. France, Marshall Islands, United Kingdom and the United States are eligible to join the convention but have not yet done so. Palau signed the convention in 1995 but has yet to ratify.

The Convention is designed to:

- Reduce or eliminate transboundary movements of hazardous and radioactive wastes into and within the Pacific Forum region;
- Minimise the production of hazardous and toxic wastes in the Pacific Forum region;
- Ensure that disposal of wastes is done in an environmentally sound manner and as close to the source as possible; and
- Assist Pacific island countries that are Parties to the Convention in the environmentally sound management of hazardous and other wastes they generate.

The Waigani Convention is a multi-lateral agreement under Article 11 of the Basel Convention (see below). The Waigani Convention bans hazardous waste imports to Forum Island Countries and in addition to the waste types controlled under the Basel Convention, the Waigani Convention includes radioactive wastes that are under the jurisdiction of the International Atomic Energy Agency. The waste types that are listed as Y46 (household waste) and Y47 (residues from the incineration of household waste) under the Basel Convention are defined as hazardous wastes for the purposes of the Waigani Convention. These wastes should not be imported into Nauru and their export should be reported to the Convention's secretariat.

Wastes controlled under the Waigani Convention can be exported from Forum Island Countries to Australia or New Zealand for treatment and/or disposal.

States which are Parties to the Basel Convention must not trade in hazardous wastes with non-Parties to the Convention, unless an Agreement is put in place in accordance with Article 11 of the Basel Convention.

Of specific relevance to the project, under the Waigani Convention, the disposal of wastes should be undertaken in an environmentally sound manner and as close to the source as possible. However, wastes can be exported to Australia or New Zealand for treatment and/or disposal. Any import or export of wastes controlled under the Convention should take place in accordance with the appropriate prior notification procedures as specified in the Basel Convention. Movements of wastes into or from Nauru should be recorded and reported to the Convention's secretariat.

4.1.2 Basel Convention

The *Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal* (the 'Basel Convention') seeks to reduce the volume of hazardous waste produced and its associated environmental impacts. The Convention adopts a system of 'prior informed consent' notification for hazardous waste import/exports.

Annual reports detailing the amount of wastes controlled under the Convention that are imported and exported along with their disposal or treatment fates are required to be submitted by signatory nations to the signatory nations.

Nauru became an accession state to the Convention on 12 November 2001. Australia became a signatory to the Basel Convention in 1992.

The Basel Convention defines:

- Hazardous waste classification, including hazardous properties;
- Recovery and disposal methods (Annex IV); and
- Categorisation for activities that have given rise to the waste.

Signatory nations are required to report in-country activities to reduce hazardous and non hazardous waste volumes, details of disposal and recovery facilities (including capacity), measures to implement the Convention, including information on:

- Exports and imports for hazardous and other wastes including:
    - Amount exported/imported
    - Waste category
    - Hazardous characteristics

- Disposal methods
- Country of transit
- Country of destination
- Final disposal operation (D code)
- Recovery operation (R code)

- Definitions of wastes, hazardous waste, other wastes;
- Control procedures for transboundary movements;
- Activities to reduce or eliminate hazardous and other waste; and
- Disposal or recovery facilities operated.

The Nauru Government does not report directly to the Basel Convention's Secretariat in respect of wastes that are controlled under the Basel Convention. This reporting is achieved through the activities of the Secretariat of the Waigani Convention.

In Australia, the Basel Convention is implemented by the *Hazardous Waste (Regulation of Exports and Imports) Act 1989* and the *Hazardous Waste (Regulation of Exports and Imports) Regulations 1996*.

Of specific relevance to the project:

- The Nauru Government does not have direct obligations under the Basel Convention. However, the Basel Convention is the principal reference document for the Waigani Convention.
- The Australian Government does have direct obligations under the Basel Convention (see the discussion of the *Hazardous Waste (Regulation of Exports and Imports) Act 1989*).

4.1.3 Pacific Regional Solid Waste Management Strategy 2010-2015

The *Pacific Regional Solid Waste Management Strategy 2010-2015* is the region's guiding strategy for solid waste management, whose implementation is coordinated by SPREP. It prescribes actions for SPREP and SPREP member countries and territories including Nauru. It addresses nine priority areas: sustainable financing; integrated solid waste management; legislation; awareness, communication and education; capacity building; environmental monitoring; policy, planning and performance; solid waste industry; and medical waste.

Of these areas, Nauru has identified three high priorities:

1. Integrated Solid Waste Management.
2. Legislation; and
3. Policy, Planning & Performance.

The Nauru Waste Management Strategy should be closely aligned with the Regional Strategy by aligning relevant strategies and high-level actions.

In response to the *Pacific Regional Solid Waste Management Strategy 2010-2015*, the draft Republic of Nauru *National Solid Waste Management Strategy 2011-2020* seeks to:

1. To reduce environmental pollution from the generation and disposal of solid waste

2. To increase economic benefits and efficiency by reusing and recycling wastes where possible
3. To reduce the costs to society of managing waste through efficient and responsible management and equitable distribution of costs.

Further consideration of the draft *National Solid Waste Management Strategy 2011-2020* is given in Section 10.2.

4.2 Australian Government

4.2.1 Environmental Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Australian Government's key environmental legislation which was promulgated on 16 July 2000. Under the EPBC Act, actions that have, or are likely to have, a significant impact on a matter of national environmental significance (MNES) require approval from the Australian Government Minister for Sustainability, Environment, Water, Population and Communities (the Minister). The Minister will decide whether assessment and approval is required under the EPBC Act. The EPBC Act is administered by the Australian Government Department of Sustainability, Environment, Water, Population and Communities (SEWPaC).

The eight matters of national environmental significance are:

- world heritage properties
- national heritage places
- wetlands of international importance (listed under the Ramsar Convention)
- listed threatened species and ecological communities
- migratory species protected under international agreements
- Commonwealth marine areas
- the Great Barrier Reef Marine Park
- nuclear actions (including uranium mines)

In relation to the project, desktop investigations have indicated that a number of Threatened Species, Migratory Species and Marine Species listed under the EPBC Act are likely to occur on or around Nauru. A summary of species identified during desktop assessments and their current status under the EPBC Act is provided in **Table 4.1**.

Table 4.1: Species listed under EPBC Act potentially occurring on Nauru

Scientific Name	Common Name	EBPC Status
Birds		
Acrocephalus rehsei	Nauru Reed Warbler	Not Listed
Numenius tahitiensis	Bristle-thighed Curlew	Not Listed
Ducula oceanica	Micronesian Imperial Pigeon	Not Listed
Reptiles		
Pelamis platurus	Yellow-bellied Seasnake	Marine
Chelonia mydas	Green Turtle	Vulnerable, Marine, Migratory(Bonn)

Scientific Name	Common Name	EBPC Status
Eretmochelys imbricata	Hawksbill Turtle	Vulnerable, Marine Migratory(Bonn)
Fish		
Katsuwonus pelamis	Tuna	Not Listed
Thunnus albacores	Tuna	Not Listed
Elagatis bipinnulata	Rainbow Runners	Not Listed
Mammals		
Feresa attenuata	Pygmy Killer Whale	Cetacean
Mesoplodon densirostris	Blainville's Beaked Whale	Cetacean
Mesoplodon ginkgodens	Ginkgo Toothed Beaked Whale	Cetacean
Lagenodelphis hosei	Fraser's Dolphin	Cetacean; Migratory(Bonn)
Balaenoptera edeni	Bryde's Whale	Cetacean; Migratory(Bonn)
Physeter catodon	Sperm Whale	Cetacean; Migratory(Bonn)
Ziphius cavirostris	Cuvier's Beaked Whale	Cetacean

In addition to regulating actions likely to have a significant impact on MNES, the EPBC Act confers jurisdiction over actions that are *likely* to have a significant impact on the environment where the actions affect, or are taken on, Commonwealth land, or **are carried out by a Commonwealth agency (even if that significant impact is not on one of the eight matters of 'national environmental significance') anywhere in the world** (section 28 of the EPBC Act).

A 'significant impact' is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts. Consideration should be given to all of these factors when determining whether an action is likely to have a significant impact on the environment.

'Actions' of the Commonwealth (whether inside or outside the Australia) that will have, or are likely to have, a 'significant impact' on the environment are prohibited except in certain circumstances, including if an approval is obtained from the Minister under Part 9 of the Act (s 28). Such actions should be referred to the Minister for a decision on whether assessment and approval is required under the EPBC Act. 'Action' is broadly defined in the EPBC Act and includes construction projects and developments (s 523).

To be 'likely', it is **not** necessary for a significant impact to have a greater than 50 per cent chance of happening; it is sufficient if a significant impact on the environment is a **real or not remote** chance or possibility. If there is scientific uncertainty about the impacts of your action and potential impacts are serious or irreversible, the precautionary principle is applicable. Accordingly, a lack of scientific certainty about the potential impacts of an action will not itself justify a decision that the action is not likely to have a significant impact on the environment.

The preliminary advice of the Australian Government Solicitor (AGS) is that the works which are the subject of the project could be an action which requires approval under the EPBC Act. The AGS recommends that DIAC considers the issue further and in consultation with SKM, considers whether a referral should be made to the Australian Government Minister for the Environment.

Rather than submission of a referral for consideration of the project under the Act, DIAC may apply to the Minister for an exemption under the Act. The following exemptions are identified in the Act.

Environmental Impact Assessments

Under s158 of the Act, the Minister may exempt a person proposing to take an action from the requirement to conduct an environmental assessment and/or obtain approval in relation to the action to which the exemption relates. Under s158, the Minister may exempt a person from any or all steps in the assessment and approvals process. However, the Minister may only grant an exemption under s158 if satisfied that it is in the national interest to do so.

Listed Species and Ecological Communities Permits

Under chapter 5, part 13, division 8, section 303a of the Act the Minister may exempt a person proposing to undertake an action from the requirement to seek permits under Part 13 of the Act in relation to the action to which the exemption relates. Part 13 of the Act, among other things, prohibits the killing, injuring, taking, trading, keeping or moving listed threatened species or ecological communities, listed migratory species, cetaceans, or listed marine species in or on a Commonwealth area. The Minister may specify that any or all prohibitions in Part 13 do not apply to a person in relation to an action to which an exemption relates. However, the Minister may only grant an exemption under s303A if satisfied that it is in the national interest to do so.

National Emergencies

Under ss28(3) the Minister may make a declaration to exempt actions that are necessary for Australia's defence or security or in relation to preventing, mitigating or dealing with a national emergency.

Commonwealth Agencies

Under ss28(4) and ss28(5), the Minister may make a declaration that actions or a class of actions to be undertaken by a Commonwealth agency are exempt from assessment and approval processes. However, the Minister must be satisfied that the Commonwealth agency will comply with state/territory environment protection laws when undertaking the action or class of actions to which the declaration applies.

4.2.2 Hazardous Waste (Regulation of Exports and Imports) Act 1989

Australia may legally import waste from Nauru in accordance with both the Waigani and Basel Conventions. The Australian Government implements the Basel Convention (and thereby the Waigani Convention) through the *Hazardous Waste (Regulation of Exports and Imports) Act 1989* and its amendments, and the associated *Hazardous Waste (Regulation of Exports and Imports) Regulations 1996*. The object of the Act and regulations is to regulate the export, import and transit of hazardous waste to ensure that exported, imported or transited waste is managed in an environmentally sound manner so that human beings and the environment, both within and outside Australia, are protected from the harmful effects of the waste.

The aims of the *Hazardous Waste (Regulation of Exports and Imports) Act 1989* are:

a) To give effect to the Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal; and

b) To give effect to agreements and arrangements of the kind mentioned in Article 11 of the Basel Convention (i.e. bilateral, multilateral and regional agreements and arrangements – e.g. the Waigani Convention).

The Act defines waste as a substance or object that:

a) Is proposed to be disposed of; or

b) Is disposed of; or

c) Is required by a law of the Commonwealth, a State or a Territory to be disposed of.

Under the Act, disposal means an operation specified in Annex IV of the Basel Convention, which includes:

a) Operations which do not lead to the possibility of resource recovery, recycling, reclamation, direct re-use or alternative uses; and

b) Operations which may lead to resource recovery, recycling, reclamation, direct re-use or alternative uses.

Thus under the Act, 'disposal' effectively covers all of the typical options for disposing of waste (including landfill, and incineration without energy recovery); and treating waste (including re-use, recycling and recovery operations).

Under the Act, hazardous waste means:

a) Waste prescribed by the regulations where the waste has any of the characteristics mentioned in Annex III to the Basel Convention; or

b) Waste covered by paragraph 1(a) of Article 1 of the Basel Convention; or

c) Household waste; or

d) Residues arising from the incineration of household waste.

The Act does not include wastes covered by paragraph 4 of Article 1 of the Basel Convention (i.e. waste from ships).

In addition, section 4A of the Act provides for an extended meaning of hazardous waste in respect of the following:

a) A case where a foreign country has classified a particular substance or object as hazardous waste; and

b) A case where a foreign country has classified waste collected from households as hazardous waste.

Section 4F of the Act also provides for an extended meaning of hazardous waste where this relates to substances or objects subject to notification or control under Article 11 arrangements (i.e. bilateral, multilateral and regional agreements and arrangements).

Thus the Act explicitly includes a wider range of wastes than are directly mandated as hazardous wastes under the Basel Convention, in that the Act specifies household waste and the residues of incineration of household waste as hazardous wastes; whereas the Basel Convention lists wastes from these sources in Annex II as 'wastes requiring special consideration'.

In respect of international movements of hazardous wastes (as defined under the Act), the Australian Government (via SEWPaC) administers a notification and permit system under the Act and regulations for waste imports, exports and movements. The permit arrangement provides a direct source of information on international movements of hazardous waste for reporting purposes under the Basel Convention.

The provisions of this Act may have some bearing on the project should wastes be transported from Nauru to Australia for disposal. In considering waste management options for the project, it is noted that Australia may legally import waste from Nauru in accordance with both the Waigani and Basel Conventions. The Australian Government implements the Basel Convention (and thereby the Waigani Convention) through the *Hazardous Waste (Regulation of Exports and Imports) Act 1989* and its amendments, and the associated *Hazardous Waste (Regulation of Exports and Imports) Regulations 1996*.

4.3 Nauru Government

The *National Environmental Management Strategy* (Republic of Nauru, 1996) provides an overview of environmental legislation in Nauru. At the time of publication of the strategy, legislation related to environmental issues was included in at least seven different Ordinances and Acts. At least twelve international treaties, agreements and conventions that relate to environmental issues to which the Republic of Nauru is signatory were also identified.

The Ordinances and Acts that have relevance for addressing environmental issues are concerned with:

- the conservation of Nauruan antiquities,
- wild bird preservation,
- public health and sanitation,
- clearing of leased land and its rehabilitation,
- marine resource management,
- import restrictions on certain animal species, and
- littering.

The identified legislation appears to be of limited relevance to management of historical contamination/pollution, pollution prevention and environmental management more broadly. According to Republic of Nauru (1996), there is limited formal integration of environmental considerations into the policy making and development planning processes and only limited environmental management capacity.

Under the *Nauru National Environmental Action Plan* (Republic of Nauru, 1996), an objective and program was proposed to strengthen environmental institutions and legislation, including:

- the establishment of a Nauru Environmental Coordinating Committee;
- adoption of the environmental impact assessment (EIA) process;
- development of a land use planning system;
- land tenure reform;
- conducting relevant environmental baseline studies;
- establishment of a Nauru Environmental Information System;
- review and enforcement of existing legislation; and
- enactment of new environmental legislation.

A *Review of Environment Related Laws - Government of Nauru* (SPREP, undated) was reviewed as part of this environmental assessment. However, the current status of environmental requirements and legislation is not clear based on available information. Nevertheless, the following Nauruan legislation has been considered in determining relevance to the project.

4.3.1 Antiquities Act 1935

The *Nauru Antiquities Ordinance* 1935 relates to 'Nauru antiquities, relics, curios and articles of ethnological and anthropological interest of scientific value'. 'Nauru antiquities' includes 'Nauru relics and curios and articles of **ethnological and anthropological interest** or value and articles **manufactured by the natives according to Nauru methods** and **historical remains of any description**, and such other articles or things of **historical or scientific value** or interest and relating to Nauru as may be prescribed.'

The key aspect of the legislation relates to the discovery of heritage items and protection of these items from damage. Section 8 requires that discoveries of antiquities be reported:

1. Any person who discovers or has good reason to believe that there exists in any locality:
   i. Caves or other places in which ancient remains, human or other are to be found; or
   ii. Representations on rocks or in caves of living beings or inanimate objects; or
   iii. Deposits of historical remains of any description; or
   iv. Places used in former times as ceremonial or initiation grounds,

   shall immediately inform the Officer in Charge of Police of the discovery or reputed existence of such places or objects.
2. Such places or objects shall not be defaced, damaged, uncovered or excavated or otherwise interfered without the written permission of the Administrator who will, if he thinks fit, appoint a suitable person to supervise any excavations.

In accordance with the *Nauru Antiquities Act 1935,* the discovery of 'Nauru antiquities' during construction may require the works to cease in order to report the site to the Nauru Administrator and obtain permission for its destruction or removal.

4.3.2 Agricultural Quarantine Act 1999

This Act provides for the protection of plants, animals and public health and the protection, development and utilisation of natural resources and the environment by preventing the introduction and further spread of injurious diseases and pests and seeks to provide procedures and facilities for services to ensure the safe movement of plants and animals into, out of and within the Republic and to extend obligatory international co-operation in the prevention of the movement of diseases and pests in international trade and traffic; and for related purposes.

The powers and duties imposed by this Act do not affect any powers and duties imposed by the *Quarantine Act* 1908-1920 of the Commonwealth of Australia (adopted) in relation to matters of human health and quarantine, but where those powers and duties are imposed in relation to matters of animal and plant quarantine, then the provisions of this Act, to the extent that they are in conflict, prevail.

This Act may have some bearing on the project in relation to the importation of goods and materials for construction and operation of the project.

4.3.3 Fisheries Act 1997

An Act to make provision for the management, development, protection and conservation of the fisheries and living marine resources of Nauru, and in particular:

a) to exercise the sovereign rights of the Republic to explore, exploit, conserve and manage those resources within the fisheries waters of Nauru in accordance with the relevant rules of international law; and
b) to utilise, manage, develop, protect and conserve those resources in such a way as to conserve and replenish them as a sustainable asset for future generations, and to achieve economic growth, improved social standards, improved nutritional standards, human resource development, increased employment and sound ecological balance; and
c) to pursue effective strategies for managing the fisheries and marine resources of Nauru, including the registration of fishing boats and the licensing of fishing and fishing activities; and
d) to repeal the *Marine Resources Act 1978*;

Offences under this Act relate to fishing without a licence or in breach of a licence, breach of fishing prohibitions, driftnet fishing, import of illegally taken fish and obstruction of authorised officers or observers. This Act is not anticipated to have any implications for the project.

4.3.4 Lands Act 1976

This Act provides for the leasing of land for the purposes of the phosphate industry and other public purposes, and for the removal of trees, crops, soil and sand and the payment of compensation and other moneys.

The implications of this Act will depend on the arrangements for securing appropriate land tenure for the project being negotiated between the Australian and Nauruan Government. Possible implications may include the payment of compensation for removal of sand and other quarry materials, or removal of certain utilitarian tree species (coconut trees, mango trees, breadfruit trees) specified in the schedules of the Act. It is recommended that DIAC seek advice from the Australian Government Solicitor in relation to requirements under this Act as part of the process of securing tenure for each of the project sites.

4.3.5 Litter Prohibition Act

The *Litter Prohibition Act 1983* prescribes fines for littering offences and empowers district constables to enforce the act. Key aspects of the Act are as follows:

Section 2 of the Act states that subject to Section 7 of the Act, any person who throws down, drops or otherwise deposits in, into or from any place in the open air anything whatsoever in such circumstances as to cause, contribute to, or tend to lead to, the defacement by litter, refuse or rubbish of any kind whatsoever of any place in the open air, unless that depositing and leaving was authorised by law or was authorised by the Minister under Section 6 is guilty of an offence and is liable to a fine of three hundred dollars; and for the purposes of this section any covered place open to the air on at least one side shall be treated as being a place in the open air.

Section 4 of the Act states that any person in whose presence an offence under Section 2 has been committed, unless he has a reason to believe and does believe that the commission of the offence was witnessed by a police officer or has already been reported to the police by some other person, shall, without unnecessary delay report the commission of such offence to the police, and if any person fails to report to the police as aforesaid, they shall be liable to a fine of three hundred dollars.

Section 6 of the Act states that the Minister may, by notice in the Gazette, authorise the depositing and leaving of anything in any place by or with the consent of the occupier or other person or authority having the control of that place if in all the circumstances the depositing of that thing in that place is a reasonable user of that place or a necessary or unavoidable concomitant of a reasonable user of that place.

Section 7 of the Act states that it is not an offence against the provisions of Section 2 for the occupier or any other person or authority having control of any place, or for the Republic or the Council, to deposit and leave on any land:

a) In the case of residential, commercial or industrial premises, such number of properly serviceable dustbins with tight-fitting lids as are reasonably required for the deposit of refuse from those premises;

b) In any place to which the public has access, properly serviceable rubbish bins; or

c) Anything in such a dustbin or rubbish bin.

4.3.6 Wild Birds Preservation Ordinance 1937

This Act prohibits any person from taking or destroying certain bird species or their eggs as specified in the first and second schedules. This includes prohibiting the taking or destroying of Frigate Birds at any time (second schedule). The Act also prohibits the taking or destroying of the following birds and their eggs during the following close seasons:

- between 1 January and 31 December inclusive each year: Magpie, Snipe, Quail, Etsirer or Nauru Canaries; and
- between 1 August and 31 October inclusive each year: White Noddies and Black Noddies.

In order to comply with these requirements, it is recommended that prior to clearing any vegetation an inspection should be carried out by a suitably qualified person to identify the presence of any of the above species or their nests. Any such species or nests present in the clearing area should be removed by a suitably qualified person in consultation with the Nauruan authorities prior to clearing. Any harm caused to any of the above species or their eggs during construction should be reported to the Nauruan authorities as penalties may apply.

4.3.7 National Solid Waste Management Strategy 2011-2020

In its draft *National Solid Waste Management Strategy 2011-2020* the Nauru Government is seeking to adopt a new approach to waste management on the island based on the following guiding principles:

- Polluter-Pay Principle: Those responsible for causing pollution should pay the cost of managing the pollution in order to maintain a healthy environment.
- Precautionary Principle: Lack of scientific data/information certainty should not be used as a reason for not acting to prevent serious or irreversible environmental damage or degradation.
- Proximity Principle: Waste should be dealt with as close as possible to the source of generation. This will reduce transportation costs, and contamination risks.
- Consultation Principle: Government at all levels will consult and work with people and organisations throughout the development and implementation of the waste management strategies and action plan.

The vision for the National Solid Waste Management Strategy is identical to the strategic goal identified in Nauru's *National Sustainable Development Strategy 2005-2025: Effective management of waste and pollution that minimizes negative impacts on public health and environment.* This vision is underpinned by three goals:

1. To reduce environmental pollution from the generation and disposal of solid waste
2. To increase economic benefits and efficiency by reusing and recycling wastes where possible
3. To reduce the costs to society of managing waste through efficient and responsible management and equitable distribution of costs.

The Department of Commerce, Industry and Environment will coordinate the implementation of the National Solid Waste Management Strategy. A multi-stakeholder forum will also be used to provide additional support to periodically review progress and provide feedback.

The above legislative review is not comprehensive and additional requirements may apply to the project. It is recommended that DIAC seek advice from the Australian Government Solicitor to confirm the applicability of international and regional treaties and agreements to which the governments of Australia and / or Nauru are signatories and the applicability of any legislation administered by the Australian Government or Republic of Nauru.

4.4 Recommendations

Based on the above, we recommend that the following actions be undertaken:

- DIAC to seek advice from the Australian Government Solicitor and Nauruan Government in relation to statutory and non-statutory requirements for the project under International, Australian and Nauruan Law;

- DIAC to consult with SEWPaC to confirm requirements for seeking an exemption or approval under the EPBC Act; and
- Any regulatory requirements should be incorporated into the 100% design and subsequent obligations of the construction contractor.

Where Nauruan law does not include any performance standards, guidelines or controls relevant to certain environmental aspects identified in this report, it is recommended that Australian / New Zealand Standards be adopted. For example, in relation to the storage of flammable and combustible liquids associated with the project, compliance with AS/NZS 1940: Storage and handling of flammable and combustible liquids has been recommended.

5. Cultural Heritage

5.1 Existing Environment

5.1.1 Historical Context

A more detailed historical context is provided in **Appendix B** provides a summary of the key historical dates and events for Nauru.

Table 5.1: Summary of key historical dates and events for Nauru

Year	Event
c.2000 years ago	Initial arrive of humans in western Micronesia, and likely Nauru.
1798	First Europeans arrive, naming island Pleasant Island.
1830s	European whalers use Nauru as port of call for food and water.
1888	Nauru becomes German colony. German trading company Jaluit Gessellschaft receives right to explore guano deposits on Nauru but these are not thought to be of great value.
1899	Arrival of first Christian missionaries.
1900	British company discovers phosphate deposits on Ocean Island (Banaba) and Nauru. British Phosphate Commission (BPC) gains rights to mine deposits from Jaluit Gessellschaft.
1907	BPC begins phosphate mining.
1914	Nauru seized from Germany by Australian troops at beginning of WWI and fell under British control. German nationals were removed from the island.
1920	Nauru becomes a mandated territory under the League of Nations and comes under control of Australia, Britain and New Zealand.
December 1940	German raiders disguised as Japanese merchant ships sink four merchant ships waiting off Nauru to load phosphate. German raider shells BPC facilities setting fire to fuel storage bins.
December 1941	Japanese aircraft bomb wireless station on Nauru. Japanese forces advance across Pacific. BPC staff and Australian military garrison evacuate island. 191 BPC workers and 1,850 Nauruans left behind.
August 1942	Japanese forces of 300 land on Nauru, taking Europeans prisoner. Nauruans placed on food rations and made to bow to Japanese. Gun emplacements, bunkers and other facilities established.
January 1943	Airfield runway completed using contingent of 1,500 Japanese and Korean labourers, and conscripted Nauruan and Gilbertese islanders. Japanese attempt to resume phosphate mining but fail.
March 1943	United States military bomb Nauru destroying 15 Japanese aircraft and damaging field installations. Japanese execute five British prisoners in retaliation. US air raids disrupt food supplies to an overcrowded island. Japanese send 1,200 Nauruans and two missionaries to Truk in the Caroline Island. Only 737 Nauruans survive to be repatriated to Nauru.
September 1945	Japanese surrender of Nauru on board the Australian warship HMAS Diamantina. Some 3,745 Japanese and Koreans are repatriated from the island.
1946	Only 737 of the 1,200 Nauruans sent to Truk return to Nauru.
1947	Nauru becomes a United Nations trust territory remaining under Australian, New Zealand and British control.
1967	Nauru gains independence. Nauru purchases assets of BPC.
1970	Nauru Phosphate Corporation established.
1980s	Nauru is one of the wealthiest countries in the world in terms of gross domestic product per capita.

Year	Event
1989	Nauru files suits against Australia in the International Court of Justice for damages caused by mining while the island was under Australian jurisdiction. Out of court settlement for lump sum and annual stipend towards environmental rehabilitation.
1990s	Phosphate deposits becoming exhausted with severe decline in earnings.
2001	Nauru agrees to accept 1,200 asylum seekers who had been intercepted in the Indian Ocean by the Australian Navy. Detention centre constructed on Nauru to house asylum seekers while applications are being processed. Known as the 'Pacific Solution'.
2008	Nauru detention centre closed.

In summary, the key historical themes for Nauru include:

- Arrival and settlement by Micronesian peoples (from approx. 2,000 years ago)
- 19th century German colonial occupation (until WWI)
- Phosphate mining industry (20th century)
- Australian/British occupation (from WWI)
- Japanese occupation (during WWII)
- Australia's immigration policy

5.1.2 Archaeological and Heritage Context

There has been no systematic survey or assessment of heritage sites on Nauru. There is some information on artefacts and sites that have been identified on the island, but locations of these sites are not always clear. There is no known heritage register or database of heritage sites on Nauru.

5.1.3 Prehistory

Nauru is a very small uplifted limestone island with a total area of ~22 km^2 (Specht, 1982:135). Much of the central area of the island has been destroyed by phosphate mining and increasingly intensive occupation and development of the thin coastal strip have likely meant the destruction of much of the island's archaeological deposits. Despite the disturbance and destruction of a significant amount of the island some archaeological material may still remain.

Whilst no systematic archaeological studies have been carried out on Nauru (Rainbird, 2004:241), Lampert (1968) and Specht (1982) have provided brief descriptions of a small number of artefacts and other archaeological material from the island. Ernest Stephen (1936) was marooned on Nauru in the 1870s prior to significant European contact and has provided a description of many aspects of life on the island which are relevant to the archaeological record.

The likely locations of archaeological deposits are difficult to model. Surface finds are reported in Lampert (1968) and Specht (1982), however no indication of the original locations of these surface finds are given. Hambruch (1915) is cited in Specht (1968:141) as describing the original location of artefacts as the 'bush'. Figures are also cited however it is unclear whether these refer to maps or drawings of the artefacts. Stephen (1936:46) describes large (20 ft deep, 6 0 ft wide and up to 90 ft long) quarries at the base of the highlands

which were mined for fossilised shells as these were harder than fresh shells and so made better adzes. These are the only cultural places with any indication of location on the island given.

Due to the geology of the island no stone or suitable clay is available for the manufacture of artefacts (Lampert, 1968:10).Instead shell, coral, bone and other organic materials were used with shell being the most commonly described material (Lampert, 1968; Specht, 1982; Stephen, 1936). Adzes are the most common form of the shell artefacts (refer to **Figure 5.1**). Also described are coconut scrapers, although there appears to be some differences in these, and what is described as a 'cylindro-conical form with a circular cross section' (Specht, 1982:140). Shell artefacts were often flaked into shape and then ground to finalise the shape and working edge (Specht, 1982:135-140). Lampert (1968:14-15) describes a centrally drilled shark tooth likely used in a weapon from Banaba (Ocean Island) and claims that similar weapons are known from Nauru. This is confirmed by Stephen (1936:62). Men's knives were sometimes constructed from human arm and leg bones while women used shark teeth knives.

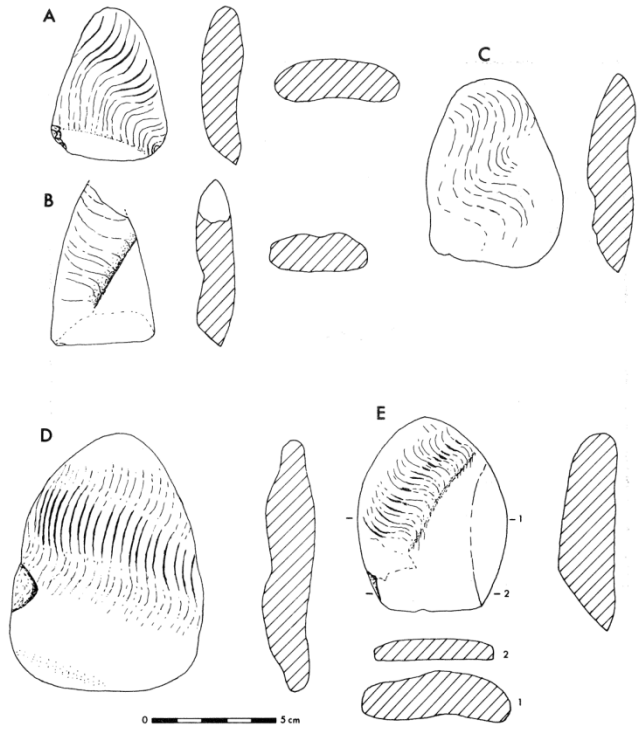

Figure 2. Shell adze blades from Nauru.

Figure 5.1: Shell adze blades from Nauru (Specht, 1982

Fish hooks were sometimes made from the area around the ear of a human skull (Stephen 1936:53). Others were made from mother-of-pearl shell and human bone combined by human hair and tree gum. Wooden hooks were also made.

Excavations on Banaba revealed distinctive human burial practices (Lampert, 1968:10). The burial practices are said to vary but be similar to those known from Nauru (Lampert, 1968:16). Common features noted are postponement of burial, possible embalming, retention of the skull and other bones by relatives and the exhumation of the body at a later stage to acquire more bones. Postponement of burial is implied by the lack of

damage to the vertebrae which indicate that the head was not removed with a cutting edge. Instead the body was allowed to decay and the head removed once the flesh and cartilage had disappeared. Stephen adds detail to this in his description of burial practices (1936:43-44). People could choose whether to be buried on land or at sea. Those who chose to be buried on land were interred on their own property. Important people were buried beneath their hut for approximately one year to allow their bodies to decompose. They were then exhumed and the skull and/or front teeth removed. Headmen were traditionally embalmed by covering them in coconut oil and then smoking the body. This process took about two months and the mummified body was then placed in the loft of the hut.

Ovens were dug out of the ground in a basin shape and were usually 2-3 feet in diameter and 1 foot deep (Stephen, 1936:47). Once a fire was established 'coral rocks' were placed over the top of the oven and once the fire had burnt down and while the rocks were still hot food is placed on them to cook. Ovens should therefore be recognisable as large, circular pits with a concentration of charcoal and possibly burnt coral rock pieces.

During the wet season people would temporarily move inland to harvest and process pandanus fruit (Stephen, 1936:53). A temporary hut would be constructed and an elaborate food processing system, which involved at least one oven, initiated. This indicates that although people spent most of the year close to sea, archaeological remains may be present in undisturbed portions of the interior as well.

5.1.4 Historical Heritage

Only one source identifying historical heritage sites on Nauru has been identified. This was undertaken by Stan Gajda (former curator of the Nauru Military Museum) and identifies extensive remains from Japanese occupation of Nauru during WWII and some rail infrastructure related to phosphate mining. Some of the locations of these are unclear from Gajda's descriptions but a summary is provided in **Appendix B.**

Sites he has identified include the remains of Japanese and American aircraft, gun emplacements and destroyed machine guns, bunkers, remnants of Japanese dwellings, and a wide range of artefacts including ceramic and metal rice bowls, beer bottles, buttons, radio valves, and ammunition. Evidence of early mining is also present including evidence of diggings, shovels, picks and other tools, early railcars and hoppers and railway lines.

5.1.5 Geographic Context

The geographic context of the three proposed project sites was identified using recent satellite imagery and descriptions from site visits by SKM design team members.

5.1.5.1 Topside Site

The Topside site is a relatively flat plateau area, 300 m x 100 m in size, comprising existing detention centre buildings. The Topside Site houses the previous and existing complex and is surrounded by trees and scrub vegetation.

5.1.5.2 Black Soil Site

The Black Soil site is a relatively flat plateau area, 6 ha in size situated 1 km north of the main phosphate mine area. There is scrubby vegetation and some trees. There is a 100 m^2 of cleared area with no 'pinnacles' (which are associated with phosphate mining). There are no obvious structures or development at the site.

5.1.5.3 Staff Housing Site

The Staff Housing site is a site 8000 m^2 in size on the western side of the island. It is separated from the beach by the island's main ring road. It comprises scrubby vegetation and trees, with a steep slope leading up to some pinnacles (related to phosphate mining). There are no obvious structures or development at the site.

5.1.6 Predicted Heritage Site Types

Based on the historical, archaeological and geographic context discussed above the following heritage site types may potentially occur at the three proposed project sites.

5.1.6.1 Topside Site

- Existing detention centre buildings related to Australian immigration policy
- WWII sites
- Unlikely to be other heritage sites (historical or Micronesian/Nauruan) due to previous development

5.1.6.2 Black Soil Site

- Micronesian/Nauruan archaeological or cultural sites (particularly due to undeveloped nature of site)
- WWII sites
- Other historical

5.1.6.3 Staff Housing Site

- Micronesian/Nauruan archaeological or cultural sites (particularly due to undeveloped nature of site and close proximity to beach)
- WWII sites
- Mining sites
- Other historical sites

5.2 Potential Impacts & Risks

The key risk related to heritage is the lack of systematic survey of the island to identify heritage sites. The outcomes of the above desktop review indicate the existence of some historical sites and the potential for pre-historical sites. Without identifying the presence of heritage sites, the self-assessment for the requirement for referral under the EPBC Act is unable to be completed.

This lack of identification of the presence of sites also places the project at risk in order to comply with the *Nauru Antiquities Act 1935*. Sites discovered during construction may require the project activities to cease in order to report the site to the Nauru Administrator and obtain permission for disturbance and / or removal of the site.

5.3 Recommendations

A systematic heritage survey of each of the project sites is recommended to be undertaken by an appropriately qualified heritage professional in consultation and with the assistance of relevant local Nauruan people prior to construction commencing in previously undeveloped sites.

6. Terrestrial Ecology

6.1 Existing Environment

The flora of Nauru is amongst the most impoverished, degraded, disturbed and displaced in the Pacific islands. Long human settlement, expansion of coconut monoculture during the colonial period, widespread destruction during World War II, and almost a century of open cut phosphate mining have led to serious vegetation degradation, disturbance, and displacement of the indigenous flora.

Although greatly outnumbered by exotics, indigenous species still occur in some of the most disturbed habitats, including the latter stages of the phosphate-mined pit and pinnacle topography, as well as constituting the most culturally utilitarian and ecologically-important species (Thaman et al., 1994:8). Much of the limited indigenous flora species still present on Nauru are in an endangered state.

6.1.1 Vegetation Types

General vegetation types on the island are not listed to be of conservation significance according to available literature. Vegetation types include (Thaman et al., 1994:8):

- Coastal strand vegetation;
- Mangroves and costal marsh vegetation;
- Relict stands of inland forest;
- Limestone escarpment (pinnacle) vegetation; and
- Secondary and cultural vegetation types (coconut dominated land, urban vegetation and gardens, severely modified post-mining succession vegetation).

6.1.2 Threatened Flora Species

Thaman et al. (1994:16) indicated that possibly 29 indigenous flora species are endangered or extinct (endangered classification is not defined within source).

6.1.3 Pest Species

Weeds are a significant issue on Nauru with weed species identified to constitute 18% of the island's flora (Manner et al., 1984:1461). Recent introductions reflect the effects of air transport to the island with a lack of quarantine regulations (Thaman et al., 1994:22) and oriental fruit fly has been eradicated from the island (Stephens et al., 2007:370).

6.1.4 Threatened Fauna Species

The IUCN Red List (BirdLife, 2012: formerly Birds Australia) lists three threatened birds on Nauru, including:

- Nauru Reed Warbler (*Acrocephalus rehsei*): Endemic to the island and listed as Vulnerable on IUCN Red List (2012).
- Bristle-thighed Curlew (*Numenius tahitiensis*): Migratory to/from other countries with tundra and is listed as Vulnerable on IUCN Red List (2012).
- Micronesian Imperial-Pigeon (*Ducula oceanic*): Migratory to/from other countries within Micronesia and is listed as Near Threatened on IUCN Red List (2012).

There is a reported lack of recorded data for ecological records at Nauru. Reptiles such as the Yellow-bellied Seasnake (*Pelamis platurus)* are present on Nauru (Buden, 2008:499). The Yellow-bellied Seasnake is listed as a Marine Species under the EPBC Act. In addition, some of the genus' listed in Buden (2008) are listed as Vulnerable under the EPBC Act, including similar species on similarly isolated island environments, suggesting these species may require further conservation consideration in light of the potential impacts of the project.

6.2 Potential Impacts & Risks

Key environmental impacts and risks relating to terrestrial ecology include:

- Clearing of vegetation for construction of buildings and associated infrastructure resulting in:
    - loss of flora and fauna species of cultural or utilitarian importance to local communities;
    - loss of internationally endangered species and / or species listed as Threatened and Migratory Species under the EPBC Act and / or habitat for such species, including the Nauru Reed Warbler known to occur in shrubby areas surrounding project sites;
- Disturbance and possible injury or mortality to local fauna, including protected bird species of cultural or utilitarian importance to local communities due to increased noise and vibration, increased traffic and movement of plant and machinery during construction and operational phases;
- Impacts on local biodiversity and agricultural productivity due to introduction of new pest species through increased shipping and air freight during construction and operational phases; and
- Impacts on cultural traditions involving indigenous fauna, including cutting off an existing road used by the local community to access habitat for black and white noddies north of the Blacksoil site.

6.3 Recommendations

Recommendations to mitigate potential ecological impacts associated with the project include:

- Conducting pre-clearing surveys to identify significant vegetation and fauna habitat / breeding places;
- Minimising the extent of vegetation clearing required for construction of the project, including ancillary infrastructure, particularly large trees which are more likely to represent remnant vegetation, threatened species or habitat, and species of utilitarian or cultural significance to local communities;
- Ensuring design of new access road for the Black Soil site avoids fragmentation of significant vegetation and habitats;
- Ensuring invasive species management is tied into future management planning, including through developing and implementing a weed, pest fauna and pathogen management plan / biosecurity / quarantine management strategy for construction and operation;
- Ensuring construction activities are undertaken to minimise impacts on retained vegetation and local fauna; and
- Maintaining access for local communities to cultural sites.

7. Coastal & Marine Ecology

7.1 Existing Environment

Nauru's marine life was first documented by North et al (1903) while subsequent surveys of algae and finfish have occurred. There are no known endemic marine species in Nauru however surveys have not been extensive (i.e. of the main island or neighbouring islands). There is anecdotal evidence of declines in fish stocks, such as coral cod, humpheaded maori wrasse, spinney lobsters, giant clams, however, there is limited data to support declines (Jacob, 2000).

7.1.1 Fauna

7.1.1.1 Fish

Eighty per cent of the Nauru's recorded catch is of tuna (*Katsuwonus pelamis* and *Thunnus albacares*) and rainbow runners (*Elagatis bipinnulata*). The majority of catch has been from mid-water hand lines and / or the use of fish aggregation devices (FADs) in the open ocean, which may include mooring buoys. Finfish associated with coral reefs are presented in Allen and Steene (1996).

Species notes:

- *Katsuwonus pelamis*: Cosmopolitan and highly migratory. Listed as Least Concern on the IUCN (2012).
- *Thunnus albacores*: Oceanic species, distributed worldwide. Listed as Near Threatened on the IUCN (2012).
- *Elagatis bipinnulata*: Oceanic fish. Not evaluated on the IUCN (2012).

7.1.1.2 Mammals

Four species of mammals inhabit the waters of Nauru including:

- *Feresa attenuate* (Pygmy Killer Whale): Listed as data deficient (DD) on IUCN (2012);
- *Mesoplodon densirostris (*Blainville's Beaked Whale): Listed as data deficient (DD) on IUCN (2012);
- *Mesoplodon ginkgodens* (Ginkgo Toothed Beaked Whale): Listed as data deficient (DD) on IUCN (2012); and
- *Lagenodelphis hosei* (Fraser's Dolphin): Listed as data deficient (DD) on IUCN (2012).

Anecdotal sightings of Sperm Whale, Bryde's Whale, Melon-headed Whales and Cuvier's Beaked Whale have also been reported in the waters of Nauru.

7.1.1.3 Turtles

There are anecdotal accounts of Green Turtle (*Chelonia mydas*) and Hawksbill Turtle (*Eretmochelys imbricate*) in Nauru, however there is no information on status, nesting, and / or the abundance of turtles should they occur (Buden, 2008).

7.1.1.4 Invertebrates

There may be an endemic species of echinoderm (unsubstantiated).

7.1.2 Habitats

7.1.2.1 Coral

A survey of 50% of the island's reefs in 2000 found them to be impoverished, with coral on the western side of the island being less healthy, with densities varying between 20 to 60% and diversity being less than seven coral species within 2 metre quadrats (Jacob, 2000). On the northern side of the island, coral density was greatest (60 to 80%) with diversity of less than four coral species (Jacob, 2000). Dominant coral genera include *Montipora* and *Acropora* which have a high susceptibility to stress, from sedimentation and turbidity (i.e. construction or dredge activity), temperature, and salinity change (Gilmour et al., 2006).

Existing threats to the coral reefs of Nauru include (North et al., 1903):

- *Fishing*, and specifically overfishing.
- *Pollution* in the form of sewage discharge or an oil spill, or both. Another threat includes ballast water and the introduction of IMS.
- *Reef blasting* from deepening of shipping passages. Nauru has no natural passageways or deepwater lagoons.
- *Sedimentation*, although there are a lack of rivers and creeks, sedimentation associated with reef blasting or dredging, or both, are apparent.
- *Mining*, and in particular phosphate mining.
- *Climate change*, and specifically drought associated with El Nino.
- *Sea level rise*, with 20% of Nauru being low lying.
- *Coral bleaching* events, and the impact these may have on fisheries and ecosystem health.

7.1.3 Seagrass and Algae

The island has little seagrass but has some 40 species of algae from intertidal, reef flats and coral reefs. Diversity was assessed as being low compared to other equatorial islands in the Pacific, potentially due to its distance from the Indo-Pacific triangle (Jacob, 2000).

7.2 Potential Impacts & Risks

Potential construction impacts of the project may include the need to construct or upgrade seawater inlet and outlet pipelines associated with a reverse osmosis (RO) plant and / or upgrades to existing port infrastructure to service increased shipping demand (e.g. supply ships).

As Nauru has no natural inlets of deep water (it is surrounded by a very wide, shallow reef), construction or upgrade of existing port facilities may represent significant impact to the marine environment. This includes the blasting of coral reef or installation of support structures (e.g. trestle) over the reef, which would result in disturbance of benthic habitats and increased sedimentation onto adjoining coral reefs. This may also result in additional noise and vibration which has implications for marine mammals. Additionally, any inlet/outlet pipelines placed in deeper water environments such as the harbour or "channel" site (smaller harbour) may impact on fishing activities.

It should be noted that the existing Port does not have strict controls in regard to pollution and therefore the design of any RO facility will need to take into account any operational risk to the equipment. The strong tidal environment has also been known to significantly affect (block) the inlet pipe with sediment and rocks.

Operational impacts are most likely to be associated with discharges to the marine environment, which may include additional saline brine from increased RO filtration or discharge of effluent (direct or indirect via runoff and groundwater discharge). Such discharges can potentially impact on water quality, marine biodiversity and fisheries productivity. Consideration should also be given to the impact of the RO facility on intertidal fishing activities such as oyster harvesting.

The Nauruan Government has specifically requested that an environmental impact assessment be undertaken if any work in the marine environment is likely to take place.

Increased shipping traffic during construction and operation of the facilities also has the potential to introduce invasive marine species (IMS), which could potentially impact on marine biodiversity and fisheries productivity.

7.3 Recommendations

Actions that will either mitigate or track any potential impacts of the project on the marine environment include:

- Completion of an environmental impact assessment will be necessary if construction of a new RO inlet/outlet pipeline (or any other marine infrastructure) within (and/or across) the reef or other sensitive area is required. The EIA would need to consider the direct physical impacts of infrastructure construction as well as indirect impacts associated with discharges, noise and vibration;
- The design will need to addresses potential impacts associated with a strong tidal environment to avoid blockages of the RO inlet/outlet pipes;
- The design will need to adequately addresses operational risks to RO infrastructure, particularly seawater intake, given the existing Port does not have strict controls in regard to pollution;
- An IMS risk assessment of project-related vessels that will be arriving at Nauru should be undertaken, and where necessary IMS surveys of vessels should be conducted; and
- If blasting, trestling or laying of pipelines across the reef are necessary, then a program of benthic monitoring (and potentially marine mammal monitoring) should be undertaken prior to construction and during operation.

8. Soils & Geology

8.1 Existing Environment

The geology of Nauru consists of thick dolomitised limestone overlying basal submarine basalts. The basement rock of Nauru was placed during basaltic hotspot volcanism 35 million years ago, forming a seamount which was initially raised above sea level. Erosion processes and changes in sea level submerged the seamount. A coral limestone atoll then grew to a depth of about 500 m on the seamount, with dolomite limestone near the surface dating from 5 to 0.3 million years old. The seamount was subsequently raised about 30 m above sea level and provided a rookery for seabirds, with guano deposits filling the cavities between limestone pinnacles (Viviani, 1970).

The limestone has been eroded to display a karstic limestone environment, with much of the island covered in limestone pinnacles up to 20 metres in height (refer to **Figure 8.1**). Holocene deposits include carbonate-coral beach sediments and guano phosphate deposits.

Figure 8.1: Limestone pinnacles exposed during phosphate mining (Source: http://www.everyculture.com/Ma-Ni/Nauru.html)

The land area of Nauru consists of a narrow coastal plain or "Bottomside", ranging from100 to 300 metres wide, which encircles a limestone escarpment rising some 30 metres to a central plateau, known locally as "Topside" (UNDP, 2006). The Topside site is a raised central plateau that consists of a matrix of coral-limestone pinnacles and limestone outcrops, between which are (or were) extensive deposits of soil and high-grade tricalcic phosphate rock (Tyrer, 1963 & Viviani, 1970: in SOPAC, 2007). Drilling has proved dolomitised limestone of Late Miocene or younger age to a depth of 55 metres below sea level (Australian Journal of Earth Sciences, 1989).

8.2 Potential Impacts & Risks

8.2.1 General

8.2.1.1 Seismic Hazard

Nauru is located on the Pacific plate, approximately 1500 km away from the Pacific- Indo Australian plate boundary and is subject to seismic activity. The level of seismic risk requires evaluation in the building design. Seismic design criteria have not been assessed in this study.

8.2.1.2 Soil Liquefaction

From the geological information available, there is likely to be a low risk of soil liquefaction on the island. This is due to the relative lack of soil (as opposed to rock) on the island, and the nature of the soils, which are typically coarse sands and gravels.

8.2.1.3 Ground Settlement

Ground "settlement" risk is recognised in karstic limestone environments. The geotechnical risk is due to the unknown locations of caves and cavities formed by dissolution of the limestone and is possibly better described as subsidence. Stormwater runoff flows down through the limestone, forming tunnels and cavities. Over long periods of time ongoing erosion can cause collapse of the cavities; which are then expressed at the surface as sink holes.

Saturation of limestone as a result of leaking water and wastewater storage and distribution infrastructure could potentially increase the risk of destabilising these landforms resulting in potential impacts on the structural integrity of built infrastructure and risks to public safety.

8.2.1.4 Contamination

The type and extent of soil contamination (if any) within the project sites has not been investigated and is unknown at this stage. However, based on historical land uses, there is potential for contamination to exist.

If soils are found to be contaminated, there is a risk of contaminants leaching through MDPE pipework proposed for potable water distribution on the project sites affecting taste, odour, general quality and potentially impacting on human health for those exposed to contaminated soils.

The potential for unknown buried waste materials to exist within the project sites also represents a risk to the project in that such materials may affect the stability of the land and may require removal and replacement with more suitable foundation materials, thus impacting on timing and cost of construction.

The project also has potential to result in contamination of soils through spillage or leakage of fuels, oils and chemicals used during construction and operation of the project, inappropriate storage or disposal of wastes, or leakage of sewage infrastructure.

8.2.2 Study Sites

8.2.2.1 Topside Site

The Topside site is at the site of the old "Menen Stadium" and was developed in 2001 as an Immigration Detention Centre, which was subsequently closed in 2007. Media photographs show a flat site, with existing facilities including kitchen, offices, medical and administration buildings situated on a large formed platform. It is likely that geotechnical investigations were carried out on the site for the previous development and that information should be sought out as it will inform the current design process.

It would appear that the bulk of the site has already been formed and further major earthworks may not be required. Minor earthworks are likely to be required including grading the site to disperse stormwater flows away from new building sites and to form platforms for accommodation modules and roads within the site.

Much of this site has already been developed and new facilities can be constructed on the sites of previous buildings.

There are no specific hazards identified on this site, other than the general comments that apply to the whole island.

8.2.2.2 Staff Housing Site

The Staff Housing site is situated within Anibare Bay, on the relatively flat coastal strip between the raised escarpment to the west and the sea. The site geology is likely to comprise a thin topsoil layer overlying alluvium and colluvium consisting of medium to coarse coral sands and gravels. The *National Assessment Report* (Republic of Nauru, 2004) suggests that topsoil at the coast ranges from 10 to 30 cm in depth, while deeper sandy soil is between 25 and 75 cm in depth. Limestone pinnacles and outcrops are found in the harbour and to the west of the site (Maharaja, 2001). It is likely that limestone underlies the soil everywhere on the site.

Bathymetry data provided by Maharaja (2001) shows the geomorphic expression of a large submarine slope failure, with the head scarp forming Anibare Bay. It is expressed as a large amphitheatre (2.5 km wide), and is thought to be formed during the collapse of the volcanic basalt edifice (**Figure 8.2**). There is a risk that a major seismic event on the island may reactivate the slope failure, which may lead to significant displacement of the existing coastal strip of land.

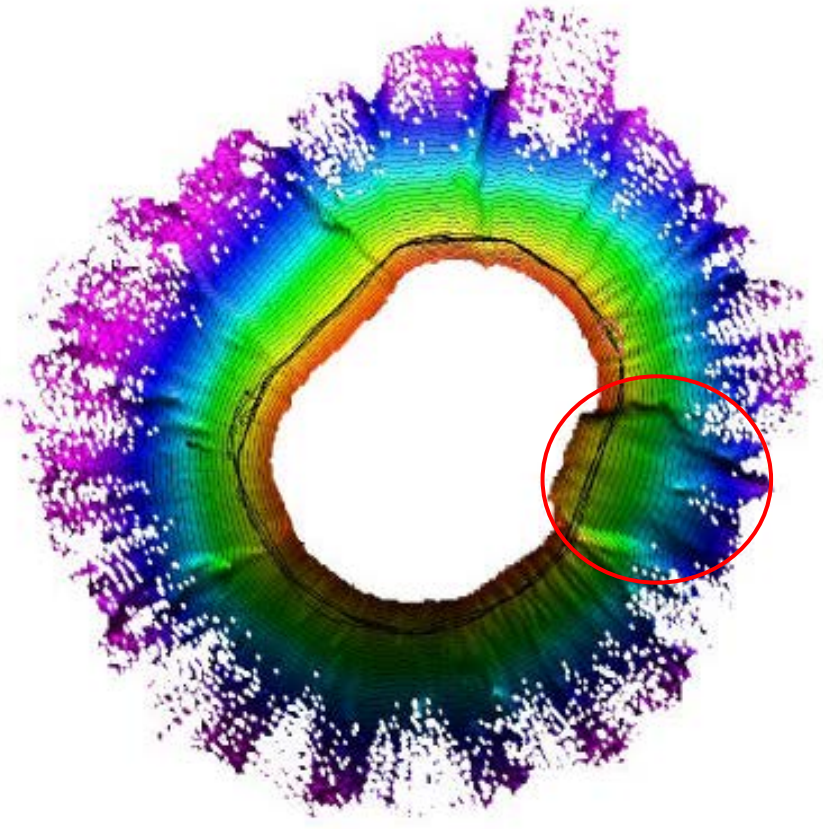

Figure 8.2: Bathymetry map of Nauru (Maharaja, 2001). The red circle outlines the geomorphic feature of interest (Anibare Bay)

As the coastal strip is not far above sea level, it is at risk of inundation in the event of a tsunami. While the island is some distance from major submarine faults that could trigger a significant tsunami, there remains a residual tsunami risk at this coastal site.

Due to the flat nature of the site, it is unlikely that extensive earthworks will be required to prepare building platforms. However the steep limestone escarpment behind and west of the site is a potential risk to a coastal site, due to limestone block failure along the cliff face. The limestone along the cliff edge is subject to weathering, which eventually develops a series of discrete limestone blocks along the edge, that are prone to falling, which may be activated by a seismic event.

This site is characterised by a number of specific hazards, including:

- Large scale landslip;
- Exposure to falling debris from the western escarpment; and
- Exposure to inundation by tsunami.

The level of these risks has not been quantified at this stage. The general risks and hazards identified in section 8.2.1 would also apply to this site.

8.2.2.3 Black Soil Site

There is little information available on this site, but it is likely to be topographically undulating with deposits of topsoil and vegetation placed on the surface as part of the phosphate excavation activities. No existing geotechnical information is known to exist for this site.

In order to provide a suitable flat building platform, removal of the existing dumped material will be required to expose the underlying limestone, which may be unmodified limestone pinnacles. Heavy excavation work and importation of suitable fill material may be required to form a suitable site for development, but at this stage, the magnitude of this work cannot be assessed.

This site will require a significant amount of work to clear the area to expose suitable ground for construction and that ground may comprise limestone pinnacles, requiring significant earthworks in order to prepare building sites. The major risks of this site are those of cost and delay to the construction program, which cannot be quantified until further detailed geotechnical investigations have been completed. However, there is no reason to expect that the site cannot be developed for the project at this stage, subject to sufficient funds, plant and time being available.

There are no specific hazards identified on this site, other than the general comments that apply to the whole island.

8.3 Recommendations

The above assessment is based on desktop investigations and preliminary site observations. Detailed site geotechnical investigations and mapping are required to quantify the risks associated with development of the project.

In particular, it is recommended that the design team secure geotechnical data for previous development on Nauru. In addition it is recommended that detailed geomorphic mapping of historic aerial photos and the preferred sites is undertaken to identify possible sinkholes and similar karstic features.

Further investigation of possible contamination is recommended, including site sampling and analysis in high risk areas, to properly assess the risk of contamination of potable water supplies and other health risks associated with handling potentially contaminated soils.

Design of all water and wastewater, storage, distribution and disposal infrastructure should be based on geotechnical advice to ensure such facilities do not result in destabilisation of limestone landforms undermining built infrastructure and representing a risk to public safety.

To prevent contamination of soils during construction and operation of the project, the following is also recommended:

- Ensure sewage pump-out facilities at Staff Housing site are designed to minimise the risk of spillage;
- Ensure fuel storage and distribution areas are appropriately lined and bunded to prevent seepage of spilled fuel seeping into the soil profile and watertable (e.g. compliance with AS/NZS1940:2004 – Storage or flammable and combustible liquids is recommended);
- Ensure any underground fuel storage tanks comply with AS/NZS1940:2004 – Storage or flammable and combustible liquids to prevent leakage to the watertable;
- Ensure any landfill is designed to an appropriate standard to mitigate the seepage of leachate to groundwater (e.g. designed to a widely accepted industry standard);

9. Hydrogeology

9.1 Existing Environment

Groundwater resources on Nauru exist in the form of a "lens" of often slightly brackish freshwater, hydrostatically "floating" on higher density saltwater beneath it and occurring within permeable limestone rock which has fissures and caves (SOPAC, 2007). According to the NRC Underground Water Project (NRC, 2008), the freshwater lens is present under approximately 50 per cent of the island area, with two main zones which are 4-5 metres thick. These zones are located in the centre of the northern end of the island and in the centre of the southern end of the island.

According to SOPAC (2007), the height of the freshwater lens above sea level and the level of salinity vary in relation to rainfall, the distance from the ocean, and with the geological character and composition of the rock near sea level.

In October 1987, Jacobson and Hill conducted a groundwater investigation on behalf on the Commission of Inquiry on Phosphate Mining including drilling 12 exploratory boreholes, from 30 m to 70 m deep, and using geoelectrical soundings to estimate the thickness of the fresh layer of the groundwater (SOPAC, 2007). The estimation of the thickness of the fresh layer was not accurate (estimates ranged from 0.5 m to 7 m for the northern bores and 3.5 m to 7 m for the southern bores), but overall the results indicated a fresh water layer of at least 3 m thickness beneath most of the island. The salinity of the groundwater rapidly increases with depth – being too salty for potable water uses only 2 m below the assumed base of the freshwater.

Twenty-one new bores were drilled by NRC in 2008, with the reported results indicating:

- Bores in the vicinity of the Topside site recorded very brackish water.
- No bores were advanced in the vicinity of the Staff Housing site or Black Soil site.

Generally, the depth of the freshwater / seawater interface can be approximated by the Ghyben-Herzberg principle which states that the depth to the interface below sea level at any one point is approximately equal to 40 times the distance of the watertable above sea level at that point. In the case of Nauru, there is an additional complication in the nature of the karstic, heterogeneous limestone which is likely to create local variations to the generalities of the Ghyben-Herzberg principle. For instance, the Jacobsen and Hill (1987) study found that below the freshwater layer there is a transition or mixing layer of up to 60 m thick, below which seawater occurs. This thickness, as the authors note, is unusually thick. This thick transition layer is attributed to intrusion of seawater in major fractures within the limestone (UNDP, 2006).

In addition to the above, an underground freshwater lake occurs in the Makwa (Moqua) Cave in the southeast (Viviani, 1970: in UNDP, 2006 and Republic of Nauru, 2003).

Apart from Buada Lagoon (approximately 14 hectares), there are no surface freshwater resources on Nauru, although there are a few brackish ponds near the base of the escarpment, especially on the northeast of the island in Ijuw and Anabar Districts. Anecdotal evidence suggests that local people utilise Buanda Lagoon for fishing.

Figure 9.1: Location of Nauru Groundwater Monitoring Bores (Source http://www.nrurehab.org/underground-water-project.php)

9.1.1 Existing Use & Contamination Issues

Groundwater is drawn from hundreds of shallow wells on the coastal margin. It is generally used for non-potable uses as water quality is brackish as a result of pumping impacts and the contraction of the freshwater lens in dry periods. These wells are also proximate to habitation, building, and sanitation structures (Republic of Nauru, 2004). The *National Assessment Report* (Republic of Nauru, 2004) noted that contamination has been detected thus further restricting the use of water from these wells.

The *National Assessment Report* (Republic of Nauru, 2004) identified the following threats to the quality of groundwater resources, including contamination by cadmium, leachate from rubbish dumps and sewage. Contaminants of concern include:

- Faecal coliforms and *E.coli* in soil / groundwater from septic tank overflow and soakage pits;
- Polychlorinated biphenyls (PCBs) associated with the power station;
- Metals (lead, zinc) associated with blasting / mining;
- Total petroleum hydrocarbons (TPH) and polycyclic aromatic hydrocarbons (PAH) associated with storage and disposal of fuels;
- Asbestos associated with building materials;
- Ordinance compounds and heavy metals associated with historical bombing;
- A broad range of contaminants associated with fill materials of unknown origins;
- Cadmium from disposal of cadmium sludge associated with mining activities; and
- Leachate from uncontrolled landfill practices.

In addition, SOPAC, (2007) stated that:

> *Long term potential threats to the quality of the groundwater resource include contamination by cadmium (from phosphate processing), leachate from the rubbish dump and sewage from the refugee camp (on Topside) and residences on Bottomside.*

SOPAC (no date) stated that:

> *Despite relatively good toilet facilities, sanitation remains a significant problem on Nauru due to the impact of the island's cesspits and septic tanks on coastal groundwater. While there is no documentary evidence of health issues arising from contaminated groundwater, Nauru has one of the higher rates of hospitalized diarrhoea in the Pacific region.*

At the Topside site, there is conjecture that the septic tank system used in the previous regional processing centre has resulted in groundwater contamination (e.g. SOPAC, 2007).

The drought from 1998 to 2001 stretched the water resources on the island and highlighted the urgent need for a sustainable water supply system. The drought resulted in overuse of the groundwater and a decline in water quality, leading to rising health and environmental issues due to soakage from household sewage pits into the increasingly brackish and contaminated groundwater (UNDP, 2006).

9.2 Potential Impacts & Risks

It is noted that groundwater is not being considered as a water supply option at any of the project sites with water being supplied through reverse osmosis (RO) treatment plants and collection of rainwater/ stormwater runoff. However, if groundwater was to be considered for water supply to any of the project sites, the following environmental risks need to be evaluated:

- Over-extraction resulting in the freshwater lens being exhausted or contaminated with seawater. To mitigate this risk, extraction needs to be within the rainfall recharge to the aquifer.
- Extraction in inland areas (eg Topside and Black Soil sites) may result in reduced groundwater through flow to the lower lying coastal areas where much of the local population extract groundwater for domestic purposes. The result could be a reduction in groundwater levels in coastal areas with an increased risk of seawater intrusion and reduced bore yields.
- Extraction at the coastal Staff Housing site may result in intrusion of seawater into the freshwater lens.

Although direct extraction of groundwater to provide water supply to the project is not proposed at this stage, excavation for building foundations and below ground storage tanks at the Staff Housing site is likely to occur below the water table. As such, groundwater seepage and dewatering of excavations and / or temporary lowering of the surrounding water table is expected to be required. Lowering of the surrounding water table could potentially impact on surrounding groundwater users and discharge water quality will need to be managed to prevent impacts on downstream waters.

The key potential risks to the groundwater resource (along with surface waters and coastal environments connected to the water table) associated with proposed construction and operation of the project includes:

- Infiltration of contaminants into groundwater from irrigation of treated effluent to land (eg *E. coli*, nitrates) impacting on water quality and existing groundwater users;
- Leakage of untreated sewage from sub-surface pipework between ablution facilities and the sewage treatment plant and below ground raw sewage storage tanks (eg. Staff Housing site);
- Overtopping of storage facilities containing untreated and treated sewage;
- Any disturbance of historical underground septic tanks or fuel storage tanks that could result in mobilisation of effluent or contaminants into the watertable;
- Spillage or leakage of chemicals or fuels stored on the site either directly seeping into the watertable or being transported by overland flow and seeping into the down-gradient watertable; and
- Seepage through any planned landfill.

9.3 Recommendations

To mitigate these risks, the following actions should be taken:

- Design of wastewater treatment facilities needs to prevent spillage or leakage of contaminants to the environment and to ensure irrigated wastewater is appropriately treated prior to discharge to the environment by:
    - Ensuring wastewater treatment and storage tanks, and associated pipework are designed to Australian Standards;
    - Providing a wastewater treatment plant capable of consistently producing effluent to an appropriate standard based on the intended method of disposal and consideration of the receiving environment characteristics. Reference should be made to the *Australia Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 1)* (Environment Protection and Heritage Council, the Natural Resource Management Ministerial Council and the Australian Health Ministers' Conference; Nov 2006) to determine an appropriate standard of treatment and other necessary controls for the proposed disposal method. Treatment technologies should be low maintenance given the remote location;
    - Incorporating automated (online) water quality monitoring equipment (e.g. dissolved oxygen, pH), installation of alarms (overflow, out of spec discharge) and appropriate chemical dosing to manage water quality;
- Design of the effluent irrigation system needs to minimise the risk of contaminants being released to surface water and groundwater, and to prevent creation of biting insect breeding habitat and odour nuisance by:

- Allowing sufficient land area and ensuring irrigated soils are capable of assimilating anticipated levels of water, nutrients and salinity without resulting in excessive ponding, runoff or infiltration below the soil profile, or loss of soil productivity;
- Ensuring adequate vegetation cover within the effluent irrigation area to maximise evapo-transpiration of applied effluent and minimise infiltration below the soil profile;
- Scheduling irrigation to prevent waterlogging causing surface ponding and runoff;

- Design of the effluent irrigation system needs to minimise the risk to public health and safety by:
  - Restricting public access to areas irrigated with Class C treated effluent;
  - Using either sub-surface irrigation methods or surface spray irrigation systems designed to minimise aerosol spray drift (e.g. selection of fittings that produce large droplet sizes and low-throw / controlled dispersal plumes, provision of adequate buffers (preferably vegetated) to separate effluent irrigation areas from habitable and food preparation areas);
  - Avoiding concentrated or excessive discharges that could potentially de-stabilise underlying karstic limestone soils and landforms;
- Design to incorporate adequate emergency storage to:
  - Contain anticipated inflows of untreated sewage during electricity outage, mechanical breakdown or other operational plant failure to prevent uncontrolled discharge of untreated sewage to the environment;
  - Provide temporary storage of treated effluent during periods of wet weather or windy conditions during which irrigation would result in unacceptable risks to the environment or human health;
- Transfield will need to implement a robust water quality monitoring regime for the discharge of treated wastewater. Initial recommendations are for monthly monitoring of discharge for *E. coli*, enterococci, total N, total P, BOD and suspended solids. Samples would need to be flown to an accredited laboratory within 12-24 hours under controlled conditions;
- Ensure sewage pump-out facilities at Staff Housing site are designed to minimise the risk of spillage;
- Ensure fuel storage and distribution areas are appropriately lined and bunded to prevent seepage of spilled fuel seeping into the soil profile and watertable (e.g. compliance with AS/NZS1940:2004 – Storage or flammable and combustible liquids is recommended);
- Ensure any underground fuel storage tanks comply with AS/NZS1940:2004 – Storage or flammable and combustible liquids to prevent leakage to the watertable;
- Ensure any landfill is designed to an appropriate standard to mitigate the seepage of leachate to groundwater (e.g. designed to a widely accepted industry standard);
- Dewatering of excavations will need to incorporate measures to ensure water quality complies with relevant standards and will not impact on receiving water quality prior to discharge; and
- Below ground storage tanks, particularly at the Staff Housing site will need to be designed to minimise infiltration of groundwater to preserve storage capacity.

10. Waste Management

10.1 Existing Environment

10.1.1 Liquid Wastes

Republic of Nauru (2004) reported that domestic and commercial wastewater and sewage on Nauru are collected by large tanker trucks from septic and wastewater storage tanks and are disposed of through a seawater pipe outfall close to the edge of the reef. No treatment is provided for liquid wastes prior to discharge in this manner.

The Travel Report – Nauru Visit – 2-5 September 2012 indicates tanker trucks may no longer be in operation: *There is no apparent sewerage reticulation system or treatment plant on Nauru. It would seem sewerage is discharged into septic tanks which overflow, or, into soakage pits*.

The Travel Report – Nauru Site Visit – 2-5 September 2012 identifies that Nauru has three Reverse Osmosis Plants, with only two operational. Jopson D (2012) indicates the concentrated salt water (brine) is usually run over the reef.

10.1.2 Solid Wastes

The *National Assessment Report* (Republic of Nauru, 2004) identifies pollution and waste management as one of the major concerns of Nauru, stating that controlled land filling is currently not practised on Nauru.

The report identifies open dumping as the most common way of disposing of solid wastes. This has been carried out mainly in designated areas above the main town centre and in an area previously mined of phosphate. However indiscriminate dumping was also noted as occurring due to an ineffective and non-integrated waste collection system.

The principal waste disposal facility on Nauru is the NRC-managed dumpsite located in the south-west of the island. The dumpsite represents a pollution threat to underground water reserves. Segregation bays have previously been constructed to allow for the separation of recyclables, however, these are no longer functioning. The operating hours of the NRC-managed dumpsite are from 7:00 am to 3:30 pm and attempts are made to control access through a lockable access gate and posted security personnel. However, it is reported that it is not uncommon to find waste pickers on the site. Dumpsite fires are also a common occurrence.

Fly-tipping (i.e. the uncontrolled and illegal disposal of waste) and litter appear to be significant environmental problems on the island despite the existence of the *Litter Prohibition Act 1983*.

Bulky metal waste such as cars, disused equipment, *etc.*, are being stockpiled along the dumpsite's perimeter fence, however, there is no plan in place to recycle this waste. Abandoned bulky wastes and other forms of litter can also be observed in numerous locations throughout the island.

Relevant waste streams affected by the lack of solid-waste management include hospital waste, quarantine waste, metal waste and the municipal waste.

Bio-wastes from medical facilities have, at times, been burned at the dump site, due to operational problems with the hospital incinerator.

Use of the existing dump site has been uncontrolled with respect to compaction and burying of organic matter, which will continue to decompose and form methane gas for many years. This decomposition will also result in the formation of liquid leachate, which will pollute the groundwater system. The *National Assessment Report* (Republic of Nauru, 2004) identifies this issue will render the land unsuitable for any other purpose, including rehabilitation.

The Nauru Department of Commerce, Industry & Environment (CIE) is responsible for the strategic planning and regulatory aspects of waste management. CIE has increased its capacity by employing an Environment Policy Officer and an Environment Project Officer.

Solid waste management operations (waste collection and disposal) are carried out by the NRC, as mandated by the Minister of CIE. The NRC operates the collection system. There is one garbage compactor truck, which has not functioned for over two years due to mechanical problems. Waste collection is therefore carried out using two pickup trucks which can transport 15-20 wheelie bins each. With daily waste collection, about 60-80 bins are emptied daily. It is understood that a new compactor truck was expected to be delivered before the end of 2010, and following this the existing truck was to be used as a backup.

A skip-bin waste collection service is provided for the hospital ($200/month), government buildings ($200/month) and some schools ($100/month). This paid service does not currently extend to private businesses whose waste is collected for free.

There are two persons engaged in commercial recycling activities on a small scale. One of these persons collects, bales and exports copper radiators and aluminium cans. He purchases aluminium cans from the public at AU$0.40 per kilo, and has accumulated a full 20-foot container load of aluminium cans ready for export. There are no fiscal measures in place to support the recycling sector on the island.

10.1.3 Hazardous and Chemical Wastes

Pollution from toxic chemicals (fuels and lubricants, paints, solvents, heavy metals, pesticides, fungicides and other industrial chemicals) is identified as a potential risk issue. No facilities are available on Nauru for the safe disposal or recycling of these substances.

Republic of Nauru (1996) identifies the presence of a cadmium "slime" dump near Buada Lagoon. The report notes that further studies need to be carried out regarding the extent of the threat of cadmium disposal to human health and the environment.

10.1.4 Asbestos

Unicef (2005) identified the widespread use of corrugated asbestos sheeting on roofs as a key issue for Nauru. Historically, this material was widely used on many of Nauru's houses, NPC buildings, schools and other public buildings.

While intact corrugated asbestos sheeting is not a serious danger to health if kept painted and undisturbed, much of that in Nauru is unpainted and now so old and weathered that it is beginning to shed asbestos fibres, presenting a serious environmental health risk.

Unicef (2005) reported that although this matter has been raised in Parliament on several occasions, as of the time of writing no steps had been taken to remove this serious health hazard.

10.2 Potential Impacts & Risks

The existing arrangements on Nauru for the collection, transport and treatment of solid waste are rudimentary. There are currently no arrangements in place for the source separation of domestic or commercial waste streams, which militates against the recovery and recycling of wastes. There is an almost total reliance on dumping of waste, either on an *ad hoc* basis (fly-tipping), or at the designated dumpsite in the south-west of the island. In addition, uncontrolled burning of waste, either in the domestic environment, or as a result of fires at the dumpsite, may pose significant local hazards to health and the environment. Surface fires are easily spotted and can be dealt with, whereas fires within the waste mass itself may occur and smoulder for considerable periods of time, potentially releasing a cocktail of toxic gases to the surrounding environment.

The humid climate, particularly during periods of heavy rainfall, is likely to result in the generation of leachate from the dumpsites as the organic wastes decompose. The leachate is also likely to contain labile metal and organic chemical species as decomposition and chemical processes proceed within the waste mass. The leachate has the potential to contaminate surface and groundwater sources. Grazing animals (particularly cows) can to be attracted to pools of leachate, and suffer poisoning as a consequence.

The current waste management arrangements afford little opportunity for the effective control of vermin (flies, rats, mice, etc) that will be attracted to waste that is dumped in an open environment. It has also been reported that waste pickers (scavengers) are common on the designated dumpsite. Whilst scavenging of waste sites is common practice in developing countries, it represents significant health and safety risks for those directly engaged in the activity, as well as for their families and associates, as waste pickers may inadvertently act as vectors for waste-borne diseases (which will be further exacerbated by the proliferation of vermin in a tropical environment).

An influx of overseas persons (DIAC clients and non-island personnel associated with operation of the project) introduces the risk of outbreaks of infections and diseases that have either been absent or are uncommon on the island. The lack of a suitable method for the control of contaminated medical dressings and their disposal at an open dumpsite will enhance this risk.

The decomposition of the organic (vegetable matter, including paper and cardboard) fraction of the waste in the dumpsite will generate the greenhouse gases carbon dioxide and methane. In an open dumpsite the risk of generating explosive concentrations of landfill gas is likely to be limited, although isolated pockets of landfill gas may occur in certain parts of the dumpsite. Nevertheless, landfill gas may adversely affect the growth of surrounding vegetation and/or crops.

The uncontrolled disposal of hazardous wastes (which may include paints, solvents, car batteries, asbestos, cleaning chemicals, etc) at dumpsites can pose a risk to the health of site operatives depositing new waste at the facility, and waste pickers. Children in particular can be at risk of poisoning due to their inability to identify or understand risks associated with such sites and materials.

The construction and operation of the project has the potential to significantly increase the quantity and range of waste types that are generated on the island. The refurbishment of existing buildings on the island to accommodate potential clients, and administrative and security personnel will generate demolition waste, some of which (e.g. asbestos) may be hazardous waste. In addition, the installation of pre-fabricated, demountable buildings is likely to generate packaging waste (e.g. packing crates, protective materials, etc) in the early stages of the project. Other construction phase wastes may include spoil from the excavation of foundations and site clearance wastes (including cleared vegetation), off-cuts and out of specification materials, and timbers that have been used for shuttering concrete, etc.

The operation phase of the project will be heavily reliant upon the import of foodstuffs and other domestic-type provisions, such as office equipment and consumables, medical supplies, and materials for cleaning and maintenance purposes. Operation of the project will generate the following key waste streams:

- Domestic type waste (similar in nature to household waste);
- Office waste (which would typically be considered as commercial waste in other situations);
- Catering waste (which is likely to attract vermin and generate odours, and possibly bio-aerosols, if not managed appropriately);
- Cleaning and maintenance waste (which may include hazardous chemicals (e.g. cleaning fluids, paints, solvents), as well as green waste from grounds maintenance); and
- STP wastes including inlet screenings and biosolids.

In addition to the above, operation of sewage treatment plants at the Topside and Black Soil sites will generate potentially hazardous waste materials, including inlet screenings and biosolids, which may result in the spread of infectious diseases if not appropriately managed. .

10.3 Recommendations

The existing waste management infrastructure on Nauru is inadequate to deal with the wastes that will be generated by the project. It is strongly recommended that a waste management policy and strategy be developed and implemented for the project with emphasis on:

- Waste prevention (i.e. the avoidance of waste through design considerations, and the adoption of sustainable procurement practices, and the use of re-usable packaging materials for the supply of construction materials, foodstuffs and other domestic-type provisions);
- The reuse of materials (for example the selection of re-usable containers for the supply of potable water);
- The facilitation of recycling of waste materials through the provision of receptacles for the separation of recyclable materials (e.g. paper, metal cans, hard plastics, glass bottles, etc);
- The provision of collection and treatment arrangements for catering wastes (e.g. food preparation waste and plate-scrapings) so that this waste can be treated at a suitable composting facility on the island;
- The separation of green waste from grounds maintenance activities so that this waste can be treated at a suitable composting facility on the island;
- The provision of separate collection arrangements for medical wastes (used dressings, out of date medicines, body tissues and fluids) so that such wastes can either be exported from the island for treatment and disposal overseas, or subject to appropriate treatment / disposal methods on the island; and
- Appropriate collection arrangements for general waste, including compaction of the waste prior to its export for treatment / disposal overseas.

Consideration should also be given to the inclusion of an appropriately scaled waste treatment facility to process the residual waste (and possibly the medical waste) that is generated by the project. The choice of a technology type would require a more detailed consideration of the quantities and types of waste that will be generated by the project, but it is known that small-scale gasification technologies are commercially available for deployment in field situations.

Finally, it is recommended that the organic waste (the catering waste and green waste from grounds maintenance) that is generated by the project is biologically treated on the island using an appropriately scaled in-vessel composting solution. It is known that small-scale, low tech in-vessel composting solutions are commercially available.

11. Air Quality, Noise & Vibration

11.1 Existing Environment

Existing air emissions associated with activities on Nauru include phosphate dust from mining activities and motor vehicle emissions (especially through the use of leaded petrol).

According to the NRC (2012), mining activities emit dust most of the time, however these activities are located away from residential and public areas, and the primary concern is the health risk to workers.

Although NRC (2012) has indicated that control of dust generated by haulage activities is being addressed by frequent and regular watering of haul roads, the proximity of mining areas to some project sites suggests that phosphate dust from extraction and stockpiling activities may still comprise a risk.

11.2 Potential Impacts & Risks

Potential risks to the project associated with current air quality issues on Nauru, include:

- Phosphate dust containing cadmium being deposited into clean water storages or storm water drains contributing to possible health risks; and
- Inhalation of phosphate dust particle containing cadmium and potentially other heavy metals by construction workers, operational staff and clients of the project.

In addition, the design indicates that a mobile crushing plant and concrete batching plant may need to be established for the construction stages of the project. Dust, noise and vibration generated by these activities and associated storage, handling and transportation of materials may cause nuisance to existing residents.

STPs proposed to service the Topside and Black Soil sites may generate odour potentially causing nuisance to local residents, as well as staff and clients of the processing centres.

11.3 Recommendations

Based on the above identified potential impacts and risks, the following recommendations are provided:

- Clean water storages should be covered to prevent the deposition of phosphate dust containing cadmium and potentially other heavy metals;
- Rainwater collection tanks should incorporate first flush devices to prevent any cadmium and other heavy metals contained in particulates deposited onto roof surfaces from entering water storage tanks;
- Maximise separation between sources of phosphate dust emissions and habitable areas within the regional processing centres and consider planting tall vegetative screening around project sites; and
- Ensure STPs, mobile crushing plants and concrete batching plants are located with adequate buffers to residential and other sensitive areas; and
- Additional dust suppression measures may need to be implemented for crushing and concrete batching plants and associated haulage during particularly dry and / or windy conditions or in the event of complaints from local residents. Due to the availability of limited water supplies on Nauru, dust suppression measures other than watering are preferred and may include covering truck loads with tarpaulins, covering stockpiles with mulch, compacting graded work areas and unsealed access roads.

12. Hazardous Substances and Materials

12.1 Existing Environment

Due to an extensive history of bombing and munitions storage associated with the occupation by Allied and Japanese forces during WWII, it is likely that unidentified UXOs remain on Nauru.

The inadequacy of waste management infrastructure on Nauru combined with extensive cavities associated with the karstic limestone landform is likely to have contributed to uncontrolled disposal of wastes, including potentially hazardous wastes such as asbestos building materials, fuels, oils, grease and possibly mining wastes (e.g. cadmium sludge). The type, quantity and location of such wastes is unknown but the presence of such wastes within the project sites cannot be ruled out at this stage.

12.2 Potential Impacts & Risks

The discovery of UXOs during construction and operation of the project represents a possible safety risk. Safety risks are associated with the discovery, storage, transportation and disposal of UXO as well as the inhalation or heavy metals in dust from old detonators.

Discovery of other hazardous substances associated with uncontrolled waste disposal could also present possible risks to health and safety of construction workers, DIAC clients and other site personnel (e.g. hydrocarbon vapour, asbestos fibres).

The discovery of unknown buried wastes within the project sites could also result in delays to construction or increased construction costs as such materials are likely to require removal in order to achieve suitable foundation material for buildings and roads etc.

12.3 Recommendations

To mitigate these risks it is recommended that:

- Basic geophysics and/or catscan be conducted across each of the project sites and access routes prior to construction; and
- Geotechnical investigations, including drilling of boreholes to determine soil profile characteristics and the presence of fill material, and possible sampling and analysis to check for contaminants.

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Appendix A. Detailed Historical Context

Initial colonisation

Nauru is one of a large group of islands known collectively as Micronesia. Micronesia is in turn part of a collection of islands known as Oceania. Initial human occupation of this area is considered to have been the most recent example of humans moving into previously unoccupied land (Rainbird 2004:70). The first archaeological evidence for humans in Micronesia comes from the western edge of the islands and dates to c. 3,600 B.P. (Intoh 1997:17). While a date is not specified for Nauru the island is located on the western side of Micronesia where dates of 2,000 B.P. are clustered and so occupation post-2,000 B.P. is likely (Intoh 1997:19, fig. 4).

Pre-WWI

The first Europeans visited Nauru in 1798, naming it Pleasant Island and describing it as an island of lush tropical vegetation with friendly indigenous inhabitants. By the 1830s, when the whaling industry penetrated eastern Micronesia, Nauru became a port of call for vessels in search of food and water supplies. This was shortly a small number of Europeans settled on the island, bringing with them alcohol, firearms, and diseases (Foster and Kiste 2012; Republic of Nauru n.d.).

The late 19th century saw the continued expansion of the empires of Germany and Britain with tension between the two powers in the Pacific. The Anglo-German Convention divided the Pacific between the two and Nauru fell under German colonisation in 1888. A large German trading company, Jaluit Gesellshaft, made major contributions in financing Germany's occupation of the region and in return received a number of economic privileges including the right to explore guano deposits in the Marshall Islands and in Nauru. In 1888, these were not thought to be of any great value (Foster and Kiste 2012; US Department of State 2012).

The German administration was followed by Christian missionaries. The first Protestant evangelist arrived in 1899 and was followed three years later by the first Roman Catholic missionary. Today more than four-fifths of Nauruans are Christians; more than half the total population is Protestant (mostly members of the Nauru Congregational Church), and about a quarter is Roman Catholic (Foster and Kiste 2012).

In 1900, a British company, the British Phosphate Commission (BPC) discovered phosphate on nearby Ocean Island (Banaba) and Nauru and persuaded Britain to annex Banaba and negotiated with Jaluit Gesellschaft for rights to the phosphates on Nauru. In 1907, mining began and has continued virtually uninterrupted. Nauru was seized from Germany by Australian troops at the beginning of the WWI and fell under British control and most German nationals were removed from the island (Foster and Kiste 2012).

Interwar and WWII

Following WWI, in 1920, Nauru became a mandated territory within the framework of the League of Nations. Australia, Britain, and New Zealand were named as the responsible authorities, but in actual practice the administration remained in Australian hands (Foster and Kiste 2012).

German raiders, disguised as Japanese merchant ships, operated out the Caroline and Marshall Islands before the war between Japan and the United States began. In December 1940 they sank four merchant ships drifting off the island waiting to load phosphate rock. Another raider shelled the British Phosphate Commission (BPC) facilities shattering buildings and setting fuel storage bins alight (Haden 2000).

A week before the Japanese attack on Pearl Harbour in December 1941 Japanese aircraft had appeared over the island and bombed the wireless station. With news of advancing Japanese forces BPC management decided to evacuate the island. The French destroyer Le Triomphant arrived in early 1942, and took aboard 61 Europeans, 391 Chinese and 49 members of the military garrison. There were 191 other BPC staff left behind, who were to be evacuated later, along with 1,850 Nauruans, however none were evacuated (Haden 2000).

A force of 300 Japanese landed on Nauru in August 1942, and immediately rounded up the remaining Europeans and made them prisoners. The local Nauruans (numbering some 1,850 in all), although still allowed the freedom of the island, were placed on food rations and made to bow to all Japanese. A number of 6-inch coastal defense guns were installed around the island, along with 127 mm antiaircraft guns at Command Ridge, plus numerous concrete pillboxes along the coast. An underground hospital was built and some inland bunkers constructed at strategic vantage points. Later, a contingent of about 1,500 Japanese and Korean laborers arrived to begin construction of an airfield. Another 300 Nauruan and Gilbertese were conscripted to augment the work force (Haden 2000).

The airfield runway was completed and made operational by January 1943, the basis of which serves as the current runway used by on the island today. Although experts came from Japan in an attempt to resume phosphate mining, this idea was abandoned and the island was left as an important link in Japan's defense system in the central Pacific (Haden 2000).

American planes bombed Nauru in March 1943, destroying 15 Japanese aircraft parked near the runway and damaging field installations. In retaliation, the Japanese executed five British prisoners. The U.S. air raids caused an interruption of food supplies to the overcrowded island causing the Japanese commander to send 1,200 Nauruans and two missionaries to Truk in the Carolines. Only 737 of these survived the harsh conditions under the Japanese on Truk. They were repatriated to Nauru in January 1946 (Haden 2000).

Conditions were also harsh on Nauru with torpedoed supply ships and continual air bombardments meaning survival depended on subsistence living. By the end of the war, some 300 Japanese had died from starvation. A U.S. B-25 bomber named Coral Princess was shot down on Nauru in June 1944. The Japanese surrender of Nauru came on 13 September 1945, aboard the Australian warship HMAS Diamantina. Some 3,745 Japanese and Koreans were repatriated from the island soon after. Some of the Japanese were later to face the war crimes tribunal over the execution of European and native prisoners (Haden 2000).

Post-war period

In November 1947, Nauru became a United Nations trust territory, an arrangement paralleling the former League of Nations mandate. The same three metropolitan powers were the responsible authorities, but Australia continued to provide the actual administration.

A series of developments in the 1950s and particularly in the early 1960s led to self-government and eventually political independence and ownership of the phosphate industry. In October 1967 an agreement granting Nauruan independence was made. The Jan. 31, 1968, the 22nd anniversary of the return of Nauruans from Truk following WWII, 31 January 1968, was chosen as Independence Day for the Republic of Nauru (Foster and Kiste 2012).

Phosphate mining

Phosphate has been mined on Nauru since 1907. For decades it was Nauru's main resource and sole export, dominating the island's economy, and its quality was the highest in the world. For much of the 20th century the phosphate industry was owned and operated by the British Phosphate Commission (BPC). In 1967, the Nauruans purchased the assets of the British Phosphate Commissioners, and in June 1970 control passed to the Nauru Phosphate Corporation and in the 1980s Nauru was for a time one of the wealthiest countries in the world in terms of gross domestic product per capita. By the late 20th century, however, the phosphate deposits were quickly becoming exhausted, and Nauru experienced a severe drop-off in earnings, leading to the country's near bankruptcy by the early years of the 21st century. Thereafter Nauru has struggled to develop other resources and find alternative sources of income (Foster and Kiste 2012; US Department of State 2012).

In 1989 Nauru filed suit against Australia in the International Court of Justice in The Hague for damages caused by mining while the island was under Australian jurisdiction. Australia settled the case out of court in 1993, agreeing to pay a lump sum settlement of A$107 million (U.S. $85.6 million) and an annual stipend of the equivalent of A$2.5 million in 1993 dollars toward environmental rehabilitation (US Department of State 2012).

Immigration and the 'Pacific Solution'

In late 2001 Nauru agreed to accept up to 1,200 asylum seekers, mostly Afghani or Iraqi, who had been intercepted in the Indian Ocean by the Australian navy. Australia paid some $10 million in exchange for Nauru's holding the migrants while their asylum applications were being processed. Detention for periods of up to several years, along with reportedly poor conditions at the camp, raised international concern over human rights violations on the part of Australia. In December 2002 the agreement was extended to cover another 1,500 people for an additional $14 million. Over the following years the number of refugees slowly dwindled as their applications were processed. In late 2007 Australia announced plans to close the Nauru detention centre, and the last refugees left the island in February of the following year. Australia pledged to assist Nauru in addressing the economic loss resulting from the centre's closure (Foster and Kiste 2012).

Appendix B. Known Historical Sites

Site	Location	Description	Condition (in late 1990s - early 2000s)
Japanese Zero Fighters	Various	Remains of fuselage, engines, cockpits, tails of various Zero aircraft	Most have been removed and various disposed of in the Nauru dump, Australian War Memorial, Nauru Museum or demolished during construction of housing.
G4M Betty aircraft	Eastern end of airfield on Anton's land, at base of ridge	Remains	Demolished during housing construction 1971. Remains existing in bush.
Machine-gun nests and small shelters	Above airport terminal Above Denig near Cliff Lodge Ewa	Six inch naval guns and gun emplacements.	Damage by Australian forces immediately post-war but still in place and relatively intact.
Command Ridge	Command Ridge, west of Aiwo, along most of the ridge including near modern telecomm tower	Artefacts including cartridge cases, ceramic rice bowls, beer bottles, radio valves, light bulbs, typewriter, enamel basin, tools, fuel drums, buttons, metal rice bowls	Existing
Japanese Command Complex	Command Ridge, west of Aiwo, near telecomm tower	Machine gun mountings, zig-zag trench system, rifle pits, stone bunker with Japanese writing, ammunition crates, search light battery, barbed wire	Existing
Japanese Bunkers	Various, including Ewa, Command Ridge, above airport, and most raised hillsides/clifftops	Concrete structures, stone structures, timber packing crates in roof structures, some underground with chimneys for ventilation, escape tunnels	Existing
B25 Coral Princess	Pinnacles area, halfway between second gun mount and NPC railway line	Remnants of wreckage, including thousands of fragments, engine parts, wings, propeller hubs, other debris	Some sent to Australian War Memorial, some existing on site
Steam locomotive	Originally located at NPC Engineering office	Orenstein and Koppel steam locomotive	Recovered, restored and on display at Nauru Military Museum
Railcars and other rail infrastructure	Various - foot of cliff near golf course, pinnacles near running track	Railcars and hoppers	Examples recovered, restored at Topside Boilermakers Shop
Japanese living quarters	South of Topside area on ridge above airport	Stone terraces, concrete floor slabs, iron, asbestos, bricks and rubble, tubs for hot baths, concrete water tank, Japanese beer bottles.	Existing

Site	Location	Description	Condition (in late 1990s - early 2000s)
MQ1 mining area	Area behind MQ1 and north and south of area	Old diggings, shovels, picks, other tools, some WWIII remnants including bomb fragments and naval shells. Phosphate mining evidence and equipment.	Existing
Japanese Power Station	Location unclear, possibly near Command Ridge	Remains of Japanese power station, underground hospital bunker, old railway workshops, crach site of American navy Hellcat Figther	Existing
Ewa Cave	100m south of Capelle store complex, up cliff face on north side of break in cliff face	Stone machine-gun emplacement, bunker and concreted recess in rocks, horizontal fuel drums cemented together as blast shelter, cave entrance at rear of blast shelter, cave extending down 8-10 metres. Finds included highly fragmented human remains from multiple individuals, rifles cases, cartridges, modern iron and aluminium objects. Large mound below opening in roof of cave containing rock, soil and bone fragments. Age and origin of human remains is uncertain.	40% of mound excavated by locals.
Topside Hospital Cave	1km from Topside Fields workshops	Natural sinkhole with large underground cavern and subsidiary tunnels, fortified walls and bunkers, engine-driven fan, timber plank flooring, hospital equipment, used by Japanese during WWII.	Cave sealed with rubble to ground level in 1988 by Nauru Phosphate Corporation.
Buada Hospital Bunker	Buada	Underground tunnel and rooms containing old beds and other hospital equipment	Tunnel immediately past first room demolished with explosives in 1980 by Nauru Phosphate Corporation. Steps to passageway and first room are accessible.