

## Appendix A

# Site Development Area

541,000

541,200

541,400

541,600

Figure 2 -  
Lombrum Point

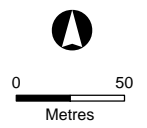
- LEGEND
- Hardstand Site 3
  - Greenfields South
  - Fisheries
  - Greenfields Site 1
  - Hardstand Site 1
  - Hardstand Site 2
  - Port Central

9,774,600

9,774,400

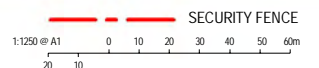
9,774,200

DATA SOURCES  
PNGDF  
Quickbird DigitalGlobe 25/07/08



[ GDA94 | MGA Zone 55 ]  
1:3,500 @ A4





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**MANUS ISLAND LOMBRUM POINT OPC2 FACILITY**  
**ZONE PLAN**

PROJECT NO: SB20334  
DRAWING NO: SD001

DATE: 24 SEPT 2013  
SCALE @ A1: 1 : 1250

PROJECT DIRECTOR:  
PROJECT MANAGER: TR

DESIGN REVIEW:  
DESIGN CHECK: GP

REVISION: P2  
AMENDMENT: PJ

PRELIMINARY ISSUE FOR REVIEW

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## Appendix B

# Manus Island Heritage Assessment

## Appendix B Manus Island Heritage Assessment

### Manus Prehistory

Manus Island is the largest island among the approximately 70 islands that make up the Admiralties group. A part of the larger Bismarck Archipelago, the Admiralty Islands are largely volcanic, although Manus also features a limestone karst system towards the centre of the island, and areas of coastal alluvium (Pavrides & Kennedy 2007). Much of the islands are covered with dense rainforest and on eastern Manus, this is interspersed with sago plantations in low lying areas, gardens and villages on hill sides, along with coastal fishing villages (Pavrides & Kennedy 2007). Western Manus is typified by coastal fishing villages and sago plantations on low-lying hinterland, but the hilly interior is given over almost entirely to forests dominated by *Calophyllum* (Prebble et al. 2011)

Although located to the north east of New Guinea, the islands of the Bismarck Archipelago were never joined to the main land mass nor the larger islands (New Britain, New Ireland and Manus) to one another (Leavesley 2006). Human settlement of the islands therefore required extended sea voyages, a process that began around 40,000 years Before Present (BP) with the arrival of people in New Ireland and New Britain. The colonisation of the isolated Manus Island was a more difficult prospect, requiring a sea crossing of around 200 km, 75 km of which was out of the sight of land (Leavesley 2006). This was accomplished some time before 21,000 BP, the first known journey of such an extent, and it suggests advanced marine craft and navigational knowledge (Leavesley 2006).

The first settlers of Manus Island were likely high mobile, marine-adapted hunter gatherers, or 'strandloopers', who focussed on the exploitation of on-shore and reef resources. Early coastal sites feature large middens dominated by shellfish (including *tridacna*, *anadara* and *geloina*), with large quantities of fish appearing in later levels (Leavesley 2006). It is unclear, however, whether the paucity of fish remains in early levels indicates an absence of intensive fishing, or is related to taphonomic factors. Tool technologies from this initial period were based on high quality chert available on the island (Pavrides & Kennedy 2007).

Such coastal adaptation was key to the colonisation of a relatively small island such as Manus, which featured limited biodiversity, and few terrestrial resources that could support a large human population. Soon after arrival, however, Manus inhabitants began to reshape the island's environment to better suit their needs, introducing food plants such as *Canarium* (c. 20,000 BP), and later small mammals, including the spotted cuscus and the spiny bandicoot (c. 13,000 BP). The presence of pelagic fish species in deposits from around this period also points to an expansion of fishing activities, possibly supported by improved marine technologies (Williams 1999).

The suggestion of more intensive sea-going activities around 12,000 BP is also suggested by the appearance of Lou Island obsidian in the archaeological record. Although Manus featured a high quality chert, as well obsidian outcrops around Mt Hahie in the south west, these raw materials are almost entirely supplanted by Lou obsidian over the last 10,000 years (Kennedy et al. 1991). As the Lou obsidian does not offer technological superiority over the local raw materials, it seems likely that it was preferred for social or political reasons, and this suggests an increasing cultural complexity on Manus Island (Leavesley 2006, Pavrides & Kennedy 2007).

The next major change in Manus Island life occurred around 4000-3,500 BP, with dawn of the Lapita period. The Lapita complex is defined by a shared material culture, specifically pottery, and by the introduction of new food crops and agriculture, and it encompassed much of island Melanesia and Polynesia, including the Bismarck Archipelago. The Lapita have traditionally been viewed as an immigrant group, but their origins and relationship to prior inhabitants is unclear (Prebble et al. 2011). Further questions have been raised by recent work suggesting that many of the cultural changes attributed to the Lapita actually appear prior to the Lapita period (Pavrides & Kennedy 2007).

The nature of the Lapita period on Manus is even more unclear. Only eight sherds of Lapita pottery have been recovered on the island, and none are from sites typically associated with Lapita occupation, suggesting perhaps only transitory contact with the Lapita complex (Prebble et al. 2011). However, it is during this period that potting technology and staple foods such as sago and taro are thought to have been introduced, and agricultural villages established in the interior of the island. In the east, these villages have survived to the present day, but those in the west appear to have been abandoned sometime in the last 1000 years, with the garden plots giving way to large expanses of *Calophyllum* forests (used locally for canoe manufacture) (Kennedy et al. 1991; Prebble et al. 2011). The reason for this radical population shift is currently unknown.

Archaeological sites have been located across the island, including Pamwak Rock Shelter (c. 21,000 BP) on the southern coast, the Peli Louson Rock Shelter (c. 4,100 BP) in the karst system of the interior, and the Father's Water open site (c. 5,100 BP) on a coastal terrace in the grounds of the Papitalai high school on Los Negros. Of these, Father's Water occupies a similar geographical and environmental context to Lombrum Point, located some 4 km to the north west. Excavations at this site revealed pottery, obsidian and bone (mostly fish and marine mammals) in the top layers, and shell and obsidian in the lower layers (Kennedy 1983). Changes in tool types and reduction sequences between upper and lower layers suggest that the site was initially a temporary living site, later becoming a base camp. Father's Water has been identified as an important site in Manus prehistory, and is thought to warrant further investigation (Allen 1984).

Like Father's Water, most archaeological sites on the island are typified by scatters of pottery sherds and obsidian and, in coastal areas, large shell middens. They occur predominately in rock shelters, along hill and ridge tops, and on coastal margins.

### **Ethnographic Overview**

Ethnographic work on Manus began in the 1930s, carried out by prominent anthropologists Margaret Mead and R.F. Fortune. In the past, the inhabitants of Manus Island were a diverse group of people who utilised a variety of cultural practices that were largely based on resource acquisition, production and trade (Dalsgaard 2009:20). These complex and interrelated groups have been separated into three distinct and differing specialisations and are described by Dalsgaard (2009:20) and others as follows:

*The inland people on the main Manus Island primarily produced sago, betel nuts and some garden produce. The inhabitants on the small fertile islands of volcanic origin made gardens, did woodcarvings and had some access to the ocean. Finally, there were the landless people relegated to living on atolls or pole-dwellings near the coast. These people depended on marine products. Among this group were, for example, people of the linguistic or 'ethnic' group today called Titan. They had established themselves as middlemen between the other groups in the southern part of Manus (Mead 1930).*

Case (2005) names and describes these groups as 'the Usiai, who, in general, live among the densely forested interior of the island, the Titan, sea-faring people who live along the coast, and the Matangkol, a group that exists as a result of the overlapping generations between the other two cultural subclasses, located throughout the island'.

The coastal people of Manus were predominantly fishing peoples who traded fish and canoes for other essential produce in regularly held markets with their neighbours. While the 'Manus canoe' was key in the exchange process, fishing people on both the northern and southern coastlines had a monopoly on their production and ownership and they sporadically entered into 'warlike clashes' when either 'ventured into their trading and fishing grounds' of the other (Mead 1937:210). The Manus people are described by Fortune (1931) as the 'fishermen and overseas traders of the Admiralty Islands' who constructed their stilt homes (Figure 1) 'from land in lagoons about the east, south-east, and south of the Admiralty Archipelago' (Fortune 1931:74). The interior of Manus Island is taken up with sago growers in the swamp regions of the island and garden growers on the higher ground. Additionally a few regions had access to special resources such as 'obsidian, pottery clay, and beds of *Imbricaria punctata*, the basis of shell money (Carrier and Carrier 1985:507).



Figure 15: Photograph by Margret Mead of Stilt homes on Manus Island coast line (Source: Online Mead Exhibits).

As each group occupied a particular ecological niche within the island they were reliant upon each other for the necessities of life through trade.

*The people on Manus Island therefore specialised in particular ecological niches which resulted in them all being dependant on one another to obtain the variety of resources needed to sustain their livelihood. However, these ecological niches and the consequent interdependence were not simply seen as an economic phenomenon but also as cultural practices 'as markers of collective and individual identity, a phenomenon Schwartz named 'cultural totemism'. These markers of identity were defended as economic resources, but were also critical to processes of differentiation and the 'reciprocal identification of individuals and groups' (Schwartz 1995:58 cited in Dalsgaard 2009:22).*

Trade was therefore extremely important and was based around the concept of 'compulsive barter: fish must be traded for taro, sago for coconuts, areca nut and the pepper leaf which is chewed with it for the pulverized lime which is a third essential ingredient of areca-nut chewing, etc' (Mead 1937:212). Ecological niches were also supported by 'social specialization', including the right to certain resources and the right to manufacture products from those resources, as well as the right to trade those products within certain trade routes (Carrier and Carrier 1985:507). The practices and the material culture of each group on Manus Island also had distinctive features and processes relating to house and canoe building, fishing techniques and the species they were able to catch, even particular reefs where fishing could occur (Dalsgaard 2009:23).

The more intangible parts of cultural such as dance and song were also distinct to particular groups within Manus Island (Dalsgaard 2009:23). These resource and trade 'monopolies' were also related to the kinship system 'production and kinship met in a system of legitimate control [which] provided a field of manoeuvre in which certain individuals could gain wealth, power, and prestige' (Carrier and Carrier 1985:507). Trade was therefore a complicated process based on well-developed processes and included affinal exchange, commercial trade in the various markets held along the coast line as well as ceremonial exchange and gift giving (Carrier and Carrier 1985:507). A man came to prominence within his own group by accessing abundant resources (usually with the help of younger men in his group) and by producing and trading items successfully (Carrier and Carrier 1985, Dalsgaard 2009, Mead 1937).

The traditional religion of Manus Island and the surrounding region appear to have centred on the ghosts of their particular ancestors; 'each ghost has its own house of abode, often the house where it lived as a mortal' (Fortune 1931:75). The personality of the ghost continues as it was before death and the ghost lives within the same house occupied during life. The more important the ghost was in life, the more important they are in the afterlife, and what interested them in life remains of interest (Fortune 1931:76).

*In the minds of mortals surviving him nothing of him is lost except his visible presence, his corporeal part. To his relatives he is kinder as a ghost than he is to persons not related to him or but distantly related. As a ghost he is severe to those of his mortal kin who flout the traditional ways of his people, just as he was as a mortal. There is but one difference here. As a ghost he knows what is going on amongst his mortal kin, not with omniscience, it is true, but with greater knowledge than a mortal could possess. As a ghost there is little secret sin hidden from him. He has lost one disadvantage of mortality. He accompanies the surviving head of his house everywhere, by land or sea. He protects him from the attacks of other ghosts if necessary (Fortune 1931:75).*

Therefore a special relationship exists between the ghost and his 'ward' in which the ghost is shown particular reverence and the ghost in return assists the ward in his life. In a complex burial ceremony the ward 'preserves the skull from the corpse' and

*'hangs it in an honoured place in the house front within a finely carved wooden bowl, and adorns the bowl with pendant cowrie shells also - if he is a man of rank and he has the right to that privilege. Into the bowl on occasion he puts devotional offerings of aromatic herbs (Fortune 1931:78).*

Ghosts are called not only by name but Sir Ghost. Sir Ghosts attend ceremonies and festivals and protect their ward against other ghosts. Wards appealed to their ghost for assistance but if a ghost does not provide assistance a ward can become angry and threaten the ghost to coax him to provide what has been requested. The ghost/ward relationship is complex and a full description cannot be undertaken here. Interestingly, one of the major reasons for Manus Island peoples adoption of Christianity appears to be that it offered them 'better protection against illness and misfortune' (Otto 1992:429).

### **Colonial Period**

European contact with Manus Island was extremely limited until around the 1870s when the island became a commercial target for pearlshell, tortoise shell, and beche-de-mer resources (Carrier and Carrier 1985:510). Located close to the East Indies and China trade routes, and within the direct route from east Asia to Australia, the Bismarck Archipelago also proved a popular way point on long journeys. Adding to the influx of new-comers were the whalers who became increasingly numerous during the mid-19th century (Gray 1999).

Trade continued to intensify during the 19th century, with Islanders exchanging coconuts, root crops and handicrafts for axes, iron, cotton and clothing. These interactions were generally peaceful, but the differential access to trade goods (particularly axes and firearms) fuelled intra- and inter- island conflict (Gray 1999). New alliances formed to secure protection from well-armed aggressors, and enemies formed over competition for trade goods. Located at the northern end of the Bismarck Archipelago, however, Manus seems to have been somewhat insulated from these social changes, as they were from the diseases introduced by the Europeans.

The first permanent settlement by Europeans occurred in 1875, when missionary George Brown established a base on the Duke of York Islands. Other missionaries and traders followed, although the European population remained low until the mid-1880s, when the islands were annexed by Germany (Schutte 1989). Seeking to establish kopra (coconut) plantations, the Germans suppressed local resistance, undertaking armed actions against peoples of New Britain, New Island, and Manus. The Germans established a colonial administration which incorporated local leaders, but tensions remained high, and violent exchanges were not uncommon (Thomas 2007).

Following WWI, control of German New Guinea, including the Bismarck Archipelago, was awarded to Australia. Australia continued to operate the kopra plantations until 1942, when the WW II Japanese invasion force took over the archipelago (Thomas 2007), including a plantation operated by Australian company Burns Philp located on Lombrum point (Courier Mail 14 November 1951:2).

Although much change occurred on Manus Island with the incursion of colonisation, their system of specialisation remained constant on Manus Island until World War II. As Carrier and Carrier (1985) note 'The peaceful Japanese capture of Manus in 1942 had little effect on the economy, but after its recapture by Allied forces in February 1944, Manus was flooded with soldiers, bases, ships and supplies'. This produced rapid physical and economic change after World War II, along with social change in the form of more complete adoption of Western religion, house structure, schooling and the English language (Mead 1957). The abandonment of tradition, however, seems to have been relatively short lived, with a 'renaissance' of traditional customs and material culture occurring 'due to both local and government initiatives' (Dalsgaard 2009:23).

This re-emergence of tradition is referred to as 'kastam' - a term used to depict 'the ways of the ancestors in that period' (Dalsgaard 2009:24). The concept of Kastam emerged out of government initiatives formulated to



create a 'Manusian identity' by sponsoring 'culture festivals', the introduction of 'culture class' in schools and of 'legislation trying to establish control of the definition and expression of Manus culture' (Dalsgaard 2009:24 see Dalsgaard 2007). Such initiatives stemming from the government coincided with local desire to revive 'what was perceived to be ancestral ways' (Dalsgaard 2009:24).

Although termed as a revival, it is clear from the literature that traditional knowledge is remembered by some older members of the community. Given this revival of the 'ancestral ways', it is likely the current Manus Island peoples have a strong connection to the island and its current resources, and that ceremonial and religious beliefs and practices may be of significance. It is recommended that the people of Manus Island be given an opportunity to communicate the significance they attach to the project area.

**World War II**

In 1942, Japanese forces moved into the Bismarck Archipelago as a part of their strategy to secure the Pacific and, eventually, Australia. The small Australian force on Manus Island was quickly overrun, and their airfield at Lorengau on the island's northern coast was claimed by the invaders. The following year, Japanese forces added a second airfield to the island at Momote, on the south east coast. These airfields were reinforced by sea and ground troops, and by the end of 1943, almost 5000 Japanese troops are thought to have been occupying Manus Island.

At this point, the Allied forces launched a dual attack on the Japanese in the Pacific, with one force moving west from the Gilbert Islands and a second, led by General MacArthur, pushing north from Australia. MacArthur's main aim was to retake the Philippines but, in order to do so; he first had to force Japanese forces from the Bismarck Archipelago. The Allies subsequently launched a series of amphibious assaults along the New Guinea coast, focusing first on the large bases on New Britain and New Guinea and then moved to Manus Island (Hirrel n.d.).

The Allied forces initially took the Momote air field, and then moved throughout eastern Manus (Los Negros), reaching Lombrum Plantation on March 8 (see Figure 16). The Allied troops found the plantation abandoned on their arrival, and took the area without any difficulty, finding 'abandoned gas, oil, and bomb dumps as well as one serviceable LMG [Light Machine Gun] Cal 25.6 with abundant ammunition' (7th Cav Historical Report in Scott 2004).

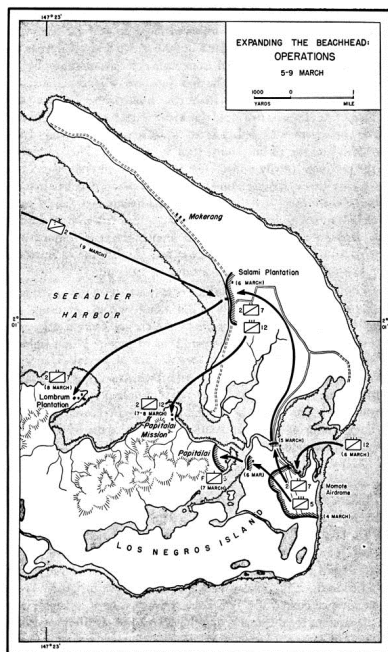


Figure 16: Map of Los Negros and location of Lombrum Plantation (Source: Hirrel n.d.).

By mid-April, the American forces began construction on a base at Lombrum Point, beginning with the construction of a road joining Lombrum to Pipitalia Point to the south. They then constructed a 250 ton pontoon dry-docks, six warehouses, two Quonset (or Nissen) huts, along with three docks and a sea place base (Scott 2004). It was estimated that the Americans spent some £50 million on the construction of the base (The Sydney Morning Herald 2 June 1949:2).

After the conclusion of the war, disagreement broke out over who should lay claim to the Manus Island military bases; the Australians who had control of the island, or the Americans who had built the bases (Courier Mail 8 April 1946:2). Australia reinforced their claims with the argument that the Manus Island bases formed a vital northern defence to New Guinea and the Australian mainland (Courier Mail 8 April 1946:2).

Facing post-war budget restrictions, the Americans eventually abandoned the bases in 1947, and ownership was passed to Australia. Before Australia took over, however, America sold salvage rights for all moveable equipment to the Chinese, who spent a year recovering several tons of abandoned jeeps, trucks and other machinery. Australia purchased all fixed equipment, including 1500 Quonset huts, for £500,000 (The Sydney Morning Herald 2 June 1949:2). A report on the island in 1949 commented on thousands of Quonset huts found on the base and 'packed like sardines' onto the Lombrum flats as part of the 'workshops and main wharf area' (Courier Mail 21 September 1949:1).

By the time Australia's defence forces arrived to take over the bases in 1949, however, they found them in ruins, with Quonset huts and other metal corroded, timber wharves disintegrating, and jungle reclaiming the area (The Sydney Morning Herald 2 June 1949:2; 22 February 1950). Rather than an operational base, Australia had thus inherited a derelict, and spent several years, and over £21 million, to bring it back into operational condition (Courier Mail 21 September 1949:1). The Royal Australian Navy initially referred to Lombrum point as Advanced Royal Australian Navy Base, then HMAS Seeadler and finally HMAS Tarangau (AECOM 2013). Photographs from the period show an extensive base which formed an important part of Australia's northern defences in the midst of continued concern over Asian military aggression (SMH 18 November 1952:3).



AUSTRALIAN WAR MEMORIAL

041523

Figure 17: Lombrum Point in 1949 (Source: Australian War Memorial).



**Figure 18: Nissen (or Quonset) Huts at Lombrum Point c 1950 (Source: Australian War Memorial)**

During the rebuilding phase, over 200 Japanese prisoners of war were transferred to Lombrum from New Britain to await trial for war crimes. In 1951, several of these prisoners were found guilty and five were condemned to death by hanging. A small gallows was erected in a hut 'near Lombrum point' (Sydney Morning Herald 9 June 1951:3) and, after the executions were carried out, the bodies were cremated and their ashes scattered (AECOM 2013).

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# Lombrum Offshore Processing Centre Expansion

EPBC Act 1999 Self-Assessment



AECOM

Lombrum Offshore Processing Centre Expansion  
Commercial-in-Confidence

## Lombrum Offshore Processing Centre Expansion

EPBC Act 1999 Self-Assessment

Client: Sinclair Knight Mertz Pty Ltd

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## Quality Information

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## Executive Summary

AECOM Australia Pty Ltd (AECOM) has been commissioned by Sinclair Knight Mertz (SKM) to undertake a desktop environmental assessment for the expansion of offshore processing facilities at Lombrum Point, Manus Island, Papua New Guinea (PNG) for the Australian Department of Immigration and Border Protection (DIBP).

The purpose of this assessment is to determine the significance of impact, if any, on the environment in accordance with requirements of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). As a Commonwealth agency, DIBP is required to assess the potential impacts of its actions against the assessment criteria in the Department of Sustainability, Environment, Water, Population and Communities' (DSEWPC) *'Actions On, or Impacting Upon, Commonwealth Land, and Actions by Commonwealth Agencies Significant Impact Guidelines 1.2'* (*Significant Impact Guidelines 1.2*).

The existing OPC is located at Lombrum Point, 12 km east of Lorengau. The sites included in the centre are collectively referred to as Lombrum Offshore Processing Centre, Manus Island and include Lombrum Greenfield Site, Hardstands 1, 2 & 3, the Fisheries area and other potential laydown areas, site access tracks and supporting infrastructure.

The assessment aimed to evaluate potential impacts of an expansion of this facility as accurately as possible, based on the desktop assessment and review of available information. The key findings of this assessment were:

- **Soil erosion impacts:** There is the potential for residual impacts of soil erosion and alterations to the watercourse and lagoon to be moderately significant. Further assessment is constrained by the uncertainties around the soil type present and the current lack of detailed design information on how erosion will be managed, what the final drainage solution will be and how this will impact on the surrounding water infrastructure.
- **Vegetation clearing and impacts on flora and fauna:** Given the fact that most of Manus Island's threatened species is endemic to the island and not restricted to higher elevations, there is a possibility that some threatened species might occur within the project site. This is compounded by the plight of surrounding lowland rainforest and impacts of traditional slash and burn agricultural practises reducing the 'quality' of surrounding lowland rainforest. The level of clearing in the context of a modified surrounding and the broader extent of forest on the island is small. However it cannot be ruled out that the project could have an impact on flora and fauna.
- **Impacts to heritage places:** Impacts on heritage values could potentially be significant as the proposed works will result in the permanent destruction of heritage buildings, the potential disturbance of archaeological deposits, and the modification of the setting of a heritage place. Impacts can be managed to a minor level of severity through a more detailed assessment of heritage values, archival recording of extant heritage and incorporation of a cultural heritage induction and 'stop works' protocol for unexpected finds into the construction environmental management plan.
- **Community:** The proposed action has the potential to impact the local community surrounding the site. As there is already a similar facility at this location, the expansion is unlikely to cause physical dislocation of the community or affect the availability of agricultural land. The design and construction methodology is expected to avoid impacts on community services and infrastructure. The provision of the facility may also provide opportunities for work and the potential to supply goods and services to the facility for some community members. However, the potential for impacts on community health and wellbeing cannot be ruled out. Potential impacts such as decreased community cohesion, increased mental health issues, increased anti-social behaviour and increased stress and fatigue could affect the health, welfare and quality of life of the community. Engagement with community representatives is recommended to identify concerns they may have on potential impacts and to facilitate positive economic outcomes for the community where possible.
- **Utilities:** The existing condition of electricity utilities to the site and provisions for solid waste disposal is uncertain at this stage however due to the proposed increase in capacity of the proposed action this may have a significant impact on the local area's amenity and ability to provide these services. Where the facility is designed to be self-sufficient, it is unlikely that the proposed action will have a significant impact on utilities and has the potential to improve existing services and associated utility infrastructure.

Where an action is likely to have a significant impact on the environment, or the proponent is unsure, a referral should be submitted to DSEWPC for further consideration. For a significant impact to be 'likely' to occur 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.

On this basis, it is recommended that the action be referred to DSEWPC for further consideration.

## 1.0 Introduction

AECOM Australia Pty Ltd (AECOM) has been commissioned by Sinclair Knight Mertz (SKM) to undertake a desktop environmental assessment for the expansion of offshore processing facilities at Lombrum Point, Manus Island, Papua New Guinea (PNG) for the Australian Department of Immigration and Border Protection (DIBP).

The purpose of this assessment is to determine the significance of impact, if any, on the environment in accordance with requirements of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). As a Commonwealth agency, DIBP is required to assess the potential impacts of its actions against the assessment criteria in the Department of Sustainability, Environment, Water, Population and Communities' (DSEWPC) '*Actions On, or Impacting Upon, Commonwealth Land, and Actions by Commonwealth Agencies Significant Impact Guidelines 1.2*' (*Significant Impact Guidelines 1.2*).

AECOM had previously been engaged by DIBP through Toll Remote Holdings to prepare an EPBC self-assessment on one of these sites, that of Greenfields Site 1. This assessment identified a number of areas or risks for the project (AECOM 2013). This assessment is to include the new sites under consideration and to consider additional information provided by SKM and sourced by AECOM in relation to flora and fauna, heritage, utilities and infrastructure.

### 1.1 Site Location

Manus Island is part of Manus Province in northern Papua New Guinea (Wikipedia, 2013). With a total area of around 2,100 km<sup>2</sup>, Manus Island is the largest of the Admiralty Islands and the fifth largest island in Papua New Guinea (Wikipedia, 2013). The population was numbered at 50,321 during the 2011 Census (Wikipedia, 2013). The capital of Manus Province is Lorengau, which is located on the island. The closest airport is Momote Airport, which is located on Los Negros Island and connected via a bridge to Manus Island (Wikipedia, 2013). The highest point on Manus Island is Mt Dremsel, located 718m above sea level at the centre of the south coast.

The existing OPC is located at Lombrum Point, 12 km east of Lorengau. The sites included in the centre are collectively referred to as Lombrum Offshore Processing Centre, Manus Island and include:

- Lombrum Greenfield Site
- Hardstand 1, Hardstand 2 and Hardstand 3 – making up one block
- Fisheries area
- Other potential laydown areas, site access tracks as designated by DIBP
- Additional infrastructure to support these facilities e.g. use of ship unloading areas, discharge of waste water from sewage facilities to ground (as in Nauru), expansion of the tip.

The development is shown on Figure 1 and the individual sites shown on the site map in Appendix A.



Figure 1 Location of Offshore Processing Centre at Lombrum Point, Manus Island

## 1.2 Scope

Under section 28 of the EPBC Act, approval of an action under the Act is required when that action is conducted by a Commonwealth agency (anywhere in the world) and it is considered *likely* to have a significant impact on the environment.

The purpose of this self-assessment is to determine whether the proposed action is likely to have a significant impact on the environment. For this purpose, the 'proposed action' is the clearing of the Lombrum Greenfield Sites, on Manus Island, and expansion of current detainee facilities and accommodation. This self-assessment is required to be carried out in accordance with the process established in DSEWPC's *significant impact guidelines 1.2*.

A 'significant impact' is defined in the guidelines as 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.

For a significant impact to be 'likely' to occur 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 the action and potential impacts are serious or irreversible, the precautionary principle is applicable. Accordingly, a lack of scientific certainty about the potential impacts of the action will not by itself justify a decision that the action is not likely to have a significant impact on the environment.

### 1.3 Self-Assessment Process

The self-assessment process followed in this report has been taken directly from the four step process documented in the DSEWPC *Significant Impact Guidelines 1.2*. This four step process is introduced below and forms the structure of this report, through Sections 2 to 4.

#### **Step 1: Environmental context**

- a) What are the components or features of the environment in the area where the action will take place?
- b) Which components or features of the environment are likely to be impacted?
- c) Is the environment which is likely to be impacted, or are elements of it, sensitive or vulnerable to impacts?
- d) What is the history, current use and condition of the environment which is likely to be impacted?

#### **Step 2: Potential impacts**

- a) What are the components of the action?
- b) What are the predicted adverse impacts associated with the action including indirect consequences?
- c) How severe are the potential impacts?
- d) What is the extent of uncertainty about potential impacts?

#### **Step 3: Impact avoidance and mitigation**

Will measures to avoid or mitigate impacts ensure, with a high degree of certainty, that impacts are not significant?

#### **Step 4: Are the impacts significant?**

Considering all of the matters in steps 1 to 3 above, is the action likely to have a significant impact on the environment (confirmed against the significance criteria set out in the *Significant Impact Guidelines 1.2*)?

- Yes, or still unsure: A referral should be submitted to DSEWPC.
- No: Referral is not necessary.

### 1.4 Project Description

DIBP currently operates an existing Offshore Processing Centre (OPC) for approximately 400 transferees and 150 staff at the Lombrum Point Papua New Guinea Defence Force (PNGDF) base, on Manus Island.

DIBP are now investigating the possibility of expanding this OPC through the provision of additional facilities and accommodation on approximately 50,000 m<sup>2</sup> of adjacent land within the Lombrum Naval Base. Those facilities will then service a total of approximately 800 staff and 2000 transferees.

Details of each site are provided in the following section. Refer also to the site map in Appendix A.

#### **Greenfields Site 1:**

The land parcels of Greenfields Site 1 are divided into three cells; Northern, Middle and Southern; and is located immediately south of the existing 45,000 m<sup>2</sup> soccer field and immediately west of the current temporary OPC facilities. The site is at a low elevation and experiences frequent runoff from surrounding areas (west) of a higher elevation. The entire project site was cleared over 70 years ago and has regenerated at Greenfields Site 1 with secondary lowland rainforest and some mangrove vegetation present (SKM, 2013). The site is mostly vegetated, except for Nissen huts located along the southern lot boundary (each 430 m<sup>2</sup>) and a building in the central-north of the site (800 m<sup>2</sup>) that are connected via an existing track. There is also evidence of dumping waste with potential for contamination across the entire site (SKM, 2013).



Figure 2 Greenfields Site 1 (SKM, 2013)

#### **Greenfield South:**

Greenfield South is located south of Greenfield Site 1 and has a few existing buildings on it. It has mostly been cleared to accommodate the existing infrastructure, except for a few mature trees located in its eastern corner.



Figure 3 Greenfield South (SKM, 2013)

#### **Port Central:**

Port central is located east of the fisheries site and south of Greenfield South. It has been partially cleared to accommodate port infrastructure, and has a few remaining trees (possibly mangroves) along its coastal border. There is also moderate coverage of shrubs with young regrowth on the port central side (eastern side) near concrete slabs.



Figure 4 Port Central (SKM, 2013).

**Hardstand Site 1, 2 and 3:**

Hardstand Site 1, 2 and 3 are located across the road from Greenfields Site 1, approximately 20 metres away to the east. The Hardstand Sites are cleared and have existing buildings and infrastructure. The northernmost hardstand (Hardstand 1) has been cleared of buildings except for a single large building at the north-eastern end of the hardstand, which will not form part of the permanent OPC facilities. Hardstand Site 2 is entirely cleared with a few buildings on it that function as workshops and storage. Hardstand Site 3 is also cleared with a few buildings being used as workshops and for storage.



Figure 5 Hardstand Site 1 (SKM, 2013)



Figure 6 Nissen Huts at Hardstand Site 2, (SKM, 2013)

**Fisheries:**

A Fisheries site is located approximately 100 m south west of Greenfields Site 1. This site has not previously been used by PNGDF. Buildings and marine infrastructure on this site were previously used for fishery industry operations. This area is proposed to be used for logistics and storage. The jetty was noted to be in good condition. Based on a site visit by SKM in September 2013, the site appeared to have a moderate coverage of shrubs with young regrowth on the eastern side of the site near Port Central.



Figure 7 Existing Infrastructure at Fisheries (SKM, 2013)





Figure 8 Existing Infrastructure at Fisheries (SKM, 2013)

#### **Proposed Infrastructure:**

The number and configuration of new buildings across the Lombrum Point site is yet to be finalised. At this stage it is thought to include the following:

- Accommodation to be separated into single rooms with two beds in each (provision for two double bunks if required);
- Male and female ablution blocks with toilets and showers to cater for 2800 persons at a ratio of 1:10;
- Laundry facilities to cater for 800 staff;
- A dining hall with capacity for 600 persons;
- An air conditioned administration office building for up to 100 persons;
- An air conditioned medical facility divided into 10m<sup>2</sup> rooms, and including vector control storage;
- Power generation to run the facility, and
- Connection to sewerage, and water supply.

A preliminary plan showing indicative locations of key facilities is also included in Appendix A.

DIBP requires that all building design must comply with:

- Commonwealth legislation;
- Building Code of Australia;
- Relevant Australian and New Zealand standards for design;
- Relevant Australian State and International standards; and
- Standard of Design and Fit out for an Offshore Processing Centre (OPC).

#### **Project Assumptions:**

The development is at a very early stage of design and as such, much of the detail of the facilities is yet to be determined. For the purposes of this assessment, the following assumptions have been made in relation to the expansion:

- For the purpose of this self-assessment, the assumption has been made that the development would necessitate the clearing of all vegetation on the project site;
- The facility will be designed to be self-sufficient in relation to water, power and sewage treatment services (via augmentation of the existing sewage treatment plant, water supply and power generation);

- Design of the facility will also establish a sustainable long term solution for waste (through development or identification of an appropriate waste facility nearby);
- Site drainage will be appropriately managed by maintenance and/or through augmentation of existing drainage;
- Fill required for land preparation will be sourced from local appropriate quarries, but may potentially include coral aggregate;
- A contaminated land assessment will be carried out and contaminated soil appropriately dealt with during construction if required.

## 2.0 Step 1: Environmental Context

The key to determining whether an action is likely to have a significant impact on the environment is to understand the environment which will be impacted.

### 2.1 Landscapes and Landforms

#### *a. What landscape features or landforms are present?*

Manus Island is part of the Admiralty Islands that are located just north of PNG. Manus is the main island that reaches an elevation of 700 m (World Wildlife Fund (WWF), 2008) and is located within the Bismark Sea eco-region, classified as eco-regionally outstanding due to its high biodiversity (UNEP, 2003).

#### *b. What landscape features or landforms are likely to be directly or indirectly impacted by the action?*

The project site is located on Lombrum Point in the far eastern part of Manus Island and the total area of all sites is approximately 5 hectares. The sites were almost completely cleared over 70 years ago during WWII. Portions of the site (namely Greenfields Site 1) have regenerated significantly since that time and are now mostly vegetated. Other areas of the site are almost completely cleared and have existing buildings and infrastructure in place. The site is at a low elevation and experiences frequent runoff from surrounding areas (west) of a higher elevation (SKM, 2013).

#### *c. Are there outstanding, rare, unusual, valuable or important landscape features or landforms?*

No outstanding rare, unusual, valuable or important landscape features were identified via the desktop study or the field visit by SKM in 2013.

### 2.2 Soils and other Substrates

#### *a. What soils or other substrates are present?*

Manus Island is of volcanic origin and probably formed around 8-10 million years ago in the late Miocene. The island substrate can therefore be categorised as either volcanic or uplifted coral limestone (WWF, 2008). Soil types on Manus Island are typically acid, nutrient-poor soils as well as limestone (Mueller-Dombois and Fossberg, 1998). Eastern Manus appears to be a cast landscape as evidenced by raised limestone formations in the vicinity of the site, although the specific location is poorly drained coastal sediment, likely to have originally been part of a mangrove complex.

#### *b. Is it likely that the soil/substrate will be directly or indirectly impacted by the action?*

Subject to site works proposed, it is likely that soil/ substrate will be impacted. Impacts will vary depending on the gradient and soil type present. This is not known at the moment but it is assumed that red clay soil types are present, which are known to be poorly structured in texture and are hence prone to erosion and waterlogging. The gradient of Greenfields Site 1 is such that surrounding areas drain into it; hence some areas are waterlogged throughout the year. Therefore, there is a high risk of erosion. Most of the rest of the sites are already cleared, disturbed and elevated, however unpaved areas of these sites are still at some risk of erosion.

#### *c. Is the soil/substrate valuable, or does it contain objects that are rare or otherwise valuable?*

*For example: archaeological items with heritage value.*

A site visit by SKM in September 2013 confirmed the presence of World War II artefacts and installations on the sites, in particular the presence of Nissen huts on multiple sites, and identification of areas likely to have been

refuse dumps and possible ammunition storage areas on Greenfields Site 1. Greenfields Site 1 was not used by the US during their occupation, likely due to drainage/flooding issues. There is hence increased potential on that site for objects that are rare or otherwise valuable to occur. This should be further investigated by undertaking a UXO site investigation as early as possible, and by incorporating an unexpected finds procedures into the Construction Environmental Management Plan.

*d. Is the soil susceptible to impacts or will disturbance of the soil cause further impacts?*

It has been assumed that the proposed project will clear all vegetation on the site, and that fill material will be required to level and flood proof the site.

A Construction Environmental Management Plan (CEMP) will manage potential impacts from clearing vegetation as well as potential impacts from movement of machinery, excavations and other works, which have the potential to compact soils, and increase erodibility. Soil protection measures such as the re-establishment of an appropriate, non- invasive grass cover should be undertaken soon after works are completed.

The soil of Greenfields Site 1 is mostly waterlogged throughout the year, with the presence of a drainage line and lagoon evident, and there is anecdotal evidence that the site generally floods during the wet season. The remainder of the sites are mostly cleared and disturbed and less prone to flooding. However, there is the need to apply basic soil protection measures to prevent compaction and erosion on all sites.

The present soil type is likely to be susceptible to impacts and disturbance should be managed tightly in conjunction with the CEMP and appropriate soil protection and rehabilitation measures.

## 2.3 Water

*a. What are the characteristics of the catchment area and what water bodies are present?*

Greenfields Site 1 is in an area that is affected by runoff from surrounding areas of higher elevation, being the lowest point within the base. Water permanently inundates part (~ 40 – 50%) of the site and significant flooding has been reported for periods during the wet season (SKM, 2013).



Figure 9 Lake at Greenfields Site 1



Figure 10 Creek at Greenfields Site 1

Moreover, the middle cell of Greenfields Site 1 has a lake present and a small drainage line that runs through the site (north, middle and southern cells). Portions of the southern cell are mostly inundated.

There were no other significant water bodies observed on the remainder of the site during the site visit. Hardstand sites and the majority of the remaining area of the naval base have been built up and incorporate man-made drainage. The Fisheries site appears to drain to the ocean.

*b. Is it likely that water bodies will be directly or indirectly impacted by the action?*

Yes. It is proposed to clear the majority of Greenfields Site 1, and the site will be provided with drainage and fill solutions to address waterlogged areas and prevent water inundation. This will include a proposal to infill the lagoon and drainage line.

*c. What is the condition and current use of water bodies which may be impacted?*

No water quality investigation has been carried out to confirm the condition of the water bodies. There is potential for contamination where the water body is in contact with historical and contemporary refuse. However a visual investigation by SKM in September 2013 indicated that the condition of the creek and lake are reasonably good. This water body is currently not being used for irrigation or drinking water since Lorengau town water is provided from a collection weir and treatment facilities south of the base.

## 2.4 Vegetation

A range of sources were evaluated in an effort to develop a reasonable species list for the proposed site on Manus Island. James Cook University has been contacted, and searches have been conducted through various library search engines providing scientific literature (journal articles and books) and internet resources about the Manus Island biota. The desktop study revealed a lack of literature, especially journal articles, or coverage by databases such as EPBC protected matters search of Manus Island.

The desktop assessment was supplemented by the findings from a one day site visit by SKM in September 2013.

*a. What general vegetation types and vegetation species are present?*

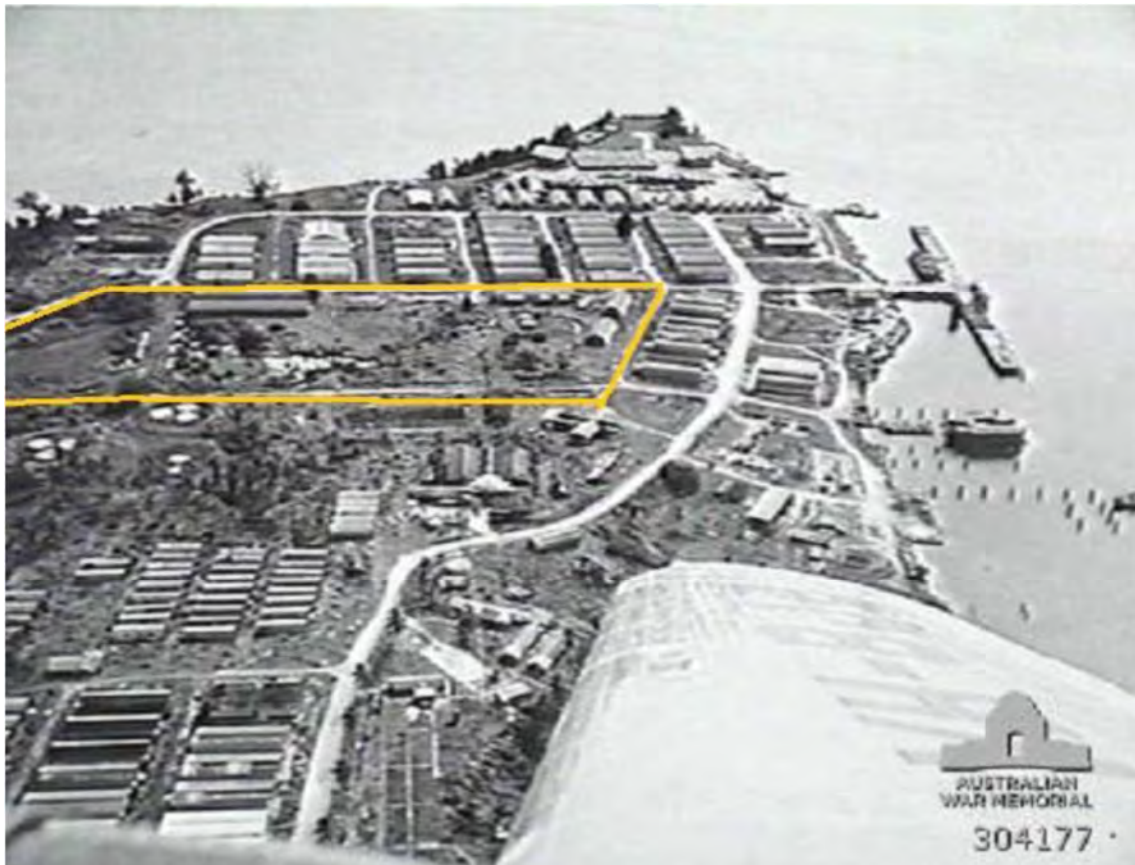
Manus Island is within the Admiralty Islands Lowland Rain Forest Ecoregion, a grouping of 18 islands of which Manus and Los Negros are the largest (WWF). Four-fifths of Manus Island is forested, although this figure is thought to include both primary and secondary forest cover (Rannells, 1995) and does not account for the traditional 'slash and burn' agriculture used by the local population, where by the lowland rainforest is periodically cleared in small patches, used for agriculture for short duration and left to regenerate. Most local vegetation appeared to be a mosaic of early regeneration lowland rainforest, no older than 10 – 20 years (SKM, 2013) Vegetation within the Greenfields site consists of Admiralty Islands Lowland Rain Forests, with a status of Critical/Endangered (WWF 2008).. Due to the Admiralty Islands being isolated from other landmasses, many endemic species have evolved such as tree species of the Calophyllum and Sararanga forests. The WWF

identified the need to protect the endemic *Calophyllum* forests as an area of high biological importance (WWF 2008).

Lombrum Point was cleared of forest in about 1927 and planted with coconut palms. During the World War II era it was known locally as the Lombrum Plantation. Some mangroves were retained along the northern coast (Figure 11). The plantation was recorded as having an area of 314 hectares and was planted with 23,021 palm trees (National Australian Archives, 1951). Figure 12 shows the level of development that existed on Greenfield Site 1 and surrounds by 1945.



Figure 11 Location of the Lombrum Plantation (Australian War Memorial, 1944)



**Figure 12** Australian War Memorial Image 1944, with the outline of Greenfield Site 1 overlain, image facing towards the east

The vegetation present at Greenfield Site can be broadly classified as secondary lowland tropical rainforest. The top cell of Greenfields Site 1 has the most well developed vegetation with lowland rainforest and some mangrove vegetation present. The middle section of Greenfields Site 1 transitions to the more disturbed areas in the southern portion of the site, but supports similar vegetation as the top cell, as well as a small water body and drainage line. The southern cell of Greenfields Site 1 has younger regrowth, dominated by pioneer species.

During the site visit by SKM in September 2013, opportunistic observations were made of plant species on the sites. Opportunistic records of a number of plant species were on made on Greenfields Site 1. A list of these species is provided in Table 2. Notably it includes the Vulnerable *Pteropus indicus*.

The visit also confirmed that most of the rest of the site has been completely cleared in the past to make way for existing infrastructure. Mature amenity plants exist along the perimeters, largely consisting of figs, banyan, and mango trees. The Fisheries area appeared to have a moderate coverage of shrubs on the eastern side of the site near Port Central, however this appeared to be younger regrowth.

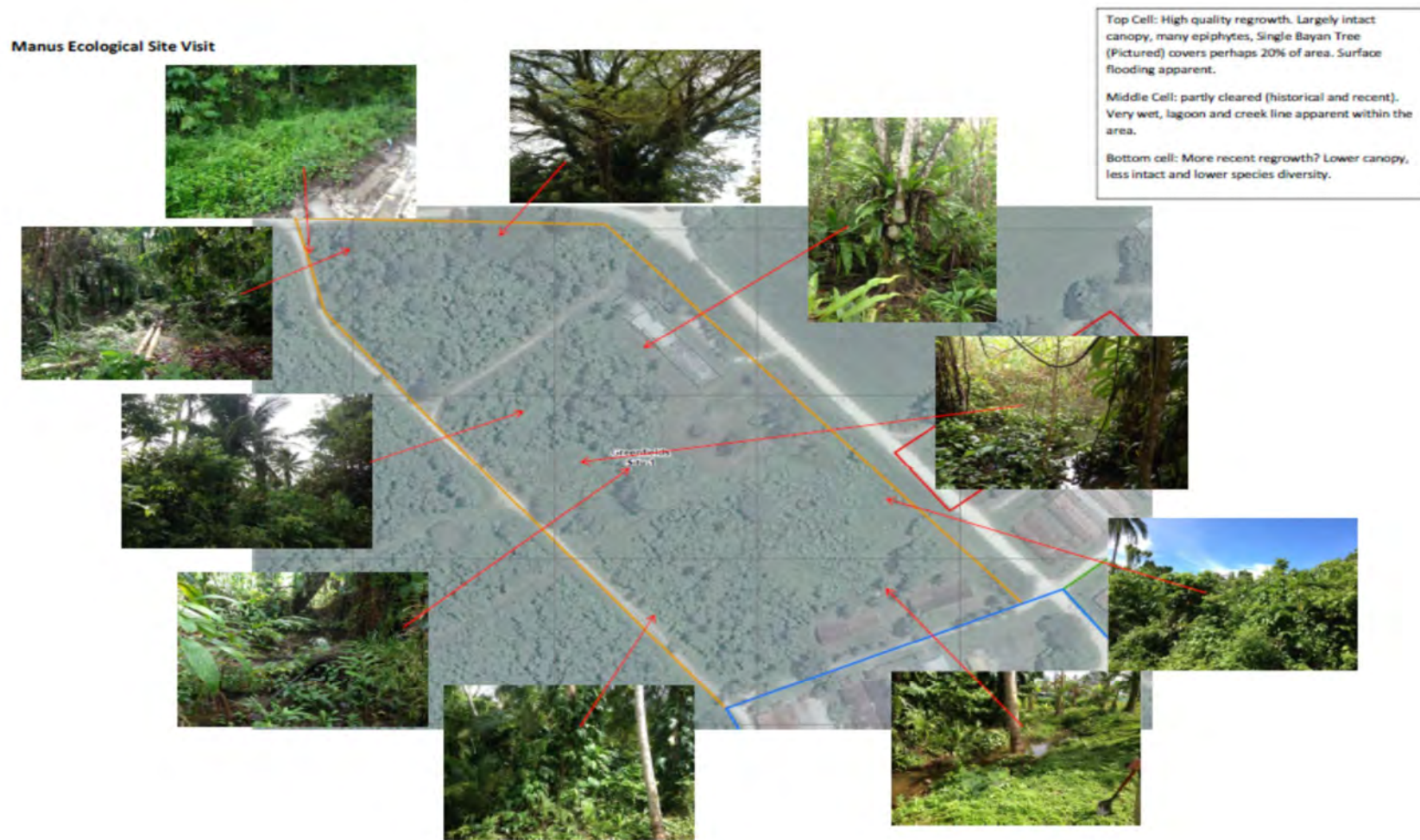


Figure 13 Ecological Site visit to Manus Island September 2013 (Provided by SKM, 2013)

b. *Is it likely that vegetation will be directly or indirectly impacted by the action?*

Approximately 4.2 hectares of vegetation (assuming the whole site will be cleared) of lowland secondary rainforest will need to be cleared from Greenfields Site 1. Typical species that may be present on site based on desktop research are summarised in Table 1. Species observed by SKM during the site visit in September 2013 are shown in Table 2. Note that this was a one day site walk around only, and it is not expected that this is an exhaustive list of vegetation present on site.

**Table 1: Typical species that might be present within the project site depending on prevailing vegetation assemblages (Mueller-Dombois & Fossberg, 1998)**

Vegetation Type	Possible Species Present
Mangroves	<ul style="list-style-type: none"> <li>• <i>Avicenna</i> spp.</li> <li>• <i>Sonneratia</i> spp.</li> <li>• <i>Ceriops</i> spp.</li> <li>• <i>Rhizophora</i> spp.</li> <li>• <i>Bruguiera</i> spp.</li> <li>• <i>Xylocarpus</i> spp.</li> <li>• <i>Lumnitzera</i> spp.</li> </ul>
Lowland rainforest	<ul style="list-style-type: none"> <li>• Conifers- <i>Agathis</i></li> <li>• <i>Dacrydium</i> spp.</li> <li>• <i>Pometia</i> spp.</li> <li>• <i>Octomeles</i> spp.</li> <li>• <i>Alstonia</i> spp.</li> <li>• <i>Camptosperma</i> spp.</li> <li>• <i>Canarium</i> spp.</li> <li>• <i>Cryptocarya</i> spp.</li> <li>• <i>Ficus</i> spp.</li> <li>• <i>Terminalia</i> spp.</li> </ul>
Garden vegetation	<ul style="list-style-type: none"> <li>• A mix of cropland (coconut, bananas, sweet potatoes, tapioca, mango, Malay apple, plums, <i>Canarium</i> almonds)</li> <li>• Many other herb-shrub- tree combinations.</li> </ul>

**Table 2 Plant species observed on Greenfields Site 1 by SKM during the September 2013 site visit.**

Species	Life form	Common name
<i>Canarium australianum</i>	tree	
<i>Canavalia rosea</i>	vine	
<i>Abutilon indicum</i> ssp. <i>Albescens</i>	shrub	
<i>Alstonia actinophylla</i>	tree	
<i>Blechnum orientale</i>	forb	
<i>Carallia bractiata</i>	tree	
<i>Casuarina equisetifolia</i>	tree	
<i>Colocasia esculenta</i>	garden plant	taro
<i>Coleus scutellarioides</i>	garden plant	mint
<i>Crateua religiosa</i>	tree	
<i>Dendrobium affine</i>	tree orchid	
<i>Drypetes lasiogyna</i>	tree	
<i>Ficus varians</i> var. <i>variens</i>	tree	



Species	Life form	Common name
<i>Nauclea orientalis</i>	tree	Leichardt tree
<i>Terminalia archipelagi</i>	tree	
<i>Pterocarpus indicus</i>	tree	
<i>Calophyllum</i>	tree	
<i>Pandanus aquaticus</i>	Understorey	
<i>Rhaphidophora australis</i>	climber	
<i>Thespesia populneodes</i>	tree	
<i>Vavaea australiana</i>	tree	
<i>Xanthostemon paradoxus</i>	tree	
<i>Octomeles sumatrana</i>	tree	
<i>Ficus hispida</i>	tree	
<i>Ficus benjamina</i>	tree	
<i>Tamarind indica</i>	tree	
<i>Asplenium australisicum</i>	epiphyte	
<i>Asplenium attenuatum</i>	epiphyte	
<i>Alpinia purpurata</i>	ground cover	
<i>Pyrrosia rupestris</i>	epiphyte	
<i>Belvisia mucronata</i>	epiphyte	

Some vegetation may also need to be cleared from other sites. This vegetation is much more recent regrowth, however, and largely consists of pioneer species and figs, banyan and mango trees (SKM 2013).

c. Are there vegetation types or associations that are rare, endemic or otherwise valuable?

The WWF (2008) lists the Admiralty Islands Lowland Rain Forests as Critical/Endangered, and has identified the endemic *Calophyllum* forests as being of high biological importance.

In the absence of coverage of Manus Island by decision support tools such as the EPBC Protected Matters Search Tool, the International Union for Conservation of Nature (IUCN) Red List has been used as a surrogate for threatened species listings for the area (Table 3). The IUCN Red List System was first conceived in 1963 and set a global standard for species listing and conservation assessment efforts, with categories revised and then adopted by the IUCN Council in February 2000 and, following further refinement, published. The IUCN categories of Critically Endangered, Endangered and Vulnerable, are assigned to taxa which are collectively referred to as 'threatened'. The category Near Threatened is "applied to taxa that do not qualify as threatened now, but may be close to qualifying as threatened, and to taxa that do not currently meet the criteria for a threatened category, but are likely to do so if ongoing conservation actions abate or cease" (IUCN, 2013). The IUCN no longer uses the term rare as a category.

The IUCN Red List provides taxonomic information, distribution and known threats. This is the basis for Table 3 below which lists species potentially occurring in the area. It should be noted that the presence/absence of these species within the project area would need to be confirmed through a comprehensive field survey. As such, a longer field visit would be required in order to fully identify if endemic or otherwise valuable species are present on site.

Table 3 IUCN Red List of threatened Manus Island flora species

Family	Scientific Name	Common Name	IUCN Status	Information
Cycadaceae	<i>Cycas bougainvilleana</i>	Bougainville sago	Near Threatened	<b>Likely-</b> <i>C. bougainvilleana</i> is confined to near-coastal sites on Bougainville and New Britain Islands in Papua New Guinea and a number of other sites within the Solomon Islands. Plants occur in low elevation moist littoral forest on stabilized calcareous coral sand dunes and headlands (Hill, 2010)..
Combretaceae	<i>Terminalia archipelagi</i>	Forest almond	Endangered	<b>Likely-</b> This large well-formed tree can be locally dominant in lowland primary rainforest. It has been and still is heavily exploited through intensive logging practices. It is much sought-after for the production of plywood (Eddowes, 1998)
Leguminosa	<i>Pterocarpus indicus</i>	Burmese rosewood	Vulnerable	<b>Confirmed</b> -A widespread tree found in lowland primary and some secondary forest, mainly along tidal creeks and rocky shores (World Conservation Monitoring Centre 1998). The Vietnam sub-population has been extinct for some 300 years. Exploitation of the few known stands in Peninsular Malaysia may have caused its extinction and what are believed to be the largest remaining subpopulations, in New Guinea, are being heavily exploited.
Palmae	<i>Ptychosperma gracile</i>	-	Near Threatened	<b>Less likely-</b> This species is endemic to the Bismarck and Louisiade Archipelagos of Papua New Guinea. Forest loss across the lower elevation areas of New Britain is a major threat for <i>Ptychosperma gracile</i> . This palm tree is scattered in rainforest on both limestone and volcanic soils. This species can survive in open vegetation or in secondary forest if it is allowed to regenerate. Most specimens have been found in very steep conditions in coral cliff forest and mossy forest on ridges dominated by <i>Syzygium</i> spp. (Loftus, 2013)
Palmae	<i>Ptychosperma hentyi</i>	-	Endangered	<b>Likely-</b> Palm tree of lowland forest. Rapid and extensive deforestation for plantation agriculture has caused population decline (Essig, 1998).
Guttiferae	<i>Calophyllum waliense</i>	Beauty leaf	Endangered	<b>Likely-</b> A species restricted to lowland rainforest on ridges of Manus Island. The habitat has been heavily logged and degraded (Eddowes, 1998).
Meliaceae	<i>Aglaiia parviflora</i>	aglaiia	Near Threatened	<b>Likely-</b> Widespread in the Moluccas, New Guinea and the Solomon Islands. This forest tree could soon be

Family	Scientific Name	Common Name	IUCN Status	Information
				threatened by habitat loss (Pannell, 1998).
Meliaceae	<i>Aglaia flavida</i>	aglaia	Near Threatened	<b>Less likely-</b> Native to Indonesia (Irian Jaya); Papua New Guinea (Bismarck Archipelago, North Solomons) and Solomon Islands. Habitat loss could pose a threat (Pannell, 1998).
Meliaceae	<i>Aglaia rimosa</i>	aglaia	Near Threatened	<b>Likely-</b> This shrub or tree is found in secondary forests along rivers and in coastal areas. Habitat loss could pose a threat (Pannell, 1998).
Meliaceae	<i>Aglaia samoensis</i>	aglaia	Near Threatened	<b>Less likely-</b> A small tree occurring in primary and secondary forest up to 830 m. Habitat loss could pose a threat (Pannell, 1998).
Meliaceae	<i>Aglaia silvestris</i>	aglaia	Near Threatened	<b>Less likely-</b> A widespread, variable species of various habitat types, occurring up to 2,100 m. Habitat loss could pose a threat (Pannell, 1998).
Meliaceae	<i>Aglaia subcuprea</i>	aglaia	Near Threatened	<b>Likely-</b> A tree of primary and secondary forest up to 2,570 m, often in periodically inundated areas. Habitat loss could pose a threat (Pannell, 1998).
Proteaceae	<i>Helicia latifolia</i>	helicia	Near Threatened	<b>Less likely-</b> Occurring in the Gulf, Central, Milne Bay and Northern Provinces of Papua New Guinea and New Britain of the Bismarck Archipelago. A tree scattered on slopes and ridges in primary and secondary rainforest up to 800 m (Eddowes, 1998).
Proteaceae	<i>Helicia polyomoides</i>	helicia	Critically Endangered	<b>Likely-</b> This small tree is restricted to Manus Island and may face extinction through commercial logging of its habitat (Eddowes, 1998).
Proteaceae	<i>Helicia peekelii</i>	helicia	Vulnerable	<b>Likely-</b> This lowland tree is thought to occur in coastal forest (World Conservation Monitoring Centre, 1998).
Proteaceae	<i>Helicia neglecta</i>	helicia	Vulnerable	<b>Less likely-</b> Occurs only on New Britain and New Ireland in the Bismarck Archipelago. A tree of primary and secondary forest up to 400 m (Eddowes, 1998). Not likely to be present on Manus Island.
Sapotaceae	<i>Manilkara kanosiensis</i>	Manilkara	Endangered	<b>Less likely-</b> Relatively widespread distribution, but occurs in low densities. It occurs mainly in areas where intense logging is being carried out, such as New Britain and New Ireland in the Bismarck Archipelago and the north-west of Papua New Guinea. This timber tree is scattered in primary lowland rainforest and threatened by clearing (Eddowes, 1998).

Family	Scientific Name	Common Name	IUCN Status	Information
Anacardiaceae	<i>Mangifera altissima</i>	Hill mango	Vulnerable	<b>Likely-</b> This species is not abundant and the timber is available only in small quantities. A timber species of lowland evergreen forest (World Conservation Monitoring Centre 1998).

It is worth noting that the majority of 'threatened' lowland rainforest species are threatened primarily as result of historical over-clearing of lowland rainforest in and around New Guinea.

d. *What is the condition and current use of the vegetation?*

Greenfields Site 1 supports approximately 4.2 ha of secondary lowland rainforest. The site itself is bounded by roads on all sides, and has some small cleared areas with associated development to the north, east and south. There is evidence of former clearing and rubbish dumping on site.

The northern cell of Greenfields Site 1 has vegetation in good condition, with mature secondary vegetation being present, with good species diversity, canopy height, cover and integrity, typical of secondary lowland rainforests. The site also contains a high diversity of epiphytes, lianas, ferns and orchids. The middle cell of Greenfields Site 1 has a lagoon and a small drainage line and is similar to the northern site in terms of vegetation composition and condition. The southern cell of Greenfields Site 1 is less diverse and may have been subject to further disturbance since WWII, with the regeneration effectively 'younger', and less well developed. This site is dominated by pioneer species. Significant mature canopy trees exist throughout the site.

As noted above, most of the rest of the site has been completely cleared to make way for existing infrastructure. Mature amenity plants exist along the perimeters, largely consisting of figs, banyan, and mango trees or younger regrowth.

## 2.5 Animal Species

In a similar manner to the vegetation assessment, a range of sources were evaluated in an effort to develop a reasonable fauna species list for the site. James Cook University has been contacted and searches have been conducted using various reference databases.

The desktop study revealed a lack of literature, especially journal articles, and no coverage by databases such as the EPBC protected matters search tool. In the absence of such coverage, the IUCN Red List has been used in addition to other references as a surrogate for threatened species listings for the area. The IUCN Red List includes taxonomic information, known threats, and summary information on habitat and ecology, although this information is generally limited.

a) *What animal species are present and what are their characteristics?*

There is limited data available on the fauna community of Manus Island, however WWF (2013) lists 122 vertebrate fauna species, as occurring on the Island, including the exotic cane toad (*Rhinella marina*). This is likely to be a substantial underestimate however, as a number of other vertebrate species known to occur on the Island are not included on this list. At least 14 endemic species occur on the Island, and a number of others are near endemics (Table 4) or endemics of the ecoregion (Figure 14). Eight species are listed as threatened on the Red List (Table 5).

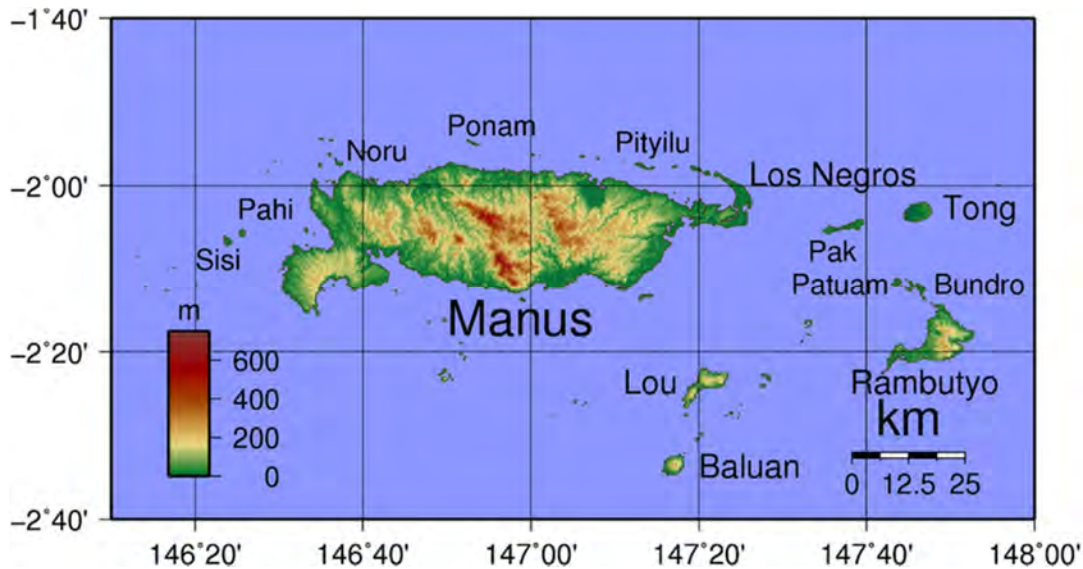


Figure 14. Admiralty Islands Ecoregion

Table 4 Endemic and near-endemic fauna species of Manus Island

Birds	Mammals	Reptiles	Amphibians
Melanesian scrubfowl <i>Megapodius eremita</i>	Spotted or Admiralty cuscus <i>Spiloglossus kraemeri</i>	Admiralty gecko <i>Lepidodactylus pulcher</i>	<i>Discodeles vogti</i>
Yellow-bibbed fruit-dove <i>Ptilinopus solomonensis</i>	Andersen's bare-backed fruit bat <i>Dobsonia anderseni</i>	Cogger's island skink <i>Geomyersia coggeri</i>	Platymantis frog <i>Platymantis latro</i>
Yellow-tinted imperial-pigeon <i>Ducula subflavescens</i>	Admiralty flying-fox <i>Pteropus admiralityatum</i>	Admiralty five-striped skink <i>Emoia mivarti</i>	<i>Platymantis admiraltiensis</i>
Pied cuckoo-dove Reinwardtoena browni	Seri's sheath-tail-bat <i>Emballonura serii</i>	Admiralty spiny skink <i>Tribolonotus brongersmai</i>	
Meek's pygmy-parrot <i>Micropsitta meeki</i>	Manus melomys <i>Melomys matambuai</i>		
Manus owl <i>Tyto manusi</i>			
Manus hawk-owl <i>Ninox meeki</i>			
Black-headed pitta <i>Pitta superba</i>			
Manus monarch <i>Monarcha infelix</i>			
Manus fantail <i>Rhipidura semirubra</i>			
Black-headed white-eye <i>Zosterops hypoxanthus</i>			

Birds	Mammals	Reptiles	Amphibians
Ebony myzomela <i>Myzomela pammelaena</i>			
White-naped friarbird <i>Philemon albitorques</i>			

The IUCN Red List covers species that are believed to be at risk of global extinction, and includes taxonomic information, distribution and known threats. This information forms the basis for Table 3 below, which summarises likelihood of species occurring in the area. It should be noted that the presence or absence of these species within the project area would need to be confirmed through a comprehensive field survey.

Table 5 - List of threatened and near-threatened fauna species on Manus Island, and the potential for suitable habitat to occur on site.

Common name	Scientific name	IUCN status	Information
<b>Mammals</b>			
Spotted or Admiralty cuscus	<i>Spilocuscus kraemeri*</i>	Near Threatened	<b>Likely.</b> This species is endemic to the Admiralty Island group of Papua New Guinea. Very common on Manus Island (Helgen and Flannery, 2004). The subpopulation on Baluan was presumably extirpated through overhunting. Its status on other islands is not well known (Helgen <i>et al.</i> 2008). The species has been recorded from almost mature forest to traditional gardens on Manus (Flannery 1995). It is an arboreal species with an annual breeding cycle.
Manus melomys	<i>Melomys matambuai</i>	Endangered	<b>Likely.</b> This species is endemic to the island of Manus and listed as Endangered as it has an extent of occurrence of less than 1,800 km <sup>2</sup> , and the habitat is being fragmented by expanding plantations and human settlement (Leary, 2008). Seems to be a largely arboreal species, and has been recorded in forested areas including a cacao plantation (Flannery 1995).
<b>Birds</b>			
Yellow-tinted imperial-pigeon	<i>Ducula subflavescens</i>	Near Threatened	<b>Likely.</b> This species is listed as Near Threatened because its lowland forest habitat is being converted to oil palm plantations or lost to logging operations, which is likely to be causing a moderately rapid population decline. It is locally common on New Britain in flocks of up to a few tens of birds but on New Ireland there are recent records only from the far south and there are only two recent records from Manus (Buchanan <i>et al.</i> 2008, Dutson, 2011).
Pied cuckoo-dove	<i>Reinwardtoena browni</i>	Near Threatened	<b>Likely.</b> This species has been listed as Near Threatened because remote sensing data indicates that lowland deforestation within at least part of its range is so intense that it is likely to be undergoing a moderately rapid population reduction. Although it is rather poorly known, it appears to be widely distributed in suitable habitat. It is suspected to have declined rapidly in recent years owing to ongoing clearance of lowland forest (Buchanan <i>et al.</i> 2008).

Common name	Scientific name	IUCN status	Information
Manus owl	<i>Tyto manusi</i>	Vulnerable	<b>Less likely.</b> This species is restricted to Manus Island and is very poorly known. Comparison with the congeneric Australian masked-owl <i>T. novaehollandiae</i> suggests that it probably occurs at low densities and therefore has a very small population which is likely to be declining owing to habitat loss. For these reasons it is classified as Vulnerable. Clarification of its likely subpopulation structure may lead to its up-listing to Endangered in the near future. It is a species of the forest interior and has not been found in heavily degraded or swamp forest, although as it is only known from two specimens, it may have wider habitat tolerances. (BirdLife International, 2012).
Black-headed pitta	<i>Pitta superba</i>	Vulnerable	<b>Likely.</b> <i>Pitta superba</i> is endemic to Manus. Four pairs have been found in recent years around Rossun Village, (which is approximately 8km away from site 1), whilst in 2002 three birds were heard within a small area of forest 10 km inland from the north-western coast. By 2007 only one bird could be located. Whilst most of Manus remains unsurveyed, and this bird may be largely silent and thus overlooked, it is absent from several seemingly suitable areas (BirdLife International, 2012).
Manus monarch	<i>Monarcha infelix</i>	Near Threatened	<b>Less likely.</b> <i>Monarcha infelix</i> is endemic to the Admiralty Islands of Manus, Rambutyo, Tong and Lou in Papua New Guinea. It is a scarce forest species with a small overall population. It is a primary forest species, occurring in closed-canopy forest, but is found albeit rarely in secondary, mangrove and submontane forest. It appears to be poorly tolerant of degraded forest and is inferred to be declining in logged areas (BirdLife International, 2012).
Manus fantail	<i>Rhipidura semirubra</i>	Vulnerable	<b>Likely.</b> Historic records from Manus and recent records from Tong indicate that it is a forest species tolerant of extreme habitat degradation, including scrub and overgrown coconut plantations. The reason for this species' disappearance from Manus is unknown. It is likely to be related to an introduced species or disease (BirdLife International, 2012).

\*An asterisk signifies that the species' range is limited to this ecoregion (see Figure 14).

b. *Is the action likely to directly or indirectly impact upon animal species?*

Based on the desktop study, the proposed site has been significantly disturbed in the past, but appears to have undergone successful natural regeneration, such that some parts of the site appear to support secondary tropical lowland forest of reasonable quality. Furthermore, surrounding lowland rainforest appears to have been subject to traditional 'slash and burn' agriculture, resulting in a mosaic of small open clearings and early phase regrowth, up to approximately 20 years of age. The lowland rainforest within the Lombrum site has not been subject to ongoing slash and burn, and is present with greater diversity and structural integrity than much of the surrounding forest observed (SKM, 2013). With much (up to 90% by some estimates) of Manus Island currently subjected to logging and other forms of disturbance, Greenfields Site 1 may be of higher quality than other parts of the Island with similar habitat. The site also contains a creek and small water body, potentially providing habitat for a variety of aquatic and amphibious species. The exact size and layout of the proposed works will not be finalised until the detailed design phase, and without a comprehensive field assessment, the likely presence of particular fauna

species on the site can only be predicted with a low level of confidence. Nevertheless, the primary impact of the project will be the loss of up to 4.2 hectares of secondary lowland tropical rainforest, including habitat for the Island's fauna, potentially including a number of threatened and endemic species. Habitat loss is the primary threat to the fauna of the Island.

A number of indirect impacts are also possible. The most significant threat is likely to be the introduction and/or spread of invasive weed species, resulting in changes in the structure and composition of available habitat, with potentially negative impacts on native species. The introduction of invasive pest species or pathogens is also a significant potential threat. Changes in nutrient flows or hydrology may result in the degradation of adjacent habitats, or facilitate weed invasion.

c. *Is the action likely to impact upon animal species that are rare, endemic or otherwise valuable?*

In the absence of field data, and using the precautionary principle, it must be assumed that the site provides suitable habitat for a number of threatened and endemic species. It is therefore also assumed that the project will result in the loss of up to 4.2 hectares of habitat for these species. Unless appropriately managed there is also the possibility that the project will result in the introduction of weed or pest species (including pathogens) that may also pose a threat to the Island's fauna.

## 2.6 Conservation and Special Use Areas

Papua New Guinea contains a wide range of endemic flora and fauna species ranking within the top five most diverse countries in the world (Guinea, 1999). Currently the *Conservation Area Act 1978* and The Organic Law on Provincial Government and Local-level Governments (OLPLLG) govern the designation of conservation areas and management in Papua New Guinea along with international non-government organisations (NGO). Like many Pacific countries, land and coastal areas are owned by local clans or communities (UNDP, 2008). Under Organic Law land cannot be purchased from traditional owners, only leased following extensive consultation. Responsibility for conservation is delegated to Provincial and Local Level Government through the Department of Environment and Conservation (DEC) (UNDP, 2008).

In 1993, Papua New Guinea published the *Conservation Needs Assessment (CNA)* which produced maps identifying sites of particularly high endemism, high species richness and unusual ecosystems and habitats (UNDP, 2002). This report recognized that the loss of biological resources in Papua New Guinea is driven primarily by non-biological factors and conservation factors must take account of social and political constraints and pressures. Manus Island was mapped as part of the CNA highlighting the importance of conservation on the island to protect the eleven bird and two mammal endemic species present (Department of Environment and Conservation, 1993). The Manus marine complex surrounding the Island was also mapped as significant as it contains many reef and lagoon complexes and is an area high in beta diversity and highly diverse reef communities. Further efforts in coordinated conservation since have resulted in the following conservation strategies and plans:

- National Biodiversity Strategy and Action Plan (NBSAP): This document is central to all programmes, projects and activities in Papua New Guinea in respect of biodiversity conservation.
- The designation of Protected Area Provisions in The Convention on Biological Diversity (CBD): A Protected Area under the CBD is "a geographically defined area, which is designated or regulated and managed to achieve specific conservation objectives" (Convention on Biological Diversity, 2013).
- Rapid Assessment and Prioritisation of Protected Area Management (RAPPAM): Provides policy makers and protected areas authorities with a methodology to identify trends and issues for improving management effectiveness in systems of protected areas. This was carried out between 2003 and 2005 which reviewed all 51 Protected Areas and provided amongst other things a 'Rescue Strategy' and additional mapping of protected areas and the protected area system. This assessment also noted that there were both formal and informal protected areas in Papua New Guinea (WWF, 2005).
- Protected Areas Initiative (PNGPAI) containing provisions for Wildlife Management Area (WMAs) under the *Fauna (Control and Protection) Act (1966)*
- Various conservation activities by the Wildlife Conservation Society which was responsible for the establishment of the Research and Conservation Foundation of PNG and the PNG Institute of Biological Research.



The World Database on Protected Areas (WDoPA), which lists worldwide protected areas under the CBD and the International Union for Conservation of Nature (IUCN) indicated that there are currently 54 protected areas listed as occurring in Papua New Guinea, amounting to 3.07% of the total area of Papua New Guinea (United Nations Environmental Program, 2013). There is one protected area located on Manus Island, Ndrolowa which is a Marine Managed Area categorised as a Category VI Protected Area under the IUCN meaning that it is a protected area which allows for the sustainable use of natural resources. Ndrolowa Marine Managed Area is managed by the Department of Environment and Conservation and is located approximately 6 km south-west of the proposed site and facilities. Twenty eight species have been reported as occurring within or in habitat adjacent to Ndrolowa including one Endangered mammal, the Manus melomy (*Melomys matambuai*) and one Near Threatened mammal, the Admiralty cuscus (*Spilocuscus kraemeri*).

There are two additional protected areas in the area surrounding Manus Island, Whal Island and M'Burke both of which are Locally Managed Marine Areas. These are located approximately 65 km and 72 km to the south west of the offshore processing centre accommodation and facilities.

In the Fourth National Report to the Convention on Biological Diversity, Papua New Guinea was divided into ecologically appropriate ecoregions. Manus Island was designated as an ecoregion containing an isolated fauna rich in endemic species including stands of *Calophyllum* and *Sararanga* forest species which are under threat by logging activities (UNDP, 2002).

Wildlife Management Areas (WMA) are areas of land or water declared as protected under the *Fauna (Protection and Control) Act (1966)*. There are currently 12 designated WMA located in Papua New Guinea primarily within the mainland of Papua New Guinea including the Eastern Highlands, Morobe, Western and Southern Highland Province (WWF 2005). No WMA are located on Manus Island or within the surrounding marine areas.

a. *Is the action likely to directly or indirectly impact upon conservation or special use areas?*

The proposed action is assumed to require all vegetation to be cleared on the land parcel where the additional OPS accommodation and facilities are proposed. The proposed action will not directly impact Ndrolowa Marine Managed Area or the Whal Island and M'Burke Locally Managed Marine Areas, which are the closest conservation areas to the site.

No marine investigation was undertaken as part of this project. For the basis of this assessment, there is the potential for sewage and waste to have secondary impact on offshore areas around Manus Island if not treated properly. As there are no conservation areas directly present on the site or within the immediate surrounding area it is anticipated that the proposed action will not have a significant impact on conservation and wildlife management areas on Manus Island.

It appears *Calophyllum* or *Sararanga* forest is present on the site, with both species evident. *Pteropus indicus* was also observed on site. As such, clearing of the site's secondary forests will remove individual specimens of these species,

b. *What is the current use and condition of conservation areas or special use places that are likely to be impacted by the action?*

The Department of Environment and Conservation recognises that the implementation of conservation policies and legislation in recent years has been uncoordinated and sporadic (UNDP, 2008). The Papua New Guinea government's effort to conserve biodiversity on Manus Island is largely supported by international non-government organisations such as Conservation International, the Wildlife Conservation Society and the United Nations Development Program. Papua New Guinea's Fourth National Report to the Convention on Biological Diversity recognised that biodiversity has been under considerable threat due to rapidly expanding human population, deforestation and logging related degradation and the increase in industries such as mining, oil and natural gas and forestry. The identification of priority areas for protection and integrated management under the RAPPAM initiative has led to pressures to designate additional Protected Areas under international conventions. At present there are three protected areas on Manus Island, none of which are in close proximity to the project site.

## 2.7 Heritage Places and Items

A review of archaeological, historical and ethnographic literature has been conducted. This revealed four main stages of Manus Island's past; the prehistoric (22,000 BCE to c. 1700 CE) the Plantation or Colonial Period (1884-1942), the Early Ethnographic Period (1930s-1950s), and WW II period (1942-1951) (see Appendix B for

further detail). Each of these eras has potential physical representation at Lombrum Point, although it is likely that the clearing and construction associated with the WW II period has disturbed or destroyed earlier phases.

This WWII heritage has most apparent significance at the site, and is present at all of the proposed development areas. Standing structures from WWII are evident at Hardstand Sites 1, 2 and 3, Greenfields Site1 and Greenfields South, Port Central, and potentially at the Fisheries, where original buildings may be integrated into modern structures. A range of other built heritage, such as foundations, roads and plantings, as well as general layout and setting, appear in all development areas. There is also the potential for subsurface features, including fuel tanks, air raid shelters, and munitions and refuse dumps across the site. These various features represent Australia's involvement in the conflict and subsequent defensive installations and it is recommended that steps be taken to record and document this heritage.

However, it is also noted that any ethnographic or prehistoric era remnants are likely to be highly valued by Manus Islanders. Given the recent revival of the 'ancestral ways' it is likely the current Manus Island peoples have a strong connection to the island and its resources, and that ceremonial and religious beliefs and practices may be of significance. It is recommended that the people of Manus Island be given an opportunity to communicate the significance they attach to the project area.

There is also some possibility that remnants of the colonial era plantation are represented at Lombrum point. However, this potential is limited by the relative briefness of the plantation period, added to the subsequent construction of WWII buildings over all known plantation structures (most notably at Greenfields South and in the Hardstand areas). Given these factors, it seems unlikely that any remains of significance from the plantation period have been preserved.

*a. Are heritage places or items present?*

The current landscape of Lombrum Point is dominated by the remnants of a WWII naval base constructed by the United States and subsequently taken over by the Australian Defence Forces (ADF) as HMAS Tarangau. The remnant buildings, roads, plantings and other infrastructure likely date to both the WWII and ADF periods. Based on current desktop assessments, it would appear that WWII period heritage is present, with varying degrees of integrity, in all proposed development sites. It is not possible to identify particular areas or structures of particular significance, but the base as whole has significance as a representation of Australia's involvement in WWII and the battle for the Pacific, and for its subsequent role as a forward defence area for Australia.

Based on available evidence, the military infrastructure at Lombrum Point meets the following heritage criteria set out for the Commonwealth Heritage List:

*a) the place has significant heritage value because of the place's importance in the course, or pattern, of Australia's natural or cultural history*

The Lombrum Point base played a vital role in the War for the Pacific, providing a staging area for the Allied forces push into South East Asia. It was subsequently taken over by Australia as a key defensive emplacement against further aggression from the north, and was the location for the trials and subsequent executions of several Japanese war criminals.

*b) the place has significant heritage value because of the place's possession of uncommon, rare or endangered aspects of Australia's natural or cultural history*

Lombrum point does not have any known uncommon, rare or endangered aspects.

*c) the place has significant heritage value because of the place's potential to yield information that will contribute to an understanding of Australia's natural or cultural history*

Lombrum point has the potential to yield information about the Australia's military history as a part of the Allied Forces, and in the post WW II period.

*d) the place has significant heritage value because of the place's importance in demonstrating the principal characteristics of:*

- 1) a class of Australia's natural or cultural places; or*
- 2) a class of Australia's natural or cultural environments;*

Lombrum Point does not have any known representative values.

- e) *the place has significant heritage value because of the place's importance in exhibiting particular aesthetic characteristics valued by a community or cultural group*

Lombrum Point has aesthetic significance as an example of a WWII military base. Although many of the buildings have been removed, the overall layout of the base and its internal and external spatial relationships remains discernible.

- f) *the place has significant heritage value because of the place's importance in demonstrating a high degree of creative or technical achievement at a particular period*

Constructed in the midst of WWII, the Lombrum Point base was at the time remarkable for the speed at which it was erected, particularly given the need to import all labour and building materials.

- g) *the place has significant heritage value because of the place's strong or special association with a particular community or cultural group for social, cultural or spiritual reasons*

Lombrum Point is strongly associated with the Australian Defence Forces, and may hold special value for this group as a result.

- h) *the place has significant heritage value because of the place's special association with the life or works of a person, or group of persons, of importance in Australia's natural or cultural history*

Lombrum Point is associated with the works of the Allied Forces during WWII and, and particularly with American General MacArthur, who was one of the leaders of the War for the Pacific.

- i) *the place has significant heritage value because of the place's importance as part of Indigenous tradition.*

Lombrum Point does not have known Indigenous values. However, such values may be identified through consultation with Manus Islanders.

In addition to the WWII and military history of the base, there is also some potential for the existence of prehistoric or ethnographic period archaeological deposits. The potential for such deposits in the general area is demonstrated by excavations at the nearby Father's Water site (4 km south east of Lombrum point), which dates to at least 5,000 BP (Before Present), and provides evidence of Manus island life in the pre-and post-Lapita periods. It is likely that such deposits have been highly disturbed or destroyed by subsequent activities on the site, but it is also highly likely that remnants that do exist will be regarded as important by local Manus Islanders.

In addition to the local importance, archaeological sites in this area may provide significant scientific information on questions of national and regional importance, such as the settlement and subsequent adaptation of the Bismarck Archipelago, early trade networks, and the origins of the Lapita Cultural Complex.

For these reasons, the continued existence of archaeological deposits should be considered. These are likely to be evidenced by scatters of obsidian flakes and pots sherds, shell middens, hut remnants or human remains.

- b. *Will the action directly or indirectly impact upon heritage places or items?*

The proposed development requires the clearing of several areas on the Lombrum Point facility. As such, it will directly impact WWII buildings, roads, infrastructure, plantings and spatial relationships as well as subsurface deposits that may relate to the WWII base, or early periods of the site's history, including the prehistoric and ethnographic periods. Based on current information, likely impacts include:

- demolition of over 30 Nissen huts dating to either the WWII or ADF periods
- destruction of plantings and landscape settings
- destruction or alteration of road ways
- potential disturbance/destruction of archaeological deposits.

It is also possible that surface or subsurface deposits around the main development areas will be indirectly impacted by vibration caused by construction work and machinery, or by changing hydrology or sediment deposition caused by major earthworks.

- c. *Will the action impact upon heritage places or items which are very rare or have special value?*

While the Lombrum Point military installation is important in the course of Australia's history, and its locality unique, this limited desktop assessment has not identified known elements of extreme rarity or special values.

However, such values may come to light when more in depth historical research, community consultation or physical site survey is conducted.

This limited desktop assessment has not been able to identify areas that have the potential for particularly rare or special archaeological deposits. Site surveys may locate areas of particular scientific importance, but other cultural values can only be assessed by Manus Islanders.

*d. What is the condition and current use of the heritage place or items?*

The remnants of WWII heritage appear to be in use for storage (Nissen huts) and transport (roads). The Nissen huts are in highly variable condition, although all appear to demonstrate some level of dilapidation. The roads demonstrate a similar variability of condition. It is not possible to assess the condition of any subsurface deposits.

## 2.8 Renewable or Non-Renewable Natural Resources

*a. Are there sources of renewable or non-renewable resources in the area?*

Papua New Guinea's natural renewable resources, including agriculture, forestry and fisheries form the basis of local resources and employment for many communities (National Agricultural Research Institute, 2012). The country contains large reserves of renewable and non-renewable natural resources with agriculture being the dominant sector, accounting for approximately one third of gross domestic product (GDP) (United Nations Economic and Social Commission, n.d.).

Mining activities in recent years have made an increasingly larger contribution to GDP and are anticipated to continue to do so following the recent discoveries of oil and gas deposits in the Gulf of Papua, and Southern Highlands and Western provinces (National Agricultural Research Institute, 2012). In 2010 Newcrest Mining and Triple Plate Junction Plc announced that they had signed a legally binding agreement to investigate potential copper and gold resources on Manus Island. This agreement of mining exploration on Manus Island does not extend to Lombrum Point or over the site where action is proposed.

*b. Is the action likely to utilise, impact upon or restrict access to renewable or non-renewable resources, either directly or indirectly?*

The proposed action will involve the removal of vegetation on the site. As there are no significant sources of renewable or non-renewable resources located on the site and the vegetation proposed to be cleared does not appear to contain mature forestry resource, the action will not impact upon or restrict access to renewable or non-renewable resources.

*c. Will the action impact upon renewable or non-renewable resources that are rare or have special value?*

The proposed action will not impact upon renewable or non-renewable resources that are rare or have special value as a desktop assessment and aerial imagery review indicated that these resources do not occur on the site.

*d. What are the existing uses of renewable and non-renewable resources?*

Historical land uses of Greenfields Site 1 were plantations (Lombrum Point was cleared in about 1927 and planted with coconut palms) and military use at the time of WWII. The site is currently only occasionally used for small scale coconut plantings.

The remainder of the site has been cleared and has existing buildings and infrastructure in place, predominantly being used for workshops and for storage. The Fisheries site is not currently thought to be in use, but buildings and marine infrastructure on this site were previously used for fishery industry operations.

## 2.9 Utilities, Energy, and Transport, Resources and Infrastructure

*a. Is there existing energy and transport resources and infrastructure in the area?*

There is an existing sewerage system in the northern part of Lombrum, with treatment via anaerobic digestion and aerobic tanks. The sewerage system discharges effluent offshore.

A power station (consisting of diesel generators operated by PNG Power) exists south of Hardstand Site 2. Power from this station is known to be intermittent.

There is no public waste collection. Road maintenance is occasional, and port and harbour facilities are limited with the best site being the Fisheries facilities.

Manus Island is served by Momote Airport on Los Negros Island. The airport has a single runway, with a chip seal surface measuring 1.87 km x 45 m. The airport can accommodate B737 operations and night flights. Air Nuigini is the only commercial airline that runs services out of Momote Airport. Flights are to four destinations; Kavieng, Lae, Port Moresby and Madang.

The existing temporary facility on site is provided with the following utilities:

- **Electricity:** Power supply is provided by the power station at the Lombrum Navy Base, which is in poor repair, lacking maintenance and is subject to frequent outages. The centre is connected to the local distribution network, which is unreliable and is therefore backed up with multiple generator sets across the site to protect against prolonged power outages.
- **Water:** The existing site has a combination of rainwater tanks and tanks for storage of groundwater. The site has its own dedicated submersible groundwater tank.  
  
Potable water is available from a collection weir and treatment system south of Lorengau. The water is of high quality, reliable and of sufficient capacity to service the development if needed.
- **Sewerage:** A sewerage treatment system exists in the northern part of Lombrum. It is a simple system using aerobic tanks. The sewerage system discharges class C water offshore into the ocean.
- **Communications:** Satellite dishes, internet access and telephone lines are all provided. Mobile phone infrastructure is provided by several private service providers and local coverage is readily available and well established.

b. *Will the action utilise, impact upon, or restrict access to existing utilities, energy, and transport resources and infrastructure, or require additional resources or infrastructure?*

As mentioned above, existing infrastructure and services are in a poor state and will need improvement under the current project.

Based on preliminary designs, the utilities and infrastructure likely to be required for the facility is outlined in the table below. Note that this is still subject to change since no master plan exists.

Table 6 Preliminary information on facilities required (as of 26 September, SKM, 2013)

Preliminary Utilities and Infrastructure	
<b>Facilities</b>	<ul style="list-style-type: none"> <li>- Gate house</li> <li>- Receiving, interview and properties facility</li> <li>- Medical, dental and mental health centre</li> <li>- Warehouse for storage and dispatch of food supplies</li> <li>- Administration buildings</li> <li>- Central kitchen, client dining and servery</li> <li>- Transferee family accommodation for 2000</li> <li>- Staff accommodation for 800</li> </ul>
Intended design life	10+ years
Central dining facility	Seating for 1000 people x 2 sittings
Kitchen and appropriate storage area	<ul style="list-style-type: none"> <li>- Freezer, cool store and dry store facilities to store food for 8 week provisioning</li> <li>- Kitchen to have capacity to serve up to 9,000 meals a day (2000 transferees &amp; 800 supporting staff for 3 meals a day)</li> <li>- An in-ground modular grease trap will be installed adjacent to the production kitchen and sized to reduce fats, oils and grease</li> </ul>
Domestic hot water	Solar thermal panel, with hot water only to be provided in the staff accommodation.
Rain water harvesting	Rain capture from building roofs potable water savings (e.g. toilet flushing). 9,000L tanks installed adjacent to buildings to store water
Sewerage treatment and effluent disposal	Sewage loading - 95% of potable water supply (see below) Sewage Treatment Plant (STP) – details are unknown at the moment. Could be a new facility, or augmentation of existing facilities.

Preliminary Utilities and Infrastructure	
Other waste	It is noted that a medical centre will be located on site and therefore the creation of medical waste is likely
Total water demand	Estimated to be 750 kL/ day
Generation of power	<ul style="list-style-type: none"> <li>- Power is likely to be generated by diesel fuelled generating sets (see below for generating sets required for desalination plant, Hardstand and Greenfield sites)</li> <li>- Design and construction to be such that future plant could be introduced</li> <li>- HV electrical reticulation likely to be distributed via underground conduits to series of transformers around site</li> </ul>
Potable water	<ul style="list-style-type: none"> <li>- Likely to be supplied via a package Seawater Reverse Osmosis (SWRO) treatment plant(s)</li> <li>- Water to be sourced from either local dam (existing system to be re-commissioned if feasible) or groundwater if feasible or from sea (RO).</li> <li>- Expected consumption to be                             <ul style="list-style-type: none"> <li>• 250L/EP/Day for staff and transferees.</li> <li>• 7.5L/ meal</li> </ul> </li> </ul>
<b>Hardstand Sites 1 and 2</b>	
Accommodation	800 staff
Facilities	Single person and double “donga” style accommodation Recreational facilities building
Cooling	Air conditioned (recreation buildings and accommodation), split system
Electricity demand (approx. max.)	1.5kVA per staff room Demand for recreational building is not known yet Likely to be approximately 1300 kVA assuming air conditioned
Strategies to reduce energy consumption	Natural ventilation to be provided where possible, e.g. cross ventilation through large louvered windows; ceiling fans, insulation.
Power generation	To be advised
<b>Greenfields Site 1</b>	
Accommodation	2000 transferees consisting of family groups (but with flexibility that it can be converted to accommodation for single males).
Cooling	Passive - natural ventilation e.g. cross ventilation through large louvered windows, ceiling fans, insulation
Electricity demand (approx. max.)	1.0 kVA per transferee room assuming no air conditioning
Power generation	TBA
<b>Fisheries Site</b>	
Logistics hub facilities	Existing large covered shelter/ workshop Existing administration building (a/c) New warehouse
Cooling	Air-conditioned office accommodation Passive design other areas

c. *What are the existing uses of utilities, energy, transport, resources and infrastructure?*

Existing infrastructure is primarily used to maintain operation for the existing facilities at Lombrum Point and service the Lombrum community.

- d. Will the action utilise, impact upon, or restrict access to existing utilities, energy, and transport resources and infrastructure, or require additional resources or infrastructure?

The new OPC is eventually expected to increase the current transferee capacity from 400 to approximately 2000 beds. The extended facility will require the upgrade, refurbishment and/or replacement of existing services.

The current sewerage network will need to be extended to the new site. It is not known if the existing waste water treatment plant has sufficient capacity to handle the projected additional volume of sewage from the new facility. It is expected however that, if properly designed, the facility is likely to leave a positive legacy with the upgrade or replacement of existing utilities, energy, and transport resources and infrastructure.

It is unclear what is currently done with solid waste generated by the existing temporary facility. Anecdotally, waste is transferred to a landfill near Momote airport and burned. With the projected increase in transferees and operational staff, it is anticipated that a dedicated landfill will need to be established and operated. AECOM is not aware of plans for a waste disposal facility of this sort. It is also not clear what the impacts of the new facility will have on the use of and services required at Momote airport over time.

## 2.10 People and Communities

- a. Are there people or communities in the area?

### Population

The existing OPC is located at Lombrum Point on Manus Island, the largest island within Manus Province, Papua New Guinea. The capital of Manus Province is Lorengau, located 12 km west of Lombrum, with an estimated population of approximately 6,000 people out of a total of approximately 50,000 people across the Province (2011 census). The Lombrum area is estimated to have a resident local population of between 1,000 to 2,000 people (1,338 in the National Statistical Offices' 2000 census).

### Recent History

Lombrum Point has been used for military purposes since the 1940s, initially as a US naval base during World War II, and later as an Australian military base when HMAS Seeadler was commissioned on site on 1 January 1950, before being re-named HMAS Tarangau. During its operation, the base was used by the Royal Australian Navy as a refuelling and stores point for ships travelling between Australia and South East Asia.

Following Papua New Guinea's independence in 1975, the base was handed over to the PNG Defence Force and was renamed PNG Navy Base Lombrum. The site has continued to be owned and managed by the PNG Defence Force since that time.

The first offshore processing centre was established at Lombrum in 2001 as part of the Australian Government's Pacific Solution. The last detainee left the centre under this initiative in June 2004. However, the relocation of transferees to Manus Island for offshore processing resumed in November 2012.

Site 1 is also owned and managed by the PNG Defence Force. The Upper Paradise site to the North of the site is currently used by the PNG Defence Force for staff accommodation.

### Known Industry

As noted above, the key use of the area over the last 70 years has been for military use, including over 30 years use by the PNG Defence Force. Other industries in the area are coconut cultivation and sea cucumber fishing. Some tourism is also present in the area, with scuba diving and kayaking tours available for many islands in the Manus Province (Wikipedia, 2013).

### Governance Structure

Manus Province is governed under the auspice of a single district. This is further divided into one urban (Lorengau) and eleven rural Local Level Government (LLG) areas, which include:

Table 7 – Manus Province LLG areas

District	District Capital	LLG Name
Manus District	Lorengau	Aua-Wuvulu
		Balopa

District	District Capital	LLG Name
		Bisikani-Soparibeu Kabin
		Lelemadih-Bupi Chupei
		Lorengau (Urban)
		Los Negros
		Nali Sopat-Penabu
		Nigoherm
		Pobuma
		Pomutu-Kurti-Andra
		Rapatona
		Tetidu

b. Is it likely that the action will directly or indirectly impact upon people or communities?

The table below lists potential impacts arising from the expansion of the OPC. These impacts are generic in nature, are non-specific and are not all inclusive. They would need to be qualified and verified through more rigorous information and data analysis and targeted engagement with key stakeholders.

Table 8: Potential Impacts on People and Communities.

Change	Potential Impacts
Transportation and traffic: use of public roads and potential effect on other road users	<ul style="list-style-type: none"> <li>- Increased risk of traffic related incidents</li> <li>- Deterioration of both main roads and alternative road paths due to heavy machinery, loads and frequency of road use</li> <li>- Disruption to local road access</li> <li>- Capacity of the airport does not meet demand.</li> </ul>
Land use: change of land usage	<ul style="list-style-type: none"> <li>- Less land for farming or agricultural purposes</li> <li>- Potential land devaluation due to land sterilisation</li> <li>- Disruption to existing subsistence patterns and the fishing industry</li> </ul>
Housing and accommodation: Increased population encroaching on housing and accommodation availability	<ul style="list-style-type: none"> <li>- Increased demand for local housing alternatives, resulting in increased housing costs</li> <li>- Increased demand for short-term accommodation (if OPC reaches capacity)</li> </ul>
Community services and infrastructure: Increased population and demand on community services and infrastructure	<ul style="list-style-type: none"> <li>- Increased demand on essential community services including specialist health services</li> <li>- Increased pressure on emergency services</li> <li>- Increased demand on local businesses for staff during recreation time.</li> </ul>
Community and workforce health and wellbeing: Influx of workers and potential community health and wellbeing implications	<ul style="list-style-type: none"> <li>- Decreased community cohesion</li> <li>- Increased mental health issues due to transient nature of introduced OPC population</li> <li>- Increased public health issues (waste materials, water, etc)</li> <li>- Increased anti-social behaviour (perceived and real)</li> <li>- Increased stress and fatigue of workforce (isolation)</li> <li>- Community discomfort with the presence of the OPC.</li> </ul>
Air quality, noise and fire hazards: Potential to expose communities or environmental receptors to increased air pollutants, noise	<ul style="list-style-type: none"> <li>- Increased noise pollution in the area from the general operations of the centre</li> <li>- Change to visual amenity of the area.</li> </ul>



Change	Potential Impacts
Training, employment and business development: Change in local employment patterns or a shift in demand for local skills or competencies	<ul style="list-style-type: none"> <li>- Increased demand for local skills and labour</li> <li>- Increased opportunities for up-skilling and diversifying skills of local workforce</li> <li>- Opportunities for employment and training opportunities for young people</li> <li>- Increased procurement opportunities for local businesses and industry.</li> </ul>
Reputation: Potential to cause a significant change in existing company relations with community members and other stakeholders	<ul style="list-style-type: none"> <li>- Potential to damage the Government/OPC operators reputation and relations with community members and other stakeholders</li> <li>- Failure to meet landholder expectations regarding payments</li> <li>- Potential to enhance the Government/OPC operators reputation if community engagement is proactive and successful</li> </ul>

The expanded facilities and its inhabitants will be primarily contained within the existing military base. This area has been used for military purposes for 70 years, Based on the site visit conducted by SKM in 2013, areas on the base are not currently used by the wider community for agriculture or the like. As such the expansion should not significantly affect the availability of land for farming or agricultural purposes. As there is already a similar facility at this location, the expansion is unlikely to cause physical dislocation of the community. The final location and configuration of the detention centre is yet to be confirmed however the design and construction methodology will be required to include provisions for an increased demand on power, water and waste treatment services (including solid waste) to ensure the impact on community infrastructure is minimised. Similarly, it is understood that the facility will include medical facilities and the like which should avoid adverse demands on existing community services.

Potential impacts in relation to transport and noise, odours, fumes, smoke, or other pollutants can be managed through the development and implementation of appropriate construction and operational EMPs.

If properly designed, the facility has the potential to leave a positive legacy with the upgrade or replacement of existing utilities, energy, and transport resources and infrastructure for the area. The provision of the facility may also provide opportunities for work and the potential to supply goods and services to the facility for some community members. Depending on the procurement of labour and services, and development of supply chains, there is however also potential for the project to result in economic displacement for people associated with the existing facility.

However, it is not possible to be definitive on the likely direct and indirect impacts on the Lombrum and broader Manus Island or Papua New Guinean communities beyond this. Furthermore, there is not enough information to be able to adequately assess potential impacts on community and workforce health and wellbeing, and on the potential of the project to cause a significant change in relations with community members and other stakeholders.

*Is the action likely to impact upon sensitive land uses?*

No information has been obtained to indicate that there are sensitive land uses on site.

*d. What is the existing social and economic status of people and communities the action is likely to impact upon?*

Due to the mixed historical use of Lombrum by both the Australian and PNG Governments, the current residential population is understood to be a combination of multiple-generation locals, employees/service providers of PNG Navy Base Lombrum, and employees/service providers of DIBP's offshore processing facility. Data on the social and economic status of the inhabitants of Manus Island was not available. Data for PNG as a whole was obtained from research conducted by the World Health Organization. Based on this data, PNG had one of the lowest life expectancies and highest infant mortality rates in the Asia-Pacific region.

## 3.0 Step 2: Potential Impacts

### 3.1 Potential Adverse Impacts

Potential adverse impacts on components or features of the local environment and communities are presented in Table 9. For the purpose of an EPBC self-assessment, direct, indirect, local and off-site impacts all need to be considered.

Table 9 identifies the potential impacts that may arise from this project in reference to the impact assessment criteria posed in the DSEWPC Significant Impact Guidelines 1.2.

Table 9 Potential impacts associated with the proposed action

Impact Type	Is there a real chance or possibility that the action will:	Potential Impact from this Project
<b>Impacts on landscapes and soils</b>	<ul style="list-style-type: none"> <li>- substantially alter natural landscape features</li> <li>- cause subsidence, instability or substantial erosion, or</li> <li>- Involve medium or large-scale excavation of soil or minerals?</li> </ul>	<ul style="list-style-type: none"> <li>- The project will not substantially alter landscape features.</li> <li>- The project will require 2 -4 m of fill at Greenfields Site 1, which will result in landscape changes in that area and could potentially impact on present soil conditions.</li> <li>- Significant drainage works will also be required.</li> <li>- There is the potential for the project to cause some instability and erosion, particularly at Greenfields Site 1, if not properly managed.</li> <li>- Short term impacts on soil are to be managed via sediment and erosion control in the CEMP. The re-establishment of ground cover should be prioritised as works are completed.</li> </ul>
<b>Impacts on coastal landscapes and processes</b>	<ul style="list-style-type: none"> <li>- alter coastal processes, including wave action, sediment movement or accretion, or water circulation patterns</li> <li>- permanently alter tidal patterns, water flows or water quality in estuaries</li> <li>- reduce biological diversity or change species composition in estuaries, or</li> <li>- extract large volumes of sand or substantially destabilise sand dunes?</li> </ul>	<ul style="list-style-type: none"> <li>- No direct impacts are expected on coastal processes since the site is (at its closest point) approximately 170 m away from the coast.</li> <li>- Potential indirect impacts to consider are from uncontrolled release of pollutants, sewage, waste and increased sediment loads after heavy rainfall events.</li> <li>- Potential impacts should be managed effectively via inclusion of an appropriate sewage treatment system, appropriate sourcing of fill material and a sustainable waste system in addition to controls in the CEMP and EMP.</li> </ul>
<b>Impacts on ocean forms, ocean processes and ocean life</b>	<ul style="list-style-type: none"> <li>- reduce biological diversity or change species composition on reefs, seamounts or in other sensitive marine environments</li> <li>- alter water circulation patterns by modification of existing landforms or the addition of artificial reefs or other large structures</li> <li>- substantially damage or modify large areas of the seafloor or ocean habitat, such as sea grass</li> <li>- release oil, fuel or other toxic substances into the marine environment in sufficient quantity to kill larger marine animals or alter ecosystem processes, or</li> <li>- release large quantities of sewage or other waste into the marine environment?</li> </ul>	<ul style="list-style-type: none"> <li>- The proposed project is not expected to directly impact on marine biodiversity or other sensitive marine environments. It is not expected to directly impact on seafloors, water circulation patterns or other habitats. There is no direct offshore component to be expected from this project except for increased ship movements, which should not cause detectable change in marine biota.</li> <li>- Considering indirect impacts from sewage and accidental release of waste or other toxic substances, the following has been assumed: <ul style="list-style-type: none"> <li>• An appropriate sewage treatment system to be in place that treats sewage and disperses effluent effectively.</li> <li>• Appropriate waste management facilities and management plans.</li> </ul> </li> <li>- Given the nature and locality of the site, as well as considering the</li> </ul>

Impact Type	Is there a real chance or possibility that the action will:	Potential Impact from this Project
		<p>scale of the proposed works, potential risks of these impacts should be managed effectively with an EMP, CEMP as well as appropriate infrastructure and services in place.</p>
<b>Impacts on water resources</b>	<ul style="list-style-type: none"> <li>- measurably reduce the quantity, quality or availability of surface or ground water</li> <li>- channelize, divert or impound rivers or creeks or substantially alter drainage patterns, or</li> <li>- measurably alter water table levels?</li> </ul>	<ul style="list-style-type: none"> <li>- The current project is not expected to reduce the quantity, quality or availability of surface and ground water if appropriate management measures are put in place (i.e. EMP and CEMP).</li> <li>- The current project will potentially impact on the watercourse and lagoon in Greenfields Site 1 by diverting, impounding or altering drainage patterns of that area. Those impacts are considered significant if the entire site is cleared and levelled with fill material.</li> </ul>
<b>Pollutants, chemicals, and toxic substances</b>	<ul style="list-style-type: none"> <li>- generate smoke, fumes, chemicals, nutrients, or other pollutants which will substantially reduce local air quality or water quality</li> <li>- result in the release, leakage, spillage, or explosion of flammable, explosive, toxic, radioactive, carcinogenic, or mutagenic substances, through use, storage, transport, or disposal</li> <li>- increase atmospheric concentrations of gases which will contribute to the greenhouse effect or ozone damage, or</li> <li>- substantially disturb contaminated or acid-sulphate soils?</li> </ul>	<ul style="list-style-type: none"> <li>- Unless a contaminated land study is undertaken, there is a high risk of contaminants being accidentally released during construction works on all sites.</li> <li>- Asbestos containing refuse was observed during the field visit (SKM, 2013), and areas were observed on Greenfields Site 1 that were likely to have been refuse dumps in the past. UXOs may also be present on site (AECOM, 2013). Civil works in this area therefore has the potential to disturb contaminated soil.</li> <li>- The construction phase of the new facility will require the storage and use of petrol, oils and lubricants (POL) typically associated with construction activities. While these are potential pollutants they are not particularly toxic or hazardous when managed correctly. The management of POLs will be a specific focus of both the CEMP and operational EMP.</li> <li>- The localised application of insecticide may be used during the construction and operation phases to improve amenity and reduce the spread of mosquito borne disease, however this is not expected to have an impact outside the footprint of the site.</li> </ul>
<b>Impacts on plants</b>	<ul style="list-style-type: none"> <li>- involve medium or large-scale native vegetation clearance</li> <li>- involve clearance of any vegetation containing a listed threatened species which is likely to result in a long-term decline in a population or which threatens the viability of the species</li> <li>- introduce potentially invasive species</li> </ul>	<p>The project will result in the removal of 4.2 ha native vegetation, Vegetation that will be removed is lowland tropical rainforest, listed as Critical/Endangered by WWF (2008). It is also likely to include a number of threatened plant species.</p> <p>While it is not possible to estimate the number of individuals of threatened species that may occur on site, it is unlikely that large or</p>

Impact Type	Is there a real chance or possibility that the action will:	Potential Impact from this Project
	<ul style="list-style-type: none"> <li>- involve the use of chemicals which substantially stunt the growth of native vegetation, or</li> <li>- involve large-scale controlled burning or controlled burning in sensitive areas, including areas which contain listed threatened species?</li> </ul>	<p>significant populations occur, particularly when considered in relation to the rest of the Island, of which 80% remains forested. Most of the Island appears to be subject to extensive disturbance and exploitation, and populations of most threatened species are likely to be low, hence even small numbers of individuals may be important. While it seems unlikely that the removal of 4.2 ha of vegetation will result in the loss of sufficient individuals of threatened species to result in the long-term decline of the species, this cannot be ruled out.</p> <p>There is the potential for the introduction of potentially invasive species if suitable control measures are not put in place. Such measures should be included in a construction management plan.</p> <p>No large scale use of chemicals is expected on the site. Small scale use for management of the site should be managed under an environmental management plan for the site.</p> <p>No large scale controlled burning is expected</p>
<p><b>Impacts on animals</b></p>	<ul style="list-style-type: none"> <li>- cause a long-term decrease in, or threaten the viability of, a native animal population or populations, through death, injury or other harm to individuals</li> <li>- displace or substantially limit the movement or dispersal of native animal populations</li> <li>- substantially reduce or fragment available habitat for native species;</li> <li>- reduce or fragment available habitat for listed threatened species which is likely to displace a population, result in a long-term decline in a population, or threaten the viability of the species</li> <li>- introduce exotic species which will substantially reduce habitat or resources for native species, or</li> <li>- undertake large-scale controlled burning or controlled burning in areas containing listed threatened species?</li> </ul>	<p>The site appears to provide suitable habitat for a number of threatened and endemic fauna species. Clearing of the site has the potential to result in a high mortality rate amongst individuals resident on site either through direct mortality, or due to displacement resulting in death as a result of increased stress, competition and susceptibility to predation. For individuals making occasional use of the site, clearance of the site may reduce the viability of their home range. As the extent of clearing is small (4.2 ha), and the site has a reasonable degree of connectivity with similar habitat, clearing of the site is unlikely to result in the loss of an entire population, or to decrease the viability of a population. Such an impact is only likely to occur if there are resources or habitat features which are not available elsewhere. No evidence has been found to suggest this, although the presence of the water body and creek may be significant for amphibians or other aquatic fauna.</p> <p>As the site occurs on the edge of more extensive areas of native vegetation, clearance of the site will not result in the fragmentation of existing habitat, nor is it likely to limit the movement or dispersal of fauna species. Eighty per cent of Manus Island remains forested; hence</p>

Impact Type	Is there a real chance or possibility that the action will:	Potential Impact from this Project
		<p>the loss of 4.2 ha will not result in a substantial reduction in the area of available habitat, although habitat resources are considered higher in Greenfields Site 1 than surrounding areas.</p> <p>There is the potential for the introduction of exotic species if suitable control measures are not put in place. Such measures should be included in an environmental management plan for the site.</p> <p>No large scale burning is expected as a result of the project, though it has not yet been determined how cleared vegetation will be disposed of.</p> <p>Given the limited scale of the project, particularly in relation to the extent of remaining habitat on the Island it seems unlikely that the project will result in the loss of sufficient individuals of threatened or non-threatened species to result in the long-term decline of the species, unless there are specific resources or habitat features available on the site which are not generally available elsewhere. No such features are immediately obvious, but cannot be ruled out.</p>
<p><b>Impacts on people and communities</b></p>	<ul style="list-style-type: none"> <li>- substantially increase demand for, or reduce the availability of, community services or infrastructure which have direct or indirect impacts on the environment, including water supply, power supply, roads, waste disposal, and housing</li> <li>- affect the health, safety, welfare or quality of life of the members of a community, through factors such as noise, odours, fumes, smoke, or other pollutants</li> <li>- cause physical dislocation of individuals or communities, or</li> <li>- substantially change or diminish cultural identity, social organisation or community resources?</li> </ul>	<p>The proposed action is anticipated to increase the population of Manus Island in particular Lombrum Point. The existing OPC operates at a capacity of approximately 650 beds including staff. The proposed action will increase the number of people inhabiting the OPC to approximately 3000. This will increase the demand for community services and infrastructure which includes water and power supply and waste disposal, however it is understood that the new facility will be reasonably self-sufficient in this regard.</p> <p>The proposed action has the potential to impact on the health, safety, welfare or quality of life for members of the Lombrum Point community. It is expected that the facility is designed to ensure its inhabitants are appropriately contained within the OPC. However, there is insufficient information to be able to assess potential impacts on community and workforce health and wellbeing beyond this. Potential impacts such as decreased community cohesion, increased mental health issues, increased anti-social behaviour and increased stress and fatigue could affect the health, welfare and quality of life of the community.</p>

Impact Type	Is there a real chance or possibility that the action will:	Potential Impact from this Project
		<p>Potential impacts in relation to transport and noise, odours, fumes, smoke, or other pollutants can be managed through the development and implementation of appropriate construction and operational EMPs.</p> <p>The expanded facilities and its inhabitants will be primarily contained within the existing military base and the expansion is unlikely to cause physical dislocation of the community.</p> <p>The provision of the facility may provide opportunities for work and the potential to supply goods and services to the facility for some community members. Depending on the procurement of labour and services, and development of supply chains, there is however also potential for the project to result in economic displacement for people associated with the existing facility.</p>
<p><b>Impacts on heritage</b></p>	<ul style="list-style-type: none"> <li>- permanently destroy, remove or substantially alter the fabric (physical material including structural elements and other components, fixtures, contents, and objects) of a heritage place</li> <li>- involve extension, renovation, or substantial alteration of a heritage place in a manner which is inconsistent with the heritage values of the place</li> <li>- involve the erection of buildings or other structures adjacent to, or within important sight lines of, a heritage place which are inconsistent with the heritage values of the place</li> <li>- substantially diminish the heritage value of a heritage place for a community or group for which it is significant</li> <li>- substantially alter the setting of a heritage place in a manner which is inconsistent with the heritage values of the place, or</li> <li>- substantially restrict or inhibit the existing use of a heritage place as a cultural or ceremonial site?</li> </ul>	<ul style="list-style-type: none"> <li>- Desktop research has identified a range of known and potential heritage values related to: <ul style="list-style-type: none"> <li>• prehistoric period</li> <li>• plantation period</li> <li>• ethnographic period</li> <li>• WWII</li> </ul> </li> <li>- Heritage sites or associated values in the development areas will be highly disturbed or destroyed by construction activities</li> <li>- This includes the: <ul style="list-style-type: none"> <li>• Demolition and removal of extant fabric (e.g. Nissen Huts)</li> <li>• Alteration of current landscape form and setting</li> <li>• Removal or alteration of roadways, plantings and other infrastructure</li> <li>• Disturbance of potential surface and subsurface archaeological deposits during clearing, demolition, earthworks and construction.</li> </ul> </li> <li>- There are no known cultural or ceremonial values associated with the site.</li> </ul>

### 3.2 Impact Severity

Under the Guidelines, assessment of severity of impact must give consideration to the following criteria:

- the scale of the action and its impacts
- the intensity of the action and its impacts, and
- the duration and frequency of the action and its impacts.

In determining an overall rating for severity of impact, the following classification system has been used:

- **Severe:** Severe impacts generally have two or more of the following characteristics: permanent/irreversible; medium-large scale; moderate-high intensity.
- **Moderate:** Moderate impacts generally have two or more of the following characteristics: medium-long term; small-medium scale; moderate intensity.
- **Minor:** Minor impacts generally have two or more of the following characteristics: short term/ reversible; small-scale/localised; low intensity.

A level of severity is attributed to all potential impacts identified in Table 10.

Table 10 Assessment of impact severity

Potential Impact	Scale	Intensity	Timing, Duration, Frequency	Impact Severity
Soil erosion	Small	Moderate	Medium/long term , construction and operation	Moderate
Environmental pollutants	Medium	Low	Medium/long term, construction and operation	Moderate
Vegetation clearing	Small	High	Permanent/irreversible	Severe
Impacts on threatened species (flora and fauna)	Small	High	Permanent/irreversible	Severe
Heritage places and items	Small	High	Permanent/irreversible, once	Severe
Renewable or non-renewable resources	Small	Low	Medium/long term, once	Minor
Water utilities	Small	Moderate	Medium/long term, construction and operation	Moderate
Electricity utilities	Medium	Low	Medium/long term, construction and operation	Moderate
Communication utilities	Medium	Low	Medium/long term, construction and operation	Moderate
People and communities	Medium	High	Medium/long term, construction and operation	Severe

### 3.3 Impact Uncertainty

**Soils and other substrates:**

It is unclear what the soil type within the project area is and therefore risks associated with excavating, filling, erosion etc. are difficult to quantify. Soil sampling would be desirable prior to finalising the master plans in order to quantify impacts on soils.



**Water:**

As above, it is difficult to quantify water impacts without a water quality investigation and detailed construction plans, including information on what will be done with the existing watercourse and lagoon. It is understood that these will be filled in and the site levelled, however it is not understood what the final drainage solution will be and how this will impact on the surrounding area.

**Vegetation and animal species:**

Given the limited availability of background information on the flora and fauna of Manus Island, and the limited (one day) field assessment, there is a high level of uncertainty about impacts on vegetation and animal species, including threatened species, and their habitats. The site visit has confirmed the presence of some threatened species, but has not ruled out the presence of others.

**Heritage Places and Items**

The proposed development is certain to have an impact on the WWII heritage of the site, as it will require the demolition of several standing structures, and the disturbance of plantings, roads and other infrastructure.

The exact nature of surface or subsurface archaeological deposits cannot be ascertained through desktop assessment, and thus it is not possible to evaluate impact on these potential heritage places.

**People and Communities**

The assessment of potential impacts has not involved any consultation with key stakeholders including impacted communities and the opportunity for in-country verification of data and studies. In order to more fully evaluate potential impacts on the community, additional information would be required in relation to local transportation routes for communities and users of the current OPC, activities mooted for the planning, construction, operation and decommissioning phases of the project, extent of indirect, cumulative and potential trans-boundary impacts from the current facility, and project construction activities including supply chain and access routes.

**Utilities:**

At the time of this report (30 September 2013), no detailed master plan exists on major utilities such as power generation, sewage treatment, solid waste and water. Therefore, there is a high degree of uncertainty when assessing impacts on services and utilities for Lombrum Point.

## 4.0 Step 3: Impact Avoidance, Mitigation and Management

Careful planning of an action can avoid, or reduce, the likelihood of a significant impact on the environment. Where possible and practicable it is best to avoid impacts. If impacts cannot be avoided they should be minimised or mitigated as much as possible.

This section proposes measures for avoiding, mitigating or managing potential impacts from this project, as identified and assessed through Step 2 (Table 10).

**Table 11 Avoidance, mitigation or management of potential impacts**

Potential Impact	Impact Severity (Refer to Table 10)	Avoidance, Mitigation or Management Measure	Residual Impact Severity
Soil erosion	Moderate	<ul style="list-style-type: none"> <li>- Develop a sustainable solution for the drainage issues at Greenfields Site 1</li> <li>- Avoid construction in wet season</li> <li>- Avoid or minimise clearing where possible</li> <li>- Soil stabilisation</li> <li>- Start revegetation/ natural recruitment asap after construction has been finalised</li> <li>- Replanting of local native species where possible</li> <li>- Construction contractor responsibility during the construction stage</li> </ul>	Minor - Moderate
Environmental pollutants	Moderate	<ul style="list-style-type: none"> <li>- Contaminated land assessment to be carried out to determine measures to be included in CEMP</li> </ul>	Minor - Moderate

Potential Impact	Impact Severity (Refer to Table 10)	Avoidance, Mitigation or Management Measure	Residual Impact Severity
		<p>and OEMPs to manage contaminated soil likely to be disturbed by the works, particularly in relation to:</p> <ul style="list-style-type: none"> <li>• asbestos containing refuse observed on site</li> <li>• UXOs and associated contamination</li> <li>• former refuse dumps</li> <li>• contamination from underground storage tanks.</li> </ul> <ul style="list-style-type: none"> <li>- Ensure applications of insecticide are localised and do not have an impact outside the footprint of the site.</li> <li>- Ensure CEMP and EMP includes measures to ensure appropriate storage and use of petrol, oils and lubricants (POL) and disposal of waste during construction and for life of facilities.</li> <li>- Design the facility to establish a sustainable long term solution for waste.</li> <li>- Provision should be made on site for the sustainable treatment of organic material from kitchen waste for the operation of the facility</li> <li>- Any fill required for land preparation to be sourced from appropriate local quarries and assessed for potential contamination prior to use.</li> <li>- Construction contractor to be ultimately responsible for dealing with environmental pollutants during construction phase.</li> </ul>	
Vegetation clearing	Severe	<ul style="list-style-type: none"> <li>- Avoid clearing native vegetation wherever possible when finalising the potential design of the project footprint.</li> <li>- Strict risk mitigation and controls to be applied to weed, pest and pathogen management (including on and off site quarantine protocols especially for ship borne pests if construction equipment is to arrive by boat).</li> <li>- Replant with local native species where possible.</li> </ul>	Moderate
Impacts on threatened species (flora and fauna)	Severe	<ul style="list-style-type: none"> <li>- Avoid clearing native vegetation wherever possible when finalising the potential design of the project footprint.</li> <li>- Strict risk mitigation and controls to be applied to weed, pest and pathogen management (on and off site quarantine protocols).</li> <li>- Replant with local native species where possible</li> <li>- Any coral aggregate used in construction to be sustainably sourced.</li> </ul>	Moderate
Heritage places and items	Severe	<ul style="list-style-type: none"> <li>- Site survey and detailed assessment of heritage values.</li> <li>- Archival recording of extant heritage.</li> <li>- Cultural heritage induction and 'stop works' protocol for unexpected finds.</li> </ul>	Moderate
Renewable or non-renewable resources	Minor	<ul style="list-style-type: none"> <li>- Avoid clearing vegetation not contained within the site footprint.</li> <li>- Replant with local native species where possible.</li> <li>- Avoid use of coral as a fill material where possible.</li> </ul>	Minor

Potential Impact	Impact Severity (Refer to Table 10)	Avoidance, Mitigation or Management Measure	Residual Impact Severity
Water utilities	Moderate	- Design to ensure that water supply and waste water management for the site is adequate and does not have a significant impact on existing water utilities.	Minor
Electricity utilities	Moderate	- Design to ensure that electricity supply for the site is adequate and do not have an impact on surrounding utilities.	Minor
Communication utilities	Moderate	- Design to ensure that communications facilities are adequate and do not have an impact on surrounding utilities.	Minor
People and communities	Severe	<ul style="list-style-type: none"> <li>- Design to ensure that infrastructure and services are sufficient to avoid drawing on surrounding community facilities.</li> <li>- Development of OEMPs and CEMPs to manage potential community exposure to noise, heat, radiation, pressure, humidity, chemical substances and biological agents.</li> <li>- Selection of construction and operation methodologies, particularly access and supply chain routes, to avoid interfering with community access to farming/agricultural land and fishing facilities.</li> <li>- Develop labour and procurement policies that facilitate positive economic outcomes for the community through avoiding displacement of individuals associated with the existing facilities, and identifying opportunities for the supply of labour, goods and services from the local community</li> <li>- Engage with representatives of the local community to provide guidance on management and mitigation of concerns they may have on potential community impacts.</li> </ul>	Moderate

Impact avoidance, mitigation and management measures will be further considered in the detailed design stage of this project and if necessary avoidance measures will be applied (i.e. modify site layout to avoid clearing native vegetation etc.). Furthermore, mitigation and management measures will be described in the CEMP and an operational EMP. The CEMP will provide for the following:

- Statutory requirements, compliance with approvals and licenses
- Environmental aspects and management measures including but not limited to:
  - Water quality
  - Erosion and sediment control
  - Noise, dust, odour and vibration
  - Air quality
  - Soil and contaminated site management
  - Flora and fauna
  - Weed and pest management

- Waste management
- Monitoring program
- Reporting and communication
  - Environmental inspection and auditing
  - Communication and complaints management.

## 5.0 Step 4: Are the Impacts Significant?

The current study aimed to establish an environmental context as accurately as possible. Based on the desktop assessment and review of available information, the following potential impacts were identified

- **Soil erosion impacts:** There is the potential for residual impacts of soil erosion and alterations to the watercourse and lagoon to be moderately significant. Further assessment is constrained by the uncertainties around the soil type present and the current lack of detailed design information on how erosion will be managed, what the final drainage solution will be and how this will impact on the surrounding water infrastructure.
- **Vegetation clearing and impacts on flora and fauna:** Given the fact that most of Manus Island's threatened species is endemic to the island and not restricted to higher elevations, there is a possibility that some threatened species might occur within the project site. This is compounded by the plight of surrounding lowland rainforest and impacts of traditional slash and burn agricultural practises reducing the 'quality' of surrounding lowland rainforest. Until future surveys confirm otherwise, the precautionary principle will be applied, which states that if an action has suspected risk of causing harm to the environment, in the absence of scientific consensus that the action is harmful, the burden of proof that it is not harmful, falls onto those undertaking the action. The level of clearing in the context of a modified surrounding and the broader extent of forest on the island is small. However it cannot be ruled out that the project could have an impact on flora and fauna. As such it is recommended that flora and fauna surveys are conducted in order to assess the likelihood of threatened species occurring on site.
- **Impacts to heritage places:** Impacts on heritage values could potentially be significant as the proposed works will result in the permanent destruction of heritage buildings, the potential disturbance of archaeological deposits, and the modification of the setting of a heritage place. Impacts can be managed to a minor level of severity through a more detailed assessment of heritage values, archival recording of extant heritage and incorporation of a cultural heritage induction and 'stop works' protocol for unexpected finds into the construction environmental management plan.
- **Community:** The proposed action has the potential to impact the local community surrounding the site. Information and data is currently unavailable on the present level of impact the existing facility has on the local community. Potential impacts such as decreased community cohesion, increased mental health issues, increased anti-social behaviour and increased stress and fatigue could affect the health, welfare and quality of life of the community. Engagement with community representatives is recommended to identify concerns they may have on potential impacts and to facilitate positive economic outcomes for the community where possible.
- **Utilities:** The existing condition of electricity utilities to the site and provisions for solid waste disposal is uncertain at this stage however due to the proposed increase in capacity of the proposed action this may have a significant impact on the local area's amenity and ability to provide these services. Further consideration will be required during detailed design to assess the constructability and feasibility of the required electricity and solid waste facilities. Where the facility is designed to be self-sufficient, it is unlikely that the proposed action will have a significant impact on utilities and has the potential to improve existing services and associated utility infrastructure.

## 6.0 Conclusion

This document has provided an assessment of the potential impacts of the expansion of offshore processing facilities at Lombrum Point, Manus Island, against the assessment criteria in DSEWPC's Significant Impact Guidelines 1.2.

Based on the desktop assessment and review of available information, several potentially significant impacts were identified, including:

- Uncertainty around potential impacts of soil erosion and alterations to the watercourse and lagoon on Greenfields Site 1
- Likelihood of impacts on threatened flora and fauna species, and uncertainty in relation to the significance of these impacts
- Potential impacts on heritage places through the permanent destruction of heritage buildings, the potential disturbance of archaeological deposits, and the modification of the setting of a heritage place
- Uncertainty as to impacts on the local community arising from the substantial increase in the inhabitants at the facility.

Where an action is likely to have a significant impact on the environment, or the proponent is unsure, a referral should be submitted to DSEWPC for further consideration. For a significant impact to be 'likely' to occur 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.

On this basis, it is recommended that the action be referred to DSEWPC for further consideration.

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