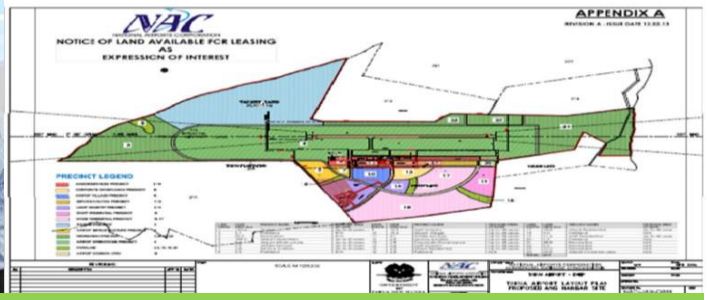
APPLICATION FOR ENVIRONMENTAL PERMIT TO ABSTRACT WATER AND DISCHARGE WASTE

BY

NATIONAL AIRPORTS CORPORATION LIMITED

KOKOPO, EAST NEW BRITAIN PROVINCE



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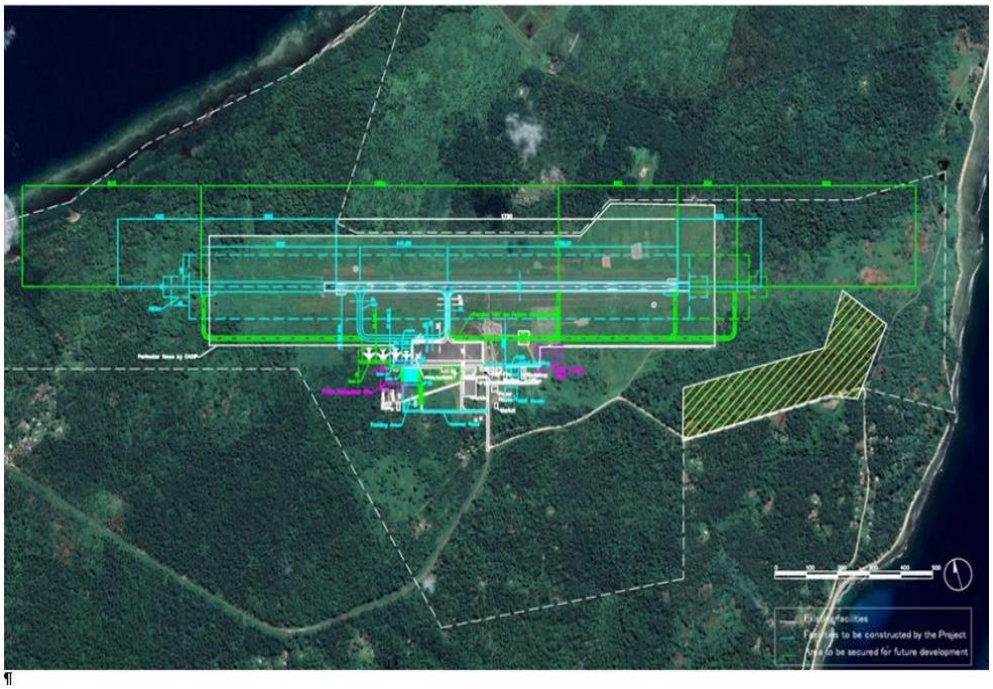
1.0 INTRODUCTION

This Environmental Permit Application is submitted by National Airport Corporation (NAC) the "organization" in accordance with the GUIDELINE FOR SUBMISSION OF AN APPLICATION FOR AN ENVIRONMENTAL PERMIT TO ABSTRACT WATER AND DISCHARGE WASTES in order to seek approval from the Conservation and Environment Protection Authority ('CEPA"), the ("Government Department"), to discharge wastes into the environment during the re-development works of the Tokua Airport by NAC in collaboration with the Japanese International Corporation Agency (JICA). These activities will involve civil works on the expansion and extension of the Tokua Airport, construction of new office facilities, drainage, waste water discharge outlet points and the collection and disposal of solid and liquid wastes from the aircrafts and the airport. Other works will involve groundwater abstraction to supply to the Tokua Airport uses.

This Environment Permit Application document accounts for the Tokua Airport Re-Development and associated activities.

The proposed development will be established within the existing Tokua Airport in Portions 210 and 211, Millinch of Kokopo NE, Fourmill of Rabaul, geographically located at 4°20´25˝S, 152°22´46˝E at an elevation of 10 m above sea level (asl), 15 km east from Kokopo town, the capital of East New Britain, just at the end of the Kokopo-Tokua Corridor. This project is a Prescribed Activity under the Environment Act 2000 because it involves civil works to redevelop the exiting aerodrome with associated facilities and waste management at the Tokua airport.

Figure 1.0 Showing the Site and Layout of the Tokua Airport Re-development Project



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This activity falls within Level 2 B (Category 12.4 ***"Construction of aerodromes or airfields except unpaved airstrips more than 10 km from an urban area"***) of the Environment (Prescribed Activities) Regulation 2002 and therefore an Environmental Permit is required for the discharges of wastes during the operation of airport, construction of a new terminal building, an air traffic control tower, and associated civil works involving vegetation clearance, earth works, drainages, waste management facilities and disposal options.

1.1 Objectives

The main objectives in redeveloping this airport by the National Airport Corporation (NAC) are: -

- To increase capacity and improve safety of Tokua Airport to meet the growth of air traffic demand not only in Tokua but also in the New Guinea Islands region.
- To re-development will meet relevant PNG National Acts & Regulations and International standards & conventions like ICAO, FAA, and IATA.
- This project implementation in fulfilment of PNG's Development Strategic Plan 2010-2030 that states that the air transport plays a vital role in the country and that the 10 regional airports be upgraded for larger jets. (Currently only Port Moresby handles large jets). Tokua airport is one of the 10 regional airport.
- It is also a development that is directly in compliance with the National Transport Strategy and the overall Government of PNG's 2050 Strategic Vision documentation. An NEC decision No. 046/2016 was made, approving the delivery of this project.
- This will complement the National Government's Economic Recovery Strategy and Export-Driven Policy.
- To boost local earnings especially through the promote of Tourism in East New Britain Province.
- To assist the LLG, Provincial and National Governments efforts to alleviate rural poverty and improve health and general lifestyle through direct employment and increase other spin off benefits like food markets at the airport area. This will also minimize law and order problems.

1.2 Potential Biophysical Impacts

The most anticipated significant biophysical impact from the project will be:

- Pollution of marine life and the mangroves along the marsh ecosystem of the north western end runway along the Kabakaul Bay coastline. The contaminated surface runoff and other wash water that is discharged from the airport terminal will filtered into the marsh environment.

- ❖ There was evidence of dolphin breeding within the mangrove areas along the Kabakaul Bay and this area needs to be protected from contamination and disturbance from any activity taking place within that coastline.

- ❖ Increase fish population and other biotic communities who feed from the rich nutrient rich effluent that flow from the discharge points. There is already increase rich biotic community within the vicinity of the waste disposal points.

1.3 Potential Socio-Economic Impacts (direct results of biophysical impacts)

The socio-economic impacts resulting from biophysical impact from this activity are:

- ➢ Potential for influx of outsiders flocking into the airport area to sell cooked food
- ➢ Increased in communicable diseases amount the human population.
- ➢ A few temporary socio-economic impacts will emerge during the construction phase. These include setback on the local community like disruption to local market place, gardens and livestock, vendor having access to markets and airline operators reducing its flight operations during construction period

1.4 Potential Benefits of the Activity

The potential benefits of the activity are: -

- Generation of cash income for the local communities through direct employment during the construction phase as well as operation phase.
- Improve lifestyle for the local community in terms of health, education and wealth.
- Increased income for provincial and national government through tax and infrastructure development in the province.
- To promote tourism industry in the province and the country. The improved airport facility will promote tourism and ripple effects are the improved services in the hotels, power and water supply to the local populace.

2.0 PURPOSE OF THE ACTIVITY

The main purpose for redeveloping the Tokua Airport is to develop the airport to a Code 4C Aerodrome to accommodate B737 operations and to appropriately plan the precincts within the aerodrome boundary.

During the time of writing this EP document NAC envisage to the develop the following civil works: -

- Runway Extension, widening and strengthening from 1,720mtrs x 30meter to a 2,600mtrs x 45mtrs runway. (Including Aeronautical Ground Lighting etc.)
- Apron extension, parallel taxiways and drainage.
- Road – airport approach road & new Carpark and drainage
- New Passenger Terminal Building
- Repurpose existing Terminal Building into Cargo & General Aviation Terminal.
- Refurbishment of Administration Building & ARFF facilities.
- New Control Tower and relevant infrastructure where required. (currently under review)
- Redevelop all relevant utilities. (Including, electricity supply, water & sewerage, fuel supply etc.)

2.1 Rationale

The Tokua Airport Redevelopment Project was one of the prioritized projects under the Medium Term Development Plan (MTDP) III to promote Tourism in Rabaul and Kokopo area. There are many tourism resources in Rabaul/Kokopo area and Tourist Promotion Authority (TPA), East New Britain Government and NAC were very desirous e to introduce international flights to Tokua Airport to promote international tourist.

NAC nationwide has a policy to develop, four airports, Nadzab, Tokua, Mount Hagen and Goroko Airports as regional hub. The major airlines in PNG such as Air Niugini and PNG Air use Tokua Airport as a hub airport for passengers and cargo in northern islands area. PNG Air operates a Dash 8 (DHC8) Freighter aircraft in the airport. There are transshipping cargo from Rabaul Port and Tokua Airport plays a role of cargo shipping hub for mines in northern islands area. Thus, this proposal to redevelop the Tokua Airport is welcomed by NAC and the East New Britain Provincial Government and the Administration.

2.2 Compatibility of Activity with National, Provincial and Local Level Government Development Goals

The proposed activity is very consistent and compatible with the various governments' development policies. For example, The Vision 2050.

However specific policy decisions include the National Executive Council (NEC) Decision No. 46/2016 which endorsed the Tokua Airport Redevelopment Project and approving the delivery of Tokua Airport Redevelopment highlighting Tokua East New Britain Province as a tourism hub.

The project is also aligned to PNG's National Vision and Strategic Development Goals especially: -

- PNG Development Strategic Plan 2010 – 2030 and MTDP III
- National Transport Strategy 2010 – 2030 and related MTTDP III

The above strategies are captured and incorporated under the National Airports Corporation Growth Strategy 2030 to develop airport infrastructure in Papua New Guinea

2.3 Benefits of the Project

The project will provide the following socio-economic benefits to the country and the province at large: -

i. Increased capacity and safety to meet air traffic demand to International Standards,

ii. The project is a development enabler – it will be used to transform and promote the region into a tourism hub,

iii. The Kokopo – Tokua Economic Corridor as planned by the East New Britain Provincial Administration will be developed as a result of the Tokua Airport Redevelopment Project.

iv. Creation of employment and business opportunities for the local economy due to the impending construction and improved facilities thereafter.

v. Also promote SMEs in terms of the local population engaged in food marketing and sale of artifacts resources near the airport and the Kokopo Township.

vi. The government will surely generate additional revenue basically from the worker's income taxes. The National Government will also benefit through various taxes, license fees assist the governments to maintain a stable economic environment and provide basic social and infrastructure services to local community.

3.0 VIALIBILITY OF THE PROJECT

3.1 Capital Cost

3.1.1 Projected Operating Costs

The estimated cost of TARP works is estimated to be approximately K850 million through donor funding. This cost covers only the overheads, contingencies, consultancy and duties which are not part of civil construction works. Moreover, cost of materials and the engineering application to build and/or procure airport and navigation infrastructure is a very expensive exercise. The cost will be further examined by JICAs during the next appraisal mission prior to project commencement.

3.2 Proponent's Technological Expertise and Resources

NAC has the capacity to hire highly skilled technical team to implement the project. Now with JICA involved in the technical design aspect of the project JICA will also help implement the project. The Project Management Unit (PMU)of NAC has engaged consultants who are working closely with local team to ensure that in-house capacity building is made and knowledge transfer is done to the advantage of the organization. This project will be executed immediately after all government processes and donor funding is made available.

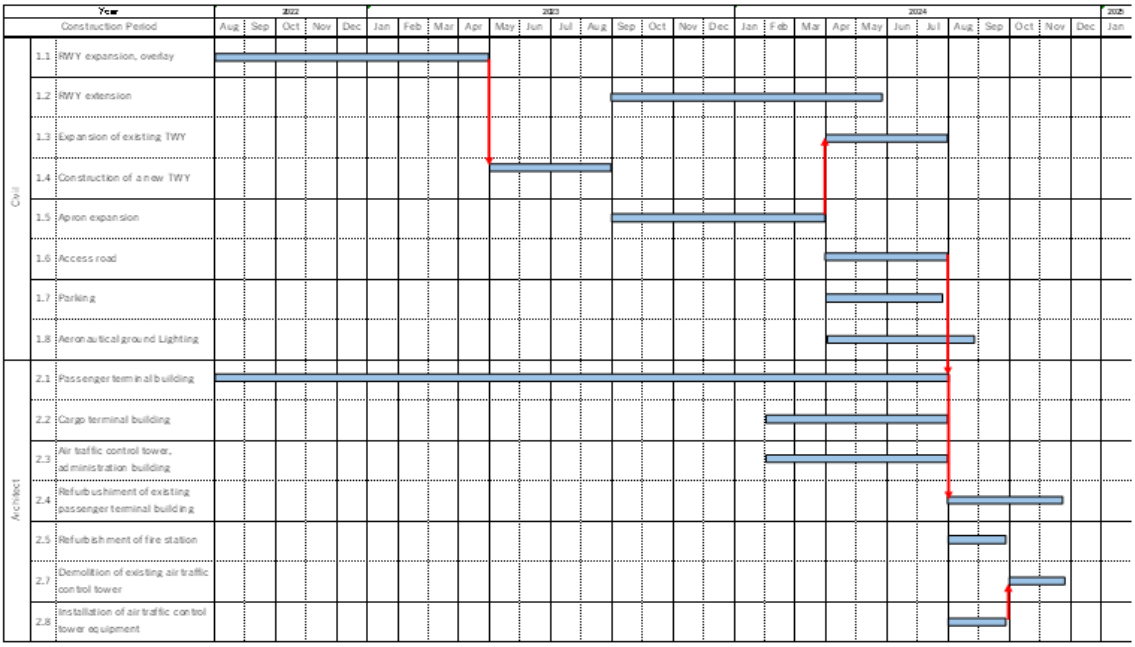
3.3 Feasibility Investigation Results

There were several feasibility studies and data collection carried out earlier by Gyro Corporation, Nippon Koei Co. Ltd from Japan in 1994 which actually led to the construction of the Tokua Airport after the Rabaul Airport was destroyed by the 1994 Mt Tavurvur Volcano eruption. Despite another study by the same company in 2019, NAC has currently engaged Oriental Consultants Global Co. Ltd funded by JICA to carry out a full feasibility study for the proposed Tokua Airport Redevelopment Project. This Environment Permit Application documentation is actually one component of the feasibility study meeting the JICA procurement process to solicit funds to implement the project development.

4.0 DEVELOPMENT TIMETABLE

This is a tentative Development Schedule.

Table 1: Proposed construction schedule



Source: JICA study team

5.0 SITE SELECTION

There is no alternative site considered for the time being than current location because the East New Britain Provincial Government has the Land Title of the land and leased it to NAC for the Tokua Airport development. The site is ideal as it is located away from active volcanic activities in Rabaul area. The area's ambient air quality is acceptable.

6.0 BASELINE ENVIRONMENTAL INFORMATION AND DATA

The baseline information discussed are based on both field observations carried out during a week-long field survey and from existing field data obtained in earlier field studies.

6.1 Socio - Economic Environment

The proposed project development is a re-development or an expansion of the existing Tokua Airport facility. The surrounding areas are predominantly covered with senel coconut plantation currently owned by the CPL Group of Companies. Most of these plantations have been inter-cropped with either balsa or cocoa to maximize economic return. These plantations include the Tovarua Plantation towards the northern of the Tokua Airport while plantations on the southeast and southwest sides of airport are all part of the Ulaveo Plantations.

The plantations were initially owned by foreign business communities during the pre-independent and post independent era when PNG economy was based on agriculture. These agriculture developments required a lot of unskilled laborers to work. The plantation owners started recruiting the Sepik first and then later the Highlanders followed between the 1950s through to 1960s to work in plantations in the coastal provinces including East New Britain. The recruitments were done in thousands. For example, in 1953, more than 2100 unskilled laborers were recruited and in 1968, a work force went up to 15,400. These laborers were distributed to all other coconut growing areas in East and West New Britain, North Solomon, New Ireland, and Central Provinces. Rubber was later introduced in the southern regions especially in Central province and later to the other four provinces.

6.1.1 Village and Demography

The proposed development area has no village as it will be developed within the State Lease land, Portions 210 and 211. Then the surround area are coconut plantations owned by CPL Group of companies. Nevertheless, the Tokua Airport area is within the Bitapaka Local Level Government.

Table 2.0 Total Population of the project Area

Geographical Area	Households	Persons	Male	Females
02 Kokopo, ENBP	13,591	87,829	45,284	42,545
06 Bitapaka Rural Local Level Government (22 Wards)	3,517	23,116	12,251	10,865
Ward 22 Ulaveo	**376**	**2256**	**1215**	**1041**

6.1.2 Land Tenure

According to the provincial government, they have the Land Title (Portions 210 and 211, Millinch of Kokopo NE, Fourmill of Rabaul) over the airport land which have been leased to NAC for the Tokua Airport Development.

There seems to be no traditional village communities exiting around the proposed project area. The current airport land and the surrounding areas were on existing coconut plantations. The rights of the original landowners may have changed hands over the last one hundred years where the colonial administrators at that time introduced coconut and cleared large areas around Kokopo, Gazelle and Rabaul for coconut plantation. There were several settlements and armlets spread out within the Ulaveo Plantation Estate on the southwest, the Tovarua Estate on the north and several scattered communities towards Reiven area. These settlements are mostly occupied by plantation workers who have mixed parentage children. The settlers have been living for more than 50 to 100 years.

There were inter-marriages between the local Tolais with Sepiks and Highlanders. Certain pockets of the plantations have been reverted back to the local owners while most of the estates are still owned by companies. Thus it was very difficult to establish who the traditional landowners were as most of the communities have user rights and actual ownership is hard to establish.

6.1.3 Political Leadership

The area has political representation in the National, Provincial, Local and Community. The representations are designated by the Governor for East New Britain, Kokopo Open MP, the President of the Bitapaka Local Level Government Council (LLG) and the Ward Councilor for Ulaveo and of course the Kokopo District Magistrates and other law enforcement agencies of government.

6.1.4 Religion

The dominant Christian denominations that exist in the area include Catholic, United Church and SDA with smaller groups of Lutheran, Pentecostals and other Christian denominations. Of course there are other traditional customary ritual practices that are important to individual members of the local communities.

6.1.5 Infrastructure and Community Services

The project is located about 12 to 15 km out of Kokopo town. There is a permanent coal tar sealed road into Tokua Airport. There are so numerous social services and infrastructure existing within the Kokopo township including, post office, banks, hospitals, shopping malls, technical colleges, teacher training colleges, nursing school, business schools, primary to secondary schools, Christian churches and off course hotels, industrial area and business communities.

6.1.6 Village Economic Activities

The major economic activity in which the village and local community participate are cocoa planting, copra work, artifacts, fishing and gardening.

Photo 1

Photo 2

Photo 3

Photo 1, 2 & 3 Shows the coconut leaf woven basket at Kokopo Market, villagers culturing watercress for market and household consumption and planting banana, and other garden crops for subsistence livelihood and marketing.

As stated above, some of the pockets of plantations have been reverted back to the local communities. They mend these plantations and continue producing copra as there is existing market. There is opportunity for vanilla and other spice products. The big plantation owners produce balsa, copra and cocoa and market to overseas markets.

Aside from cash crop developments, they are a huge tourism industry boom with hotels, scenic and war relics sites that keep the local tourism activity robust. Thus, there is a very vibrant cash economy in the Kokopo District and the Tokua Airport Area.

6.1.7 Education

Most of the people in and around the project area are literate. This has been attributed by the early colony administration and establishment of a lot of schools from primary to secondary schools, technical colleges, nursing school and teacher's schools.

6.1.8 Health and Nutrition

The general observations on the health of the settlers and local community indicated that the people are healthy. Health services in the area are relatively adequate, there is Vunapope Catholic Hospital and the Vunapope Nursing College. There several clinics readily available to provide medical services.

6.1.9 Available Labor Force

NAC has the capacity to hire contractors to do the specific contract works. They have the appropriate project management team within their structure and contracts are put up on Tender for bidding by the public.

6.1.10 Cultural and Archaeological Sites

There is no culture or archaeological site found within the project site. However, if there were any of these sites in existence then they could have been exploited already during the clearance of the area for coconut and cocoa plantation some 80 years ago.

6.1.11 General Community's Perception of the Project

This project is highly regarded as the best development for the Aviation and Tourism Industry in PNG. As observed during the earlier study by various JICA team, the local communities observe this development positively. The local community do sale cooked food "*aigir"* and other products in a few stalls which would increase as the airport increase capacity to allow big planes to land.

6.2 Physical Environment

6.2.1 Topography

The project area is part of the fertile undulating volcano-alluvial fans and plains which characterize the lowland areas of Kokopo and the Cape Gazelle. Slopes in the project area are generally 5 to 15m asl. The main drainage system in the area of the project site is the main drainage from the airport flowing northwards to Kabakaul Bay and Blanche Bay into the Bismarck sea. There are several other small creeks and ground springs that discharge into the mangroves on the north western end of the airport. The porous volcanic ash soils permit rapid infiltration and subsurface flow, and thus intense rainfall is required to generate sufficient surface runoff for such small drainage channels to flow. On the all, the Tokua Airport is well drained with no temporary or permanent inundation, although the gully probably remains moist for much of the year because of the high ground water table.

6.2.2 Soil Types

The soils of the general area are dominated by Eutrandrandepts and Vitrandepts with some Dystrandepts (Bleeker 1988) formed on volcanic ash deposits. They are deep (>1m), well drained, medium textured (loams, with textures varying from clay loam to fine sandy loam), fertile soils with moderate cation exchange capacities (CECs), high base saturation, and high nitrogen and organic matter levels in the top soils (typically 15-25 cm deep). Soil organic matter contributes substantially to the CEC Graham and Baseden 1956), but high cultivation rates have resulted in loss of organic matter and soil degradation in some areas (Bleeker and Freyne 1981). The high allophone levels in the volcanic soil parent materials result in low levels of available phosphate and high anion fixation.

Rapid infiltration rates, good vegetation cover and high surface soil organic matter levels generally result in low soil erodibility.

At the project site, rates of soil erosion are currently very low or negligible. However, vegetation clearing and compaction with heavy equipment movement could render the site prone to gullying on the slopes. In the existing coconut, balsa and cocoa plantation, the heavily shaded soil surface is covered with a 1-3cm thick litter layer composed mainly of cover grass and leaves. This litter breaks down rapidly under the prevailing warm humid conditions, and contributes to the high organic matter content of the topsoil and to a rapid nutrient cycle in the plantation ecosystem.

6.2.3 Climate and Rainfall

The climate in Papua New Guinea is mainly divided into two seasons; dry season from May to November and rainy season from December to April. In the Köppen climate classification, Papua New Guinea is divided into the equatorial climate (Af), the tropical monsoon climate (Am), the tropical savanna climate (Aw) listed from the north. The main New Britain Island in which Tokua airport is located

belongs to the equatorial climate, but the temperature difference is small and the maximum temperature rises to around 30°C throughout the year.

Based on data for 10 years: from 2009 to 2018, the average rainfall amounts are recorded as 2,498 mm/year at the Tokua airport Observatory. As mentioned above, the climate in Papua New Guinea is mainly divided into two seasons. But the distinction between rainy season and dry season at Tokua airport is smaller than in other regions because of its relativity to the equator.

Figure 2.0 Koppen Climate classification in PNG

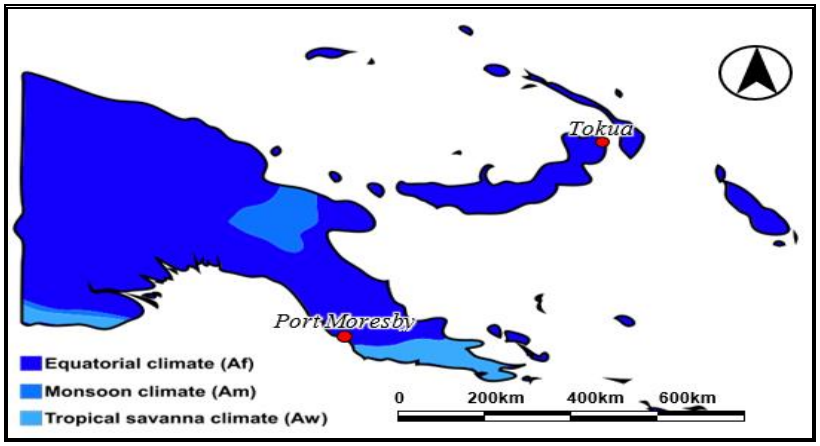
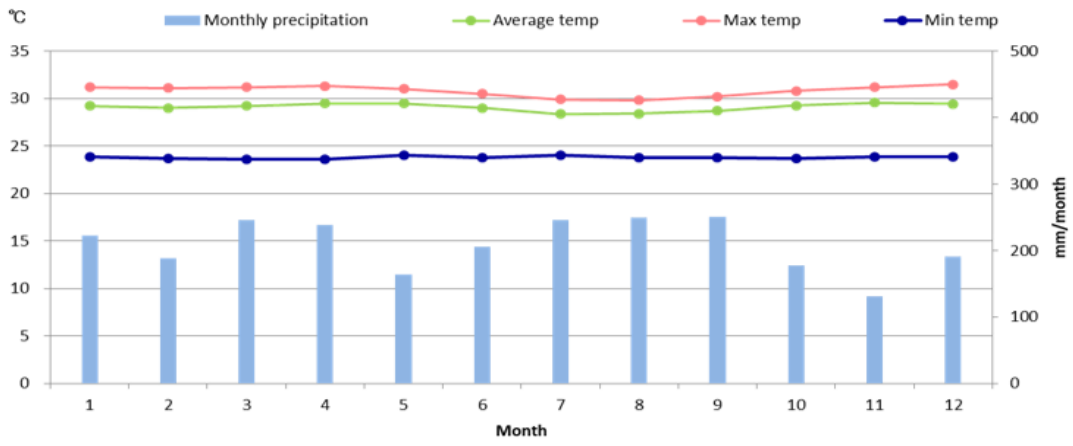


Table 3: Rainfall and temperature of monthly average at Tokua airport (2009 - 2018)

Item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rainfall	222.1	188.2	246.1	238.5	164.0	205.2	245.2	248.8	250.6	176.8	131.2	191.0	2,498
Temperature	29.2	29.0	29.2	29.5	29.5	29.0	28.3	28.4	28.7	29.3	29.6	29.4	29.1
Max Temp	31.2	31.1	31.2	31.3	31.0	30.5	29.9	29.8	30.2	30.8	31.2	31.5	-
Min Temp	23.9	23.7	23.6	23.6	24.0	23.8	24.0	23.8	23.8	23.7	23.9	23.9	-



6.2.4 Air Quality

The ambient air quality within the project area is typically clean and unpolluted. There are no industrial or agricultural activities within or adjacent to the project site that would contribute to the secondary air pollution. However, there is marginal aerial emission from vehicle exhaust fumes and the ship chimney fumes. These emission sources have no significant impact on the air qualities as the emissions are small in quantities and marginal.

The quality of air around Tokua Airport and Kokopo in general is moderately polluted. Measurements of PM_{10} and $PM_{2.5}$ were <3 µg/m^3. Sulphur dioxide (SO_2) appeared to influence the air quality over Tokua Airport (Table 1). Large amount of SO_2 are emitted from quiet emission of gas in active volcanoes of Mt Tarvurvur, Vulcan and Mt Ulawun. Studies have shown that a number of volcanoes around the world continuously exhale water vapor laced with heavy metals, carbon dioxide, hydrogen, sulphide and Sulphur dioxide, among many other gases. Of these, Sulphur dioxide is the easiest to detect from space (Aura, https://aura.gsfc.nasa.gov/)

Table 4. Air quality data for Tokua Airport/Kokopo over 4 days.

Date	Time	AQI	SO_2 (µg/m^3)	O_3 (µg/m^3)	CO (µg/m^3)	PM_{10} (µg/m^3)	$PM_{2.5}$ (µg/m^3)	Pollution Status
2020.02.19	11.06pm	41	95	52	113	-	0	High
2020.02.20	5.33am	33	67	52	111	-	0	Moderate
2020.02.20	8.22am	31	58	52	112	-	0	Moderate
2020.02.20	1.37pm	28	47	49	107	-	0	Moderate
2020.02.20	5.00pm	35	73	45	109	-	0	Moderate
2020.02.20	10.30pm	50	125	46	113	-	0	Moderate
2020.02.21	5.01am	43	101	46	118	-	0	Moderate
2020.02.21	10.07am	33	67	47	107	-	0	Moderate
2020.02.21	9.40pm	64	186	38	119	-	0	High
2020.02.22	6.57am	75	235	39	121	-	0	High
2020.02.22	12.20pm	42	96	40	122	-	0	Moderate
2020.02.22	3.38pm	36	77	36	120	-	0	Moderate
2020.02.22	10.37pm	78	252	32	123	-	0	High
2020.02.23	7.11am	94	324	31	125	1	-	High
2020.02.23	12.03pm	63	182	35	-	3	2	High
2020.02.23	3.45pm	44	102	31	-	2	1	Moderate
2020.02.23	11.13pm	81	267	29	-	1	0	High
2020.02.24	6.55am	133	447	28	114		0	Very High
2020.02.24	10.07am	60	173	31	-	0	0	High
2020.02.24	4.08pm	37	79	31	-	0	0	Moderate
2020.02.24	10.07	77	248	28	104		0	High
2020.02.25	6.07am	132	446	28	118		0	Very High
2020.02.25	12.10pm	55	145	-	-	3	1	High

6.2.5 Noise

The ambient noise level within the project site area is very low. The only noise generated is from the ship and the ice making plant. These noises are more localized and workers communicate clearly and so there is no major audibility problem. Even then, the nearest village is about 2 kilometers and so impact on the local community is minimal.

6.3 Biological Environment

The biological environment comprised of floral and faunal species occurring within and around the project. The biological community accounted in this section is based on field observation, data collection and literature search.

A rapid biodiversity assessment of areas around Tokua airport was conducted from the 30th January to 2nd February, 2020. The biological information (flora and fauna) and the physical settings were observed and recorded while traversing the airport area. Other information and data were extracted from both published and unpublished reports for the Province and the New Britain-New Ireland eco-region. For verification purposes, information on floral and faunal compositions were sourced from the National Herbarium (PNGFRI, Lae), UPNG Natural Science Resource Centre (NSRC) and the PNG National Museum. Other site specific information (physical) were extracted from landsat satellite images (www.googlemap.com) and from the PNGRIS datasets (Bryan and Shearman, 2007; Hammermaster and Saunders, 1995).

6.3.1 Terrestrial Faunal Environment

a. Mammals

The mammal diversity of the proposed development areas, is very low compare to the Baining Mountains. This may be an artifact of sampling efforts since only few samples had been recorded. A list of species known to occur in the area is provided in Table 2 together with their conservation status.

Table 5. List of mammals common in the area (source: Flannery, 1995; Bonaccorso, 1998).

Family	Genus	Species	Status	Common name
Rhinolophoridae	*Rhinolophus*	*megaphyllus*	Unknown	Eastern Horseshoe Bat
Rhinolophoridae	*Rhinolophus*	*euryotis*	Secure	New Guinea Horseshoe Bat
Hipposideridae	*Hipposideros*	*diadema*	Secure	Diadem Horseshoe-Bat
Hipposideridae	*Hipposideros*	*servinus*	Secure	Fawn Horseshoe-Bat
Vespertilionidae	*Myotis*	*adversus*	Unknown	Large-footed Mouse-eared Bat
Vespertilionidae	*Pipstrellus*	*papuanus*	secure	Papuan Pipistrelle
Muridae	*Rattus*	*rattus*	Introduce	Common House Rat
Muridae	*Rattus*	*praetor*	Introduce	Large spiny Rat

Photo 5. Showing *Rattus rattus (rat)*

Photo 6. Photo Showing The broad-eared horseshoe bat, *Rhinolophus euryotis* (https://www.bing.com/images/search?Q =Rhinolophus+euryotis).

b. Birds

During the rapid assessment only few birds were observed. Over 50 species of birds had been observed and recorded within area. Only 15 species were considered rare, threaten, endemic or protected under the CITES II listing or protected by the PNG Laws (Table 3).

Table 6 Protected avian fauna known to occur in the area and towards the Baining Mountains (source. Coates, 1985).

Common name	Scientific	Conservation Status
Blyth's hornbill	*Aceros plicatus*	Common, Protected
Eclectus parrot	*Eclectus roratus*	Common, CITES II
Black kite	*Milrus migrans*	Common, CITES II
Red breasted pigmy parrot	*Micropsitta bruijnii*	Common, CITESII
Blue eyed cockatoo	*Cacatua ophthalmica*	Common, CITES II
Brush cuckoo	*Cacomantis variolossus*	Endemic
Eastern black-capped lory	*Lorius hypoinchrus*	Common, CITES II
Dwarf cassowary	*Casuarius bennetti*	Threaten
Rainbow or coconut lorikeet	*Trichoglossus haematodus*	Common, CITES II
Brahminy kite	*Haliastur indus*	Common, CITES II
New Britain babook orol	*Hinox odiosa*	Endemic, CITES II
New Britain buzzard	*Hernicopermis infuscate*	Endemic, CITES II
New Britain sparrow hawk	*Accipiter brachyurus*	Endemic, CITES II

Photo 7. Showing *Megalurus timoriensis*. Common in grassland (https://www.bing.com/images/search? q=megalurus+timoriensis).

Photo 8 Showing *Monarcha cinerascens.* (https://www.bing.com/images/search? q=monarcha+cinerascens)

Photo 9. Showing blue-eyed cockatoo *and other cockatoos*

Photo 10. Showing Blyths's Hornbill (*Aceros plicatus)*

Other widely distributed species can be observed throughout peripheral forests and plantations. Table 3 lists some of the more common birds that dwell within the plantations and the surrounding disturbed forests.

Table 7. Common bird species of the area.

Family	Common names	Species
Hirundinidae	Red-rumped Swallow	*Cecropis daurica*
Hirundinidae	Tree Martin	*Hirundo nigricans*
Hirundinidae	Pacific - Swallow	*Hirundo tahitica*
Campephagidae	White-bellied Cuckoo-Shrike	*Coracina papuensis*
Campephagidae	Varried Triller	*Lalage leucomela*
Sylviidae	Tawny Grassbird	*Megalurus timoriensis*
Sylviidae	Golden-headed Cisticola	*Cisticola exilis*
Rhipiduridae	Northern Fantail	*Rhipidura rufislentris*
Rhipiduridae	Willie Wagtail	*Rhipidura leucophrys*
Monarchidae	Island Monarch	*Monarcha cincrascens*
Pachycephalidae	Common Golden Whistler	*Pachycephala pectoralis*
Nectariniidae	Black Sun bird	*Necterinia aspasia*
Nectariniidae	Yellow-bellied Sun Bird	*Necterinia jugularis*
Passeridae	Blue-faced Parrot Finch	*Erythrua trichroa*
Sturnidae	Singing Starling	*Aplonis cantoroides*
Sturnidae	Metalic Starling	*Aplonis metallica*
Sturnidae	Yellow-faced Myna	*Mino dumonti*
Artamidae	White-backed Wood Swallow	*Artanus insignis*
Corvidae	Toresian Crow	*Corvus orru*

c. Amphibians

So far 5 species are known to occur in the area (Allison, 1993). The common ones include the introduced species of cane toad, *Bafo marinus, Platymantis papuensis,* and a species each of *Litoria*, and *Discodeles. P. papuensis* is endemic to the area. Apart from *B. marinus* which is common in plantations, the other four species are very sensitive to disturbances and tend to occur near streams and creeks.

Photo 11. showing Green frog

Photo12 Showing Emoia bismarckensis, a skink, foraging in under growth of secondary regrowth forest

d. Reptiles

Only the *'monitor lizard'* becomes traditionally important to the local people for the use of skin to make cultural instruments such as the *'kundu'* drum. Other species, recognized traditionally to the people with little or no importance are skinks, geckos, and snakes.

e. Insects

The diversity of insects under old coconut plantations cannot be ascertain. However, the most economically important groups include the Pteridae (butterflies), Lycaenidae (butterflies), Curculionidae (Weevils), Cetoninae (beetles), Lucanidae (beetles) Dynastinae (beetles) and moths.

6.3.2 Terrestrial Faunal endemism

Faunal endemism appeared to be restricted towards the Baining mountains away from the existing plantations. Because of a very depurated vegetation, endemics are rare but smaller animals may persist in riparian forests.

6.3.3 Terrestrial Floral Environment

The project area is presently entirely utilized as part of a cocoa, balsa and |coconut plantation. The original natural vegetation has been cleared for plantation development, gardening and other uses. What is seen are some pockets of remnant been vegetation and secondary forest from previous clearance. Prior to conversation to agriculture, the vegetation would probably have been characterized as large to medium crowned forest with a canopy height of 30-35m. A high degree of floristic diversity occurs in the tall lowland forests, with the main tree species being Pometia pinnata, Octomeles sumatrana, Ficus spp. alstonia scholaris and Terminalia spp. (Saunders 1993). Other genera include Pterocarpus, Artocarpus,Planchonella,Canarium, Elaeocarpus, Cryptocarya, Celtis, drancontomelon, Dysoxylum, Syzygium, Vitex, and Spondias.

Photo 13. Showing the eastern end of Tokua Airport extension showing herbaceous vegetation with regrowth from former coconut plantation near the NAC managed open dump site.

Photo 14. Showing stunted beach strand forest dominated by species of *Scaevola, Premna*, and *Tournefortia* with *Terminalia catappa* as emergent in the background. This area is used as rubbish dump. The tractor in here has just unloaded solid wastes from the airport into this crude open pit.

6.3.3.1 Tovarur Estate (CPL owned coconut and balsa plantation)

Photo 15. Showing the northern extension of Tokua Airport showing old senile coconut plantation. The wood pegs or markers indicate space preparation to plant balsa trees (potted seedlings).

Photo 16 Seedling of balsa tree (*Ochroma pyramidale*) that was planted some weeks ago. The light-weighted tree grows very fast, reaching up to 30 m.

Photo 17. Showing senile coconut plantation located northern side of the Tokua airport. Inter cropping with balsa. CPL owned plantation

Photo 18. showing technical personnel ready for tree counting (coconut and balsa) including shade and fruit trees planted by plantation workers

Photo 19. Showing fruits trees planted by plantation workers near their living quarters. (Tauvaur coconut and balsa plantation.

Photo 20 Showing ferns, mango, grasses growing under senile coconut

Photo 21 Showing Balsa tree intercrop among the senile coconut plantation.

Photo 22. Showing *Spathodea campanulate* (African tulip), a native tree of tropical Africa and introduced to the area. Common in the regrowth forest around the Tokua Airport extension boundaries.

Photo 23 Showing a mixed species of ferns (Alsophila spp., Asplenium spp.,), swamp lily *(Crinum pedunculatum*), *Cupaniopsis spp., Cyperus odoratus,* Vatica spp. Aglaia spp., Myrtaceae and Fagaceae family species, Ischaemum sp. *Ipomea aquatica* (Kangkong), Gingerberaceae etc…

The estates are planted with young to mature balsa and cocoa with shade provided by tall coconuts, some gliricidia (*Gliricidia sepium*), and leucaena (*Leucaena leucocephala).* The balsa and cocoa plants on the south eastern and south western side of the airport are relatively recent. Ground cover on less shaded areas is a mixture of common weeds and grasses, including mimosa (*Mimosa invisa*), wandering Jew (*Commelina diffusa*), cobbler's pegs (*Bidens pilosa*), mile- a-minute (*Mikania micrantha*), and pueraria. Ocassional volunteer and some planted agricultural plants are scattered throughout the area, including cassava, volunteer coconuts, pawpaw, bananas, Chinese taro, swamp taro, chilies, elephant foot yam, fig tree, mango, citrus fruit trees, breadfruit and few orchids etc.

Tokua airport is surrounded by a mosaic of habitat types ranging from mangrove and beach strand forest on the coast to plantations. These are presented in Figure 3 and the proceeding photogenic descriptions.

Figure 3. Vegetation or Habitat types surrounding Tokua Airport.

6.3.3.2 Mangrove and Marsh Environment of Tokua Airport area

Photo 24. Showing mangrove species *(Rhizophora sp*.) and ferns (*Acrostichum aureum),* and other creeping plants and shrubs. Shots taken from the western end of Tokua airporit

Photo 25. Showing Mangrove forest in Marsh ecosystems on the western end of the Tokua Airport. The mangrove species found are *Rhizophora sp.*

Photo 26. Showing Mixed species of *Rhizophora sp*. and black mangrove (*Avivennia sp.) Terminalia sp.*

Photo 27. Showing mixed mangrove *(Rhizophora sp)* and other coastline forests with Terminalia sp. and other shrubs.

Photo 28. Showing creeping vines and *pandanus sp.* along a water passage within the mangrove forest.

Photo 29. Showing rosewood (*Pterocarpus indicus*) occurring along the water passage on the southwestern end of the project area (Tokua airport).

Photo 30. Showing strands of beach vegetation, shrubs, *Terminalia sp*. senile coconut (*Cocos nucifera*, Arecaceae).

Photo 31. Showing mixed mangroves (*Rhizophora sp., Bruguiera sexangula*, *Conocarpus (*Combretaceae), black mangrove *(Avivennia sp.) Terminalia sp.* and other shrubs

Photo 32. Showing watercress plant is a freshwater aquatic plant that is edible *(Nasturtium officinale)*, usually cultured by individuals along fresh water within swampy or marshy environment.

Photo 33. showing a groundwater spring used by most of the plantation workers and other settlers located about one kilometer (1km) from the south western end of the airport.

a. Beach Strand

Beach strand forest occupy the coastal areas north to northeast and northwest of Tokua Airport. The forest is generally stunted due to clearing by locals and settlers. Common tree species include *Terminallia cattapa, Scaevola taccada, Pandanus tectorium,* and *Hibiscus tiliceaus*.

b. Mangrove

Mangroves protect shorelines from damaging storm and hurricane winds, waves, and floods. **Mangroves** also help prevent erosion by stabilizing sediments with their tangled root systems. They maintain water quality and clarity, filtering pollutants and trapping sediments originating from land.

Mangroves are victims of dredging, filling, and diking, water pollution from oil spills and herbicides, and urban development within the state of Florida.

The **major threats to mangrove** forests include population explosion, conversion to aquaculture ponds, clear-felling for timber, charcoal and wood chip production for industrial and urban development.

Mangroves are also ecological bellwethers and their decline in certain areas may provide early evidence of serious ecological threats including rising seawater levels, excess water salinity, overfishing and pollution.

Fringe mangrove forest occur to the west of the airport. Species present are *Rhizophora apiculata, Bruiguera sp. Exocaria agallocha, Acrostichum aureum, Dolichandron spathoidea,* and *Exocarpus granatum.*

The fringe mangrove stand is very luxuriant with little disturbances. The brackish conditions for mangrove growth and survival is maintained by swamp water and small streams that eminate from the western end of Tokua Airport.

Mangroves are significant that serve as refuge, spawning and nursery grounds for many fish species, including dolphins.

c. Swampland

This habitat type occupies the western end of the airport. It is probably an extension of the mangrove swamp forest before it was cleared Figure 4, 6). It was originally dominated by floodplain tree species of *Nauclea orientalis, Octomeles sumatrana, Kleinhofia hospita,* and *Myristica spp* but now dominated by different species grasses. The grass, *Chionachne macrophylla* (*Polytoca macrophylla*) or locally known as karapai is very prominent. In waterways (drainages/streams), the aquatic plant species of *Ipomea aquatica, Ludwigia* spp*, Ischaeme* sp, floating *Lemna* sp. and *Polygala* sp*.* become dominant.

Photo 34 Swamp grassland

Photo 35. Wetland grass

d. Shrub/Grassland

This vegetation occurs on the eastern end of the runway and comprises low shrubs and trees. It is maintained at low stature for safety reasons

e. Secondary regrowth

The alienated land areas surrounding Tokua Airport are dominated by coconut/cocoa plantations that are no longer in large scale production. A large portion of the land area are now planted with balsa trees (*Ochroma*) under old coconut trees.

Secondary regrowth is dominated by grasses, zingers, legumes and tree species that do not form any distinct tree canopy. This generally indicates the first phase of succession. Given that these plantations have been managed for many years, succession would be very, very slow in some areas. In well drained areas, secondary regrowth is more advanced with secondary tree species forming some distinct layers. Common secondary species include, *Ficus spp.*, *Spathodea campanulata, Melanolepis multiglandulosa*, *Artocarpus, Terminalia*, *Alstonia spectabilis* or *Eleocarpus* species. Often times the invasive species, *Spathodea*

campanulata (or commonly known as pispis diwai) may dominate the secondary forest.

The settlers within the plantations also influence the regrowth forest by clearing smaller plots for gardening. This contributes toward mosaic vegetation pattern observed within the entire area.

6.3.4 Endemic Flora.

No endemic, rare or threaten plant species were recorded from surveys and assessments conducted in forests surrounding the plantations. These could be overlooked due to low sampling intensity. However, endemic species of palms and most orchids are likely to be present but outside the plantations. Note all orchid species are protected under the PNG Laws. Orchids were not mentioned in previous reports because of their epiphytic nature, but are common in the forests including the mangrove forests.

The proposed activity is located within an existing cocoa and coconut plantation where the natural original flora and faunal communities have been clear felled thus species of special use have been completely destroyed or permanently displaced some 60 years ago. Thus species (flora or fauna) that occur in the vicinity of the project site are mainly exotic species with a relatively low biodiversity. They do not require special protection or description. They are mainly creepers, weeds and scattered shrubs growing under the cocoa and coconut plantation that would hardly provide an appropriate niche.

However, the main areas that needed particular attention is the marine ecosystem that would ultimately be impacted by the wastewater discharged into the sea via a soakage trench. The impacted area would be the aquatic and the marine environment as they would be the recipient of possible contaminated wastewater and any pollutant that may affect the marine species that come in contact at the discharge points.

Table 8: Status of a few Threatened Plant Species known to occur in the Area

Species	Family	Status
1. Ptychosperma gracile 	Palmae	Confined to New Britain and New Ireland, this palm tree is scattered in rainforest on both limestone and volcanic soils. Populations have declined because of rapid and extensive deforestation for plantation agriculture. This species can survive in open vegetation or in secondary forest if it is allowed to regenerate.
2. Manilkara kanosiensis 	Sapotaceae	Relatively widespread but uncommon, this timber tree is scattered in primary lowland rainforest. 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.
3. Terminalia archipelagi 	Combretaceae	Occurring on the islands of the Bismarck Archipelago, this large well-formed tree can be locally dominant in lowland primary rainforest. There were a handful of stands scattered within the project land among the plantation trees and near the mangroves.

Source: IUCN listing

6.3.5 Marine and Aquatic Faunal Environment

The marine environment especially the western end of the airstrip would be affected from waste discharged and surface runoff if not managed properly.

The current marine environment of the Kabakaul Bay is still in its pristine condition. There is no sign of die-back of mangroves, sea grass and weeds, no sign of coral bleaching, fish, crustaceans.

One spectacular observation is the daily display of Spinner Dolphin (*Stenella longirostris*) within the Kabakaul Bay. It is famous for its acrobatic displays in which it spins along its longitudinal axis as it leaps through the air. It is a member of the family Delphinidae of toothed whales. An ideal spot for tourism and divers within Kokopo area.

Photos 36 and 37 Spinner Dolphin *(Stenella longirostris*) playing with the Kabakaul Bay
Photo by S Mandeakali

The spinner dolphin is listed as one the endangered marine animal species that required protection. It is listed as “data deficient” on the IUCN Red List.

Spinner dolphins are usually caught by the thousands in purse seine nets targeting tuna, although their populations are slowly recovering due to restrictions. Spinner dolphins are carnivores, they feed on fish, squid, eels, jellyfish and shell less snails, at night, they travel to deeper water to eat. In the morning, they move back to shallow water to rest, play, and watch for predators such as sharks. It is during the early hours of morning that they play around Kabakaul Bay that enlightens the locals and foreign tourist.

As expected, both ends of the western and the eastern side of Tokua airport have marsh and marine environment that has a rich biodiversity. Apparently, there was no in-depth study of the marine environment but the following captions demonstrates some of the rich marine life of the sea fronts. These photos were taken during the field study of terrestrial flora and fauna and photos taken by interested tourist who dive within the Kabakaul Bay and Kokopo area.

6.3.5.1 Fish and Corals found within Kabaul Bay areas in Kokopo. Photos taken by Kokopo Divers

Photo 38 Showing red Emperior fish *(Lutjanus sebae*)
Kokopo Market

Photo 39 Showing Yellowtail fusilier
(*Caesio cuning)*

Photo 40. *Plectorhinchus vittatus* (Oriental sweetlips)

Photo 41. *Chelonia mydas* (Green turtle, common species hunted by locals.

Photo 42. *Acropora hyacinthus*

Photo 43. *Acropora gemmifera*

Photo 44. *Acropora hyacinthus* and *acropora sp*, (Rabaul Dive) Kokopo Dive

Photo 45. *Acropora sp.* Fion's reef in Kokopo

Photo 46. Sea anemone *Heteractis sp.* (Stichodactylidae) hosting a tunicate (yellow).

Photo 47. *Porites sp.* (Hump coral) on reef slope.

6.3.6 Marine and Aquatic Flora

a. Sea Weed

Photos 48 and 49 Showing seagrass (*Posidonia australis*) and Marine algae, (*Sargassum* sp) respectively common on reef adjacent to Mangrove forest, grown widely along the Kakabaul Bay on the sandy banks.

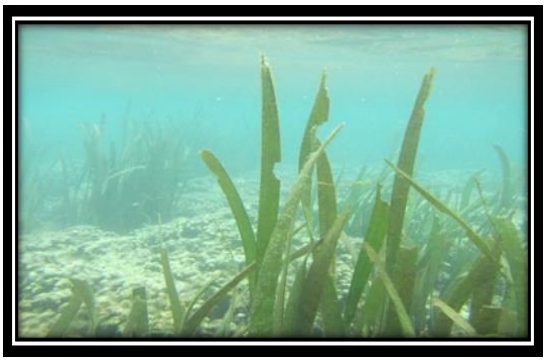


Photo 50. Showing *Enhalus acoroides* (seagrass) dominating the sand flat near mangrove, west of Tokua Airport

Photo 51. Showing *Gracilaria salicornia*(algae) observed near mangrove edges.

6.4 Conservation and Protected Areas

There is no specific site identified as a Conservation or Protected area found within the Tokua Airport area. There was a Conservation Need Analysis (CNA) survey carried out by CEPA, CCDA and UNDP in collaboration other NGOs but there was no special mention of Cape Gazelle except the Duke of York Island LLG.

Despite this situation, there are traditional historical sites and war relic sites within Bitapaka LLG and the Kokopo Urban LLG but no special sites of interest areas were found within the proposed development site. However, there are spots within the Kabakaul Bay where a school of the gray colored Spinner Dolphins are found in the early morning hours, a pleasing site for tourist and scuba divers. They are also enlisted on the IUCN red List as a protected species. The Kabakaul Bay is regarded by the local community as a protected area.

7.0 DESCRIPTION OF THE ACTIVITY

7.1 Location

The proposed project "Tokua Airport Re-development Project" will be carried within the existing Tokua airport land, Portion 210 and 211. This site was initially the old Tokua coconut estate comprising 1,030 hectares of land. This land was rezoned and registered as a" declared" aerodrome land and belongs to the State in 1979.

7.2 Tokua Airport Redevelopment Activities

Tokua airport is an existing airport currently operated and managed by NAC. It is taking in Fokker 100, but the re-development proposal will pave way for Tokua Airport to a Code 4C Aerodrome to accommodate B737 operations.

NAC envisage to the develop or construct the following infrastructure and associated civil works: -

(1) Runway Extension, widening and strengthening from 1,720mtrs x 30meter to a 2,600mtrs x 45mtrs runway. (Including Aeronautical Ground Lighting etc.)

(2) Apron extension, parallel taxiways and drainage.

(3) Road – airport approach road & new Carpark and drainage

(4) New Passenger Terminal Building

(5) Repurpose existing Terminal Building into Cargo & General Aviation Terminal.

(6) Refurbishment of Administration Building & ARFF facilities.

(7) New Control Tower and relevant infrastructure where required. (currently under review)

(8) Redevelop all relevant utilities. (Including, electricity supply, water & sewerage, fuel supply etc.)

Please Note

a. The detailed project design is still at the drafting stage.
b. NAC requests CEPA to approve this EP in Principle pending the completion of the full design which require approval donor fund approval. In fact, the EP approval is required by the financiers as well.
c. The various waste management aspect from the airport operation will be critically viewed.

8.0 POTENTIAL IMPACTS OF THE ACTIVITY

The impacts identified in this section are specific to those that will be caused by the various activities during the construction and the operational phases of the airport redevelopment.

8.1 Physical Environment

8.1.1 Soil

There will be no impact on the soil because all wastes will be collected and disposed or discharged systematically. The wastes will have no direct or indirect contact with the soil. The soil will be compacted and cover by surfacing materials for as concrete pathways, runways, or planted with grasses and mowed down and keeping the grass lower all the time. Silt and any soil particles that gets erode during rainy water from the construction site will minimal because airport area is relatively flat. Any runoffs will be settled in the drainage and the settlement pond before dredging the drains from silt build up.

8.1.2 Climate

There will be minimal impact on the climate of the area as a result of the activity. The aviation fuel emission is given off during landing, taxing and takeoffs. The gases are emitted within a short time and is easily disperse into the natural atmosphere by the strong south easterly winds. Aviation emission accounts for about 5% of the greenhouse emissions globally and every industry player are well aware and there is continuous discussion on the best solutions to minimize these emissions and rectify the issues of climate change. However, as for Tokua unlike some of the industrial and busy airports around the world, is not that busy and emissions are relatively low. CASA PNG ensures that all protocol and international standards are always maintained to deliver quality air services and minimize risks including air pollution.

8.1.3 Water

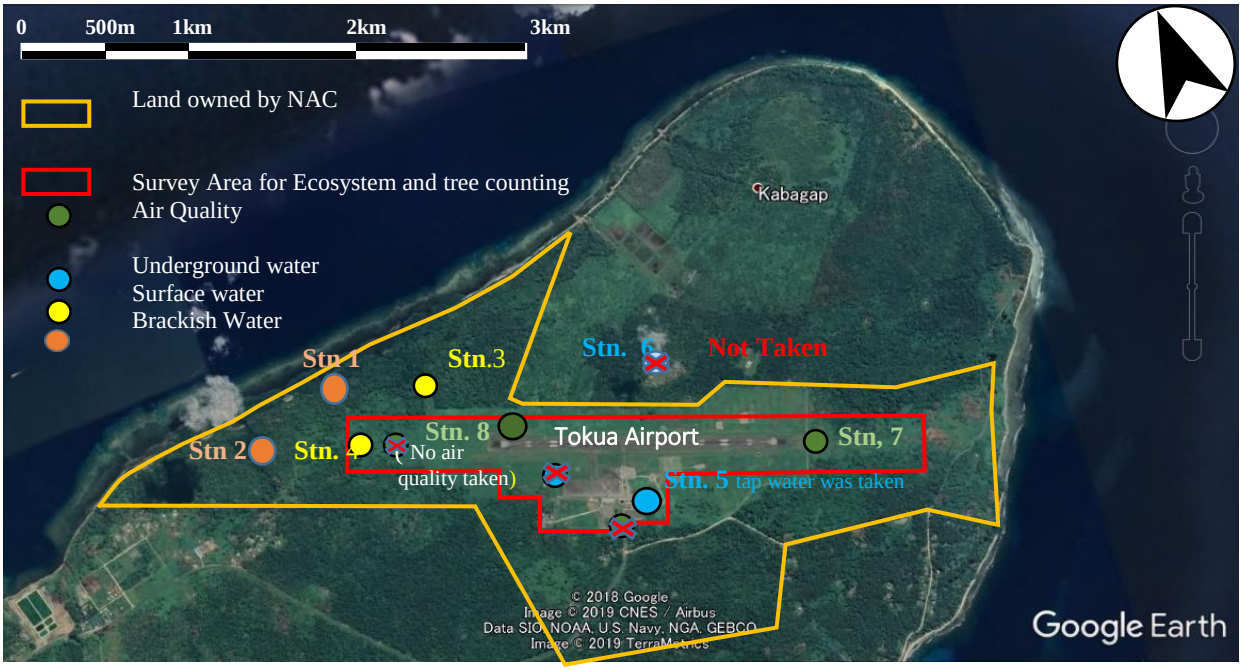
All wastewater from the airport development area channeled into the main drain and discharged at the north western corner of the airport through naturals swamp shrubs and vegetation as filter. Apparently, this discharge outlet will be changed to the western end of the airstrip. The waste water will be drained out via several settlement ponds before discharged into the marsh environment and into the mangroves and the sea. The wastes generated from this proposed activity are will not be toxic but are biodegradable. Therefore, any potential environmental impact would be minimal.

As described earlier, the expected combined wastewater stream will have a mean BOD value of 30mg/L with a mean temperature of 30° C and pH value of 7.5mg/L. Now, these physical environmental parameters are well within the ambient conditions of the receiving seawater environments and so it should not pose any serious environmental harm. Even then, there will be no chemicals of a highly contaminating nature present in the wastewater stream.

To determine the current water quality status, five (5) water sampling sites were identified and water samples being collected. The sampling included 2 from the brackish mangrove water outlet into the sea, another 2 samples from surface drainage water outlet from each sides of the Tokua airstrip and 1 groundwater), collected and analyzed at were analyzed.

8.1.3.1 Water Sampling Sites

Figure 4. Showing below water and air quality sampling sites in Tokua Airport




Station 1


Station 2


Station 3


Station4

Photos 52 -55 Show the four (4) Water sampling Stations (sites) where waters were collected for water quality testing

The groundwater could not be taken. NAC has a ground water borehole that pumps water to the Tokua airport facilities. It was difficult to access ground water direct from the borehole because the setup was in-built with electric power to pump water direct through water pipes to the airport facilities for their uses. The water was not treated. Nevertheless, the untreated ground water was used at the airport lavatories. The technical team collected the groundwater from one outlet tap outside the NAC office. This tap was spotted as Station 5.

The appropriate parameters were determined the corresponding data were analyzed at the National Agriculture Research Institutes' Southern Regional Centre - Chemistry Laboratory at Kilakila, NCD. It has NISIT and PNGLAS accreditation #52. The results attached as **Appendix 1.0** but the data analysis are tabulated in **Table 9.**

a. Water Sample Results and Comments

1. Results from the water sampling indicate that the exiting water quality were within the acceptable CEPA and WHO water quality Standards.
2. The excessive coliform (500mg/L) presence in Station 2 of brackish water suggests concentrated discharge of coliforms present in human excreta or other animals or could be sewerage from nearby houses or NAC sewerage (night soil) discharged from NAC's waste treatment plant. It is highly anticipated the treated sewerage from NAC waste treatment plant may be the main source of this increase coliform count in the water samples from station 2.
3. There was also presence of oil and grease sheen found in the surface water but well mixed with other dissolved solids including human waste. There was adequate vegetation cover in all drain water passages and areas towards the western edge of the airport. The nutrient rich contaminated water bodies filtered well through the brackish environment.
4. The ground water is pump up by electric powered pump from a 30m bore hole. Apparently the bore water is untreated but used effectively by NAC. That water was very good for human use. Refer to Table 9.0

8.1.4 Noise Emission

There will be noise increase within the project site from the existing aircraft noise emissions during landing, taxing and takeoff. Other usual noise is from standby generator, vehicles, heavy equipment and machines used during the construction and other civil works involved with the extension of the airport. These noise levels will not be loud enough to cause any substantial change or harm to any biotic community. The noise will not affect the human population because the nearest villages are situated one to two kilometers away from the activity areas. The noise levels are dispersed rapidly in the open natural environment.

8.1.5 Air Pollution

The gaseous wastes and air particulates wastes that will be generated are mainly from aviation fuel emissions comprising largely carbon dioxide (CO2). Other sources include, occasional smoke from bush burning and gardening by surrounding communities, exhaust fumes from standby generator, trucks, buses and cars.

There is good southeasterly winds and sea breeze that disperses any high concentrated air pollutants emitted from the aero planes during take-off and landing. The air emission content and quantity is not substantial to cause any significant impacts on the air quality.

PNG lacks in appropriate apparatus to measure air quality. Nevertheless, during the environmental study air quality data was collected through android (mobile phone) using various applications (apps) and are tabled in Table 4.0. The team also placed two filter funnels with filter paper to trap air particulates and dissolved solids that would pass through the filter paper. The results are analyzed in Table 9.0.

Photo 56 and Photo 57 Showing team placing the filter paper in a funnel to collect air particulates in the filter paper and the dissolved solids in the rainwater in the funnel.

The air particulates collected both on the filter paper and the dissolved solids in the funnel indicate the ambient air quality is **not significantly overladen** with a significant quantity of air particulates. The air quality apparatus like Sulfide and Nitrates were **not significantly harmful** though Mt Tarvurvur and Mt Vulcan in Rabaul are active including Mt Ulawun in West New Britain province.

8.2 Biological Environment

8.2.1 Flora

The proposed activity will have little or no impact on the floral environment, because there is no new clearance of forested area nor any toxic wastes being discharged into any floral environment.

8.2.2 Fauna

There are two faunal communities that will be impacted, the marine biodiversity and avifauna. The marine life, within marsh and the estuarine environment with the mangroves will be impacted by the wastes and wash water from the airport facilities. The discharges are from surface runoff from the airport run way the both sides of the airport runway main drainages that terminate via two settlement ponds and filter through a sand bank and into the swampy marsh environment at the north western ends. The mangroves play a very pivotal rolled as a buffer. Thus, it is anticipated that there will be minimal pollutants entering the sea because the discharge contents are organic substances rich in nutrients for both flora and faunal communities within the marsh and mangrove ecosystems. It is most likely the fish population would increase because the nutrient rich wastewater can enhance the fish population.

8.2.3 Conservation and Protected Areas

The proposed coastal management area being identified can be impacted but the NAC's positive attitude towards sound environmental management practices would provide leadership through awareness among settlers to protect the mangroves and marsh vegetation from any form of disturbance. The surface runoff and waste water from the terminal operation would flow through a settlement pond which several partitions to filter contaminated wastes from direct discharge into drainages and any outlets. It is assumed that any form of contaminants would not be discharged directly into the drainage.

8.3 Socio-Economic Impacts

The potential socio-economic impacts resulting from biophysical impact from this activity are:

- Deprivation of the local community's exclusive use of the Kabakual Bay for recreation and fishing.
- Attraction of more fish and other marine species around the mangroves to feed on the nutrient rich water discharged into the marsh environment from the airport terminal.

- There will be more SMEs especially local markets selling artifacts, food, fruits and drinks that may cause disgruntled locals who may miss out on spacing.
- There will be more people employed and thus increase cash flow within the local communities, but that also question employment preferences.

These impacts however would not be very significant to the local community because:

- ❖ The local communities are mostly settlers who have tolerated living together with mixed group of people and they also know how to sort themselves in allocating marketing space.
- ❖ The Tokua Airport is an existing facility and it would not cause a lot of anxiety among local communities and surrounding areas.
- ❖ In addition to the existing waste management programs and plans, the NAC will ensure thorough collection all the solid wastes from local market, passengers throw-away rubbish, solid wastes from inside the terminal area and the administration office and all surrounding area's activity wastes. These wastes will be disposed in the Kokopo Municipal Town Authority Sanitary Landfill site. The current solid waste dump site will be abandoned and closed.

9.0 WASTE MINIMIZATION AND CLEANER PRODUCTION

9.1 Waste Management

Various types of wastes generated in this airport redevelopment project need a good management system that will identify the wastes types and work out a waste minimization program which assists in minimizing the waste generation and its impact on the receiving environment.

There is no cleaner product to be applied in the waste management aspect of the airport, except to use management options that are feasible and used in PNG like waste collection and disposal of the same in a rubbish dump or a sanitary landfill site. There are few sanitary landfill sites in PNG, while most of the major towns dispose all kinds of wastes into a crude rubbish dump.

The solid wastes can be systematically collected on a routine basis, like three times a week in appropriate trucks and taken to Raniolo Landfill site. That site is a crude indiscriminant dumping place. It requires a complete face-lift to a sanitary landfill status. Current operation is not sanitary and can pose health hazard to nearby communities.

Captions of current waste management sites in Kokopo town and the NAC waste management in Tokua airport.

a. Tokua Solid Wastes Dump Site (NAC)


Photo 58 and 59 Showing the crude open dump site of all airport solid wastes at the eastern end of the Tokua airport about 1.5km east from the Tokua Terminal.

Photos 60 and 61. Showing NAC tractor loading airport solid wastes to dumping sites and disposing by jerking trailer full of solid wastes off on to the dumpsite.


Photo62 and 63. Showing NAC solid wastes rubbish dump site located parallel to the shoreline or beach front. Eastern end of the Tokua airport runway. The beach is quite clean.

b. Raniolo Solid Rubbish Dump (Kokopo Municipal Authority)

Photo 64. Showing open crude dumping of solid wastes at the main Raniolo Dump site, located 5kilomters from Kokopo town

Photo 65. Showing rubbish collector truck off-loading rubbish and rubbish burning

Thus, this section will attempt to identify the waste sources, the types of wastes, nature of the wastes, and generate a waste management program to remedy possible the adverse impacts**.**

9.2 Sources and Types of Wastes

Solid wastes discharge into other segments of the environment would be minimal and their impacts would be insignificant. Aerial emission generated from the aviation fuel used in the big jets planes and small twin or single propeller engine planes will be easily dispersed by the strongly northeasterly wind that will diffuse the CFC and other pollutants into the open sea breeze.

The major environment concern would be noise from the aero plane engines during landing and takeoff period which is usually less than 20minutes per plane. These noise level have been tolerable by airport workers, passengers and the surround community. Airport traffic workers usually wear ear phones to protect

their ear drums. Otherwise the audibility is normal within the working environment. Solid wastes of domestic origin and solid inert industrial wastes would be disposed in Raniolo landfill, Kokopo town rubbish dump site. Industrial wastes consisting of waste oil and materials from machinery repair and servicing would be securely disposed of in a specially located site within the landfill site.

9.1.1 Sources of Waste Products

There are three (3) major activities lumped them into their nature of the Tokua airport Re-development works. These areas are as follows: -

1) Civil works on the runway extension, widening and strengthening from 1,720mtrs x 30meter to a 2,600mtrs x 45mtrs runway. (Including Aeronautical Ground Lighting etc.); Apron extension, parallel taxiways and drainage; Road – airport approach road & new Carpark and drainage; New Passenger Terminal Building

2) Re-construction and renovation of the existing Terminal Building into Cargo & General Aviation Terminal; refurbishment of Administration Building & ARFF facilities, Control Tower and relevant infrastructure where required; redevelop all relevant utilities. (Including, electricity supply, water & sewerage, fuel supply etc.)

3) Airport Operation; including the management of the Aviation Terminal, Administration Block and Control Tower, Airport, car park, market, drainage, sewerage systems, water abstractions points, stand by generator, and aero planes.

The first two activities are temporal activities which would last for 6 months to 18 months whilst the last activity is the on-going management of the Airport that NAC will seriously strategize and plan in combating the waste management issues for Tokua Airport.

9.1.2 Types of Waste Products

a. Solid Wastes

Solid wastes generated from these activities silt and sediment load in the drains, night soil and sewerage from the planes, soil debris, bottles, containers, paper bags, plastic bags, rubber, wood and plywood off cuts, metal cuttings, empty tin paints, tins, canteen wastes (boxes, plastics, packets, empty can, leaves, coconut shells, glasses cuttings, electric wires, PVC pipe cuts, cement wastes, ceramic tile cuttings, grasses, branches, trees, coconut trees and other fruit trees (pawpaw, banana, citrus trees) etc.… It is obvious that the solid waste is routinely collected every two days is disposed at the eastern end of the airport which is not sanitary but open rubbish dump site. The solid wastes shall be collected and dispose by contractors or NAC to the Raniolo Rubbish Dump managed by the Kokopo Municipal Authority

b. Liquid Wastes

The liquid wastes generated from the proposed development and operation will be mostly wash water and sewerage from the aircrafts (mixed night soil treated with detergents inside the plane's lavatory which are collected in special sealed containers), the terminal and administration block with all other associated infrastructure facilities activities.

The sewerage and wash water from the airport terminal, airport tower, administration office, and public toilet and sewerage from the plane are currently collected and disposed into a small treatment plant near the terminal. The liquid wastes are mixed with detergents using a small motorized mixture and allow biodegrading and the effluent sinks at the bottom water table and the overflow filters through a heap of sand filter into a drain that connects to the main drain outlet towards the west and the northern end of the airstrip.

NAC will also ensure that there are no toxic and hazardous wastes generated or used within the airport area. These toxic liquid wastes from associated activities like spilled fuel, detergents and lubricants will be contained in-situ as they are more concentrated near and around the fuel storage area.

Surface runoff will flow into two main parallel drainages that join at the end of the western end of the airport. There is currently one outlet towards the northern corner of the runway. NAC can still use this one or have another one right at the western end because the current airport will extend further towards the western tip of the runway. The drain water will naturally seep into the ground because of the subterranean porous limestone base. The area is covered with grass so direct discharge from the airport area is naturally filtered by the grasses into the main parallel drains on both sides of the runway that terminate towards the western end of the airstrip.

c. Air Pollutants and Gaseous Wastes

The gaseous wastes that will be generated are mainly aviation fuel emissions comprising carbon dioxide (CO2), but occasional smoke from bush burning from gardening by surround communities, exhaust fumes from standby generator, trucks, buses and cars. These emissions will be very marginal and insignificant. NAC in collaboration with CASA PNG will ensure quality control on both ground and air safety is maintained. These would include:

1. Fly more efficient aircrafts
2. Use new Technologies to set more efficient flightpaths and reduce delay
3. Use sustainable lower-carbon alternative fuels and;
4. Invest in emissions offsets within or outside of the aviation sector.

The other source of air pollutant that is of concerns is the dust and other gaseous volcanic emission, mainly CO2, nitride, methane and sulfides. These pollutants are predominant during the days of volcanic eruption. Currently, there is some minimal amount of emissions monitored by the Rabaul Volcano Observatory.

Attached is existing emission data from the Rabaul Volcano Observatory (**Appendix 2.**0 and a week's data collected **(Table 4.0**) from in-built apps from the mobile phone observed at Tokua airport for 4 days.

d. Noise Pollution

The main noise emission will come off from plane landing, taxing and takeoff. Also helicopters can land as well from time to time. The other noise emission source will be from standby generator, vehicles and trucks. Again the noise level will be well below the acceptable level and would therefore pose no major impact to the workers and the surrounding community. The current noise level is acceptable and has not caused serious concerns to the surround communities. Tokua Airport is also located away from the main towns of Kokopo and Rabaul.

9.3 Nature of Specific Wastes

It is a vital component of the waste management program to determine the waste products and identify their specific nature all phases of this Airport Redevelopment Project.

The nature of specific waste is classified into degradable, non-degradable, toxic and hazardous which are very relevant for respective waste treatment and the disposal approaches or strategies.

9.3.1 Biodegradable Waste

This type of waste is capable of being decomposed by bacteria, fungus or other biological means. The residues of decomposition are usually not harmful or toxic to living organisms and human beings. However, the wastes may render negative environmental effect like bad odor, eye sore, other side effects like increase of vectors, rodents, and flies when poorly managed. The organic wastes generated in this operation are mainly sewerage, night soil, soil debris from civil works and market wastes and timber, wood and other debris the renovation and building activities and silt laden surface runoffs in the drains.

9.3.2 Non-biodegradable Waste

The proposed activity will generate minimal non-biodegradable wastes but during the civil works and renovation of existing and construction of new buildings; the following wastes will be generated, scrap iron, metals, cement, ceramic tiles,

chairs, rubber and solid plastic materials, electric wires, power cord, PVC pipe cuttings, tins, cans, wires, tires, bottles, drums, corrugated roofing iron. These types of wastes do not decay or decompose easily. They take very long time for any form of disintegration. They remain in-situ for a long time. These wastes need to be disposed properly in an environmentally friendly manner. The waste management for these types of wastes is addressed by the Kokopo Municipal Authority when disposed into the Raniolo Rubbish Dump site.

9.3.3 Toxic or Hazardous Waste

These types of wastes are common products of industrial or commercial processes that are capable of causing injuries and possibly death to living organisms. It is also harmful to human health. These wastes include fuel/oil spillage, paint residues and chemical wastes.

The emissions from the aircrafts are a significant contributor to climate change. The worldwide aviation industry is contributing more than 5% - 10% of the greenhouse gas emission especially carbon dioxide (CO2), nitrogen oxides, vapor trails and cloud formation triggered by the altitude at which aircrafts operate.

Of course, Tokua Airport will have its share of emissions, but Air Niugini as being the major aviation company operating in Tokua and PNG has do what every countries of the world are doing by using sustainable lower-carbon alternative fuels and Invest in emissions offsets activities in PNG.

9.4 Site-Specific Potential Impacts

The specific site that needs particular protection is the Kabakaul Bay marine ecosystems including the mangroves, the reefs and the entire marine environment of that area.

Tokua airport is within an existing coconut plantation. The area has been long disturbed for more than 80 years. Thus, any disturbance from the Tokua Airport Re-Development Project will not pose a significant impact to any human settlement or community. The floral and the faunal ecosystems existing within the vicinity of the airport occur within a secondary vegetation cover that has been continuously disturbed over many years of human activities. Once upon a time a large lowland rainforest has been clear felled for plantation development by the colonial administrators. The original birds, insects, amphibians, reptiles and mammals have either migrated or extinct. The biodiversity species composition is anticipated to be migratory or highly adaptive species occurring on secondary forests and the plantations. Please refer to Section 6 – 8 that describes the biodiversity both flora and faunal communities of the Tokua airport area.

As anticipated, there is no record of endemism of any species on situ, but recognize occurrence of the spinner dolphins within the Kabakaul Bay on the western edge of the Tokua Airport. This dolphin tends to be swimming around the Kakabaul Bay every morning. Little is known of any one species endemism.

9.5 Waste Management Program (WMP)

The waste management program comprises of eight components such as:

- Identification of Sources and Types of Waste
- Identification of Specific Waste Products
- Waste Control, Containment and Minimization Action
- Waste Storage and Treatment Method
- Waste Handling and Transportation Method
- Final Waste Disposal Method
- Collection and Disposal Frequency
- Responsible Personnel

9.5.1 Waste Management for the Specific Environmental Issues

The project particularly identifies environmental issues generated from different phases of the Tokua Airport Re-Development Program and other support/related activities, which are necessary to address in waste management plan.

The following environmental issues are:

- Air Related Issues- these are waste product emissions such as fuel spillage, product of incomplete combustion, dust and particulate.
- Water Borne Pollutants - these are wastewater containing oil, fuel, solvents, wash water from workshop, suspended solid such as dirt, soil, solid waste deposits and contaminated storm water.
- Liquid Waste Issues - these are waste lubricating oil, fuel, hydraulic oils, chemical spillage and other hydrocarbon products.
- Solid Waste Issues - these are off cuts timbers, plywood, iron cuttings, ceramic tiles cuttings, pvc pipe cuttings, mechanical parts, packaging from parts and equipment, other rubber parts, plastics, batteries and contaminated absorbents and filtered wastes.
- Noise Pollution - Noise emission generated by planes during landing and taking off period of the schedule flights aside from aeroplane engine. However other sources of noise emission are from generators, heavy machines, loaders, trucks, graders, and other machines.

9.5.2 Method of Waste Disposal

NAC or its specialized, waste collection company that collects the solid or the liquid waste will collect the respective waste types from the collection point and dispose accordingly.

It is understood that solid wastes will be systematically collected and disposed in the Raniolo Rubbish Dump. The Raniolo Rubbish Dump is just a crude dumping site where all kinds of solid wastes.

However, night soil from the aircraft and the sewerage from the airport terminal area should be systematically collected for proper disposal into the Rabaul sewerage pond where such wastes are disposed. It seems the NAC manages its own sewerage and night soil onsite. There is a small enclosed mechanized sewerage treatment plant or a facility that mixes the sewerage with detergents and allow biodegradation. Apparently the detail process was not made known to the consulting team. It is assumed that the effluent overflow may be filtered via some compartment and allow natural seepage on to the top soil and eventually into the main drainage that discharge into the western end of marsh vegetation. No wonder there was high E Coliform in water sample collection from Station 2.

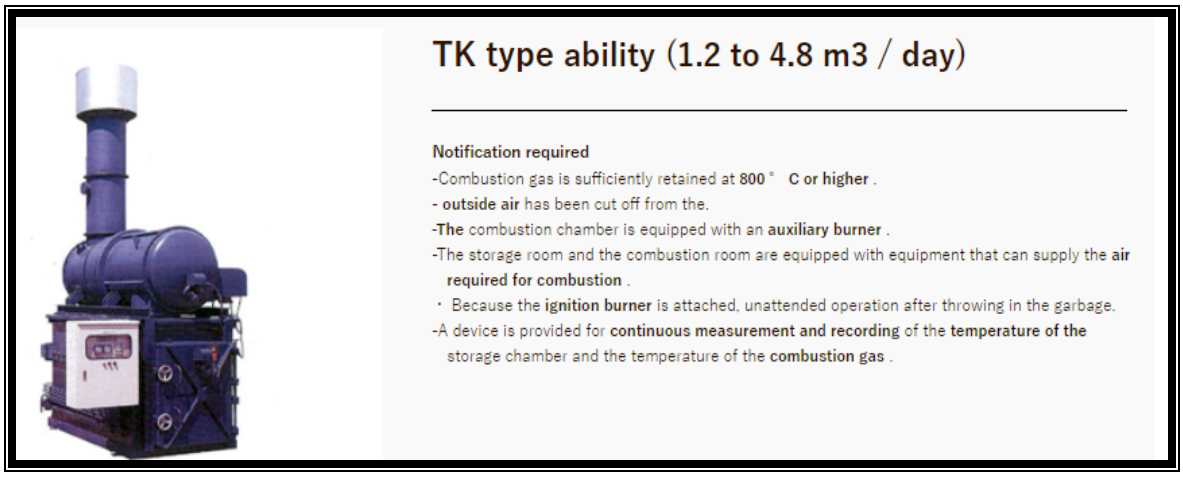
During the execution of this project, this aspect of the waste treatment and management should be clearly factored and developed using proper standard sanitary design.

All surface runoff and wash water shall be channeled through several settlement and screening ponds before raw discharge into the western end of the runway. There is no special treatment for these wastes. These wastes are biodegradable and easily digested by microbial activities before being discharge through soakage trench.

Another option would for the JICA technical Consulting proposes a mini - Incinerator to burning up all forms of wastes from NAC activities including special wastes from the aircrafts. Below is a caption showing the kind of incinerator that could be used if current negotiation with Kokopo Municipal authority to collect wastes from Tokua airport does not take effect.

Therefor final design of the waste management component will be supplied to CEPA in due course after NAC and the Kokopo Municipal Authority has an agreement or contract for wastes collection and disposal or that NAC decides to management their own. The current practice is that NAC manage its own wastes in their own designated rubbish dump and the special wastes treatment plant located 100m from terminal. This waste manage approach should be systematic and NAC shall adopt such a process that should be built into the Airport Redevelopment.

Figure 5.0 Showing a mini Incinerator that can be purchased to contained all wastes generated at the NAC premises – Tokua Airport.



9.5.3 Emergency Action Measures

Non-routine incidents like fuel and oil spillage and gas explosion can occur. The Emergency Action Measures (EAM) identified for this airport re-development well covered in CASA's quality Control Manuals and Checklist. In fact, NAC ensures a high level of security in all its premises and this highly evident in all airports in PNG and Tokua airport is no exception.

9.6 Personnel and Staff Support

NAC has contracted Oriental Consultants Global (Japan JICA) to engage the services of ENRD Systems Management Services Limited a, local PNG Environment Consulting firm to prepare this Environment Permit Documentation. NAC shall have the opportunity to consult ENRD or their stock of technical consultants carry out environmental monitoring on a quarterly or yearly basis. The periodical engagement of this environmental consulting firm will report to Conservation and Environment Protection Authority (CEPA) on a yearly basis. The entire operation will be supervised by the NAC's Tokua Airport Operation Manager.

9.7 Commitments

NAC shall implement the Waste Management Program effectively. Furthermore, it is the sole obligation of NAC to comply with the environmental requirements particularly waste management as mandated by the Environmental Law of PNG to protect the environment of the project site for the welfare of the local and the international travelers and other communities.

10.0 CONFIDENTIAL INFORMATION

There is no particular confidential information regarding the Tokua Airport Re-Development Project, technical and financial capacity and other information that needed attachment in this section.

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12. Acknowledgements

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