ANNEX A

INFRASTRUCTURE STOCKTAKE

Table of Contents

I. WA	TER STOCKTAKE	1
Α.	Assets	1
В.	Current Status	3
C.	Proposals	5
II. PO	WER	7
Α.	Assets	7
В.	Current Status	8
C.	Proposals	9
III. SA	NITATION1	1
Α.	Assets1	1
В.	Current Status1	1
IV. SC	DLID WASTE MANAGEMENT1	3
V. ME	DIA AND ICT INFRASTRUCTURE1	5
VI. AV	/IATION1	7
VII. T	RANSPORT – LAND TRANSPORT2	1
Α.	Assets2	1
В.	Current Status	2
C.	Proposals2	4
VIII. N	1ARITIME	5
Α.	Assets	5
В.	Current Status	7
C.	Proposals2	8
IX. Bl	JILDINGS - ADMINISTRATIVE	9
Α.	Assets	9
В.	Current Status	9
C.	Proposals	0
X. BU	ILDINGS - EDUCATION	1
Α.	Assets	1
В.	Current Status	2
C.	Proposals	3
XII. B	UILDINGS – HEALTH	4
Α.	Assets	4
В.	Current Status	5
C.	Proposals	5

I. WATER STOCKTAKE

A. Assets

1. The Nauru Utilities Authority is responsible for production, storage and distribution of potable water. It was officially commissioned in 2007/2008 and assumed responsibility of existing assets and infrastructure which were previously within the Nauru Phosphate Corporation (NPC). The NPC has since been reformed and re-structured to RonPhos (Republic of Nauru Phosphate Corporation)

2. Although the official and legal transfer of assets is still unclear, the operational and maintenance burden is on NUA. Cost recovery is extremely difficult with GON subsidies for domestic users and the only commercial entities being RonPhos and Nauru Rehabilitation Corporation (NRC), which also assist delivery by providing their own trucks. During the visit a delivery charge of \$100 for 10kL for businesses, and \$5 for 5kL for residential deliveries has been levied.

1. Intake

3. The source is a sea-water intake located within the Nauru Ports Authority boundaries, approximately 200m from the desal plant location within the NUA boundaries. Although details and drawings were not available for the intake, it consists of two large pumps, one of which is for standby. At this stage the NUA personnel estimate that one of these pumps intakes more sea-water than what can be handled by the RO units. A crude estimate of 60% was made for the volume actually pumped towards the RO units. Since the intake pumps were installed with the larger Multi-Effect Distillation Desalination unit in 1992, these have had to be re-connected to the RO Units.

4. The MED Desal Unit had a production capacity of 1200kL/day. Since the RO units in full capacity produce 360kL/day, it can be estimated conservatively that only 50% of the intake is used by current processes.

5. The MED Desal Unit used the waste heat from the Power Generators to produce steam, and due to operational and maintenance problems was producing only 650kL/day in 20021. As the Generators were changed and improved efficiency, and less heat being available, this unit has not been in use and ancillary equipment and connections re-arranged to feed the RO units.

2. Filtration

6. Normally the 3 Veolia Containerised RO Units are working 24/7 to meet increasing demand. Each of the current units has the capacity to produce 120kL/day. These were installed in 2003-2004. One of of these has been relocated to NUA from the Menen.

7. They are all powered by 1×100 Psi retro-fitted compressor to pressurise the intake water, with the concentrate being gravity-fed to the sea without any further treatment.

¹ Pacific Islands Applied Geoscience Commission (SOPAC) 2010. Country Implementation Plan for Improving Water Security in the Republic of Nauru, Funded by European Commision EDF9 National B-Envelope, January 2010.

8. The RO units are serviced locally with twice-a-year technical inspection by the suppliers. This inspection agreement has come to an end. The RO cartridges are monitored and usually changed every 3months, while the membranes are replaced on an annual basis.

9. The units are directly powered from the Power Station which is next door, and no metering exists to assess power usage. However it has been estimated that 3 dedicated RO units use upto 20-30% of the 2.5-3.3MW produced daily on a 24/7 operation, producing 360kL/day. This equates to about 21kWh or 7kWh per RO Unit.

3. Distribution

10. The filtered water is usually stored in 3 concrete tanks (out of the 6 available), and thereafter pumped into trucks for delivery around the island, on a user-pay system. Other tanks and pipelines used for storage and reticulation at other areas have been either decommissioned, not maintained or left out due to inadequate supply.

There are 3 6kL Community tanks in each district, a total of 45. These are occasionally used for some storage but the water quality is a major concern, due to contamination. Leakages are profound and therefore these have to be re-filled on a twice-a-week schedule in most cases.

11. The larger distribution tanks are concrete or steel, both types needing urgent maintenance to be of any use. The table below summarises the tank assets and their capacities over the years. The volumes are approximate in ML/day, as the original data is unclear between UStons and British tons, UStons are assumed. Used Capacity refers to storage for potable RO water.

Intended Purpose	Туре	Size (approx) External	No	Location	Total Design		Used C	Capacity N	ЛL
		Dimensions			Capacity ML	2002	Sept 2009	Jan 2010	Oct 2010
Operational	RC	8.8mdia x 4.8m	6	NUA Storage Shed	1.756	1.6	0.5	0.03	0.03
Operational		9.4mdia x 4.7m	6	Golf Course	2.064	2.0	0.5	NIL	NIL
Operational		9.3m x 12.3m x 3.3m	1	RON Hospital	0.378	0.35	0.35	0.35	0.35
Operational		Avg Size 9.1m x 4.6m	15	LOCATION area	3.88	Mostly Storage	used	for	Rainwater
Operational		16.5mdia x 4.2m	1	LOCATION	0.895	Mostly Storage	used NIL	for	Rainwater
Operational		12.2mdia x 3.5m	2	NRC	0.826	Current original network	Use ly was	is un not par	clear, but t of public
Bulk Storage	MS	19.5mdia x 15.8m	12	Around No.3 Unit except B10	56.723	6.8	2.1	2.1	NIL* - B13 only
Secondary Storage	RC/ S6&S 7 MS	Various sizes and shapes	9	RonPhos areas and S6&S7 at RONHospital	9.6	U	U	U	NIL* - S6/S7 only

RC – Reinforced Concrete; MS – Mild Steel Lap-welded; U – Unclear, or no data available. NIL* - not sufficient production

12. The piping system information is also difficult to ascertain. From an old layout (NPC Drawing No. 93-N32C/N1), the main materials are Galvanised Iron and Fibre RC, with sizes of

75mm, 150mm and 200mm. These materials are old and therefore losses including head and quality, are likely.

Truck Name	Owned by	Capacity kL	Total Delivery in kL/day						
			*	Not for Publ	ic Consump	otion/Totals c	lo not tally		
			Mon	Tue	Wed	Thur	Fri	Sat	
Big Red	NUA	10	80	90	40	85	50	U	
Hino	NUA	4	44	8	40	Servicing - Nil		lil	
NRC	NRC	6	24	12	60	48	24	U	
Ronphos	RonPhos	11.2	33.6	U	U	U	U	U	
Capelle	Capelle	11.4	34.2	U	U	U	U	U	
Big White	NUA	10	Nil	20	28	32	24	100	
Fire Truck	DCA	11.2	22.4	U	U	U	47.6	U	
Total			247.6*	158.4*	U	U	U	U	
Delivered									

13. The Trucks used to distribute water are listed below with deliveries for the week 11 to 16 October 2010.

B. Current Status

14. Only one tank (B13-Steel) is usable and was last filled up to 10m height in November 2009 (approx 2.9ML or about 50% of its capacity). This used to be the fill-up point for the delivery trucks. The storage and supply tanks S6 and S7 at the Ron Hospital are no longer in use due to low supply and losses within the distribution system if pumped from the RO units at NUA.

15. Only 3 out of the 6 concrete tanks available for storage at NUA have been in use since 2005. During the visit only C4 was in use at 10% due to increased demand and reduced production. C4 is also leaking considerably above a height of 1.5m so can only be filled to this level. Tanks C5 and C6 can be filled and have no leaks, but there are no pumps to load the delivery trucks and they cannot supply to B13 or other larger storage tanks.

16. Other tanks are not structurally sound, are leaking or contaminated, or the associated piping and pumps are not working. Tanks B6 to B9 do not exist, and usage of other tanks around RonPhos and NRC is unclear. Tanks C14 to C29 are within the Location area and are used for storage of rain water but are contaminated.

17. Losses of around 15-20% are experienced within the current production/storage/delivery cycle, based on estimates by NUA personnel. There are no reliable flow-meters to provide sufficient data.

18. A recent survey implemented by SOPAC (January 2010 EDF9 B Envelope) notes that the full production capacity of RO Units is 360kL/day, while the total possible distribution per day is 180kL/day. The total potable water demand for Nauru is estimated at 800kL/day with possible increases during dryer spells. The production is less than half of demand, while the supply is less than a quarter per day. In addition there are serious doubts that the RO units are working to full capacity as they are pressure fed by only 1 100psi Compressor. During the visit, one RO unit was awaiting repairs, increasing the burden on other units, as well as creating a delivery backlog

19. The Intake, filtration and distribution pumps are so old that there is very limited information is available on their ratings. The electrical system associated with these are either damaged, not maintained or currently would not meet regional standards of safe installation or use. The piping system exists but much has since been damaged, changed, diverted or forgotten about since they are connected to un-usable tanks.

20. On the morning of Monday 20 October 2010, the storage was expected to be 320kL in concrete storage tank C4, based on the production (and no-delivery) on Sunday 19 October 2010. Only 90KL was estimated as being available for delivery on Monday morning. No explanation was available for this event, and the shortfall was attributed to tank leakages, RO shut-downs and lower production.

21. Operators and Supervisors have no choice but to overload the production and distribution equipment and processes to meet the demand. A back-log of up to six-weeks delivery has been experienced in the current year. Only a maximum of 26 residential orders can be supplied within a day. Active servicing/maintenance schedule cannot be implemented without adding to the backlog, and all maintenance is generally re-active to break-downs. General maintenance and overhaul is not on this schedule however, due to difficulty in obtaining necessary spares in time.

22. The demand for potable water increases during dryer spells when ground water and rainwater reserves run-out. This is when storage is limited, as demand exceeds what can be supplied, and the trucks are overworking and unable to meet the daily delivery schedule. However the ineffectiveness of meeting is demand is partly a result of delay in ensuring scheduled maintenance and servicing of equipment, as well as inadequate storage capacity. In addition, there is reduced production capacity from the existing RO's. It is necessary to boost the production capacity, while improving maintenance and asset management as well as increasing storage capacity.

23. In totality the water production and distribution network and equipment is mostly old and being operated and maintained with increasing difficulty. In addition, the delivery truck with the largest capacity of 14kL has been out action for over a year. A part was finally received for this at end of October 2010, but was not the correct one, and therefore had to be returned. In the meantime, the truck is deteriorating, and other mechanical and electrical components would have to be overhauled before the truck is workable again.

24. Pumps and components are quite old or provided under aid arrangements and therefore vary in make and models. Delivery Trucks are in the same situation. Therefore only limited parts are available worldwide, and most have to be made-to-order, modified and/or machined to suit and then shipped to Nauru.

25. Even if additional RO units are installed to increase production, storage and delivery equipment and plant issues remain. Increasing Storage capacity will assist to some extent, but if this is affected, than the current situation remains. Additional delivery trucks will also be affected by the in-ability to maintain them and have them operational within a quick turn-around time.

26. For instance a 5kL tank is located outside the gates of the NUA_Water section. This is filled up and the public has access to this free of cost. This tank empties out every hour and needs to be refilled up to 8 times a day. Using RonPhos and NRC trucks is under mutual understanding, but these are also not sufficient to meet the backlog as their priorities continuously shift towards their own employees. From figures obtained from NUA Water

Delivery personnel, the current delivery on a good day is 240kL/day with some larger trucks (NUA, RonPhos, NRC, Capelle) doing at least 8-10 trips. This is still less than the demand estimated at 800kL/day. Operations for 24/7 to produce/store and deliver water is still unable to meet the demand during dry spells at current levels of production.

27. The Fire Station has additional requirements especially during flight-days and have to be in readiness during dry spells, so Fire trucks fill-up almost every morning as well. During the visit, the RonPhos truck was twice observed at the Fire Station as back-up supply during flight times.

C. Proposals

1. Additional RO's

28. A larger RO will ensure dedicated supply to other industrial and corporate uses while ensuring adequate supply for emergency services such as Hospitals (new or existing), the Airport and Fire Services.

29. A proposal to acquire and install a 265kL/day RO has been submitted by NUA for budgetary allocation. If approved and installed, the total production capacity will be 625kL/day. The O&M cost of this proposal and its load on electricity supply is unclear and information unavailable. It is necessary to consider other larger and possibly more energy efficient units.

30. A 4kL/Hr solar powered model has also been proposed by CIE, based on a Hitachi Plant Technologies Ltd Proposal for PIC's under the PEC Fund. This unit requires a 1200sqm area, 50% of which will be occupied by solar panels.

31. A RO unit which does not require diesel generated electricity, can be installed at other locations on the island, and this can be linked to increased storage capacity outside of the NUA boundaries. The reverse linkage is also viable ie if there is adequate storage and rainwater harvesting, and RO water is not in demand, the renewable energy can be added to the NUA-Power grid. This may need further analysis to determine the actual kW output of solar panels during the rainy and cloud-covered season.

2. Workshop and Stores

32. The current operation is a juggling exercise and testament to the hard-work and resilience of the NUA staff in this sector. A non-existent support system in the way of a dedicated stores and workshop only adds to the operational burden. There is a storeroom but most of the spares and materials belong to RonPhos. Very few parts are stored for the water sector leading to mis-n-match fitouts to generators, pumps, compressors and trucks to ensure continuous operations.

33. A dedicated workshop will not only provide necessary and timely support to the water sector, but can also be used for the Power Sector. The GON Bus Transport fleet could also make use of this facility, as well as the Airport, the Fuel Tank Farm, Nauru Ports Authority and other entities. The possibility of linkages with NRC and Ronphos workshops should be further studied.

34. A detailed assessment has to be made for the needs of the numerous components and their maintenance/overhaul or replacement. Pumps in intake, filteration, storage and on trucks, compressors and generators, and associated electricals, trucks, and hosing, piping and valves for reticulation all have to be assessed to determine the spares/parts to be in stock in a dedicated workshop. The workshop and stores can also ensure RO units are maintained with shorter down-times.

35. The workshop should offer as a minimum: adequate spares, readily available machined/made-to-order Truck parts and accessories, pump, pipe and valve requirements, fleet and special-use vehicle maintenance, auto-winding, tyre repair, and machining capacity. Other uses will dictate final list of services provided.

II. POWER

A. Assets

36. The Nauru Utilities Authority is responsible for generation and transmission and distribution of electricity for the whole country. It was officially commissioned in 2007/2008 and assumed responsibility of existing assets and infrastructure which were previously within the Nauru Phosphate Corporation (NPC). The NPC has since been reformed and re-structured to RonPhos (Republic of Nauru Phosphate Corporation)

37. Although the official and legal transfer of assets is still unclear, the operational and maintenance burden is on NUA. Cost recovery is difficult with GON subsidies for domestic users and the only commercial entities being RonPhos and Nauru Rehabilitation Corporation (NRC). The distribution network consists of 3 Ring Mains and a smaller dedicated feeder to RonPhos.

38. The current System comprises of a diesel powered generation room, with controls and switchgear controlling outputs of 11kV and 3.3kV. Distribution around the island is via three ring mains of 11kV, and one dedicated 3.3kV feeder main to RonPhos. The three ring mains consist of two OH lines (North and South Ring Mains) and one UG (East Ring Main) cable to serve the Aiwo and Yaren districts for airport, GoN offices and parliament, and connects to the OH grid at Menen Hotel.

1. Generation

39. The Table below summarizes the main generators currently on the island, and their capacities.

Location	Make & Operational Name	Model	Speed RPM	Design Output MW	Limits on Output/ MW	Status 22 October 2010/ Production MW
NUA	Rushton Unit#1	12RK270Markl	750	2.50	80%/ 2.0	Operational 1.6
Power Station	Rushton Unit#4	16RK3C	750	2.08	80%/ 1.66	NIL – Awaiting Maintenance
	Rushton Unit#5	8RK3C	750	1.00	80%/ 0.8	Operational 0.8
	Rushton Unit#6	16RK3C	750	2.00	80%/ 1.6	Operational 1.6
	Rushton Unit#7	12RK270MarkII	750	2.96	80%/ 1.6	Operational/ Stand-by
Ex IOM C	omplex Gen 1			0.56		
Ex IOM Complex Gen 2				0.44	No Data Available, Possible Standby	
Menen Hotel			0.56			
Ronphos Office/Workshop				0.56		
TOTAL				12.66		4.0

40. Although the models at the Power Station are the same, their sizes and capacities vary and therefore parts and components are different as well. It is also unclear whether other generators are actually connected to the grid for standby supply.

41. The Generation building, although having being patched up still has a leaking roof in parts, although most of these leaks are away from the actual generators. However the current state of the asbestos cement tiled roof is a concern. The building is structurally sound and has been modified internally to house the control rooms, NUA offices and stores. Other parts of the building still leak and in urgent need of maintenance, and therefore are vacant.

2. Controls

42. These are mainly located at the Power Station and within the control room next to the Generation room. The 3.3kV switchboard consists of 8 Generator Breakers, 3 inter-bus transformer breakers, 8 feeder breakers 3 LV services transformer breakers, and 1 bus-section breaker. The 11kV Switchboard consists of 3 inter-bus breakers, 3 main feeder breakers, and 4 bus-section breakers. Most of these appear to be Merlin Gerin and the availability of components and specialist personnel is a concern.

43. Both sets of switchgear were replaced in 2000 but due to the outages and load shedding their operations in the short period have been surcharged. Although maintenance concerns have been raised over the years about gas pressures and leaking roofs and cable joints, it is unclear how many of these have been rectified. The balance of the equipment seems to be at least 50 years old.

44. The inter-bus transformers connecting the switchboards are rated at 2.5MVA. The LV services transformers are 2 x 1MVA and 1 x 500kVA. The status of these are unclear but power station supervisor advised that oil changes and scheduled maintenance is difficult due to production demands and the lack of standby transformers for diversion. No information was available on the status of the UG cables and OH distribution lines outgoing from the power station complex.

3. Distribution

45. The transmission on the 11kV OH lines are controlled by 11 Pole Mounted Transformers, 27 Air Break Switches, 7 ground-type transformers and 4 pad-mounted transformers. Grid connection points are controlled by 3 or 4-way ring main units. Generally the grid and poles are in satisfactory condition, however there are isolated poles and most of pole-mounted equipment which show signs of corrosion, and possible vandalism. These have been identified as being in urgent need or replacement for some time.

46. Although the feeder controls are connected, the RMNorth feeder does not trip when there is a fault. This has been raised as a concern for some time by the personnel, and a fault had to be actually reported after a heavy –rain event during the visit, and rectified.

47. The 3.3kV Feeder and equipment is reported to be acceptable condition with minimal maintenance requirements, apart from the annual wayleaves clearance necessary.

B. Current Status

48. The equipment, plant, generators, instrumentation and controls, switch-gears, transformers and distribution network is old and being operated and maintained with increasing difficulty. Skill-sets are lacking locally, outages still occur although reduced, and obtaining parts is very difficult. In some instances the ordered parts arrive six-months later.

49. For instance although 4 out of 5 generators are in operation most of the time, these are not utilized to their full capacity. There is an operational limit of 80% capacity enforced to limit risk to the Rushton Generators. Since Rushton models are not in commercial production, only limited parts are available worldwide, and most have to be made-to-order, modified and/or machined to suit and then shipped to Nauru. Operators and Supervisors ensure reduced loading per generator by hourly monitoring (no alarms), and an active servicing/maintenance

schedule is under way with a limit of 3000hrs per generator. General maintenance and overhaul is not on this schedule however, due to difficulty in obtaining necessary spares in time.

50. The installation of pre-paid metering to most house-holds (EU Project) has increased energy-efficiency while reducing the demand on generation by as much as 20-25%. This has reduced the load on the generators, allowing timelier servicing/maintenance. However the fact that demand is constant is only due to limited economic activity and reliable supply is only possible as a result of this constant and manageable demand.

51. A slight increase in demand or slippage in regular servicing, mechanical failure or breakdown can affect this balance considerably and reliable supply will be affected. It must be noted that in-direct demand can also affect this balance. For example, due to increased demand for potable water, and with the possibility of installation of further RO units, demand on power is expected to increase. Presently 3 dedicated RO units use upto 20-30% of the 2.5-3.3MW produced daily on a 24/7 operation, producing 360,000L of potable water.

52. Based on observations during the visit, Generator #4 was awaiting the arrival of parts ordered some 4 months earlier. This was expected to be in-country later in the year with the Generator going on-line by December 2010. The capacity is 2.4MW but will only be producing 1.6MW daily as before. By this observation, only one generator can realistically be maintained/overhauled completely per year. NUA has 5 operatable Rushton Generators, and 4 need to be working at all times with reduced limits to meet the current levels of demand.

53. No data was available on the losses experienced under the current system and level of generation. In addition, details on outages are still forthcoming.

C. Proposals

1. Additional Generation Capacity

54. To be detailed in comparison with Renewable energy options. Current discussion of obtaining additional 1 x Rushton Generator from Singapore (Shell/Total)!! Possible connection to IOM generators??? Is there demand to justify?

2. Workshop and Stores

55. The current "managed" operation is a result of a non-existent support system in the way of a dedicated stores and workshop. An injector room was built 10 years ago but due to roof leaks, this is not in operation. The existing store-room has more RonPhos spares and only a limited and dwindling supply of gaskets and seals for the Rushton Generators.

56. A dedicated workshop will not only provide necessary and timely support to the power sector, but can also be used for the Water Sector. The GON Bus Transport fleet could also make use of this facility, as well as the Airport, the Fuel Tank Farm, Nauru Ports Authority and other entities. The possibility of linkages with NRC and Ronphos workshops should be further studied.

57. A detailed assessment has to be made for the needs of the numerous components and their maintenance/overhaul or replacement. Special components such as relays and gas monitors for switchgear, mechanical components and electronic controls, ring sets, pistons and

con-rods and bearings, gaskets and seals, injectors and as well as poles and conductors, oils and line-testing, cable-joint and testing equipment, are just some of the stores requirements for the operations.

58. The workshop should offer as a minimum: adequate spares, readily available machined/made-to-order Rushton parts and accessories, pump and valve requirements, fleet and special-use vehicle maintenance, auto-winding, tyre repair, and machining capacity. Other uses will dictate final list of services provided.

III. SANITATION

A. Assets

59. The Ministry of Commerce Industry and Environment is responsible for policy and pilot projects in this sector. It is also involved in implementation of sanitation initiatives and has control over new developments in terms of environment.

60. According to the 2002 census, around 83% of HH's² used flush toilets, 12% used external tank or pour-flush toilets and 2% had no access to proper sanitation facilities. It was also determined that 55% of HH's directed sewer to cesspits. Only some houses and commercial entities as well as GoN buildings and quarters use septic tanks.

61. Currently there is no piped sewer reticulation or treatment available on Nauru. Only at Location a sea-water flushed reticulation was in operation with outfalls to the sea. This system was recorded³ as being un-operational in 2007. Sea-water was pumped to storage tanks on Command Ridge and then gravity fed to household reticulation. The outfalls are however still operational and raw sewage is gravity fed to the sea. The flushing is by pumped brackish water and rainwater sources. The reticulation system has operational and maintenance problems and upgrading requirements, which need to be seriously considered. The Location and Denig area represented 39% of HH's in the 2002 census which discharged effluent in this manner.

62. The Pacific HYCOS⁴ survey team carried out the Identification of 336 domestic wells and septics in Nauru which were then promoted to a spatial database using GIS. This information is available with CIE Project personnel and is the most recent survey of its kind (April 2010). The septics identified are not twin-chamber tanks but concrete lined or rock-lined cess-pits⁵. These are usually pumped out when required. A new alarmed tank system is installed at NSS which is also connected to an existing outfall.

63. There is a Sludge pump-out truck donated by AusAid and currently with NRC. It was meant to be operated by Eigigu Holdings Ltd, but recently been "transferred" to NRC who have fixed it and are providing the service on request. This is outside the mandate of NRC. The sludge is then pumped out via a outfall located near Cantilever 2. This outfall, like others around the island are infiltrated by tide, in disrepair and terminate within the 250m wide fringing reef. No tidal flaps or non-return valves were observed.

B. Current Status

64. CIE is working on establishing a Sanitation Policy based on a pilot project which will see 20 HH's have new twin-chamber septic-tanks. This is expected to be complete by first quarter of 2011.

² HH - Households

³ SOPAC 2007. National Integrated Water Resource Management Diagnostic Report, SOPAC Miscellanous Report 640, November 2007 ⁴ SOPAC 2010. Accessing the Mutrarel With a Construction of Co

⁴ SOPAC 2010. Assessing the Vulnerability of Shallow Groundwater Domestic Wells in Nauru, SOPAC Technical Report 435, July 2010.

⁵ Usually 2m deep, no lining at the base allowing waste-water to infiltrate into the karstified Limestone substrate. According to Eigigu Holdings (SOPAC 2010) 1000 estimated cesspits are currently in use.

65. The Pacific HYCOS survey revealed a high-level of EColi contamination of groundwater resources, and this has been directly attributed to sanitary practices at the ground level, mainly cess-pits mentioned earlier. The results of the survey are tabulated below:

Risk	MPN	No. samples	% of samples
Low	0-20	85	31%
Low- moderate	20-50	33	12%
moderate	51-100	26	9.5%
moderate- high	101-500	52	18.5%
high	>500	79	29%
TOTAL		275	

Fecal contamination risk

MPN: Most Probable Number of E Coli Bacteria per 100ml sample Pacific HYCOS - www.pacific-hycos.org

66. Currently water quality is monitored only by way of chlorination⁶ of water tanks around the island. There is only a monthly quality testing done at the NUA on desalinated potable water at this stage. All other water is recommended to be boiled and the practice is widely acceptable.

Insert Water related diseases Data

67. NRC is providing the sludge truck operations as a community initiative and is not commercially inclined to continue this service, nor expand.

C. Proposals

1. LOCATION Sewer and Water Reticulation Upgrade

A detailed assessment is necessary of the existing systems and network. Following this, a upgrade or replacement project can be designed and implemented. Since this the most densely populated area, it is highly vulnerable from a public health point of view.

2. CIE Nauru Sanitation Policy

68. This needs to be developed for the whole of Nauru. Other Pacific Island Countries have some possible solutions to provide, including public health regulations and standards which can be suited to the Nauru situation.

69. Extension of support to implement more twin-chamber septic tanks with associated reticulation maybe part of the Sanitation Policy but needs a time-based plan to work with other ground-water harvesting and IWRM projects.

⁶ Community and school tanks and RoNHospital tanks are sampled and monitored once a fortnight. Chloramine slow release tablets are mostly used, as well as Chlorometers, test-kits and Sensafe products. This is provided to MoH Environmental Officer from the Nauru Country Budget by WHO based in Suva, Fiji.

IV. SOLID WASTE MANAGEMENT

A. Assets

70. The Ministry of Commerce Industry and Environment is responsible for policy and pilot projects in this sector. It is also involved in implementation of Waste Management initiatives and has control over new developments in terms of environment.

71. The NRC controls the current un-lined dump on Topside. It also provides a weekly garbage collection service. Most of HH's⁷ have been provided to wheelie-bins upto 200L which are then hand-loaded onto a flat-deck truck and transported to the dump.

72. Recycling as a option has just been implemented and skip bins are visible around the major public areas such as government buildings, Hospitals, schools and in Location. Industrial bins are available for new construction and demolishing activities.

73. In addition there is almost an abundance of waste material suitable for dumping around the island. Recycling some of these whole items such as rolling stock (from mining operations), old vehicle shells, tanks, and structural steel is an option for nominal non-commercial purposes. However the lack of appropriate painting and treatment options must be considered in any such venture. Also around the NPA and NUA areas, substantial areas are occupied by derelict structures, materials, sheets, anchors and chains, tanks and associated items from during the NPC days.

74. There is also limited personnel capacity for the removal and proper storage or asbestos cement roofing material which is quite common in houses, commercial and industrial buildings and schools. This issue is a concern with local contractors and also with rain-water harvesting by locals, although ingestion is not a health issue.

B. Current Status

75. CIE is working to establish a Waste Management Policy. A draft was prepared some years ago and current status of this is unclear. NRC operations need to be reviewed in detail to assess future plans and programs.

76. Although locals appear to have some understanding of environmental implications, there is little effort observed to ensure proper disposal of waste, other than the use of garbage bins. This could be attributed to difficulty in transporting other waste materials to the dump, or collection of the same.

77. In addition there appears to be little regulatory control or standard enforcement on the numerous fuel service stations located around the country. It is noted that almost all appear to have in-ground storage tanks and make or type of which is unclear. Also the heavy-fuel and waste diesel storage tanks used by RonPhos have been identified as potential sources of hydrocarbons in ground water wells around the Aiwo district.

⁷ HH - Households

C. Proposals

1. Upgrading NRC dump to Lined-Dump

78. A detailed assessment is necessary of the existing dump, materials collected and disposal methods employed. There is likely infiltration of leachate into ground-water but this has to be verified as well.

2. Review of Fuel Storage Tanks at RonPhos/Airport/Tank Farm/Service Stations

79. The Pacific HYCOS⁸ survey revealed hydrocarbon presence in ground-water wells mostly in the Aiwo district, closer to the main Topside road junction. An area of 400sqm and 4 domestic wells appeared affected, some of which have not been used for domestic purposes since 1990's.

80. Other tanks have been reported to be leaking or having leaked at some point in time, including the jet-fuel storage tank at the airport. A review (although carried out for the Tank Farm) needs to extend to all fuel handling and storage systems to assess level of leakage/deterioration and recommend alternatives or remedial measures.

3. CIE Nauru Sanitation Policy

81. This needs to be developed for the whole of Nauru. Other Pacific Island Countries have some possible solutions to provide, including public health regulations and standards which can be suited to the Nauru situation.

82. Extension of support to implement more twin-chamber septic tanks with associated reticulation maybe part of the Sanitation Policy but needs a time-based plan to work with other ground-water harvesting and IWRM projects.

83. Protection of Groundwater resources should dictate direction of future sanitation programmes.

4. Deep Sea Dumping

84. Given the extent and sizes of derelict items and structures, and having a large EEZ comparative to land size, with a well functioning Port Cause-way, deep sea dumping needs to be further reviewed as a viable option. This would tie in with other projects such as NPA_DMP, NUA workshop and environment upgrades, and RonPhos streamlining its operations. Although no income maybe generated the benefit of effective land-use and a better environment must be considered as this is part of NSDS milestones.

⁸ SOPAC 2010. Assessing the Vulnerability of Shallow Groundwater Domestic Wells in Nauru, SOPAC Technical Report 435, July 2010.

V. MEDIA AND ICT INFRASTRUCTURE

A. Assets

85. The Ministry of Home Affairs is responsible for the set-up, operations and maintenance of the Media Department. The ICT is regulated within the Ministry of Transport, and is subject to a commercial agreement with the only Mobile and Internet technology provider Digicel.

86. The Media Department is housed in a concrete structure adjacent to the GoN Buildings, which has been retrofitted over the years to suit the functions. With AusAid support there are now a full range of radio, television and print media services provided. Radio coverage is island wide and with good reception in all the populated areas. Free-air Television coverage is also quite good and continues to improve. Some private households, diplomatic and business complexes have pay-tv dishes as well.

87. The mobile network coverage is island wide and generally excellent, with some isolated spots on Topside having at least minimum coverage. A Wi-Max facility has been recently launched with 90% coverage over the island. The maintenance and upgrading of related physical infrastructure is subject to this agreement. This internet facility is accessed by GoN for its operations as well.

88. The land-line network has been de-commissioned since early 2010, due to high maintenance burdens. Most of this appears to be overhead and reliant on NUA OH power grid.

89. The communication towers for all media are located around Topside and Command Ridge, and monitored regularly.

B. Current Status

1. Media Department

90. The building which houses the Media Department was possibly designed and built for a multi-story facility, however only the ground floor is built and has a cast-concrete first floor decking as a roof cover. This first floor is used to mount the main transmission dish and antennae and is accessed by concrete steps. The slab is exposed to elements and being quite close to the sea (within 20m) has been subject to corrosion of exposed reo-steel which in turn has led to some cracking and slight subsidence. The structural frame is adequate to take the minimal loading on this first floor. However the slab leaks and this is a risk to the comms equipment in the Department below.

91. No requirements have been raised for the improvement or upgrade of physical infrastructure for the radio network.

2. ICT

92. The ICT network is monitored in two parts it appears. The GoN ICT Department is responsible for the GoN ICT services and its operations. The Digicel network is maintained by its own staff and technical support from regional centres such as Fiji and Australia.

93. During the visit there have been a minimum of 3 internet outages ranging from a few hours to 1 hour duration. These are both with the GoN intranet as well as outside Wi-Max facility. There also have been issues in accessing popular websites and downloading capacities.

94. How vulnerable this system is, to the provision of NUA power is not clear.

C. Proposals

1. Increasing Wi-Max internet coverage to 100%

Additional towers???

2. Upgrade of Media Department Building

95. Internal refurbishment to suit studio and improve provision for sensitive equipment. Water-proofing of first floor deck for protection and leakage prevention.

VI. AVIATION

A. Assets

96. The Nauru International Airport (NIA) was officially opened in the 1970's with further upgrades in 1993, and is the home base of Nauru's Our Airline. In 2007, Our Airline was one of only three airlines in the region, which are fully owned by their country and provide international services.⁹

97. The Terminal Building is one double storey structure with visitor areas, check-in areas, departure and transit lounges, immigration and customs, cargo handling, and office spaces which is also used by Ministry of Transport. There is adequate parking outside the building for the current volume of vehicular traffic. An adjoining structure is proposed for upgrade. Land ownership by DCA is unclear.

98. The asphalted apron area is large enough to cater for the two Boeing 737-300's in the Our Airline fleet. Under normal circumstances only one of these aircraft occupies the apron. The apron is accessed by taxiways which are adequate for the aircraft size. The direction of maneuvering from runway to apron is straight and the distance approx.100m, and no difficulty is observed for the current aircraft.

99. Between the runaway and the terminal/apron area, and traversing the taxiway, a 2.5km section of the main Island Ring Road is open to traffic during non-flight times. This section is closed from thoroughfare during these times by a gate across the road from the west end. Only the eastern end is accessible, which terminates to the airport car park.

100. The existing runway is 2150m long by 45m wide with 75m grassed strips along the asphalt runway on either side. The 1993 extension of the eastern end of the runaway was only possible with reclamation and road re-alignment and substantial coastal protection work. Navigational Aids are still ground-based and visual approach systems are in use.

101. There is no firm proposal for extension or a new airport at this stage, based on current traffic volumes, and projections (data required) do not justify large investments at this stage, although 'Topside' remains an option for a larger airport complex.

102. Over the years, with various oversights carried out by ICAO, CASA, ACNZ and PIASA¹⁰, operational and infrastructure shortfalls have been identified (along with institutional) with varying degrees of concern. While some improvements have been made and others are considered, the lack of adequate and timely funding has delayed some identified projects by several years.

103. The NIA is located in a residential area, and in close proximity to a school. The Fire Station is outside the main aerodrome boundaries. There is no dedicated Metereological service for the aerodrome, and weather forecast is obtained from the Bureau of Meterology website from Australia.

⁹ Pacific Islands Forum, 2007. Proposed Joint Venture Air Services: Analysis of Socio-Economic Impacts, June 2007. Prepared by Mercury Consulting Services in association with Moncrieff Management Limited.

¹⁰ ICAO – International Civil Aviation Organisation; CASA – Civil Aviation Safety Authority (Australia); ACNZ – Airways Corporation New Zealand; PASA – Pacific Islands Air Services Agreeement,

B. Current Status

104. Currently NIA handles only two commercial Boeing 737-300 flights per week. Being a transit point, and the only point of air-freight and passenger exchange with the outside world, it is critical to the transport network for the country as well as the region.

ROUTE	FLIGHT FREQUENCY/WEEK	SEATS	WEEKLY SEATS	SEATS
	& AIRCRAFT	ONE WAY	AVLBLE	OCCUPIED
INU – TRW/NAN	2 x B737-300	130	260	
BNE/HIR - INU	2 X B737-300	130	260	

105. At the present moment, no operational difficulties are observed apart from the institutional shortfalls identified in the oversights. However a lack of maintenance of aircraft, on and off island has been the cause of flight delays. No capacity in hardware or personnel in on island to provide such services. It is unclear if during stop-overs in Nadi and Brisbane if any maintenance is carried out.

106. Since the Nauru International Airport (NIA) is located in a residential area, and in close proximity to a school, the airport and the runaway continue to be accessed by general public and in some cases house-hold pets. The existing fence was installed around 10 years ago and consists of steel and timber posts, mostly cast in concrete, with a 1200mm high chain-link mesh. There are gates and entry points for locals, which are meant to provide a pedestrian and motor-bike thoroughfare to access the government-building/ fire station side as well as terminal side of the runaway.

107. Since there are presently only two flights per week, the runaway is almost daily used for recreation by nearby residents. Garbage and rubbish is a on-going pre-flight problem as a result. In addition there are instances of vandalism which contribute to the breaking down of posts, mesh and gates. In recent times, certain sections (approx 25m) of fence have been removed or flattened. Although maintenance has been observed, this has been only to remove vegetation and clear drains alongside the fence.

108. The runway surface is in need of urgent maintenance to curb further deterioration as observed by Fulton Hogan (NZ) in 2009¹¹. Neither of the options provided have been carried out a year later, and although the pavement surface is holding up, this is only due to easier weather conditions and lower traffic volumes.

109. There is no further land available for lengthwise extensions. A height restriction on buildings is imposed on the western approach, hence the Aiwo Primary School future buildings are affected.

C. Proposals

1. Airport Development Master Plan

110. Given the operational and institutional shortfalls identified by the ICAO oversights, a Master Plan (NIA_DMP) is deemed necessary to provide a time-based road-map for further and necessary development. Such a plan would also enable easier planning for the GON which is the main funding agency.

¹¹ Fulton Hogan, 2009. Nauru Runway Inspection Report, July 2009.

111. It is intended that the NIA_DMP will include the entire aerodrome upgrade requirements (eg Infrastructure, NavAids, Terminal Buildings and Services, Security, Meteorological, land availability) as well as institutional capacity-building to meet current and appropriate regional/international standards. The Plan should also take stock of current projects and studies in place or underway.

2. Safety Fence

112. The ICAO USOAP¹² of 2008, finding states the need for the DCA to provide a fence suitable to aerodromes. Although a previous Universal Security Audit of August 2007 and a later follow up to the USOAP in September 2009 both raised the concern for a proper safety/security, the fence has not been upgraded, and continues to deteriorate.

113. According to the DCA, this has been a major issue during the USOAP's in the last three years. It must be noted the fire-station will still require a dedicated access through any new fence due to its present location.

114. Given the uniqueness of the airport location, the possible use of the runaway as a run-off catchment, the standards required by ICAO and other regional regulatory bodies, a replacement fence would have to be designed specifically for NIA, and thereafter priced.

3. Runway Maintenance and PAPI

115. Last Runway Upgrade and extension was done in 1993, by Fulton Hogan (FH) out of New Zealand. Since the ICAO Universal Safety Oversight Audit Programme of March 2008, further assessment and inspection has been carried out of the runway surface and two options were priced by FH. A total asphalt overlay option was given which can be included with the Airport Master Plan Development Project. The maintenance option could be implemented within a year and would see the continued used of the runway for a further two years at least.

116. While active maintenance and vigilance has ensured the survival of the current T-VASIS (Visual Approach Slope Indicator System) lights, safety and technical oversights over the years have highlighted the need for replacement. These lights were installed in the 1970's and maintenance included the availability of parts is proving difficult. Other PIASA countries are also installing the PAPI (Precision Approach Path Indicator) as a replacement, which ensures better light intensity and reduced operational and maintenance burden. An Instrument guided approach system is not required at this stage, but can be included in the Airport Master Plan Development Project.

Additional Data Required

- Landing under wet-conditions any incident reports? Pilot or Aerodrome concerns raised in recent times 2009/2010?
- NRC local materials:-
 - Availability (quantity, production rates, delivery),
 - Quality suitable for PCN standards, testing and existing results, standards?
 - Bitumen/Asphalt options.
- Aerodrome Pavement Marking Runway, Taxiway and Apron improvement benefit in line with Master Plan/ICAO requirements.
- ICAO Requirements.

¹² ICAO Universal Safety Oversight Audit Programme, March 2008. AGA/07 Aerodromes, page 67

- Minimum Requirements Document
 - o TORA/TODA
 - o ASDA
 - o LDA
 - Stopway?
- Data on Freight Tonne-km available vs used/performed
- Data on Passenger-km available vs used/performed
- Market Demand passenger and freight, current/ Forecast
- Charter Flights, special and urgent flights (emergency? Refugees? Diplomats?)
- Payload characteristics
 - current fuel-load vs pay-able seats/passengers
 - Percentage of transit passengers, locals, international (Fiji, Australia final destination, tourism?)
 - Freight breakdown in-bound vs outbound, types (bottled water? Agricultural? Industrial? Etc)
- Aircraft types and number of landings/take-offs per year STOL, helicopters, commercial, private, military,

VII. TRANSPORT – LAND TRANSPORT

117. As most of the population and activities are concentrated on the coastal plains and distributed around the island, the transport linkages necessary for daily activity are achieved by means of transportation on the coastal front.

A. Assets

118. During the visit it was unclear which department of GoN was responsible for the road network on Nauru. Apparently, Government has just returned O&M to Department of Traansport and allocated minimal budget. However it was reliably established that the roads use for the mining operations remained within RonPhos and NRC responsibility.

119. The coastal regions are serviced by a sealed two-lane carriageway which is about 21.9km¹³ long, and runs mostly at a minimum of 40m and maximum or 200m (at the airport) parallel to the coast line. There are other sealed internal roads of around 8.6km in total which service residential and business areas such as Aiwo business area, Bouda Lagoon area, Denig RonPhos Offices, workshops and Harbour, the Domestic and IOM Topside locations and others. All other roads are unsealed and well maintained if within the mining and haulage routes.

120. The roads are 12m wide nominally, with carriage- way widening in populated or more trafficked areas. Most of these areas have form-cast kerbs and footpaths on both sides. In areas where the population is less, there are form-cast drain kerbs on either or one side, with adequate cross fall. Around 11km of carriageway is boarded by these drain kerbs on at least one side.

121. The Ministry of Transport operates a public transport system with a fleet of 10 buses of various capacities. These are tabulated in the next section and indicate the level of service. A mechanical workshop is also established and this is situated in building space rented out from Eigigu Holdings Ltd, next to the football adjacent to the Ron Hospital. During the visit, this was in operation and a glassed area was also used to hold vehicles for other purposes.

122. There is no Land Transport regulatory body as such and the MoT is looking into establishing such an institution. Traffic Safety is not a concern at this stage however, there is an absence of adequate street lighting and signage, including road marking which appear to have weathered in most cases. There appears to be an understanding amongst most road users on traffic behavior and etiquette, and this order prevails in absence of stricter control measures.

123. The most common type of vehicle appears to be the motorcycle or scooter which most Nauruans have access to. There are some re-fitted Landrover Jeeps which are used for family or recreational uses. Most of the heavier traffic is confined to the mining areas with 10-wheeler haulage trucks and tankers. The larger size water delivery trucks are in-frequent users at this stage. Side-lifter trucks for transportation of 20-foot shipping containers around the island are in minimum use as most containers are emptied at NPA¹⁴ or are transported from Harbour to the

¹³ Included the duplication of the Main ring Road, on either side of the NIA runway, approx, 2.5km.

¹⁴ Nauru Ports Authority

main shopping or industrial areas in Yaren, Aiwo, Denig or Anetan¹⁵ only once a month at nominal payload of around 7¹⁶ tonnes per axle.

B. Current Status

124. As most of the road is two-coat bituminous seal around the coastal areas, there is evidence of oxidation on the surface with loss of coating. Since the aggregate in the seal is also limestone, there is a high incidence of polishing along the wheel paths. It is noted that the operational design speed is 50kmph, and as during the visit it was generally dry, no skidding or loss of tread-friction was observed. There was also no severe loss of chip-seal or pavement cracks. The cracks observed were within 2-3mm wide and about 2mm deep, and in some cases, patterned where wheel-paths were clearly rutted. Although the pavement and seal is generally intact, this is a result of the following:

- Where heavier vehicles traverse, the pavement is furthest from the coastline.
- Where the pavement is closest and most exposed to the elements, there is minimal traffic, mostly scooters and/or motorbikes.

125. The design of the pavement is appropriate/modified to Australian standards with at least 300mm of kerb concrete protecting the pavement material on both sides. There is little incidence of runoff or groundwater infiltration and therefore no potholes. However, in areas where the footpath is severely broken, or the drain-kerbs are exposed due to erosion of shoulder, this is likely to be an issue in the near future. There is however serious subsidence in several locations¹⁷, but with no associated break in seal or apparent loss of pavement material. The Main Ring Road is generally in good trafficable condition. The only break in seal and pavement was observed at the cut/fill lines on the roads to Domestic and TopSide.

126. At least 8.9km18 of the Main Ring Road is in a lesser populated area on the Eastern to North Eastern coastline. These sections are generally covered by vegetation which is encroaching on the pavement and drainage and therefore needs to be removed immediately. In addition all gully pits were observed to be full of silt, or rubbish, and the outfalls points could not be identified. The status of the culverts from the gully pits could not be determined. However during the visit there were two major rain events, and in almost all culvert outfall locations, there was ponding and significant and unacceptable delay (upto a minimum of 48hours) in runoff removal. The lack of infiltration or loss in pavement structural properties is attributed to the integrity of the seal and the concrete kerbs.

127. It is noted that from the east-end of Aiwo Bridge/Overpass over pipe-lines to the northwestern boundary of the Ron Hospital, the kerbs and footpath are older and constructed from pre-cast units of 900mm length. This almost 2km road section appears to have been re-sealed during the remaining road upgrade, but the status of the pavement substructure is difficult to determine. The pavement structure of roads leading to the RonPhos Offices, Harbour and NUA is broken and damaged, needing maintenance or upgrade. It is unclear if these pavements are of the same age as the remaining 80% of the roads on the island.

¹⁵ Capelle & Partners Warehouse and Stores.

¹⁶ The containers offloaded onto motorized lighters (from ship) to the Harbour with the Omega Cranes are within the 16 - 18 tonne range.

^{17 50}mm deep x 300mm square in Anabar (1 Location); 75mm deep max across entire one lane in Meneng; group of patched potholes near West Taxiway at Airport.

¹⁸ Most of Meneng, All of Anibare, Ijuw, Anabar, and parts of Anetan

128. The 200m section fronting the Ron Hospital is therefore perceived to be an older vertical alignment and with the newer upgrade, this section is now lower and prone to flooding. The culverts and storm water systems in place are either blocked or silted up, and this section of road is always inundated during rain events. The Fire Brigade and RonPhos trucks are used to pump the water away. Upgrades at the Hospital and main road have been done including raising the carpark and courtyard, with no obvious benefit. The last flood event of February 2010 resulted in at least 300mm of water in the entire Ron Hospital complex.

129. The MoT also is responsible for the operation of the Public Transport which comprises of buses only. There is no national or regional taxi service as most households have at least a motorbike or scooter. These buses have numerous uses but the nominal daily uses are tabulated below.

Capacity	No. in Fleet	Donor/Supplier	Status
52 seater	1	S. Korean Government	Out of action, possible disposal
52 seater	1	"	Operational, School Bus
52 seater	1	"	Under repair
20 seater	5	AusAid	"Coaster", operational for Public, Workers and Students
20 seater	1	"	Under Repair

MOTRANSPORT BUS FLEET

130. The school and worker trips are scheduled to leave at 7am from the Eigugu Holdings Ltd Denig Depot, with the larger buses going southward, and smaller ones travelling northward. There are 2 deidcated trips to Bouda/Topside and Domestic. According to the Transport Fleet Officer, 2 additional larger buses are required. Some time ago there was a community service from 6pm to 11:30pm daily at a fare of 50c round the island, which yielded approximately \$30,000.00 per annum revenue. Two buses were usually adequate and generally full in the weekend. Buses are also hired out for Bingo nights and church services, with \$65 for the larger and \$55 for smaller buses. It is reported that more revenue is earned this way than by having a community bus service.

131. The Transport Office also reported that a well-equipped workshop was located at Topside at the former IOM complex but was inaccessible. The MoT workshop had no tyre repair facilities, or hoist or compression equipment. This affected the extent of repairs which could be carried out at the MoT workshop. In addition there was a likely delay of 6 months to a year between ordering and receiving parts, and although some belts and filters were available locally, other components such as batteries, motors and hoses had to be imported. Some of the maintenance work has to be outsourced subject to budget provisions.

132. During the visit it was noted that the volume of traffic was high in the morning before school which starts at 9am, and after 5pm. On Bingo19 nights, traffic including pedestrians increased around and in locations where bingo was held. Minimal Police monitoring was observed.

¹⁹ Bingo must be noted as a major social event as this generates traffic, trips and also pedestrian occupation of road-sides and surrounds, often at night with minimal lighting.

C. Proposals

1. Road Rehabilitation

133. The Main Ring Road is generally in trafficable condition as mentioned earlier. However urgent maintenance is required in order to increase design life. This will involve removal or vegetation which is encroaching on pavement and kerbs, as well as a general clean out of all gully pits and rehabilitation of culvert outfalls. In areas where footpath and kerbs is severely damaged or broken, urgent repairs and replacement is necessary. Bituminous re-surfacing is required all throughout and can be carried out with the Airport Runway re-surfacing activity.

134. This project can also include a review and assessment, design and construction of appropriate measures to prevent flooding at the Ron Hospital section of the main road.

2. MoT Fleet Augmentation

135. Additional buses are needed to provide adequate capacity. The MoT has a budget approval for 2 new larger buses but the status of this is unclear. Maintenance of these remains an issue.

VIII. MARITIME

136. Nauru is highly dependent upon sea transport for most inputs and shipping is the only link for vital supplies such as food, diesel fuel, general equipment and machinery, and consumer goods. The port also facilitates the country's exports of phosphate, coral aggregate. There is a project to increase fish exports by setting up of a cannery or loining plant, but the current status of this is unclear.

A. Assets

137. Nauru Ports Authority assets have been inherited from the old NRC, and there is still some confusion of asset ownership between NPA and RonPhos.

138. The following table details the main assets which are within the NPA maintenance responsibility and is based on previous studies carried out as well as site investigations during the visit. The NPA landside operations cover an area of about 3 acres, but due to old structures and waste material the operations are restricted to the seaside strip of about 40m wide by 200m long.

Asset	Supplier and date	Current Condition/Remarks		
Sheds 1 & 2 with OH Gantry	Built during 1960's	Demolish. Unsafe, structure is unsound, collapse imminent. Roofing has been changed in 1990's. Corroded runway for Gantry - not in use.		
Shed 3 (Transit Shed)	Built 1980's	Paint treatment to portals and cladding changes required. Can be used for Harbour operations while Sheds 1 & 2 are demolished.		
Adjoining Sheds (Old Hardware Buildings)	Built during 1960's	Demolish. Unsafe, structure is unsound, collapse imminent. Building layout is not suitable. Area can be used for container storage.		
Container Area	North side of boat-harbour	Area needs to be defined. Demolished buildings will provide more area on Southern side.		
Harbour Offices	Affected by Sheds 1 & 2 conditions.	Can be housed in Shed 3 when remodeled.		
Boat Harbour	Date not clear	Usable for most of the workboats in most conditions. To be retained as structurally sound. Old barge/raft wreck should be removed to provide additional draft and room.		
Concrete Deck and Ramp	Date not Clear	No structural defects noted from surface inspection. Will require detailed assessment for fixed crane installation.		
Cantilever #2 North & South Arm	Built during 1960's	Both arms currently under repair and upgrade. North expected to come online with the mooring upgrade completion.		
Mooring System	Currently being replaced with new system ²⁰ .	New system to have cathodic protection of buoys, higher strength rigging and chains, Quick-release hooks, and load tested. Expected completion Mid November 2010. Older buoys to be used where possible with appropriate treatment. Older system had 12 buoys. New System has 10.		
2 x New Motorised Lighters	Cuddon Ltd NZ March 2010	1 motorised Lighter is still in serviceable condition although requires extensive treatment. Optimum		

²⁰ Mooring system upgrade had to be spearheaded by RonPhos as NPA lacked capacity for maintenance. RonPhos financed new motorized lighters, hire of tugs and led the design for the new system.

		operations need 3 container lighters.		
1 x New Raft	Shipbuilding Fiji Ltd, May 2010	ay Motorised barge still required. New Raft needs continuous maintenance		
1 x Pilot/ Tug Boat	Date not Clear	Extensive corrosion. Replacement needed. Quotations sought.		
1 Forklift	Kalmar 32 tonne, supplier and date unclear	Good condition. Used for all container movements on Land side.		
2 x Omega 65 Ton P&H Ronphos hires out one crane Mobile Cranes for port operations		Ronphos crane provides all carnage services. NPA crane usually out of service for various maintenance		
	The older one is NPA, date not clear	ISSUES.		
Gantry Units, 1 Raft and 2 x lighters	Date Not Clear	Extensive corrosion or maintenance requirements. Currently abandoned.		

139. In the absence of a all-season berthing facility or dedicated harbor, the ships were moored for loading operations by means a system of 12 buoys positioning the vessel under the cantilever arms and approx 200m south-west of NPA Boat Harbor. With anchors set in the seabed at around 450m, and off the reef, a system of chains and shackles provide a sturdy berth. The last upgrade to this was completed in 2006 and although expected to last 5 years with nominal maintenance, by 2008 one of the four outer buoys had detached and was lost. Replacement of chains is necessary mostly on the reef edge where the greatest deterioration occurs and this is programmed for every 2 years. Annual inspections are necessary however it is unclear whether NPA has the capacity to carry these out.

140. The cantilever structure was completed in the 1960's and used rivet technology. Given the exposure conditions, the structure is reasonably sound due to older gauge steel members. With expected increase in phosphate output and lack of maintenance from NPA, RonPhos has led the upgrade and repair of cantilevers.

141. A causeway/loading bridge is also used to load and unload barges and bring in construction equipment, and other atypical cargo. This causeway is also maintained by RonPhos and NRC mostly for the growing aggregate export market. With a crusher capacity of 1500tonnes/day established on Topside, expected export volumes are 120 000tonnes per annum or 60 000m³. The causeway is in very good condition which is attributed to NRC having appropriate equipment and personnel for maintenance.

142. Only the Transit shed or Building #03 is structurally sound for any further fitout within limits for the interim time. However repairs to column bases and some steel treatment and suitable paint work is necessary to increase useful life. The cladding has to be changed and the existing concrete wall on the sea-side must be retained for protection.

143. All other buildings are structurally unsafe and should be demolished with immediate effect. This has been highlighted since early 2009²¹, and it is understood the GoN now has the budgetary provisions to undertake the demolition.

²¹ Reeves Construction Services, 2009. Nauru Port Infrastructure Project – Review of Nauru Ports Facility April 2009. Part A by Reeves Construction Services Pty Ltd, Part by BMT WBM Pty Ltd for RCS.

B. Current Status

144. The ADB Nauru Travel Report of November 2009 stated that, "According to Government statistics, an average of 5-7 vessels visit Nauru per month. The shipping services are composed of a mixture of container ships (1-2), diesel tanker and 3-5 vessels loading the bulk phosphate for export." The following table indicates the characteristics of the vessels.

	Scarlett Lucy (general cargo/containers)	Atom 7 (bulk fuels)	Heracles (bulk fuels)	Phosphate Dry Bulk Vessels (Various)
Year built	1993	1985	2006	
Length x Beam	97.8 m x 17.3 m	98.1 m x 15.5 m	90.0 m x 14.7 m	175m max
Draft	6.0 m	6.4 m	5.3 m	
Deadweight	4 739 tonnes	5 170 tonnes	3 620 tonnes	45,000tonnes
Container capacity	224 TEU	not applicable	not applicable	
Volume capacity	not applicable	5 447 m3	3 628 m3	
Load-out rate,	not applicable	2 400 m3/hr (300 mm	1 500 m3/hr (250 mm	
maximum		dia discharge)	dia discharge)	

Table 2 – Visiting Vessel Characteristics

145. The frequency of ships had reduced for the months of October and November 2010 due to upgrades to the cantilever and mooring system. It is expected that with the upgrade of the Fuel Tank Farm, ship calls may increase for refuelling options.

146. With the new motorised lighters, 8 x 20ft containers can be offloaded within an hour under optimal seastate²². This operation is restricted to daylight hours only, due to lack of lighting options at the harbour and on the lighters. On the last trip of Scarlett Lucy²³, 45 containers were offloaded in two days, and backloading of empty container took 10 hours. The containers are emptied out usually within Shed 2 and stored in the container area to the north of the boat harbour.

147. The current Mooring System upgrade which was underway during the visit, is nearly complete and subject to load test at completion to determine appropriate vessel characteristics. Conservative estimates by Ronphos indicate a 30-35DWT vessel under expected normal seastate conditions could be moored under the Cantilver 2 North Arm. This upgrade has cost \$XXXX and there is limited clarity on a maintenance plan, warranty or material treatment requirements. The new system consists of 8 buoys with use of suitable existing buoys and 6 new buoys. All other components of the system are new. Some of reef staples and deep-sea anchors are used again, subject to design suitability.

148. Only Cantiliever 2 is being repaired – South Arm (\$2million) under repair, expected to complete by mid-2011. The North Arm was also under repair (\$1million) during the visit and expected to be operational by end of November 2010. Cantilever No.1 is out of action and no plans exist to upgrade this. The cantilevers can output 1500tonnes per hour.

²² Optimal conditions are usually with northerly winds of 2-3knots. Westerly winds are deemed to unsafe for berth/mooring and operations. The "Draft Guidance to Pilots of Ships in the Port of Nauru" notes a 25knot westerly to be considered unsafe. Better weather also allows for larger vessels to be moored, although tension on mooring lines have to be maintained to avoid reef-ward displacement.

²³ Scarlett Lucy arrived on 12 October and departed on the evening of 13th October 2010.

C. Proposals

1. Port Development Master Plan

149. Given the operational and infrastructure difficulties identified by the various studies over the years, a Master Plan (NPA_DMP) is deemed necessary to provide a time-based road-map for further and necessary development. Such a plan would also enable easier planning for the GON which is the main funding agency.

150. It is intended that the NPA_DMP will include the entire harbor and port upgrade requirements (eg Infrastructure, NavAids, Buildings and Services, Security, Meteorological, land availability) as well as institutional capacity-building to meet current and appropriate regional/international standards. The Plan should also take stock of current projects and studies in place or underway.

151. It should be noted the current operations are within an area also used by NUA (Water RO Intake, Fuel Tank Farm Pipelines), RonPhos (Cantilevers, mooring). A Land use plan is critical.

2. Replacement Pilot Boat and Omega 65tonne Crane

152. These can be replaced without much planning and would assist in the current operations, given that containerised traffic is not expected to increase in the short time.

3. Capacity Building

153. Mostly to inspect and maintain the mooring system

4. All Season Berthing Facility

154. A detailed design and economic feasibility is required to carry-on from the ADB Oldfield Report which discussed berth structure and options for the Harbour development. This could also be the first stage of the NPA_DMP

IX. BUILDINGS - ADMINISTRATIVE

155. The Ministry of Finance is responsible for the operations and maintenance of infrastructure in the Government Buildings Complex. The organizational structure is unclear although servicing and regular maintenance is underway.

A. Assets

156. The main GoN offices are housed within a 2acre area, with direct road access from the Main Ring Road, and between the Yaren District School and the Parliament Building.

157. The buildings are single storey to double storey timber framed structures with weatherboard external cladding and klip-lok profile roofing. The timber appears to be treated and is mostly in good condition, although fixtures and additions such as single-unit Air conditioners have been added. The roofing and guttering is mostly in good condition. The Media Department is housed in an adjacent concrete building and this has been identified in the Communications Sector Report.

158. Some GoN offices are located at the former IOM complex, where buildings are sound, although internal refurbishment is required in some instances. Others are housed within the respective operations such as Health, Ports and Transport²⁴.

159. There is no centralised HVAC system except at the NIA Terminal Building which has the DCA and MoT offices. Fire Services are existent but not serviced or inspected in recent times. The location of the Fire Station close by is useful however. Brackish water is used to flush the toilets while potable water and rainwater tanks provide the balance of water needs.

160. The parking areas are gravelled and accessible by public. Only at the former IOM complex, a security check was compulsory. The offices at the NIA are reliant on airport security, while the main GoN office blocks are un-manned and usually very accessible to public.

B. Current Status

161. As mentioned before, the buildings are generally in good order and only minor repairs and refurbishment is required. Except for the Harbour Offices which are part of the Port Building Upgrades being proposed, no further building construction is ear-marked for the near future.

162. The New Police HQ is expected to be completed by end of 2011, and the police offices will be relocated here from the current set-up at the Civic Centre Complex.

163. Concerns have been raised by some departments on space constraints within the main GoN complex. Some Ministries are cramped within the space allocated and with expected further staffing, this will be an issue.

164. The services for these buildings need to be reviewed and analyzed in detail. There are instances when pumps are not working, and there is no back-up generator for power outages. The use of energy efficient lights and air-conditioning needs to be encouraged as well.

²⁴ MoT offices are at the Nauru International Airport Terminal Building.

C. Proposals

1. Review of Building Services

165. With the increased usage of GoN buildings, services such as ventilation, toilets and water are under heavier loading than probably originally designed. A review needs to be undertaken to assess the current status and load levels, and provide suitable solutions for further development.

X. BUILDINGS - EDUCATION

166. The NSDS milestones within the Social sector highlight education as critical to the socioeconomic development of Nauru.

167. The Ministry of Education is responsible for the operations and maintenance of infrastructure in schools. There are school Environment Officers who report to the Education Buildings Manager with weekly updates for infrastructure status and needs.

168. The education system comprises of Infant schools, Primary, Senior Primary, Junior Secondary and Secondary Schools. In addition there is a Able Disable Center located at the Ex IOM complex, which is also funded from the MoEducation budget. The Kayser College is owned by the Catholic Parish Convention, but is also largely supported by the MoEducation.

169. The Education Bill dictates the minimum service standards for the facilities in schools.

A. Assets

170. There are 4 Infant Schools situated around the country, and have 3-5 year olds. These schools provide playcentre, pre-school and prep curriculums. They are located at Meneng, Boe, Nibok and Anetan. Most are timber frame structures with some blocks such as toilets made of rendered concrete. In addition there are water pumps, gravity water systems, cesspits, fencing and lighting. The Play areas are usually on natural ground within the fenced compounds of the schools.

171. The Yaren Primary School is situated adjacent to the GoN buildings in Yaren District, and across the road from the "fenced" NIA runway. This school caters for Years 1-3 only. The main building is of timber frame and some buildings are metal framed. The play area is in the central courtyard with some grass, and surrounded by school buildings. A Brackish water well supplies flushing requirements, with cesspits providing appropriate disposal. Solar Panels are located on the Computer Room roof.

172. After a major fire earlier in 2010, the Aiwo Primary School, for Years 4-6, has been relocated from Aiwo District to the Topside former IOM complex in the Meneng District. The facilities at the IOM complex are still in good condition with pre-fab timber structures, but subject to increased usage. The old school site still has 3 buildings remaining including a toilet block. The MoEd wishes to have this school in operation in the short-medium term due to its central location and accessibility.

173. The Kayser College located in Ewa District is maintained mostly by the Catholic Parish. It is made up of timber framed and concrete block structures. The EBM advised that these buildings are "seriously deteriorated" and in urgent need for maintenance and refurbishment. It is unclear what portion of this will be taken up by the Parish. The play area is covered with a steel-frame structure.

174. The Nauru College is a Junior Secondary School for Years 7-9 in the Denigomedu District. The buildings are timber framed with cement sheet cladding, and are in good condition. The central courtyard is concreted and has brackish water for flushing with cesspits. There are

solar panels on the North and South roofs, which are connected to the NUA grid, producing at least 4,500 kWh per month on average²⁵.

175. The Nauru Secondary School caters for Years 10-12 and is located in the Yaren District, across from the NIA Runway. This has just been completed in March 2010, and has concrete block construction for the 2-storey blocks and a timber framed structure for the Sports Barn. Rainwater is harvested into tanks and 5 septic tanks with the "Steritron" waste water treatment system which is alarmed and connected to a sea outfall. There is also a brackish water system and other ancillary services such as fire protection, generators and air-conditioning. Concerns have been raised that more sustainable designs could have been employed as well the use of materials specified by designers outside of Nauru where their warranties are not applicable²⁶.

176. As part of Phase 2 of the NSS project a Learning Village project is proposed. There is space available on the west of the NSS and the project is to have a Public Library, USP and other tertiary outlets, community learning and possibly other trade and TVET provisions.

177. The Able Disable Centre is also located at the former IOM complex. There are access concerns raised by MoEd staff and although the NSS has these provisions, other schools need to be remodelled to suit these requirements. Maintenance at the IOM complex is the responsibility of the OPC management according to the EBM.

B. Current Status

178. The smaller schools have reduced play areas due to a lack of adequate provision of land. The schools were started off in the 1950's with available land and minimal buildings. With the increase in the younger population over the years, most buildings have been added to the same areas resulting in a reduced play area in most cases.

179. The buildings are in need for urgent repairs or maintenance, and in some cases refurbishment to meet the curriculum needs and minimum levels of service. At Kayser College, the main double storey structure is in urgent need to refurbishment and possible structural upgrade.

180. A maintenance plan is being prepared at this stage. The current process of weekly reports and inspections by EBM is highlighting areas of attention quite well and with a well-defined plan, the scheduled planning of maintenance will be possible.

181. Potable Water is scheduled for delivery to the school tanks at the rate of 10kL/week per school via NUA trucks. It is unclear if these are actually delivered with reliability, however MoEd staff mentioned that in some cases all the delivered water is used up within 48hours. There are also concerns on security for water. This is billed at \$25 per month for each school.

182. Electricity costs range from \$350 to \$1950 per month, the highest being at Nauru College with adequate solar panels. No discount arrangements exist with the NUA, however with the increasing maintenance burden to MoEd, this needs to be investigated.

²⁵ Analysis of the Nauru College PV system, October 2008 – February 2010. May 2010.

²⁶ Alexander and Lloyd Group, 2009. Independent Technical Review Report No.4: Planning and Implementation Review of the End-of-Project Phase, November 2009

183. Spare parts for machinery and pumps are not available on island and these have to ordered through the GoN processes, which can take up to six-months in delivery. It must be noted that this problem is prevalent in other sectors as well especially with NPA and NUA. The EBM has indicated that dedicated stores with adequate spares will result in quicker maintenance and lesser deterioration of equipment lying idle.

184. Waste Management and cesspit bail outs cost around \$100 for 3 months with weekly garbage collection by NRC.

185. Concerns have been raised by MoEd staff on transportation issues with the delays by public buses. The need for more sustainable designs in future buildings is also seen as a way to reduce reliance on NUA services.

C. Proposals

1. Aiwo Primary School Redevelopment

186. A TA is being formulated to review and carry out feasibility on four options developed so far. It is expected be undertaken in 2011. This needs to tie-in with the Airport Development plans as the school is within the western approach path.

2. School Refurbishment Program

187. Most of the schools²⁷ need refurbishment of various components and at varying magnitudes. As part of this program a minor project to install Solar Panels and remove reliance on NUA, can be carried out. These panels can in fact be connected to the NUA grid and provide necessary support during non-school periods.

3. Disability Access Project

188. Increase access to existing schools and facilities. NSS has a extensive access ramp and walkway and provisions. An Appropriate design can be adopted to all schools.

²⁷ Except NSS which is still under a defects liability period.

XII. BUILDINGS – HEALTH

189. The NSDS strategy of providing quality and effective service delivery through infrastructure development and upgrading and milestones within the Social sector cover the provision of better health services to Nauru as well.

190. The Ministry of Health is responsible for the operations and maintenance of infrastructure in hospitals and health centres. These are monitored by a Infrastructure Manager and a maintenance department, with budgetary provisions from MoH used for operations, upgrading, repairs and maintenance.

A. Assets

191. There are two main Hospitals complexes providing health services.

192. The RonHospital (RonH) is located at Denigomodu District, across from Location settlement. It provides accident and emergency, acute clinic and operation theatre, and other curative services, as well as a laboratory and blood bank. The Administration offices are also located here. The capacity is 56 beds spread over the whole operation.

193. The older buildings are mostly brick construction and were built by NPC at least 50 years ago. The roofing is made of asbestos tiles. Later buildings have Fibre reinforced concrete sheets with metal roofing. The carpark has been recently raised to reduce flooding however this has failed to address the problem. A sump pump is installed to divert excess water and the pump is an increased maintenance burden.

194. The concrete water tank C13 is partly in ground and has rainwater infiltration at times. In addition there are leaks so it is only filled up to 93% by NUA delivery trucks on order. A RO unit is used to convert brackish water to potable for Hospital use, and stored in PE tanks. The RO unit is locally maintained. Two reserve Mild Steel tanks S6 and S7 located behind the complex on the hill side are not in use as there are significant leaks when directly pump-fed from NUA. Rainwater is also harvested and stored in PE tanks. All sources of water are not enough to meet the Hospital needs.

195. The RonH has its own back-up generator and this is maintained by a local contractor as well, so outages do not affect operations.

196. The Nauru Public Health Centre (NPHC) is located at the north western borders of Denigomodu District and about 250m from RonH. It provides preventative and public health services. The only Dialysis unit for Nauru is located here as well.

197. The main building is of brick construction and has been renovated in 2009, at a cost of \$15,000.00²⁸. Other two buildings are timber framed with Fibre reinforced concrete sheets and metal roofing. There is also a recently constructed covered concrete patio for physiotherapy other services. In addition a concrete block fence surrounds the complex and is located only 20m from the buildings, although the land area available to MoH appears larger. It appears to have been designed for coastal protection as this complex is within 40m from the coastline.

²⁸ GoN, Project Proposal Format, 2009. Republic of Nauru Hospital and Public Health Service Building Repairs and Maintenance Funded through AusAid PPD Budget for Financial Year 10-11

198. The NGH RO unit is dedicated to the Dialysis operations and converts seawater. A backup generator is also located here, and it is unclear whether it works. Potable water is provided through tanks, with rainwater harvesting as well.

199. A health centre is also refurbished and rented from the community at Bouda Lagoon but this is not operational due to lack of water supply. There are plans to have one health centre per district in the future.

B. Current Status

200. MoH has highlighted the ongoing refurbishment requirements for the buildings at both sites in recent budget proposals. According to the redevelopment plan for a new Hospital facility, a total of approximately \$1m has been spent over the last three years in various repairs, refurbishment and building improvement projects.

201. There are still critical areas of operations which require urgent attention and these have also been raised by MoH. In addition the operational and logistical difficulty in having two sites has been highlighted as a problem. Visiting medical specialists have also suggested a single medical facility to cater for all health needs of Nauru as a better solution.

202. There are services problems with the buildings, and given their need for a clean environment, this is a problem. The toilets and critical areas such as labs and blood banks are located close to each other. Ceiling mounted air-conditioning units are causing condensation and moulding problems. The Operating Theatre is in need of a better access arrangement to prevent infections.

203. Lack of water storage capacity is highlighted as a problem and this needs to be rectified with NUA. The flooding issue is also critical as services and accessibility to hospitals is a worry. A rain event in February 2009 caused about 300mm of inundation and while pumps had been installed these failed to work. The Fire Trucks and Ronphos water truck were used to remove the water from the main road and RonH area. The pump is currently with Ronphos for repairs.

C. Proposals

1. Nauru DOH Multi-Purpose Health Facility

204. With the high level of maintenance requirements at the current sites and given the operational difficulties, it is proposed to have a complete health care facility at a site to be determined. A suggested capacity is 40-beds. Sustainable design options need to be considered strongly as well as disaster risk reduction in siting a new Hospital. A feasibility study is required.