

**Consultancy for Contemporary Used Oil Audits in Selected
Pacific Island Countries**

**Report for the State of Chuuk
Federated States of Micronesia**

**Prepared for the Secretariat of the Pacific Regional
Environment Programme (SPREP)**

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Executive Summary

This report covers the State of Chuuk component of a project involving used oil audits in selected Pacific Island countries. The objective of the audits is to establish volumes of lubricating, hydraulic and transmission oils imported annually into each country and the volumes of used oil produced, stored or otherwise disposed. The work has been carried out by Contract Environmental Ltd under a contract to the Secretariat of the Pacific Regional Environment Programme (SPREP), with funding provided by the Global Environment Facility. Most of the information required for the audit has been obtained in a country visit undertaken by Martyn O’Cain from 9 June to 15 June 2014 and was organised through the local Environmental Protection Agency in Chuuk.

Used Oil Production

The quantity of lubricating oils imported into Chuuk for 2013 based on figures provided by private importing companies was about 95,000 litres and it is estimated that approximately 50% of that will end up as used oil. In addition small amounts of the 3,790,125 litres of diesel imported into Chuuk ends up in the used oil stream. Other used oil components come from diesel waste, small amounts of hydraulic and transmission oils, brake fluid and vegetable oil. It is therefore estimated that about 47,880 litres of used oil is produced per year. Certainty estimates for the estimated volumes are given at the end of s4.

Used Oil Collection and Disposal

There are no private used oil recovery companies in Chuuk. There is no formal used oil collection point in Chuuk. Oil is stored at the location where it was generated. Any disposal of used oil on Chuuk is not governed or managed by either the private sector or a government agency.

Based on the volumes of used oil that are being generated and the figures showing what is being stored and stockpiled there is a possibility that oil is being disposed of in an uncontrolled manner however it is more likely that the shortfall is being taken up by the vessel Thor Finn. The Thor Finn is a tourism vessel that burns used oil as fuel for its steam engine.

There are no oil reuse options available on Chuuk with regard to light or heavy industry at this stage. The best management option is for the used oil to be collected and exported off shore.

National Instruments

The local EPA does provide limited governance over the management of used oil. The most prescriptive regulation is in Part 8 (e) of the Solid Waste Regulations which describes briefly how waste oil should be managed.

The Marine and Freshwater Quality Regulations also provide governance on the management of petroleum products however the enforcement of such regulations is difficult due to limited resources.

Recommendations

Based on this audit of used oil in Chuuk State the following recommendations are offered:

- Encourage the reuse of used oil by the Thor Finn;

- Enter into immediate discussions with Chuuk Public Utilities Corporation (CUPC) to establish whether it is possible to establish a burner that has suitable capacity to take all of the Island's used oil being generated. The scheduled upgrade of the power plant is an ideal time to include, or at minimum, future proof the design so that appropriate facilities could be introduced at a later date;
- Establish a specifically designed centralised collection point within Chuuk. This will include establishing an environmentally secure collection facility that is bunded, covered and monitored to ensure the entry and exit of used oil is correctly managed. The location should be carefully considered so that it complements any potential future reuse options that may be established;
- Establish a formal procedure for collecting, managing and disposing of used oil at the centralised collection point;
- Investigate a 'user pay' system for collecting used oil to help offset the costs for setting up and running the collection process. This may be coupled with leasing the collection and delivery of used oil to the private sector. A designated oil recovery company is motivated to ensure all used oil is managed correctly if the costs are realistic and provide value;
- Establish suitable time frames for exporting the collected oil to an offshore facility given that the estimated amount of used oil being generated each year is now available. This includes executing tender contracts within a timely manner;
- Independent scrutiny of tendering contracts for the export of the used oil. Consideration should be given to the reputation and professionalism of the appointed contractor. Such things as ensuring they have appropriate ships for carrying the oil; they have good history within the industry; they have guaranteed contracts with an approved treatment facility and that they will guarantee stewardship of the product once it has left Chuuk; and
- Consider re-use options on Chuuk. The most obvious re-use option would be to establish a waste to energy system at the existing power station. This would complement the proposed upgrade for the power plant. A suitably sized burner capable of being fuelled by used oil is connected to a heat or steam driven turbine that catches the energy generated by the oil combustion. Connect the turbine to the main power grid which will supplement the existing power production. A feasibility study may be required to establish whether or not enough used oil is generated to warrant such a system.

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1. Introduction

1.1 Purpose

This report covers the State of Chuuk component of a project involving used oil audits in selected Pacific Island countries. The objective of the audits was to establish volumes of lubricating, hydraulic and transmission oils imported annually into each country and the volumes of used oil produced, stored or otherwise disposed. The work was carried out by Contract Environmental Ltd under a contract to the Secretariat of the Pacific Regional Environment Programme (SPREP), with funding provided by the Global Environment Facility. Most of the information required for the audit was obtained in a country visit undertaken by Martyn O’Cain from 9 June to 15 June 2014 and was organised through both the Office of Environment & Emergency Management of the Federated States of Micronesia and the Environmental Protection Agency of Chuuk State.

1.2 Scope of Work

A copy of the Terms of Reference for this work is given in Appendix 1. It lists the following tasks:

- a) *Establish and document national oil import/generation volumes and rates for the last 3 years ideally 2011, 2012 and 2013;*
- b) *Establish national used oil production rates for the last 3 years ideally 2011, 2012 and 2013;*
- c) *[Prepare an] Oil Audit Balance for the last 3 years ideally 2011, 2012 and 2013;*
- d) *Document and summarise existing national used oil management procedures; and*
- e) *Document and summarise existing national used oil management instruments.*

1.3 Report Content and Layout

Section 2 of this report provides details of the annual oil imports to Chuuk, based on the data obtained from the Customs Department and from companies that import directly into Chuuk (CTSI, FSM Petroleum Corp, Ace Hardware).

An estimate of used oil generation rates and volumes is set out in Section 3 and Section 4 contains the overall audit balance, including an assessment of uncertainties in the data.

Section 5 provides information on existing storage facilities for used oil and current stockpiles; current reuse or disposal methods; and an assessment of possible future alternatives. Information on the current shipping costs to the nearest main port is also covered here.

Section 6 sets out the details of the relevant national instruments for used oil management.

Section 7 provides some overall discussions and recommendations, and is followed by the following three (3) appendices:

- A copy of the TOR is given in Appendix 1;
- The organisational details for the country visit and a list of contacts are given in Appendix 2;
and
- The relevant EPA regulations for managing used oil.

2.0 Oil Imports

2.1 Information Provided by the Chuuk Customs Department

The data in Table 1 have been obtained from the Customs Department for 2011, 2012 and 2013.

Table 1 - Oil Import Data for Chuuk State (2011-2013) as provided by Customs Department

| Type of Oil | 2011 (litres) | 2012 (litres) | 2013 (litres) | 3-Year Average (litres) |
|-------------------|------------------|------------------|------------------|-------------------------------|
| Various Oil Types | 70,743 | 47,792 | 53,168 | 57,234 |
| Diesel | 3,096,232 | 6,936,489 | 1,337,655 | 3,790,125 |

2.2 Additional Information on Imports

Table 2 shows the data that has been collected from individual importers of oils that include but are not limited to lubricating oil, hydraulic oil, transmission fluid and two-stroke oil.

Table 2 – Lubricating Oil Import Data for Chuuk (2013) as Provided by Importing Companies

| Company | 2013 (litres) |
|---------------------|------------------|
| FSM Petroleum Corp. | 16,160 |
| Ace Hardware | 10,840 |
| CTSI Ltd | 68,000 |
| Total | 95,000 |

The 2013 Customs data represents only 56% of the oils brought onto the Island by various importers during 2013.

2.3 Cost and Price Information

The following price information for lubricating oil was obtained from CTSI Logistics Ltd.

| Item | Wholesale Price |
|-----------------------------|------------------------|
| Lubricating oil, 208 litres | \$378 - \$499 |
| Lubricating oil, 20 litres | \$46 - \$55 |
| Lubricating oil, 1 litre | \$3.30 |

Note these costs include freight and customs duty of 4%

The Yap power company advised that their current costs for diesel fuel ranged between \$1.16 and \$1.33 per litre from January 2012 to June 2014. Similar costs are expected throughout the Federated States of Micronesia.

3.0 Used Oil Production

The information collected on the production of used oil in Chuuk was obtained by visiting as many companies and operations that could potentially generate used oil. Individuals at each location were asked specifically how much used oil their operation generated over a set period of time. The information was provided verbally as very few operators kept detailed written records. The information was usually provided as drums per month which was then extrapolated to litres per year. The volumes of used oil identified at each locality are included in the contacts list attached as Appendix 2.2.

3.1 Used Oil Recovery by Vehicle and Machinery Servicing

Eleven sites were visited that maintained or serviced vehicles either for their own use or for offsite customers. The businesses and organisations that were visited included auto repair shops, construction companies, oil supply depots and air and sea port terminals.

The annual volume of oil generated by these businesses is calculated to be 6,600 L/yr

3.2 Used Oil Recovery from Ship and Boat Servicing

Four boats were visited that maintained, repaired or serviced their engines within the port at Weno. The boats were solely used to transport people as well as freight to the outer islands of Chuuk. They use diesel fuel when operating. One site that was visited serviced their own outboard motors.

The annual volume of oil generated by these businesses is calculated to be 2,490 L/yr.

There are a number of small boats that operate with outboard motors many of which are used to commute from the main town of Weno to the outer islands however a specialist servicing and repair shop for outboard motors could not be identified on Chuuk. It is understood that servicing is primarily carried out by the individual owners.

Chuuk does not have the facilities nor the capability to accept used heavy fuel oil from visiting ships. Boats visiting Chuuk are mainly cargo ships providing necessary supplies to the island.

3.3 Used Oil Recovery by Power Stations and Small Generators

Large power generators often use heavy fuel oil as their operating fuel. In Chuuk all the generators that were inspected used diesel as the fuel source therefore any used oil that is being generated at these sites is from the use of lubricating oil for running and maintaining the generators.

3.3.1 Small Generators

The power supply on Chuuk is considered fairly unstable in recent years however it is said to have improved markedly in very recent times. As a result of the main power supply being somewhat unreliable there are a number of private generators still being used. These are mainly located at large retail shops, hotels, government departments and public facilities. Only two businesses were identified that used generators as their main source of power (Blue Lagoon Resort and Shigetos Store).

Thirteen businesses were visited that operated a small generator either on a full or part time basis. The annual volume of oil generated by these operations is calculated to be approximately 8,900 L/yr. Please note that this quantity also includes a small percentage of vehicle maintenance oil which some of the businesses also collected.

3.3.2 Chuuk Public Utility Corporation (Power Station)

The Chuuk power station (CPUC) is located in Iras on the outskirts of the main commercial area in Weno.

Oil collected from the maintenance of the 4 diesel generators at CPUC is collected in a 24,000 L tank which is located on the property. Once an unspecified volume has been collected, the oil is given for free to a local steam ship that uses it to fuel the onboard boiler. The use of used oil by the ship will be discussed further in Section 5.2.

The annual volume of used oil generated by CPUC is estimated to be 10,000 L/yr.

3.5 Used Oil Recovered from Outer Islands

The 2010 census indicates that the total population of Chuuk State is 48,651 with 13,856 living in and around the state capital, Weno. Over 70% of the population therefore lives on islands within Truk Lagoon or beyond the atoll on the outer islands. These figures show that a significant proportion of Chuuk's population lives outside the state capital however no formal information was available regarding oil use or used oil generation. The other islands do not have utility power nor do they have any vehicles. Used oil generation will be primarily from small generators and the maintenance of outboard motors. It is accepted that there would be a small percentage of the total volume of used oil being generated on the outer islands however anecdotal evidence gathered from the main centres throughout Micronesia indicates that used oil is re-used for such things as pest control, suppressing odour from 'natural' toilets and fuel for lanterns.

3.6 Survey Allowance

It would be unrealistic to assume that this audit is without inaccuracies and incomplete data. It is accepted that there are businesses and companies that generate used oil but were not visited as part of this audit. Such operations would also include individual vehicle owners that carry out their

own maintenance and repair. It is unknown how many of these operations there are therefore a 10% allowance has been applied to the total volume of used oil that has been determined from visiting individual sites.

4.0 Oil Audit Balance

4.1 Theoretical Used Oil Production Rates

An estimate can be made of the quantities of used oil produced based on the information provided in the previous section.

Waste oil from lubricating oil:

The total annual quantity of lubricating oil imported is approximately 95,000 litres, based on the 2013 figure provided by the importing companies. The private import company data has been used instead of the customs data as it is felt that there are discrepancies in the way the customs information is collected and recorded that could lead to an under estimation of the actual volume.

Typically about 50%¹ of 95,000 litres being imported would be burnt and 50% would contribute to the total used oil produced. The estimate of used oil from lubricating oil is therefore **47,500 litres**.

Waste Oil from Fuel Oil used by Power Stations

Many fuel-operated generators found in small countries use heavy fuel oil rather than diesel. This is not the case for Chuuk. The generators operating in Chuuk use standard diesel to produce the State's power supply. No used oil is generated from the ignition process however it is generated from the lubricating oil that is required to run and maintain the engines.

Waste Oil from Ships

FSM is not a member of the International Convention for the Prevention of Pollution from Ships (MARPOL) therefore it is not expected to accept used oil from visiting ships. It is our understanding that none of the Federated States of Micronesia accepts used oil from visiting ships. On-site observations confirmed that each of the states do not have the facilities at the docking ports to accept, handle or dispose of such a product in the quantities that would be generated.

Waste Oil from Diesel and other Sources

Diesel and other products (e.g. solvents, mineral turpentine, grease, hydraulic oil, cooking oil, etc) also contribute minor amounts to the used oil stream at say 0.01% of the figures that are available from the Customs Department, i.e. **380 litres/year**.

The above figures are summarised in Table 3 below:

¹ These figures have previously been accepted by SPREP based on earlier used oil audits

Table 3 – Theoretical Used Oil Production in Chuuk

| Source of Used Oil | Estimated Quantities (litres/year) |
|-------------------------------------|---|
| Lubricating Oil | 47,500 |
| Waste from Diesel and Other Sources | 380 |
| TOTAL | 47,880 |

4.2 Actual Used Oil Production Rates

The used oil being collected on Chuuk by auto repair shops, heavy plant and machinery operators, generator operators and boat maintenance operations is generally being mixed without any record of what waste stream it is being generated from. No operators were able to indicate the quantities of used oil generated from the different oil products. Therefore for the purpose of this report used lubricating oil, hydraulic oil, transmission oils, grease, and diesel 'slops' are considered as the total used oil generated.

Table 4 – Actual Used Waste Oil Collection in Chuuk

| Source of Used Oil | Actual Quantities (litres/year) |
|---------------------------------|--|
| Vehicle and machinery servicing | 6,600 |
| Ship and boat servicing | 2,490 |
| Small generators | 8,900 |
| CUPC Power Station | 10,000 |
| Sub Total | 27,990 |
| Survey Allowance (10%) | 2,800 |
| TOTAL | 30,790 |

4.3 Used Oil Balance

There is about 36% difference between the theoretical oil production rates and the actual oil production rates as determined from interviewing individual businesses. It is difficult to identify why there is such a significant discrepancy between the two values however some of it may be explained by the following:

- The theoretical assumption that 50% of the oil would be burnt during a normal life cycle may be under estimated.

- The use of oil on the outer Islands of Chuuk may be greater than anticipated
- The contribution of diesel slops to the waste stream may be too low
- The 10% survey allowance is not high enough
- An under estimate by the individuals that were interviewed regarding the actual amount they expect to generate each year
- A combination of some or all of the above

4.4 Certainty Assessment

The confidence levels for each component of the audit balance are summarised below:

- The data for lubricating oil imports can be taken as having a **medium to high level of confidence**. The audit has used the data provided by the import companies for 2013 rather than the Customs data. The reason being that there seems to be an element of subjectivity when describing the type of oil that is being imported under the Customs data system. There is significant scope for data to be missed or categorised incorrectly. The importing companies provided the data directly from their yearly accounts.
- The figure for total used oil produced can be taken as having a **medium to low level of confidence**. The data is reliant on the accuracy of the people that were interviewed at each of the locations and that at least 90% of the used oil generators were visited. The difference between the theoretical used oil volumes and the actual volumes would indicate that some data is missing.

5.0 Current Storage and Disposal Practices

5.1 Existing Storage Facilities and Current Stockpiles

5.1.1 Specific Used Oil Storage Facilities

There is no specialised oil recovery company based in Chuuk nor is there a designated area where used oil can be safely left and stored by individuals or companies. Currently in Chuuk used oil is mostly being stored at the site where it is being generated. Used oil is being stored in drums, plastic pails and the original quart bottles.

5.1.2 Current Stockpiles

Twenty nine individual sites were visited as part of the used oil audit. At each location the volume of used oil that was being stockpiled on the site was recorded and photographed. The total volume of used oil recorded at the time of the audit was 19,680 L. This figure is likely to be slightly underestimated as it is accepted that not every container holding used oil was inspected by the project representatives. Similar to the survey allowance described for the used oil generation an increase of 10% would be considered realistic.

The total volume of used oil stockpiled on Chuuk is estimated at 21,650 L. It is interesting to note that the volume of used oil currently stockpiled on the island is less than the volume that is expected to be generated each year (30,000 L to 50,000 L). This indicates that a significant amount of oil is either being discharged to the environment in an uncontrolled manner or the oil is being reused at a rate that exceeds the annual volume being generated. This is discussed further in Section 5.2 below.

The volumes stockpiled at each location are included in the contacts list attached as Appendix 2.2.

Very few of the sites that were visited had well-managed storage facilities that included bunds and weather protection. The drums and containers were poorly managed and exposed the local environment to significant risk from the uncontrolled release of used oil. Figures 1 & 2 show examples of used oil drums located at local businesses in Chuuk.

It should also be noted that approximately 7,000 L of oil was identified at the former Pacific International Incorporation (PII) construction yard. PII were the contractors commissioned to build the road but were released from the contract prior to it being completed. The used oil at this location is being stored in drums with no weather protection or bunded surrounds.

Figures 1 & 2 – examples of oil drums stored on Chuuk



5.2 Current Reuse or Disposal Methods

Currently there are no heavy or light industry options on Chuuk that are capable of utilising the Islands' used oil. The hospital runs two incinerators for the destruction of medical waste however one runs on kerosene and the other diesel. They have not considered used oil as fuel source.

Based in Truk Lagoon is a tourism operation that provides accommodation and transport for visiting divers. The vessel (Thor Finn) is a former whaling ship that still uses the original steam engine. The vessel is owned and operated by Captain Lance Higgs. Captain Higgs uses used oil as fuel for heating the boiler.

At the time the investigation was carried out Captain Higgs was in Canada however subsequent correspondence indicated that the Thor Finn collects the oil from Chuuk and occasionally from other parts of FSM free of charge. The captain is reluctant to pay for the fuel as it is of low quality but suitable for operating within the Truk Lagoon. According to Captain Higgs the Thor Finn is capable of storing up to 378 000 L of fuel however it is understood that it has never reached this volume in recent years and often some of the tanks are used to store water. Captain Higgs indicated that the tanks are about one third full at the time of the investigation. Unfortunately it is unknown if this is one third of the total storage capacity (126,000 L) or one third of what he normally keeps stored as fuel.

It is understood that Captain Higgs preferably collects used oil from the servicing of generators, the local power plant being the main supplier. The used oil from the generators tends to be 'cleaner' with less water and sediment included.

Captain Higgs also stated that the burning of the used oil is at temperatures that do not harm the receiving atmosphere, however confirming this is outside the scope of this investigation.

Outside of the reuse option that is provided by the Thor Finn, the only alternative option for the disposal of the excess used oil from Chuuk, at the time the audit was undertaken, is to have it taken offshore and disposed of at a facility that has the capability to treat the product to a standard where it can be reused for light and/or heavy industry purposes elsewhere.

5.3 Assessment of Possible Future Alternatives.

Future alternatives are limited on Chuuk given the absence of any significant light or heavy industry. However it was encouraging to hear from the Operations Manager, Mr Dennis Triana, at CPUC that they were planning to upgrade the power plant with new diesel generators. The upgrade would include a used oil burner similar to that seen at the Aimeliik power station in Palau.

The upgrade of the power plant and the inclusion of a used oil burner creates the opportunity to discuss alternative reuse options with the owners/designers of the plant. Discussions should be centred on the opportunity to install a used oil burner that has the capacity to accept used oil not generated solely from the power plant but also from local businesses and individuals.

There is also the opportunity to extend this scenario further and couple the oil burner with a heat recovery unit that could generate energy thus providing a waste to energy option. Such a facility is ideally suited at the power plant as they already have the infrastructure to deliver the energy that is generated.

An alternative option that may warrant further research is discussing with the hospital the possibility of using used oil to fuel their incinerators. Initial discussions indicated that this is not possible using the current system however if it could be modified or upgraded it would provide a reuse option for the island.

It is acknowledged however that an upgrade or introduction of new technology would require significant upfront capital which would most likely be outside the means of the State or Federal government without an offshore partner. It is also acknowledged that these systems are reasonably 'high tech' and carry significant risk if not managed or used correctly. Assistance in training and maintaining such equipment would have to accompany any reuse initiatives.

5.4 Administration of Used Oil Exports

The Federated States of Micronesia and therefore the State of Chuuk is a party to both the Basel Convention and Waigani Convention. As such, Chuuk may export used oil to other countries that are parties to Basel and/or the Waigani Conventions.

5.5 Current Shipping Costs

Mr Rick Doydec of CTSI Logistics estimated the cost to ship a 20 ft container from Chuuk to the Phillipines at \$3,000 - \$4,000. This does not include the collection, loading and unloading of the drums, port handling fees or insurances.

6.0 Relevant National Instruments

6.1 Relevant National Legislation and Regulations

The State of Chuuk has a number of regulations that control various environmental activities and include references to used or waste oil.

The management of used oil is regulated under the country's solid waste regulations. Part 3 (II) defines solid waste as *"...garbage, refuse and other discarded solid materials including solid waste materials resulting from industrial and commercial operations, and from community activities, ... This definition is intended to include liquid waste materials such as waste oil, pesticides, paints, solvents, and hazardous waste."*

Section (e) Part 8 – Standards for Hazardous Waste specifically address the management of waste or used oil, *"Generators of waste oil shall adopt all practical measures to reduce waste quantities and to reuse or recycle waste oil to the maximum extent possible. Where it can be demonstrated that wastage is necessary, disposal methods shall be approved by the Director. Spreading of oil on roadways, airports, or other areas for the purpose of dust control shall be initially limited to areas which preclude the possibility of contamination of (1) potable ground water; (2) surface waters; and, (3) areas under agricultural cultivation of foods crops"*.

The Marine and Freshwater Quality Regulations also provide a level of governance aimed at the correct management of oil products. Section B(9) of Part 6 – Water Quality Standards states that for all waters *"the concentration of oil or petroleum products shall not:*

- a) Be detectable as a visible film, sheen or discoloration of the surface or cause an objectionable odor.*
- b) Cause tainting of fish or other aquatic life, be injurious to the indigenous biota or cause objectionable taste in drinking water.*
- c) Form an oil deposit on beaches or shoreline or on the bottom of a body of water."*

The relevant EPA Regulations are attached as Appendix 3.

6.2 Relevant National or State Programmes and Policies

No information on National or State programmes was provided by Chuuk EPA staff.

7.0 Discussion and Recommendations

7.1 Used Oil Generation

The average quantity of lubricating oil imports into Chuuk was about 95,000 litres for 2013 and it is estimated that approximately half that would end up as used oil. In addition small amounts of the 3,790,125 litres of diesel and other oil based products imported into Chuuk would end up in the used oil stream.

All the oil generated is collected from the maintenance of vehicles, boats or generators. Chuuk does not have the facilities to collect and treat used fuel oil from visiting ships.

There are no established companies in Chuuk that recover used oil from the businesses and companies that generate the used oil as part of their day-to-day operations. Used oil that is generated is currently being stored on the premises where it is being generated or given to 'locals' for pesticide control, lantern fuel or for lubrication of concrete block moulds to name but a few examples.

The amount currently being generated is estimated at around 47,000 L/year while at the time the investigation was undertaken about 21,650 L of used oil is currently stored on Chuuk. The current stockpile volume is less than what is expected to be generated each year indicating that a significant amount is being disposed of inappropriately or the local steam boat the Thor Finn is reusing enough used oil to help keep the volumes on Chuuk at a manageable level.

It is noted that at the time of the investigation the Thor Finn may have up to 115,000 L of used oil stored on board. This would bring the volume of stockpiled oil on Chuuk up to around 162,000 L however given that the Thor Finn uses the oil as an operating commodity, the volume on board, at any given time, will vary therefore difficult to accurately estimate the effect on the amount stockpiled on Chuuk.

7.2 Used Oil Collection

As discussed in Section 5.1.1 there is no established oil recovery company operating in Chuuk nor is there any formal centrally located collection facility for used oil. Currently used oil is collected in drums or other various containers and stored on the premises where it originated. The manner in which the oil is being stored is not environmentally protective with many of the storage containers exposed to the elements.

It has been identified however that the vessel Thor Finn does collect some of the used oil generated on Chuuk to use in the running of its steam engine.

Currently there is an estimated 21,650 L stockpiled on premises around Chuuk. This poses a potential significant environmental risk to Chuuk. The only current reuse option available to Chuuk is the amount collected by the Thor Finn for fuel purposes. The Thor Finn is helping to keep

stockpiles down however it appears that the amount being generated exceeds the amount that the Thor Finn is utilising.

The only existing option available to businesses and industries that accumulate used oil is to continue storing at the originating premises or giving it away to locals for various uses. There is no formalised or centralised collection system.

7.3 Used Oil Management

The volumes of used oil that are being generated and those that have been identified in stockpiles indicate that a significant amount may be mismanaged as there is a noticeable deficit between the stockpiled volume and the annual volume being generated. However it is expected that most, if not all, of the deficit is being used by the Thor Finn as fuel. The only evidence of used oil being disposed of in an uncontrolled manner is the second hand stories regarding locals requesting it from businesses for treating timber to protect against termites, using it as a lubricant when making concrete blocks, lantern fuel and so on.

The main issue to arise from the investigation undertaken on Chuuk is the lack of environmental management being implemented by businesses generating and storing used oil. This is a natural consequence of Chuuk not having a centralised and well managed collection point.

Establishing a centralised collection point will require due consideration particularly regarding the location. There was no obvious location identified on Chuuk however, similar to Yap State the likely sites are the power plant, the FSM Petroleum Corp. tank farm and the local port area however the landfill site is not an option as it is small, near capacity and looking to be relocated.

Power Plant (CPUC)

The power plant is an obvious location for establishing a used oil collection point, however initial observations indicate that it may not have the space required to establish a suitably designed collection point. This issue would require discussions with the current site management.

It was encouraging to hear that the power plant was being upgraded in the near future which would include an incinerator for getting rid of the used oil generated by the power plant. As discussed in Section 5.3 if the capacity of the burner was extended to accommodate burning used oil from other businesses then the natural progression would be to establish a collection point at this location as well.

If a burner suitable for accepting used oil from all over the island is not included then the location of the power plant may not be suitable for collecting and storing used oil on the basis that it is some distance from the port. If the excess oil is to be exported off the island then it would need to be transported to the dock.

Port Area

The port area was not specifically investigated with regard to establishing a centralised collection point however there did appear to be plenty of space available. This would need to be confirmed with port management.

A location at the port would assist with exporting the oil off the island if this is what is required, particularly in the short term. Any port security issues regarding access would also need to be discussed with port management.

The availability of a large storage tank located within the port area was not explored however this could also be discussed with port management.

FSM Petroleum Corporation tank farm

The FSM PC tank farm is located alongside an easily accessed wharf within the port. If FSM PC were in a position to assist with providing a large storage tank then the site would be ideal for establishing a centralised collection point. It is acknowledged however that FSM PC is a private company and therefore they may not wish to be involved in any used oil management initiatives due to limited infrastructure for such a product as well as access, health and safety, security and/or liability concerns.

The Chuuk EPA office does have capacity within its current regulations to enforce safe and effective storage of used oil on the island(s) however there was a noticeable undertone within the organisation that when such issues were raised by EPA staff they were going largely unnoticed by local businesses.

With regard to the management of used oil at a state level, the findings of this report do suggest that collecting it and exporting it offshore is the most appropriate way to manage the product in the foreseeable future. The Thor Finn will continue to take and use used oil however the excess will need to be better managed.

The most urgent aspect associated with the short and long term management of used oil on Chuuk is to establish a formal, well designed centralised collection point. Coupled with establishing a collection point is the requirement to raise the awareness of the producers of used oil to the potential adverse effects that the product can have on the environment if it is not properly managed. This can be delivered via various media outlets and through EPA visits.

The following table provides a summary of the key information collected in the survey:

Table 5: Summary of Key Information on Waste Oil for Chuuk

| ANNUAL OIL IMPORT VOLUME (LITRES/YEAR) 2013 | ANNUAL WASTE VOLUME ESTIMATE (LITRES/YEAR) | CURRENT STOCKPILE OF WASTE OIL ESTIMATE | ORGANISED COLLECTION BY? |
|--|--|---|---------------------------------|
| 95,000 litres/year | 31,000 – 47,000 litres/year | 21,650 litres | Nil |
| DIRECT CONTAINER SHIPPING ROUTE TO PHILIPPINES? | SHIPPING COSTS (APPROX. FOR A 20FT CONTAINER) | CURRENT REGULATORY DRIVERS? | PARTY TO BASEL/WAIGANI? |
| Yes | US\$3,000 - \$4,000 (excludes wharf fees, insurance etc) | Yes (EPA regulations however they appear limited) | Yes/Yes |

7.4 Recommendations

Based on this audit of used oil in Chuuk State the following recommendations are offered:

Short to medium term

- Encourage the reuse of used oil by the Thor Finn;
- Enter into immediate discussions with CUPC to establish whether it is possible to establish a burner that has suitable capacity to take all of the island's used oil being generated. The scheduled upgrade of the power plant is an ideal time to include, or at minimum, future proof the design so that appropriate facilities could be introduced at a later date. Similar discussions could also be had with the hospital to understand what would be required to upgrade their facility;
- Establish a specifically designed centralised collection point within Chuuk. This will include establishing an environmentally secure collection facility that is bunded, covered and monitored to ensure the entry and exit of used oil is correctly managed. The location should be well considered so that it complements any potential future reuse options that may be established;
- Establish a formal procedure for collecting, managing and disposing of used oil at the centralised collection point;
- Investigate a 'user pay' system for collecting used oil to help offset the costs for setting up and running the collection process. This may be coupled with leasing the collection and delivery of used oil to the private sector. A designated oil recovery company is motivated to ensure all used oil is managed correctly if the costs are realistic and provide value;
- If establishing a used oil incinerator at the power plant or hospital is not an immediate option, establish suitable time frames for exporting the collected oil to an offshore facility given that the estimated amount of used oil being generated each year is now available. This includes executing tender contracts within a timely manner; and
- Independent scrutiny of tendering contracts for the export of the used oil. Consideration should be given to the reputation and professionalism of the appointed contractor. Such things as ensuring they have appropriate ships for carrying the oil; they have good history within the industry; they have guaranteed contracts with an approved treatment facility and that they will guarantee stewardship of the product once it has left Chuuk.

Long term

- Consider re-use options on Chuuk. The most obvious re-use option would be to establish a waste to energy system at the existing power station. This would complement the proposed upgrade for the power plant. A suitably sized burner capable of being fuelled by used oil is connected to a heat or steam generated turbine that catches the energy generated by the oil combustion. Connect the turbine to the main power grid which will supplement the existing power production. A feasibility study may be required to establish whether or not enough used oil is generated to warrant such a system.

It is acknowledged that the implementation of some of these recommendations will require significant financial capital that is unlikely to be readily available. Funding from or partnering with an outside agency would more than likely be required. It is also acknowledged that these systems are reasonably 'high tech' and carry significant risk if not managed or used correctly. Assistance in training and maintaining such equipment would have to accompany any reuse initiatives.

Appendix 1: Copy of the Terms of Reference

Summary

Completion of contemporary used oil audits in Cook Islands, FSM, Kiribati, Marshall Islands, Nauru, Niue, Palau, PNG, Solomon Islands, Tonga, and Tuvalu

Objective

Completion of contemporary used oil audits in Cook Islands, FSM, Kiribati, Marshall Islands, Nauru, Niue, Palau, PNG, Solomon Islands, Tonga, and Tuvalu to establish volumes of lubricating, hydraulic and transmissions oils imported into each country and the volume of used oil produced, and stored or otherwise disposed of.

Location of Work

- Sub-region A: PNG
- Sub-region B: FSM, Marshall Islands and Palau
- Sub-region C: Kiribati, Nauru , Solomon Islands and Tuvalu
- Sub-region D: Tonga, Cook Islands, and Niue

Tasks

For each nominated sub-region (A, B, C & D), the Consultant will visit each country and spend as much time as is necessary to collect the information required to:

- a. Establish and document national oil import/generation volumes and rates for the last 3 years ideally 2011, 2012 and 2013:
 - i. Document by major suppliers, the annual volume of lubricating, hydraulic and transmission oils imported into each country for internal use;
 - ii. Document quantities of each oil distributed to outlying islands from main port(s) of entry;
 - iii. Obtain retail and wholesale purchase costs for: a 205litre and 20litre drum; and 5 litre, 4 litre and a 1 litre containers of lubricating oils; and
 - iv. Identify prices for fuels in particular the cost of diesel fuel purchased by power generators.
- b. Establish national used oil production rates for the last 3 years ideally 2011, 2012 and 2013:
 - i. Document used oil volumes recovered from outlying islands;
 - ii. Visit large and small vehicle service centres to establish actual recovery rates;
 - iii. Visit bus, haulage and construction companies to establish actual recovery rates;

- iv. Visit the port authority, operators of fishing/private vessel and international vessels, shipping agents and shipping companies to establish actual recovery rates;
- v. Visit electricity generators using diesel powered generators to establish recovery rates; and
- vi. Document volumes of used oil generated by any other major users.
- c. Oil Audit Balance for the last 3 years ideally 2011, 2012 and 2013:
 - i. Prepare an audit balance of new oils and used oils.
- d. Document and summarise existing national used oil management procedures:
 - i. Identify existing storage facilities and stored oil volumes;
 - ii. Identify where possible, current used oil disposal locations;
 - iii. Provide photographic records of existing collection and storage facilities;
 - iv. Identify possible end users in country or within the relevant distribution network for the used oil, either using the used oil as a diesel extender, a supplementary furnace fuel etc;
 - v. Review the paperwork pertaining to the transportation of any used oil from each country; and
 - vi. Document shipping costs of containerised or tank-tainers of used oil to the nearest main port with adjacent used oil recycling facilities (e.g. Australia, Fiji, India, Japan, New Zealand, Philippines, Singapore). Shipping costs shall include documentation costs, port handling costs and any insurance costs.
- e. Document and summarise existing national used oil management instruments:
 - i. Document used oil provisions in national legislations by identifying relevant national waste management legislation, regulations and policies that manage used oil, and provide an overview of any national used oil management regulatory considerations.

Project Deliverables

Provide comprehensive draft audit reports (individual reports for each country) including the methodology used and associated confidence levels for the reported data for each country by the 29th August 2014 and final reports by the 30th September 2014 or other date subsequently agreed with SPREP.

Timeframes

All final reports completed and submitted to SPREP within twenty six (26) weeks from the date of contract signature.

Appendix 2: Organisational Details and List of Contacts

A2.1 Organisational Details

The visit to Chuuk took place from 9 June to 15 June 2014. The consultant was Martyn O’Cain.

The primary agency for liaison was the Chuuk Environmental Protection Authority, and the following personnel were involved:

Ismael Mikel, Office Manager

Jack Sham, Environmental Officer

These officers were very helpful and provided considerable support during the visit.

Numerous other people were visited and considerable assistance was willingly provided. Full contact details are given below.

A2.2. List of Contacts

| Company | Date | Location | Type | Category | Contact | ULO Generated (litres/year) | Stockpiled (litres) |
|-------------------------|------------|-----------|---------------|-----------|-------------|-----------------------------|---------------------|
| Micro Enterprises (IDC) | 9/06/2014 | Iras | Engine repair | Vehicle | Ray Sambile | 1,900 | 300 |
| Nien Chuuk | 9/06/2014 | CFTI Port | Boat | Boat | | 230 | 208 |
| Lien Naufich | 9/06/2014 | CFTI Port | Boat | Boat | Frank | 1,000 | 0 |
| Unnamed Boat | 9/06/2014 | CFTI Port | Boat | Boat | | 1,000 | 0 |
| KSVI No 1 | 9/06/2014 | CFTI Port | Boat | Boat | | 230 | 230 |
| CPUC Power Station | 9/06/2014 | Iras | Power Station | Generator | | 10,000 | 5,700 |
| Chuuk Telecom | 9/06/2014 | Iras | Telcomm | Generator | | 75 | 75 |
| Bernies Store | 9/06/2014 | Iras | Supermarket | Generator | | 90 | 0 |
| Jordans Auto | 9/06/2014 | Iras | Engine repair | Vehicle | | 1,150 | 28 |
| Kurussa Hotel | 9/06/2014 | Iras | Hotel | Generator | | 28 | 15 |
| FSM Petroleum Corp | 10/06/2014 | Nepukos | Oil Company | Vehicle | | 208 | 0 |
| Lucky 8 Auto | 10/06/2014 | Nepukos | Engine repair | Vehicle | John Paul | 900 | 75 |
| Chuuk Hospital | 10/06/2014 | Nepukos | Hospital | Generator | Stephen | 1,250 | 2,700 |
| EPA Office | 10/06/2014 | Mechitiw | Govt. dpmnt. | Generator | Jack Sham | 20 | 75 |
| High Tide Hotel | 10/06/2014 | Iras | Hotel | Generator | | 57 | 300 |
| Samis Store | 10/06/2014 | Nepukos | Supermarket | Generator | | 57 | 208 |
| Winipat Auto | 10/06/2014 | Sefin | Engine repair | Vehicle | | 208 | 57 |
| GPPC | 10/06/2014 | Iras | Construction | Vehicle | Anthony | 625 | 208 |
| AWM Enterprises | 11/06/2014 | Sefin | Supermarket | Generator | Carlos | 830 | 0 |
| Reos shop | 11/06/2014 | Sefin | Engine repair | Vehicle | | 230 | 0 |

Chuuk State Waste Oil Audit

| | | | | | | | |
|------------------------------|------------|---------|------------------|-----------|-----------------|-------|------|
| Transco (port) | 11/06/2014 | Nepukos | Engine repair | Vehicle | Conrado Fedrigo | 930 | 0 |
| Recycling Centre | 11/06/2014 | Nepukos | Waste Management | Generator | | 3,000 | 0 |
| PII former construction yard | 11/06/2014 | Iras | Engine repair | Vehicle | | 0 | 7000 |
| College of Micronesia | 11/06/2014 | Nepukos | College | Generator | Regan | 113 | 300 |
| Truk Stop Hotel | 12/06/2014 | Sefin | Hotel | Vehicle | Randy | 208 | 100 |
| Blue Lagoon Resort | 12/06/2014 | Neiuo | Hotel | Generator | Loreni | 2,700 | 730 |
| Latter Day Saints Church | 12/06/2014 | Sefin | Church | Boat | Siramino | 30 | 0 |
| Airport Utilities | 12/06/2014 | Iras | Airport | Vehicle | | 240 | 800 |
| Shigetos Store | 12/06/2014 | Nepukos | Supermarket | Generator | Hector | 680 | 570 |

Appendix 3: EPA Regulations

SOLID WASTE REGULATION

PART 1 AUTHORITY

These regulations are promulgated by the Chuuk State Environmental Protection Agency pursuant to Public Law 2-94-01. This regulation shall have the force and effect of law.

PART 2 POLICY

The purpose of this regulation is to establish minimum standards governing the design, construction, installation, operation, and maintenance of solid waste storage, collection and disposal system.

Such standards are intended to:

- a) Prevent pollution of the drinking water or waters of Chuuk State;
- b) Prevent air and land pollution;
- c) Prevent the spread of disease and the creation of nuisance;
- d) Protect the public health and safety;
- e) Conserve natural resources; and
- f) Preserve and enhance the beauty and quality of the environment.

PART 3 DEFINITIONS

- II) "Solid Waste" means garbage, refuse and other discarded solid materials including solid waste materials resulting from industrial and commercial operations, and from community activities, but does not include solid or dissolved materials in domestic sewage or other substances in water sources, such as silt, dissolved or suspended solids in industrial waste water effluents, dissolved materials in irrigation return flows or other common water pollutants. This definition is intended to include liquid waste materials such as waste oil, pesticides, paints, solvents, and hazardous waste.

PART 8 STANDARDS FOR HAZARDOUS WASTE.

Each island shall be responsible to see that facilities for the disposal of hazardous waste materials are available.

Any person desiring to dispose of hazardous waste materials shall notify the Chairman of his authorized island representative of the intention to do so. Such disposal shall be completed only upon authorization of the Chairman or his representative.

Any solid waste facility that accepts hazardous waste materials for disposal shall dispose of such wastes in accordance with the rules and regulations of the Board and the standards of this section. The Chairman shall adopt and from time to time, revise such standards as he deems necessary. Such standards and revisions shall include procedures designed to prevent damage to human health or living organisms from exposure to the hazardous wastes identified in this section.

- a) Infectious and pathological wastes generated at medical, veterinary and other facilities shall be incinerated, sterilized or otherwise rendered safe prior to removal from these facilities for final disposal.
- b) Toxic, caustic, volatile and flammable chemical waste may be incinerated or disposed of in a manner approved by Chairman prior to final disposal. If such wastes are delivered directly to a landfill, it shall be rendered non-hazardous by chemical neutralization or stabilization prior to final disposal.

The disposal of chemical wastes at a landfill shall be in a special trench or pit that is designed to retain the wastes and prevent infiltration into ground and surface waters.

The burial area shall be clearly marked with adequate warning signs and under no circumstances will smoking or open flames be allowed when these types of wastes are being disposed of. The burial site shall be recorded in the final plan of the completed site and made a part of the legal description of the property.

- c) Dewatered sludge from water treatment plants and Dewatered digested sludges from water treatment plants shall be mixed with the other deposited solid wastes at the landfill to prevent localized leaching. Raw sewage sludges and septic tank pumping are prohibited at all solid waste disposal facilities.
- d) Any proposed new activity or modification to an existing activity, which cause the generation of hazardous waste shall submit to the Chairman a hazardous waste management plan. The new or modified activity shall not commence prior to acceptance of the plan by the Chairman.
- e) Generators of waste oil shall adopt all practical measures to reduce waste quantities and to reuse or recycle waste oil to the maximum extent possible. Where it can be demonstrated that wastage is necessary, disposal methods shall be approved by the Director. Spreading of oil on roadways, airports, or other areas for the purpose of dust control shall be initially limited to areas which preclude the possibility of contamination of (1) potable ground water; (2) surface waters; and, (3) areas under agricultural cultivation of food crops.

MARINE & FRESH WATER QUALITY STANDARD REGULATION

PART 6 WATER QUALITY STANDARDS

9) Oil Petroleum Products

The concentration of oil or petroleum products shall not: **All Waters**

- a) Be detectable as a visible film, sheen or discoloration of the surface or cause an objectionable odor.
- b) Cause tainting of fish or other aquatic life, be injurious to the indigenous biota or cause objectionable taste in drinking water.
- c) Form an oil deposit on beaches or shoreline or on the bottom of a body of water.