

# **Time & Motion Study Report 2013**

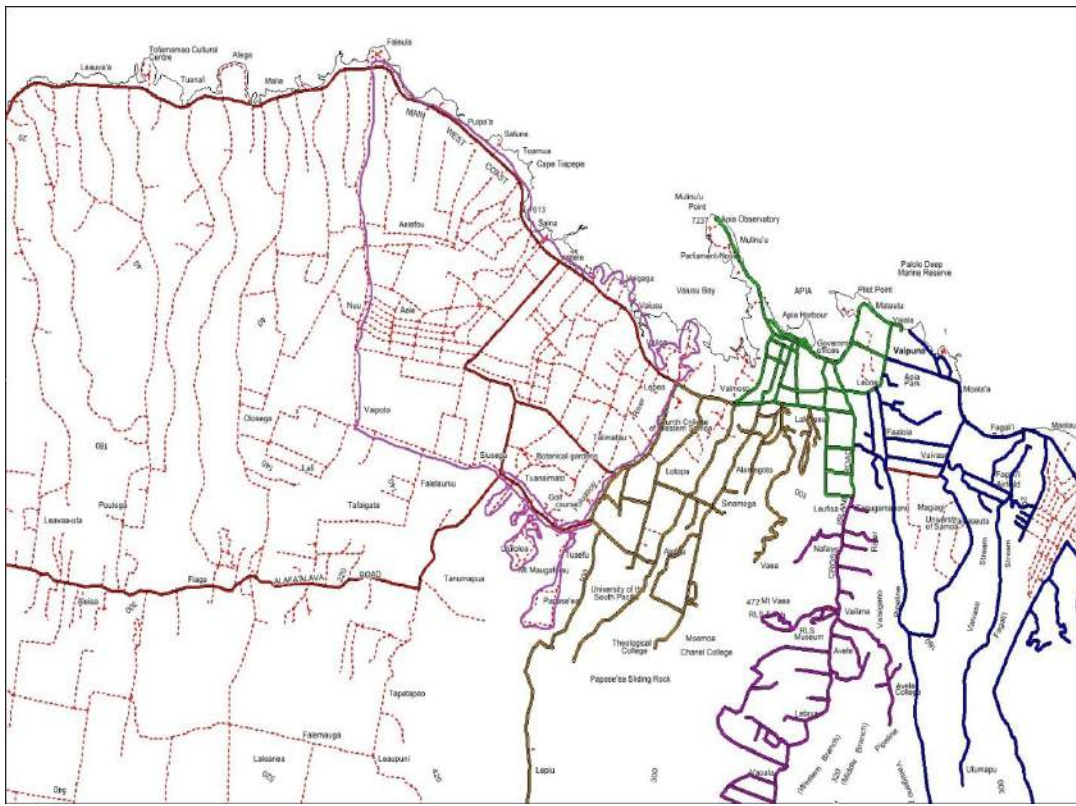
# Table of Content

1. Introduction
  - 1.1 Background Information
  - 1.2 Objectives
  - 1.3 Survey Items and Analysis
  
2. Methodology
  - 2.1 Preparation
  - 2.2 Study Area
  
3. Survey Results
  - 3.1 Vehicle Capacity Utilization
  - 3.2 Working Hours Utilization
  
4. Conclusion

# Introduction

This report presents the analysis of data collected during the time and motion study conducted for Zone A rubbish collection (marked green in the map below). This zone is currently serviced by Jaffa's Sanitary System Contractor under the Ministry of Natural Resources of Samoa's supervision.

The study was carried out under the J-PRISM project coordinated by the Waste Management Section of the Ministry of Natural Resources and Environment. J-PRISM Project focuses on Waste Management in terms of minimizing and sanitary disposal of waste. The waste collection data collected from this survey provides the basis of future waste management programs and actions to be conducted and implemented by MNRE to properly manage solid waste generated in Samoa.



## **Background Information**

Time and Motion Study provide important data and information to assist national governments and responsible waste management organization and agencies in designing and developing proper plans, programs and actions to efficiently collect the waste generated in the city and to guide and minimize generation of solid waste. It is vital to obtain appropriate data and information for planning purposes and to continuously make use of this information to manage waste. The procedure for the time and motion study is outlined in the Guides for Municipal Solid Waste Management in the Pacific Islands Countries (WHO 1996) and lessons learnt through the training participated in Japan 2012.

Currently there are only 2 types of collection introduced in Samoa since 2001 for households only. The first is general waste collection twice per week in all zones except zone A where the collection is twice daily, and second type is the bulky waste collection once in every 3 months for all zones. Partnership with JICA through J-PRISM Project, Samoa introduced a recyclable collection for Rubbish Collection in Zone A which is the town area for every Saturday starting from the first Saturday in November 2013 for 1 year. This time and motion study was conducted before the new collection was introduced and the data from this survey will be compared with a schedule survey that will be conducted after one year of the new collection.

## **Objectives of the Survey**

To study and understand the current status of waste collection for appropriate actions.

- To determine how efficient the rubbish truck is being used and suitable to the size of their collection zone
- To study the behaviour of the crew and how efficient they carry out their service.
- Identify the cooperation between the service provider and the discharger.
- To check whether the collection route is appropriately planned.
- To check whether the collection time is suitably scheduled.
- To check if the containers used by the dischargers are appropriate

## **Survey Items / Analysis**

### A) Collection Vehicle

To determine how efficient the collection vehicle is being used for the designated zone following items to be survey:

- The capacity of the vehicle

- The type and year of fabrication
- The working condition of the vehicle during the collection
- Population of the designated zone
- Number of households of the designated zone
- Any littering of the wastes from the truck, leakage of leachate or bad odour during transport

B) Discharge Method

To determine whether the collection time is properly scheduled and whether the public cooperate in the collection due to proper storage following items to survey:

- How the discharger packed and store their rubbish
- Location and heights of platforms
- Time of collection

C) Collection Route

To determine whether the collection route is properly designed following are items to survey:

- Condition of the road
- Distance covered
- Distance between collection points
- Number of collection points
- Traffic and road conditions along the route

D) Crew working conditions

To determine how the crew manages their collection. Following are items to survey:

- Number of crew members
- Cooperation between the driver and the helper(s)
- Safety gear
- Handling of waste during emptying and loading
- Cleaning of scattered rubbish lying around the platforms due to poorly packing
- Number of break times during the collection

E) Disposal Site

To study the offloading condition

- Time spent at the disposal site
- Distance of the designated zone and the disposal site
- The crews interaction with the waste pickers
- Controlling the collection truck location while offloading

# Methodology

The study carried out in accordance with the standard procedures set under WHO for Time and Motion Study.

The preparation and planning of the study was assessed during the dialogue training in Japan. Data analysis and calculations of time spent, distance, man hours etc was calculated using information provided during this training.

## Preparations

### Information and documents

- Data sheet to record all information on the arrival and departure time of the collection vehicle, time spent between collection points, the distance between stops and number of plastic bags discharged.
- The collection zone map to track the crew's route
- Data on the number of households and population of the collection zone
- Number of the crew
- Characteristics of the collection vehicle
- Details of the collection schedule

### Equipment's and tools

- Digital watch to check the time of every movement of the collection truck
- Weigh bridge for measurement of the collected load
- Vehicle for the study team

### Responsibilities of each member of the study team

- 4 team member
  - o 1 driver responsible for the odometer reading
  - o 1 beside the driver to call out the number of trash bags collected by the crew
  - o 2 recording members, 1 for the time consumption and the other for the waste collected.

## Study Area

The selected area studied was the town area and suburban areas collection zone which is the rubbish collection zone A with the total population of 7050 and 977 households. The Government Collection was only for residence not including Commercials and Institutions but most of the businesses, organizations, institutions and schools are located in this collection zone. And it covers a lot space mainly in the centre of Apia Town and it's another cause of increase in travelling time during the study.



# Survey Results

## Working Hours Utilization

Times spent during the study are shown in the following tables. The study started at 1:43am and finished at 7:01am. The time counted started from departure at the contractor's garage to the collection route, after collection and disposal site.

<b>A. TIME ANALYSIS</b>	<b>1<sup>ST</sup> TRIP</b>	
	<b>SECOND</b>	<b>%</b>
Total Time	5:18:31	100%
Collection Time	1:34:26	30%
Travel Time	2:11:05	41%
Break Time	0:27:50	8.7%
Traffic Time	0:01:44	0.5%
Scale Time	0:01:14	0.4%
Dumping Time	0:12:23	3.9%
Waiting Time	0:49:49	16%
<b>B. DISTANCE ANALYSIS</b>		
Garage – First Station	0	
First – Last Station	29	
Last – Dump Site	10	
Speed (Garage – 1st Station)	0	
Speed (1st – Last Station)	8.8kph	
Speed (Last – Dump Site)	21.4kph	
<b>C. WASTE COLLECTION</b>		
Weight of waste	2800kg	
Number of stations	173	
Average Wasteamount per station	16.2kg/sta.	
Population served in trip	7050cap	
Unit generation rate (UGR) for 1 collection	0.40kg/cap	
Unit generation rate for Zone A (collection was twice daily)	0.20kg /cap	
<b>D. EFFICIENCY</b>		
Load/working hour	.35 (ton/hr)	



Load / collection time	1.78 (ton/hr)
Labor Time efficiency rating	41%
Gross man minute	514.08 (min/ton)
Net man minute	69.68 (min / ton)
Total Time for 1 <sup>st</sup> trip load	33.60 (hr/ton)

### **Vehicle Capacity Utilization**

One collection vehicle servicing the whole zone twice per day. The collection schedule was 2:00am and 5:00pm. The collection truck was suitable for the collection zone, based on the total weight of the load. The collection truck was not overloaded during the collection and only 1 trip to cover the whole zone per schedule collection.

<b>Collection Vehicle</b>	<b>Results</b>
Year of fabrication	1999
Collection Vehicle brand	Mitsubishi
Vehicle Body Capacity	19m <sup>3</sup> / 6.70 tonnes
Working Condition	Good

<b>Discharge Method</b>	<b>Results</b>
Packing / Storage	<ul style="list-style-type: none"> <li>• Various types of rubbish bags ie: plastic bags, cardboard boxes, rice, sugar and flower empty sacks, woven bags, trash bags, rubbish bins, gallons, plastic containers</li> <li>• Some platforms, rubbish were not packed properly,</li> <li>• Some of the packing materials were broken, (got holes, cracked or without caster)</li> <li>• Some villages not all the families or residents have platforms. Some just put their rubbish beside the roads in front of their houses, some don't have.</li> </ul>
Location / Heights of Platforms	<ul style="list-style-type: none"> <li>• Some platforms' locations are not</li> </ul>

	<p>suitable and safe for the crew. Other families platforms are inside their compound fences and so high so that the crew can't reach them from outside.</p> <ul style="list-style-type: none"> <li>• Some platforms are too low that the stray dogs can easily scatter the rubbish.</li> <li>• Other platforms are damaged and the dogs and cats can easily jump in and destroy rubbish bags</li> <li>• Roughly 40 % of the collection zone are having problems on storage and packing include the residents without platforms</li> </ul>
Schedule Time of collection	<ul style="list-style-type: none"> <li>• The time was suitable for the town area. The collection went smooth because the roads were clear, no traffic except in the morning during the collection of schools.</li> </ul>

Collection Route	Results
Condition of the road	<ul style="list-style-type: none"> <li>• Most of the roads are well paved</li> <li>• Some roads are closed due to cyclone damage and it caused duplicates</li> <li>• Other roads are narrow but manage to flow the collection</li> </ul>
Time Spent at the collection zone	<ul style="list-style-type: none"> <li>• 1:34:26</li> </ul>
Distance Covered	<ul style="list-style-type: none"> <li>• 29km</li> </ul>
# of collection points	<ul style="list-style-type: none"> <li>• 173 including waste along the road sides, :34 empty platforms, some access roads were not covered during this collection only Mondays and Fridays collection</li> </ul>

Crew Working Condition	Results
# of crew members	<ul style="list-style-type: none"> <li>• 1 driver + 2 collectors</li> </ul>
Cooperation between the driver & crew	<ul style="list-style-type: none"> <li>• Well cooperation between the driver and the crew especially during loading time. The driver was serious on crew before loading for safety.</li> </ul>

Safety gear	<ul style="list-style-type: none"> <li>• They were wearing their safety gears except gloves and clear glass for their hands and eyes safety from sharp waste and leachate.</li> <li>• Safety gears (overall / safety boots / mask / vest with reflectors )</li> </ul>
Handling of waste during empty and offloading	<ul style="list-style-type: none"> <li>• The crew was doing a great job in collection of waste from platforms also loading time; we discovered how energetic the collectors were. They were running from the beginning of the collection, they only rest during break time and then continue their usual move for the collection and it save the time and finished their zone before dawn and traffic.</li> </ul>
Crew behaviour during collection	<ul style="list-style-type: none"> <li>• The crew behaved well during the collection time,only on travel time that they use the back bumper to stand on which is unsafely.</li> </ul>
# of break time	<ul style="list-style-type: none"> <li>• 1 break time</li> </ul>

Disposal Site	Results
Time spent at disposal site	<ul style="list-style-type: none"> <li>• 12minutes and 23 seconds</li> </ul>
Distance between last station and disposal site	<ul style="list-style-type: none"> <li>• 10km</li> </ul>
Crews interaction with waste pickers	<ul style="list-style-type: none"> <li>• Landfill worker guided the truck to the location for off-loading. About 5 waste pickers were at the landfill during off loading and they were waited till the truck finished off loading before they did their job.</li> <li>• No interaction between the crews and the waste pickers</li> </ul>
Controlling of the collection vehicle while offloading	<ul style="list-style-type: none"> <li>• Well controlled</li> </ul>

## Conclusion

The outcome of this survey performed in Samoa is very important for the Ministry. This will appropriately address and put in place actions to address the current status and nature of domestic collection in the town area in order to improve our waste management collection services for the protection of human health and our surrounding environment. The survey results reflect the current situation in terms of time spent for the collection, the contractor's performance and the public collaboration. These results mentioned on the report provide accurate information useful for plans, policy and awareness on waste collection services performance and cooperation from the public or the discharger.

A lot of improvements need to carry out in this zone,

Firstly; all households reside along the main road and access road with tar seal and wide should enforced to have platforms in a standardize and strong formation not only for the safety storage of waste but also for hygiene and health protections for the discharger and the collectors it's also important for beautify the community for tourist attractions.

Secondly; the crew needs to fully wear safety gear. Noticing from the study they wore some of the safety gear but they need to wear all full set of safety, the safety hat, safety glass, mask, gloves, overall, vest and safety boots. The need is for their own protection and health.

Third; the number of crew should increase from 2 to 4, we notice that the garage is located in the centre of the Zone A, so it's better to break at their garage and change the shift there. The collection time is more than one and a half hour and only 27 minutes break. It's not good for the health of the worker.

Forth; they need to study their zone root. We've notice duplicates and it's spent a lot of time and also sometimes these duplicates can cause U turn and that is illegal in the roads regulations. The owner and the driver need to work on the map to create a better root to save the time and less unexpected mistakes on the road.

Fifth; School does not include in the collection, it's the cause of the delay of the study and also in the contract it's only for household. But I've already interview the owner of the contract and he said he is not paid for the removal of waste from schools but these schools always complain about not picking their waste so his company is volunteer to remove these waste from schools in his zone and the important thing to him is for his zone to clean. So it needs to enforce that any kind of business, institutions, commercials and schools has to prioritise to transport their waste to the landfill.

Collaboration and cooperation between the service provider and the public is very essential and useful. Working together will improve the services and minimized problems that are currently happened.

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