Performance Audit Report on the Management of the City of Francistown Council Sanitary Landfill

REPORT NO 3. OF 2011

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The Chief Executive Officer
City of Francistown Council
Private Bag 40
Francistown

15 December 2011

Dear Sir

PERFORMANCE AUDIT REPORT ON MANAGEMENT OF THE CITY OF FRANCISTOWN COUNCIL LANDFILL

I have undertaken a performance audit on Management of the City of Francistown Council Landfill pursuant to Section 29 of Finance and Audit Act.

The objective of performance auditing is to strengthen the accountability process through the provision of an objective and independent feedback to the stakeholders on the performance of public sector entities. The aim of this audit is to assist management in streamlining their work by identifying operational and managerial gaps and suggest the steps that if taken may improve efficiency and effectiveness of delivery of services by respective organisations.

I therefore, submit the Performance Audit Report No.3 of 2011 on Management of the City of Francistown Council Landfill and you are required to table this report before the Full Council.

Yours faithfully

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R.B.Sebopeng
Auditor General

AUDITING FOR BOTSWANA GOVERNMENT

The Auditor General is the Head of the Office of the Auditor General, appointed under the Constitution. The Auditor General carries out his duties under the Finance and Audit Act 1997. He, thereof, undertakes Performance Audits on the public sector bodies and submits reports to the National Assembly. The aim is to improve the public sector administration and accountability.

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ABBREVIATIONS

CEHO	-	Chief Environmental Health Officer
CoFC	-	City of Francistown Council
DWMPC	-	Department of Waste Management and Pollution Control
NDP	-	National Development Plan
OAG	-	Office of the Auditor General
PEHO	-	Principal Environmental Health Officer
PEHT	-	Principal Environment Health Technician
SEHT	-	Senior Environmental Health Technician
WMA	-	Waste Management Act

EXECUTIVE SUMMARY

Good management of waste and disposal is a fundamental need for every city to provide a healthy and clean environment for its inhabitants. Therefore it is important that Local Governments provide a sound basis of an efficient and reliable waste management system. Land filling is the oldest and the most widely practiced method of disposing of solid waste.[1] A landfill is a specially designed area of land where a large amount of waste is disposed of and buried underneath the earth. A landfill is different from other waste disposal areas because it is engineered scientifically according to international standards which emphasizes on safe disposal. For that reason, waste generated is to be disposed of in an environmentally acceptable manner so that the people and the environment are risk free.

There has been a growing concern over the years on the management of waste disposal in Botswana, where waste had been disposed of in unsafe and uncontrolled manner. Since Botswana like other countries has been conscious about these issues which affect the environment and the human, in recent years the Government decided that there was need to have instruments which addressed safe and proper disposal of waste. Owing to the above, in order to ensure that waste was efficiently disposed of during the National Development Plan (NDP) 8, the Government under the Urban Sewerage Programme, constructed landfills at different Cities and District Councils. This initiative was taken after several studies which deemed the then methods of disposal to be hazardous to the environment and human. The City of Francistown (COF) was one of the areas in which there were unsatisfactory methods which were used for disposing of solid waste within the City. Due to those unsatisfactory disposal methods, a new modern solid waste landfill was constructed and the then existing one was rehabilitated and closed. The new landfill became operational in 2000. According to the NDP 9, landfills generally on average cost P15 000 000.00, as they include plant and equipment. For those reasons; the Office of the Auditor General carried out an audit to ascertain whether the City of Francistown Council (CoFC) efficiently managed its landfill in order to prevent it from being a threat to the environment and the public at large.

The audit's focus was on the planning, administrative and operational activities that were followed in the handling, incinerating and disposal of waste within the landfill as well as maintenance of landfill equipment. The audit was conducted at both the City of Francistown Council Headquarters and the City of Francistown landfill. The audit covered the financial years 2006/07, 2007/08, 2008/09 and 2009/10. The significant observation made during the audit were that;

1. The landfill was operating without a license. An inspection that had been conducted by the Department of Waste Management and Pollution Control (DWMPC), which is Department responsible for issuance of such licenses, revealed that the landfill was operating with "multiple critical violation" and therefore it could not be issued with a license.

[1] World Health Organisation (1995)

Recommendation

The CoFC should strive to operate the landfill in accordance with the requirements of the Waste Management Act, Operational Manual and the Guidelines for the Disposal of Waste by the Landfill. Adherence to these instruments will be guarantee that the landfill will be able to produce desirable results.

Management Comment

Management indicated that the Department of Waste Management and Pollution Control (DWMPC) had carried out an inspection on 29th December 2010 and the Council was to comply with covering of waste on daily basis, placing litter trap nets around the landfill, re-construction of the used oil storage bund wall and introduce an oil rehabilitation plan. Management responded that the information was submitted to DWMPC on 15th February 2011 and the Council was waiting for the provisional license.

2. The weighbridge which was to weigh the amount of waste that was disposed of at the landfill had been non-operational since 2008 and it remained in that status for more than two years.

Recommendation

The CoFC should ensure that the weighbridge is functional at all times. This will enable the CoFC to establish the quantity of waste that enters the landfill.

Management Comment

Management highlighted that the Council had tendered for the maintenance of the weighbridge and the sitting and Adjudication Committee of 10th December 2010, the Committee resolved to reject the tender since no company qualified. Therefore, in the meantime Civil and Mechanical and IT Departments were in the process of coming up with alternative measures to address the problem.

3. The clinical waste was not handled, treated and disposed of according to the Waste Management Guidelines. The clinical waste was also not completely combusted in that residue had harmful substances that could be risky to human health and the environment. There was lack of daily coverage of the working phase. There was inefficient management and the hazardous waste cell was inoperative

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Recommendation

The CoFC should ensure that the handling, treatment and disposal of clinical waste are performed according to the guidelines for the waste disposal and its management.

Management Comment

Management indicated that the incinerator had a problem with the temperature controllers and those were maintained on the 16th June 2011.

4. There was no adequate maintenance of equipment at the landfill. Equipment such as the steam jet cleaner, tyre cutter and compactors were not operational at the time of audit and they remained idle.

Recommendation

The CoFC should come up with a viable maintenance strategy which will tackle all the maintenance issues at the landfill. This strategy will assist the CoFC to make informed decisions on maintenance of different landfill equipment and infrastructure.

Management Comment

Management concurred that the maintenance plan will be put in place and that already that responsibility had been conferred to a Chief Technical Officer. Management indicated that maintenance of the bulldozers and the compactor (Bomag) had been outsourced as a key maintenance strategy.

5. There was no documentary evidence that the CoFC appropriately monitored efficient gaseous emissions. Therefore no evidence that the gas had been tested since the landfill started operating in 2002 except for the groundwater quality tests which had been conducted on quarterly basis.

Recommendation

The OAG recommends that the CoFC appropriately make an effort to manage and monitor gaseous emissions at the landfill.

Management Comment

Management indicated that the Council had made estimates in the 2011/2012 recurrent estimates for the purchase of the sampling equipment to monitor gaseous emissions at the landfill.

CHAPTER ONE

1.0 **INTRODUCTION**

1.1 **Background**

The need for an environmentally acceptable yet cost effective waste disposal has become a priority in Botswana. This is because increasing population and urbanisation have resulted in growing waste generation, placing pressure on the environment. There is also an increasing awareness of environmental issues and a desire for a clean environment on the part of the public. Therefore, waste disposal by landfill is necessary to minimise both the short and long term impacts on the environment. As such, the disposal of waste into the landfill needs to be controlled and that the landfill be appropriately managed, so that sustainable development is realised.

Historically in Botswana waste has been disposed of on land, because this is the cheapest and most convenient method of waste disposal. Landfilling is the most common solution for handling either all the waste or the residuals that cannot be treated as a part of other waste processing methods, such as compositing incineration etc. It essentially refers to waste disposal on land whilst site only refers to the particular piece of land upon which the waste facility is situated. There is a wide range of landfills that vary from open dumps that create adverse environmental problems to soil, water and air to sanitary landfills that are a full acceptable solution. On that note, Landfill site is a central and essential component of any waste management concept.

Consequently, the responsibility for the provision of waste management services including waste collection, transportation, treatment and safe disposal as well as the management of waste disposal facilities, which include landfills, are vested on the Councils. As such, the City of Francistown landfill is a facility under the City of Francistown Council.

The City of Francistown landfill came into effect as a result of unsatisfactory methods which were used for disposing of solid waste within the City. Due to those unsatisfactory disposal methods, a new modern solid waste landfill was constructed and the then existing one was rehabilitated and closed. The new landfill became operational in 2000. The Landfill has been designed to serve a population greater than 100 000, as it is even used by other Councils as far as North West and North East District Councils. Thus the new landfill is classified as a medium sized landfill, according to the Guidelines for the Disposal of Waste by Landfill. The landfill has also been designed for 40-50 years of use but currently the new developed area has been envisaged to take 20-25 years to fill. The landfill site is located on a higher-

lying plateau, 4 kilometers north-east of the City and approximately 1 kilometer east of the main Bulawayo/Francistown road and rail route.

1.2 MISSION, VISION AND VALUES

As one of the Divisions under the City of Francistown Council, the Environmental Health Division operates under the mission, vision and values of the City of the Council. They are as follows;

1.2.1 Mission

"We exist to provide quality social services and physical infrastructure through implementation of government policies and programmes. We will do this in an impartial manner through competent, motivated and disciplined manpower in order to improve the quality of life of the community in collaboration with our stakeholders."

1.2.2 Vision

The City of Francistown Council strives "to be a competitive provider of an excellent social services and physical infrastructure to the satisfaction of our community."

1.2.3 Values

Amongst other values, the City of Francistown Council considers the following;

- Commitment
- Transparency
- Botho
- Creativity
- Accountability
- Integrity
- Cooperation

1.3 ENVIRONMENTAL HEALTH DIVISION

The City of Francistown sanitary landfill falls under the City of Francistown City Council. The landfill falls directly under the Environmental Health Division. The main role of the Division is to coordinate and manage functions and activities of environmental and public health. The Division controls the physical, chemical and biological hazards that impact on health. It also deals with waste management within Francistown.

1.4 ORGANISATIONAL STRUCTURE

The Environmental Health Division is headed by the Chief Environmental Health Officer 1(CEHO) who is housed at the City of Francistown Chamber. The Organisational Structure is depicted at **Annexure 1**. The CEHO oversees all the activities that are undertaken at the landfill. The Landfill Manager who is the Principal Environmental Health Technician (PEHT) is the head of the landfill and reports directly to the CEHO. **(Refer to Annexure 2 for the PEHT responsibilities).** Below the Manager, is the Assistant Landfill Manager who is the Senior Environmental Health Technician (SEHT). The landfill activities are also supported by subordinate structures that report to the SEHT.

1.5 STAFFING

The landfill boasts of 13 employees whose responsibility is to ensure that the landfill site functions appropriately. These employees work directly within the site.

1.6 FINANCES

At the time of audit, the only available accounts for the City of Francistown Council were for 2006/07 and 2007/08. The budgets and expenditures of the CoFC are inclusive of those of the landfill. They are presented hereunder;

FINANCIAL YEAR	BUDGET ESTIMATE	EXPENDITURE	MORE THAN ESTIMATE	LESS THAN ESTIMATE
2006/07	11 399 40	632 448 90	147 662 27	644 153 37
2007/08	14 450 40	507 010 91	5 640 00	943 669 09

SOURCE: City of Francistown Statement of Expenditure for 2006/07 & 2007/08

1.7 AUDIT MOTIVATION

Disposal of various types of waste at a designated area is of critical importance to the general public and surrounding communities. The public and the affected parties wish that the various types of waste be disposed of in a safe and controlled manner, to protect the environment from pollution and the public from health hazards. If waste is not appropriately disposed of and controlled, these issues can result in severe harm to landfill employees and the public thus leading to adverse financial consequences for the Government.

Owing to the above, there has been a growing concern over the years on the management of waste disposal in Botswana, where waste had been disposed of in unsafe and uncontrolled manner. As a result, in order to ensure that waste was efficiently disposed of during the NDP 8 the Government under the Urban

Sewerage Programme, constructed landfills at different Cities and District Councils, including Francistown. According to the NDP 9, landfills generally on average cost P15 000 000.00 as they include plant and equipment. For those reasons; the Office of the Auditor General carried out an audit to ascertain whether the City of Francistown Council efficiently managed the landfill in order to prevent it from being a threat to the environment and the public.

CHAPTER TWO

2.0 AUDIT DESIGN

2.1 AUDIT OBJECTIVE

The objective of the audit was to ascertain whether the City of Francistown Council efficiently managed the landfill in order to prevent it from being a threat to the environment and the public.

2.1.1 Specific Objectives

The following objectives were the basis of the audit:

- To ascertain the extent to which the City of Francistown Council managed the landfill.
- To assess the procedures and processes that the City of Francistown employed to manage the landfill.
- To determine the extent to which the City of Francistown complied with the regulations for the disposal of waste by the landfill.
- To assess the extent to which the City of Francistown Council applied the Waste Management Act, 1998 that addresses the risk of damage to the environment.

2.2 SCOPE AND LIMITATIONS

2.2.1 Scope

The audit focused on the planning, administrative and operational activities that were followed in the handling, incinerating and disposal of waste within the landfill as well as maintenance of landfill equipment. The audit was conducted at both the City of Francistown Council Headquarters and the landfill. The audit concentrated on the financial years 2006/07, 2007/08, 2008/09 and 2009/10. The four years were able to provide comprehensive trends of the management of the landfill.

2.3 METHOD OF DATA COLLECTION

The audit was conducted in accordance with the INTOSAI Auditing Standards and OAG's Performance Audit Manual. Interviews and document review formed the basis of the data collection.

2.3.1 **Document Review**

Documents pertaining to landfill management, disposal, design of the landfill site, maintenance and sampling and biochemical tests were perused. The review of the documents was undertaken to appreciate how the landfill was planned for in terms of its feasibility and the design. The documents were also reviewed in order to establish the different operations at the landfill and the methods of disposal and the overall management and coordination of the landfill. The documents are depicted at **Annexure 3**

2.3.2 **Interviews**

Nine (9) Interviews were conducted with eight (8) Officers who performed their duties directly at the Landfill. These Officers included all Officers from the different cadres, that is, those who were responsible for carrying out management and administration duties and operatives at the site. In addition, another interview was with the Chief Environmental Health Officer (CEHO) at the City Of Francistown Council Headquarters. The interviews were conducted in order to complement what was gathered through document review. The Officers interviewed at the landfill were;

- Landfill Manager
- Assistant Landfill Manager
- Incinerator Operator (2)
- Plant Operator
- Heavy Duty Truck
- Weighbridge Operator
- Litter Picking Officer

2.3.3 **Observations**

Observations were made at the landfill site and at various workshops within the landfill in order to establish the status of the machinery, the different cells and to observe how operations such as incineration were carried out. Observations were made at the following places;

- Incinerator Room
- Landfill Site
- Workshop
- Designated Area for the Jet Steam Cleaner
- Boreholes
- Security Entrance Gate

CHAPTER THREE

3.1 THE CITY OF FRANCISTOWN SANITARY LANDFILL

The landfill required a designated suitable place which after numerous surveys, assessments and reviews was developed at Dumela industrial site about 4km from the City Centre. The sanitary landfill site is made up of the landfill area where waste is disposed of and landfilled and the services area which consists of buildings and facilities used for landfill operation. The Operational Manual for the landfill describes every aspect and details of how the landfill site is arranged and the various components found within the site.

The total area reserved for the landfill activities is 67 Ha. The area which has been developed currently is 45 Ha of which 8Ha is for services and the remaining 37 Ha is for waste disposal. The waste disposal area has been divided into smaller units for disposal of different waste types. For the site to operate efficiently and to allow for reclamation of some wastes, the waste disposal area has been divided as indicated below;

3.1.1 Landfill Area

The landfill area is essentially the waste disposal area. It is demarcated on the periphery by soil berms, 3m high and 20m wide at the top screen from the surroundings. These soil berms are used for capping the landfill during the closure of the landfill. A gravel road divides the landfill area into two sections which is the main access into the landfill area. The two sections are then divided into soil berms of the same size as above. The cells have been designed for the disposal of certain type of waste namely; clinical and hazardous waste, used tyres, leachate, scrap metal and bulky waste and builders' rubble (**See Annexure 4).** The rest of the landfill area is reserved for general waste.

Within the cells, there are smaller berms 2m high by 2m wide at the top, which are the initial cover materials. The internal larger berms are also used as cover materials when smaller ones are exhausted. The whole landfill area is covered by a minimum of 300mm thick of clay liner which acts as a barrier to seepage of leachate into the ground. Perforated pipes have been installed under clay liner, to collect any leachate that may be produced and drains it into the leachate lagoon. Manholes are provided at junctions for maintenance purposes.

Hazardous cell and leachate lagoons have in addition, been lined with geo membrane to ensure leachate and hazardous liquid waste does not seep into the ground. A chain link fence has been erected around the hazardous cell to prevent any scavenging. A small berm 0.5m high has been heaped around this fence to prevent surface water from entering the hazardous cell. Slopes of leachate lagoon have been covered with gabion mattresses to prevent erosion of the slopes. Banks of the dam have been raised 1m above the ground to prevent

surface water draining into the leachate lagoon. A trench to monitor gas production has been excavated around the landfill area and filled with boulders. It is located at the inside toe of the peripheral berms. Pipes have been installed vertically to monitor gas production from the landfilled waste.

Storm water drains within the landfill area run transversely and along the road. The drains on both sides of the road have been lined with concrete to prevent seepage of water into the ground. Water is collected into sumps constructed at the lower end of the landfill and pumped into open drains to the Ntshe River. Thirty six (36) liters per second pump with floating switch has been installed at the sumps to pump out the storm water.

3.1.2 Cells for Types of Waste

(i) General Waste

General waste includes domestic, commercial, certain industrial wastes and garden and builders' rubble and they are supposed to be deposited at Cells A & B as indicated by the signs in the landfill area. First at A and when the Cell is full, then is disposed of to the next cell, thus Cell B.

(ii) Clinical Waste

Clinical Waste is produced from both hospitals and animal carcasses and the recommended method of disposal is by incineration. Incineration performs two functions which, are to sterilise the waste and to destroy it leaving a relatively harmless ash as a residue which is then safely co-disposed with non-hazardous waste at the hazardous cell. The types of clinical waste that can be incinerated include;

- Blood
- Pharmaceuticals
- Carcasses of small animals; e.g. dogs, cats, goats, pets, etc.
- Used and unused needles
- General Medical Waste
-

The following types of waste are not allowed in the incinerators;

- Radioactive materials
- All flammable substances e.g. acids, spirits, oil, petrol etc
- Large carcasses e.g. horses, cows etc
- Any General waste that can be landfilled without any treatment

(iii) ***Hazardous Waste***

Hazardous waste is the type of waste which even in low concentration can have a significant adverse effect on public health and/ for the environment. This can be due to its inherent chemical and physical characteristics such as toxic, ignitable, corrosive, carcinogetic or other properties. Hazardous waste includes asbestos, acidic chemicals, pesticides and odorous waste, mercury and copper. The hazardous waste is disposed of at the designated cell for its disposal.

(iv) ***Used Tyres***

The City of Francistown is surrounded by hinterlands of small towns and villages which dispose of tyres at the landfill. In Botswana, at present, there is market for tyres for reuse and recycling[2]. However, there are still surplus tyres. In addition, since the tyres are durable and not biodegradable, they cannot be destroyed naturally. For these reasons, they are supposed to be disposed of by cutting them into pieces by a tyre cutter machine type TC-125 before they are landfilled at the used tyre cell.

3.1.3 Service Area

The service area consists of buildings and facilities used for landfill operations. Although all the facilities at the landfill are crucial and add value to the efficient operations, it is important to mention some of the service areas which are central to the overall efficiency of the landfill operations. These include;

(i) ***Guard House***

The guard house forms the centre of security issues for the landfill site. This is a two storeyed room building, which is used by the security personnel. The room at the ground floor is for recording vehicles as they enter and exit the landfill. The top floor room is meant for monitoring security for the landfill area. The guard house is to be manned by at least two Security Guards during the day and four at night.

(ii) ***Weighbridge House***

The structure of the house is similar to the guard house. The ground floor is used for keeping records of waste disposed of and for issuing receipts of waste disposal charges. The room on the first floor contains weighbridge scales and controls hooked on two computers one for each weighbridge for recording waste disposed of at the landfill. Two weighbridges have been installed on each side of the weighbridge house with a capacity of 60 tonnes. Although the weighbridges have been installed for weighing incoming and outgoing trucks respectively, they

[2] Ministry of Environment, Wildlife and Tourism-(DWMPC), 2000

are also meant to complement each other in the event that the other one malfunctions or during maintenance or servicing periods.

(iii) ***Tyre Wash Bay***

A bay has been constructed adjacent to the weighbridge and a high pressure jet washing machine has been provided for washing tyres of trucks coming from the landfill area stuck with mud. A catchpit with grease trap has been constructed to retain dirt washed from tyres before water is allowed to flow into open storm water drains.

(iv) ***Incinerators Building***

The incinerators' building is housing two incinerators and a space for storage of waste to be incinerated. Each incinerator has a capacity to incinerate 200kg of waste per hour.

(v) ***Landfill Workshop***

The landfill has been provided with a workshop in which the following equipment can be maintained and serviced.

- Hanomag Compactor
- Tractor -Loader –Backhoe
- Tyre Cutter
- Tyre Wash Machine
- Tipper Trucks

(vi) ***Fences***

There are three types of fences at the landfill namely; palisade, razor mesh and chain link. In addition to the regular patrol by the security guards, boundary fences are to be inspected at least once a week by the Landfill Manager or Landfill supervisor for any openings which have to be closed immediately by fencing companies available at Francistown.

(vii) ***Landfill Net***

The Operational Manual stipulates that there should be a 5.6m screen wall made of synthetic net installed along the North East of the landfill to trap all waste that may be flown by wind such as paper, paper bags, etc.

(*viii)* ***Recycling Shed***

The CoFC has given permission of collecting recyclable waste to the private sector. Therefore, there is a recycling shed within the landfill which, is rented by

the private entrepreneurs for storing collected recyclable waste. The workers for these companies are to be provided with proper clothing and working gear including boots, gloves, overalls and hats by their employer. These workmen are required to strictly adhere to landfill operational procedures. The landfill management has the right to expel any worker found to contravene or disrupting the laid down procedures from the site.

CHAPTER FOUR

4.0 PROCESS DESCRIPTION

The process description mainly focuses on the landfill area because that is the central site where waste disposal takes place. It is worth mentioning that most of the process descriptions were derived from the Landfill Operational Manual of the City of Francistown Council.

4.1 ENTRY INTO THE LANDFILL SITE

Entry in and exit from the landfill is being monitored by use of one entry/exit point which is controlled by the security. Vehicles and visitors, who intend to enter and exit the landfill site, stop at the entrance gate for permission and security checks. All vehicles expecting to dispose of waste at the landfill have to register with the landfill Office and such a list kept at the Guard house. Vehicles carrying waste for disposal are required to pass through the weighbridge to be weighed before proceeding to dispose of the waste. They are also required to be weighed on exit.

4.1.2 Vehicles Using the Waste Disposal Route

Vehicles using the waste disposal route return by the same route so that their tyres can be washed in case they get stuck with mud or dirt from the landfill area. Mud from tyres and water used to wash them has to be collected in the holding tank built underground adjacent to the tyre washing lay-by. Mud accumulated in the tank has to be scooped once in a while and disposed of in the landfill area. Therefore, there is supposed to be periodic inspections to determine when to scoop out the mud.

4.1.3 Vehicles Carrying Clinical and Other Waste

The vehicles use the services' area to unload clinical waste before they proceed to the landfill area to dispose of other wastes. They are supposed to exit using the waste disposal route so that the tyres can be washed for the same reasons mentioned for vehicles that use the waste disposal route.

On route, information and direction signs are placed to assist in the location of the intended destination. In addition to the signs within the landfill area, there are spotters to direct vehicles where to dispose of the various waste types.

4.2 WEIGHBRIDGE OPERATIONS

Traffic signals have been installed at the weighbridges to control traffic moving on and off the weighbridges during entry and exit. The vehicles approaching the weighbridge stop at the edge of the weighbridge until the traffic signal turns green to allow the vehicle onto the weighbridge. As soon as the vehicle enters the weighbridge, the signal turns red to signify that the vehicle has to stop to be weighed and other particulars taken. When the signal turns green the vehicle proceeds either as directed by the staff or follows the direction signs. The same procedure is followed when exiting. In order to get accurate weights of waste deposited, vehicles have to maintain same occupants during weighing at the time of entry and exit. All drivers are to sign and collect the weigh slips at the weighbridge on exit.

Each weighbridge is connected to one computer which has software for recording and processing the data on waste disposal. Both computers are in turn networked to the Landfill Manager's computer. In the event that one computer malfunctions both entering and exiting vehicles are directed to one weighbridge. There are two Weighbridge Computer Operators for each weighbridge. One Officer on the ground floor room issues weigh slips to drivers and receives payments for waste disposed of.

4.3 WASTE DISPOSAL METHODOLOGY

The landfill forms the basis of every integrated waste management plan. There are a number of alternative treatment options for waste which include incineration. None of the treatment options can function alone, but rather they require landfill as a necessary complement. Therefore after treatment, waste disposal is made at the landfill.

4.3.1 Handling, Treatment and Disposal of Hazardous Waste

Hazardous waste is off-loaded inside the hazardous cell (Cell F) indicated by the direction sign. This waste has to be tested and analysed to determine hazardous substances therein. Then such waste is treated before it is disposed of or co-disposed with other wastes that may have a diluting effect. Thus every load of hazardous waste brought on site has to be sampled to determine its composition. Sampling has to be carried out so that the sample retrieved represents the bulk of the hazardous waste disposed of and the retrieved sample has to be taken to a laboratory for testing. Once the hazardous substances contained in a load of waste has been determined, then pre-treatment and disposal methods are identified.

4.3.2 HANDLING, INCINERATION/TREATMENT AND DISPOSAL OF CLINICAL WASTE

Medical waste is usually delivered in boxes or clinical bags (red) plastic. Clinical waste is to be off-loaded at the incinerators building and kept at the storage space provided, to prevent exposure to the sun and rain and pollution to the surrounding areas. Most of this waste needs to be incinerated before it is disposed of. In addition, each type of chemical waste has to be stored separately but can be mixed during incineration in order to optimise energy produced. On the other hand, animal carcass is normally delivered in black plastic refuse bags. This does not have to be stored for more than two days; otherwise it will be disposed of into landfill with general waste.

4.3.2.1 Incineration and Disposal of Clinical Waste

The frequency of clinical waste incineration is determined by the Landfill Manager. Usually depending on the volume of the waste, incineration of clinical waste is not expected to be done on daily basis. The incinerators are supposed to be operated strictly in accordance with the manufacturer's specifications. It is vital for the Operators to ensure that fuel that can run the incinerators for the expected duration of the incineration process is available.

Medical waste is received at the incineration room and on receipt it is weighed before incineration, since the incinerator can only carry a load of 200kg/hr. Incineration process begins when medical or clinical waste is loaded into the feeding ram manually. Then the feeder ram, is operated by electro-switch buttons. At this juncture, excessive loading of waste is prohibited as waste will not burn properly and thus producing excessive smoke which will pollute the environment. During the incineration process, the Operators stoke the burning waste and it is worthwhile that they must constantly check the smoke from the chimneys to determine if it is not excessive. After incineration, ashes or residue from the incinerators are removed from the rear door only after the incinerator is switched off and has cooled for a while. The ash is allowed to cool completely in a bin before it is disposed of. Where necessary, water may be used to cool the residue. Residue from the incinerator is to be co-disposed of with non-hazardous waste in the hazardous waste cell. The ash is not supposed to be used as cover material or landfilled with general waste. The pictorial presentation below depicts the type of waste received at the incinerator room:

Clinical Waste in Red Bags

Old Hospital Bedding

Waste stoked during incineration

Needles and syringes in the containers

FIGURE 1: CLINICAL WASTE AWAITING INCINERATION AND WASTE STOKED DURING INCINERATION

4.4 SHREDDING AND DISPOSAL OF TYRES

Used tyres are stored at the designated used tyre cell in the landfill area. Traders dealing with used tyres are allowed to buy tyres that they want to re-trade or re-use before they are shredded and disposed of. All the remaining used tyres are taken to their respective cell where they are cut into pieces by a tyre shredding machine before being landfilled. After shredding, all the shredded tyres are landfilled at the used tyre cell. The Landfill Manager designates days in which tyres are shredded.

4.5 DISPOSAL OF GENERAL WASTE

The general waste does not need any treatment before disposal. Upon entry at the landfill and after all the other entry procedure, the vehicles carrying general waste proceed to the general waste cell. There is always a Spotter at the cell who guides the vehicles where to dispose of the waste.

4.6 WASHING TYRES STUCK WITH MUD

A steam jet cleaner has been provided to wash tyres of trucks that will be stuck with mud from the landfill area particularly during the rainy season. A lay-by has been provided on the exit lane just before the weighbridge for trucks to park and have their tyres washed.

4.7 SPREADING AND COMPACTION OF WASTE AND APPLICATION OF COVER MATERIAL

At the end of each disposal operation, spreading and compaction of waste and application of cover material is carried out. Waste is covered on a daily basis at the end of each day's operation. This is crucial, because covering of waste prevents open fires, unbearable smell and the spread of flies. Waste to be disposed of is allowed to accumulate before it is spread, compacted and covered with soil.

4.8 MONITORING OF THE LANDFILL

Monitoring of the landfill is carried out by the Department of Waste Management and Pollution Control (DWMPC), the Council and the Landfill Management. Each institute has set up its own monitoring mechanisms. Therefore, the landfill is administered for different aspects and at various levels. On the other hand, monitoring of gas production and leachate at the landfill is also carried out.

4.8.1 Department of Waste Management and Pollution Control

The Department of Waste Management and Pollution Control (DWMPC) conducts audit inspections at the landfill on quarterly basis. The purpose of these inspections is to assess how the landfill is managed and make recommendations for improvement. The DWMPC is also mandated to license the landfill as it does with all the other waste management facilities within the country, to ensure compliance with environmental statutes and prevent environmental pollution. Therefore, the DWMPC has to conduct a licensing inspection to assess and license the facility, provided its operations and processes meet the provisions stipulated by Section 16 of the Waste Management Act (WMA).

4.8.2. **Council Level**

The Chief Environmental and Health Officer (CEHO) visits the landfill at least once a week to inspect the operations and the performance of the staff on site. The CEHO compiles monthly briefs to the City Clerk on landfill operations. In addition, the CEHO prepares reports to the DWMPC on landfill operations and arranges for sampling and testing of water pollution at the landfill sites.

4.8.3. **Landfill Management Level**

The Landfill Manager on a weekly basis compiles and consolidates all individual reports prepared by operators and other staff on a daily basis. In addition, the Landfill Manager submits monthly reports to the Council regarding operations of the landfill for the preceding month including the following:

- Problems encountered and proposed mitigation measures.
- Recommendations for improvement.
- The type, volume and tonnage of waste disposed during the month.
- Equipment utilisation.
- Status of Cover material.
- Weather conditions including rain, wind direction, surface water runoff and drainage etc.
- Staff matters and any training that has been carried out or required.
- Financial statement.

4.8.4 **Gas Monitoring and Handling of Gas Produced**

Once a cell has been landfilled with waste to the desired height above the ground, monitoring of gaseous emissions has to commence. This is done on a continuous basis by detecting change of odour in the air as well as receipt of complaints from the public. In addition, after every three months, physical check of gaseous emissions through gas pipes has to be carried out by igniting at the top of the pipe and also measuring gas concentration. Where measurements of emissions recorded exceed the 1% by volume of STP, specified by the Guidelines the Landfill Manager informs the Council and DWMPC for remedial measures to be taken.

4.8.5 **Monitoring of Leachate**

Once a year the underground perforated pipes are flashed with water to unblock any blockage or any sanitation that may have occurred. Once leachate is produced and accumulated in the leachate lagoon, it is sampled and tested. A diluting agent is determined and applied in appropriate proportions after which the underground liquid is pumped out into the storm water drain. Four boreholes have been drilled within and outside the landfill area and equipped for sampling

underground water. Regular sampling is taken from the boreholes and from the stand pipe at the landfill on quarterly basis and then tested to determine whether there is any contamination. Any contamination observed is referred to DWMPC for remedial action to be taken.

4.9 MAINTENANCE OF INFRASTRUCTURE AND FACILITIES

Regular maintenance of facilities and infrastructure provided for the landfill is a mandatory requirement in order to maintain their level of serviceability and prolong their life span. The equipment includes; incinerators (2), tractor loader backhoe, hanomag compactor, tipper trucks (2), tyre cutter, tyre washing machine and weighbridges. Servicing and maintenance of equipment and trucks working at the landfill site is undertaken at the workshop building within the landfill. The Landfill Manager prepares a maintenance schedule of all facilities and infrastructure for disposal of waste in order to ensure that it is adhered to.

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CHAPTER FIVE

FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

This chapter presents the results of the fieldwork and the analysis of information on the management of the CoFC landfill

5.1 CORPORATE ISSUES

5.1.1 Strategic Approach-Landfill Management

Landfill management decisions need not to be made in isolation. They need to be part of the overall framework of decision-making in the CoFC. They also have to be consistent with corporate objectives and intergraded with other management strategies. Notwithstanding, the OAG noticed the weakness, primarily relating the lack of strategic landfill management. In particular, the OAG found, that the landfill management decisions were not integrated into the management planning. The indicator of this was that the CoFC had not linked management of the landfill to the objectives of the Council. Neither were there Division's performance site specific plans.

The OAG is of the view that effective and sound landfill management planning needs to be regarded as an integral part of the CoFC corporate culture.

RECOMMENDATION

The OAG recommends that the CoFC should commit to the introduction of integrated landfill management plans. These plans should be integrated into the CoFC management system and include quantitative performance indicators, review and reporting mechanisms.

Management Comment

Management indicated that the operations of the landfill were integrated into the CoFC management system and the quantitative performance indicators were in place. They further indicated that these measures included; number of re-engineering processes to be re-engineered at the landfill, level of compliance to set standards and feedback on level of customer satisfaction.

5.1.2 Landfill Licence

The Department of Waste Management and Pollution Control (DWMPC) is mandated to license all waste management facilities in the country, to ensure compliance with environmental statutes and prevent environmental pollution. Furthermore, the Guidelines for the Disposal of Waste by the Landfill stipulate

that before a landfill is constructed or operated, a licence is to be acquired from the DWMPC. This is done through licence application and consultation in which the DWMPC decides after all the necessary investigations. At the time of audit, the CoFC landfill had not been provided with a licence, since the DWMPC inspection in December 2010, reckoned that the facility had "multiple critical violations" of the Waste Management Act (WMA). These violations included; inoperative weighbridge, non availability of maintenance logs, non-adherence to Landfill Operational Manual and non covering of daily waste and spillages of oils and fuel. As a result, the facility did not meet the licensing requirements as provided for in Section 16 of the WMA. Since the landfill operated with such "grave contraventions", it was highly likely that the envisaged period of 40-50 years landfill use would not be realised.

Additionally, absence of a licence meant that the City of Francistown landfill was operating illegitimately, thus violating the requirements of the WMA, which could attract a fine not exceeding P8000.00 or imprisonment not exceeding 7 years. Therefore, it was essential that corrective action on the landfill is taken.

RECOMMENDATION

The OAG recommends that the CoFC should;

- Strive to operate the landfill in accordance with the requirements of the Management Waste Act, the Guidelines for the Disposal of Waste by Landfill and the Operational Manual.
- Ensure that the landfill operates without any violations of the requirements. This will give the COF the prospects that the landfill will be able to operate for the predicted period of use and also produce the desirable results that will not have adverse impact to the human health and the environment.

Management Comment

Management highlighted that the Council strove to operate the landfill in accordance with the relevant Statutes, Guidelines and Operational Manuals. However, Management indicated that the Council was faced with frequent breakdowns of equipment due to their old condition and inadequate funding for maintenance.

5.2 CONTROLS AT THE ENTRANCE

Rigid controls at the landfill entrance are necessary in order to ensure that only permitted types of waste are deposited in the site. In addition, detailed records of the source of the waste, the type of the waste accepted and the volumes of waste are to be identified. Nonetheless, the OAG identified shortcomings pertaining to entry into the landfill, as discussed under;

5.2.1 **Weighbridge**

The weighbridge at the site entrance is crucial because it provides detailed records of waste quantities that are disposed of at the landfill on a daily basis. However, the weighing and recording of waste entering the landfill did not occur as anticipated, since the weighbridge was out of order and therefore, waste volumes could not be recorded. According to the records, the two weighbridges remained non functional since 2008. Since the weighbridges were out of order, the Landfill Management had not devised an alternative which could enable them to weigh the waste quantities. Hence, it was likely that the volumes of waste disposed of at the landfill could exceed the quantities of the waste that the landfill was to carry. This could have a negative impact on the engineering aspect of the landfill. In addition this could also harm the environment, hence contributing to the prospect of environmental pollution. Consequently, the life span of the landfill could be reduced. However, the OAG appreciates that at the time of audit, the tendering process was ongoing for service, maintenance and repair contract of the two weighbridges.

RECOMMENDATION

The CoFC should ensure that the weighbridge remains functional at all times. This will enable the COF to establish the quantity of waste that enters the landfill. Most importantly, there will be certainty that there will be no harm to the landfill environment, hence landfill sustainability and its longetivity realised.

Management Comment

Management indicated that there was no budget provision for weighbridge maintenance for 2010/2011. Further, Management highlighted that since that was a critical matter, the Department would establish the cost of maintenance of the weighbridge and that they would do what they could do.

5.2.2 **Visual Examination of Incoming Waste**

Visual examination of the incoming waste by the Gate-keepers is important in addition to the documentation provided. There is security at the landfill entrance and its purpose is to ensure that the vehicles which enter and exit the landfill are thoroughly checked**.** Observations made at the entrance on November 2010 and February 2011 revealed that incoming waste was not always examined. The only method applied at the time was to register incoming vehicles and inspect the vehicles upon exit. There were no procedures put in place, on how best to verify the incoming waste and determine if it was accordingly segregated. As a result, it was highly likely that waste might be deposited at the wrong site, and either way waste could be deposited whilst mixed, hence some of it being incorrectly disposed of. Management highlighted that since the breakdown of the

weighbridge, the visual examination function was transferred to the spotter working at the disposal cells to check the type of waste and advice on where to dispose of, accordingly. On the contrary, the audit through observations depicted that there was no such arrangement as the spotter solely directed the vehicles to the cells without visual examination. It was crucial that the CoFC arranged for waste to be visually inspected in order to reduce the likelihood of waste being incorrectly disposed of and causing harm to the environment and to the community at large.

RECOMMENDATION

The OAG recommends that the COF should;

- Ensure that incoming waste is visually examined in order to establish the type of waste that enters the landfill.
- Establish ways which could strengthen the visual examination.
- Be committed in ensuring that waste which enters the landfill is that which has been under the waste category. This will assist the Council to assure stakeholders including Environmentalists that the landfill is appropriately managed and that the environmental risks are addressed.

5.3 COMPLIANCE WITH THE ENVIRONMENTAL AND HEALTH STANDARDS

Compliance with the Environmental and Health standards promotes and sustains a safe and healthy environment. Compliance ensures that effective standards and practices are maintained. Therefore, it is fundamental that the CoFC adheres to the health and environmental standards. The observations hereunder, address issues pertinent to compliance of the environmental and health standards;

5.3.1 Handling, Treatment and Disposal of Waste

Proper handling of waste is imperative to the health of Workers who are exposed to direct contact with the waste. Additionally, disposing of waste in a proper manner reduces the probability of contamination of the soil and ground water with chemicals or microorganisms. Proper landfill management also reduces the adverse health effects. On that note, the Operational Manual clearly stipulates how clinical waste, general waste and the other types of waste are to be safely treated and disposed of. In addition, the Operational Manual indicates the apparatus needed for disposal of different types of waste. During the audit, it was noticed that disposal of waste was not done according to the provisions of the Francistown Sanitary Landfill's Operational Manual. The OAG noticed the following anomalies relating to lack of compliance to the environmental standards;

5.3.2 **Clinical Waste**

*i) **Handling of Clinical Waste***

Clinical Waste has the potential to cause injury and infection. Therefore, it requires careful handling between the place of production and that of final disposal[3]. Moreover, Section 49 (b) of the WMA states that "hazardous or clinical waste, of a kind as may be specified by order, shall be packed and clearly marked and labelled as may be prescribed."

Observations made at the landfill were that clinics, hospitals and other health facilities brought clinical waste without appropriate procedures. A significant number of clinical waste bags were not labelled. The review of 130 cases of available records of registration of incoming clinical waste revealed that, about 74% of the clinical waste received was not labelled. On the other hand, about 13% of clinical waste bags were not tied at the tip. This resulted in spillage, hence posed a health threat to the incinerator operatives. Non- labelling of the type and the source of clinical waste was in violation of Section 49 (b) of the WMA as quoted above. The interviews revealed that the health facilities were trained and advised on how to handle and dispose of clinical waste, nonetheless, the situation prevailed. However, the OAG could not confirm how effective consultation between the CoFC and other stakeholders had been with regards to the pertinent issue. Therefore, it was difficult to establish if the problem persisted due to the laxity of the health facilities or whether the training acquired by the stakeholders was not extensive enough to sensitise the health facilities on the importance of proper handling of clinical waste. Management indicated that the Council with the help of the Ministry of Health had conducted refresher training on handling, treatment and disposal of Clinical Waste in June 2010. Conversely, the OAG accentuates regardless that inspite of the training the stakeholders were still non-compliant. Therefore, it is essential that the CoFC devise mechanism in which they would ensure that clinical waste was delivered in accordance with the Waste Management Act requirements.

*ii) **Treatment of Clinical Waste***

Clinical waste was treated at the incinerator room. According to the procedures the smoke discharged from the incinerator through the chimney has to be colourless in order to prevent air pollution. In addition, overloading of clinical waste into the incinerator is to be prevented, since it may lead to non-combustion of the waste. After incineration, the residue is removed from the incinerator and cooled for disposal at the hazardous waste cell. Notwithstanding the set procedures, there were weaknesses in the way clinical waste was treated and disposed of. Incineration was not properly managed as the incinerators were technically inefficient. For instance, on receipt, the clinical waste was not weighed since the weighing scale had not been provided at the incinerator room.

[3] National Conservation Strategy Co-ordinating (Agency),1996

As a result, the clinical waste was loaded into the incinerator without any knowledge of how much the quantity was. It was observed that the Operatives only estimated the load of the waste. At the time of audit, only one incinerator was operating and the other one remained non-functional. It was indicated that it had been like that for about 3-4 years. For that reason, during the times when the Operators were overwhelmed with clinical waste which would have started decomposing, there was likelihood of overloading the incinerator. Overloading of the incinerator may result in non- combustion and consequent risks to those handling the residuals. Overloading may also lead to a reduction in the incineration temperature with consequent unacceptable levels of smoke emissions. Non-combustion of the clinical waste may lead to the formation of dioxins which are toxic substances that may cause air pollution.

On the other hand, it was observed that the residue was not totally combusted. This might have not been only due to overload, but also because the burners of the working incinerator were not efficiently functioning. The other factor could have been that the rear door of the incinerator was damaged and therefore, could not close properly. The OAG also observed that there was leakage through the incinerator door. As a result, this might have had a negative impact on the combustion of the waste; and a health hazard to the operators. During the observation, the OAG noticed that dark smoke came out of the chimney and it was excessive when the waste was being stoked. The black smoke emitting from the chimney may cause pollution to the environment and harm the community. The OAG acknowledges that at the time of audit in February 2011, the CoFC was in the process of acquiring services for maintenance of the incinerators and the burners.

iii) ***Disposal of Clinical Waste***

On disposal of waste, the OAG was informed that the residue was to be disposed of at the general waste cell. Nevertheless, the observations made in February 2011, attested that clinical waste was not fully combusted and it was alleged that the residue contained harmful substances which could be risky to human health and the environment. Although there was provision in the Guidelines for the Disposal of Waste by Landfill that the residue could be co-disposed with non-hazardous waste in the general waste cell, the disposal of such residue, could pose a health threat to individuals and the environment. It is necessary that in instances where combustion would have not been effective, other methods of disposal could be used to ensure that there was safe disposal, to protect both the environment and the public.

Smoke emitting from the Chimney

Residue after Incineration

Cracked incinerator Infractor door

Blood Stains dripping from the incinerator

FIGURE 2: The pictures show smoke going out through the chimney, the residue after incineration in which non-combustion occurred, the infractor door with cracks and corroded lining and substances dripping from the infractor door during incineration.

RECOMMENDATION

The OAG recommends that the CoFC should;

- Ensure that the handling, treatment and disposal of clinical waste are performed according to the guidelines for the waste disposal and its management.
- Strive for ways of dealing with waste which will notably reduce the occupational, human and environmental risks.

- Be vigilant of the risks associated with managing waste and ensuring that safety measures are instituted at all times.

5.3.3 **Tyres**

The Operational Manual (2000) requires that, tyres be shredded with a tyre cutter and disposed of at their respective cell. The Operational Manual also asserts that before shredding and disposal, the entire community be invited to buy tyres. During the audit, the OAG noticed that the tyre cutter had been out of order since 2003/2004. Therefore, the tyres could not be procedurally disposed of. As a result, they were lying around the landfill. It was observed that the cell which had been designated for disposal of such waste was then used as a general waste cell. During the interviews, the OAG was informed that tyres had not been disposed of at the "would be" cell due to the past fire outbreaks.

The OAG is of the view that the major contributing factors for diverting the tyre cell into general waste was that, due to non-cutting of tyres, it would be difficult to dispose them of when they were intact. By cutting tyres, their volume is reduced by 60% and shredded tyres may have the potential for energy recovery[4].For these reasons it is important for the CoFC to carve the tyres.

Additionally, the interviews enlightened that buying of tyres by the public helped in the reduction of the number of tyres at the landfill. Although it is appreciated that selling of tyres helped in saving landfill space by diverting them to valuable use, it is noteworthy that not all tyres were sold. Therefore, for those which were not retailed, they remained scattered around the landfill; and this situation was an eyesore. If the situation is left to prevail, it may lead to the state where the landfill will be deplorable in the long run. In addition, if tyres are deposited whole in a landfill, they can rise and cause void spaces which, break the surface and encourage vermin (Guidelines for the Disposal of Waste by the Landfill, 1997). The tyres may also be a potential for mosquito breeding grounds especially during rainy seasons. In addition, they may contribute to surface instability and represent a fire risk, with the potential of excessive black smoke that contain gases which, could be dangerous to human and animal health.

[4] National Conservation Strategy (Co-ordinating) Agency, 1999

Tyres piled at the landfill

Tyres stacked at the landfill

FIGURE 3: Tyre heap at the City of Francistown Landfill at different sites

RECOMMENDATION

The CoFC should;

- Have proper tyre management system which will reduce environmental pollution.
- Ensure that tyres are disposed of through acceptable procedures. This will reduce the considerable volumes they take up within the landfill and also reduce the risks of open fires which may create substantial amounts of water and air pollution.

Management Comment

Management highlighted that they were in the process of purchasing new tyre cutter blades.

5.3.4 General Waste

Good site management including daily safe disposal of waste, proper compaction and cover of waste is vital in order ensure that environmental and health risks are prevented. The Operational Manual further emphasises that waste be covered on a daily basis at the end of each day's operations. At the CoFC landfill, general waste was disposed of at the designated cell (working phase). The OAG observed that some of the waste which was disposed of had not been segregated at source. For instance, this included clinical waste such as; used syringes, blood stained swabs and expired drugs. This posed a health risk especially to the workers at the landfill. Moreover, there was no one at the working phase to ensure that the correct waste was disposed of. There was only

a “spotter” at the site who directed vehicles where to dispose of waste at the working phase. Improper disposal of waste could have been exacerbated by lack of examination of waste on entry to the landfill.

The OAG observed that waste deposited at the landfill was not compacted and covered on daily basis. This was contrary to the Operational Manual and the Guidelines for the Disposal of Waste by the Landfill. At the time of audit, the OAG was informed that waste was only covered during the weekend. This was said to be due to constant breakdown of machinery and inadequate workers on the ground that could operate the functioning machines. For example, there was no Front Loader Machine Operator, as the post had remained vacant since 2009. As a result, reliance was on external workforce. Operatives’ inadequacy was authenticated by the Human Resource Management, who confirmed that there was need for the operator, but elucidated that it was a challenge to find a suitable driver who had the required qualifications.

Non-compacting of waste resulted in papers lying around the landfill to an extent where they even spread to the other side of the landfill, which was not the working phase. The sight was appalling. As such, the landfill was prone to vermin and disease vectors such as flies, despite the fly traps erected on the site. There was unbearable odour from the waste that had been placed at the landfill uncovered. This may lead to occupational hazard to the workers at the working phase. There was also a putrefying smell at the landfill due to non-covering. The offensive odours may cause local nuisance. Another concern was that non-covering of waste enticed the scavengers to enter the landfill and obtain contaminated foodstuff which was hazardous to their health. There was need for daily coverage as well as proper compaction of waste in order to control the odours from the waste and also reduce the risk of accidental fires in the landfill.

Uncovered waste at the working phase

Heap of Uncovered Waste

Clinical Waste wrongly disposed of

FIGURE 4: The working phase with waste spread out due to non compaction and covering of the landfill. The picture also shows clinical waste having been incorrectly disposed of.

RECOMMENDATION

The CoFC should;

- Strive to adhere to the Guidelines for the Disposal of Waste by Landfill and the Operational Manual in order to prevent human health risks and pollution to the environment.
- Ensure that these guidelines are implemented to the letter and that there is compliance to the relevant procedures and duty of care taken into cognizance.

Management Comment

Management indicated that the Council strove to operate the landfill in accordance with the relevant Statutes, Guidelines and Operational Manuals. Management further highlighted that the Council encountered frequent breakdowns of equipment which was due to their old condition and inadequate funding for maintenance.

5.3.4 Hazardous Waste

Hazardous waste presents an intrinsic risk to the environment and human health. Therefore, one of the major factors in ensuring that landfills do not adversely affect health or cause environmental harm is in the proper selection of different ways of waste disposal including, hazardous waste. Hazardous waste such as chemical waste has to be separately landfilled or dispersed in specified areas with appropriate permits and require pre-treatment. The CoFC Sanitary Landfill Operational Manual clearly states that there is a hazardous cell that has been separately erected and fenced for disposal of hazardous waste. The Guidelines for the Disposal of Waste by Landfill further provide that the landfilling of hazardous waste can be done through co-disposal, where the waste is mixed

with general waste in acceptable ratios, or through mono-disposal, where the waste is deposited in an unmixed state. In that regard, the CoFC relied on the mono-disposal method.

The interviews with Landfill Management revealed that the hazardous waste cell had not been as anticipated, (lined with geotextile membrane prior to lining with clay and gravel). For that reason, the hazardous waste cell remained unutilised for the purpose intended. The situation prevailed for more than 10 years. The interviews divulged that if the cell could be used on its current status, it could be risky to human health and the environment. The interviews with CEHO indicated that hazardous waste was piled at the designated cell pending appropriate disposal. He further reiterated that disposal of such waste could only be done in South Africa through the Basel Convention Agreement, which controls the transboundary movements of hazardous waste and their disposal. However, there was no documentary evidence as to when hazardous waste had been transported to South Africa for safe disposal. Therefore, it was likely that such waste might have been disposed of in ways which would be detrimental to the environment. It is implied that some of the hazardous waste found its way to either solid waste/clinical waste cells without proper treatment.

RECOMMENDATION

The CoFC should endevaour to correct the defects of the hazardous waste cell. This will ensure that hazardous waste is appropriately disposed of and in accordance with the Waste Management Guidelines.

Management Comment

Management indicated that the landfill did not have a hazardous waste cell and that a place had been designated for the storage of hazardous waste before it could be disposed of in South Africa, which has facilities for such in accordance with the Lome Convention.

5.3.5 Protective Clothing

The Operational Manual maintains that the CoFC has to give business of recyclable waste to companies. It further declares that it is the responsibility of the recycling companies to provide proper clothing, suitable for the workmen hired. It further states that if the workmen do not accordingly comply with landfill operations, they may be expelled. During a site visit, the OAG observed that the workers were not dressed with the required clothing. The OAG observed that the workmen collected and sorted recyclable material with bare hands and without facial masks. The interviews with the workmen revealed that it was easier and quicker to use bare hands. In an interview with Management of the Landfill, this was confirmed as a concern, but no measure was put in place to ensure that the workmen adhered to the set rules. This condition posed a health threat to the workmen. Management noted that all the landfill workers were provided with

protective clothing and that a code of conduct was developed and strictly enforced for those involved in recycling. Nonetheless, the observations conducted by the OAG were contrary to the Management assertion.
Therefore, there was need for intensive sensitisation and regular inspection to ensure that the workmen worked under the prescribed safety regulations and where non-compliance was established; expulsion would have to be exercised.

RECOMMENDATION

The CoFC should adhere to the Operational Manual (OM) requirements and ensure that the measures concerning protective clothing that is provided for in the OM are complied with. The OAG also recommends that the CoFC should strictly apply measures where applicable and intensify inspection to ensure compliance.

5.3.6 Usage of Embankments or Nets

To protect the local environment, embankments or nets are to be used in addition to a recommended regime of daily cover to reduce windblown litter to a minimum.[5] The Operational Manual also emphasises on the importance of placing nets around the landfill. In this regard, the working phase was supposed to have been surrounded by nets which would prevent litter from scattering all over the landfill. Nonetheless, there was non-adherence on the part of the Landfill Management. Nets were only noticeable at the closed site. Non placement of nets on the landfill as required led to littering. Despite the presence of Litter Pickers to collect windblown litter around the landfill, it is imperative that the CoFC complies with both the International Environmental Standards and the Operational Manual; to reduce the risk that may occur emanating from hazardous waste. Existence of embankments would have been crucial especially during the times when there was non-coverage of the waste.

[5] World Health Organisation, 1995

FIGURE 6: The picture shows the nets placed at the closed tipping face

RECOMMENDATION

The CoFC should comply with the World Health Organisation (WHO) and the Operational Manual to ensure that there was usage of embankments or nets. The use of these nets will prevent litter from being carried away around the landfill. The initiative will protect both the environment within the landfill and the public at large.

Management Comment

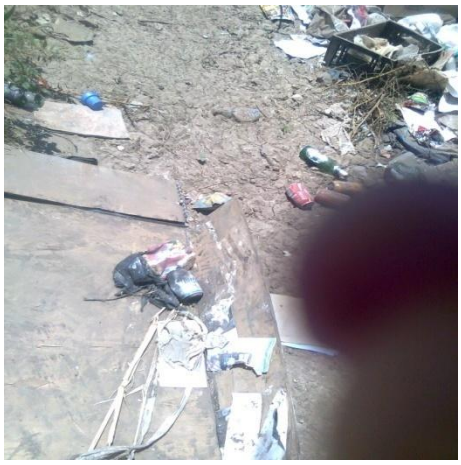
Management indicated that the stationery poles were available at the landfill but the challenge was relocating them according to the changes in the prevailing wind directions. Management however states that the Council was planning to fabricate nets that could be easily moved according to the prevailing wind in 2011/2012.

5.3.7 **Drainage System**

The operational Manual clearly asserts the importance of storm water drains around the landfill. The Manual further provides that whenever mud has accumulated in the drains, it has to be scooped and disposed of into the landfill area. Hence, there is need for periodic inspection in order to ensure that the drains are without sludge. This is to prevent seepage of water into the ground some of which may be contaminated. The observations made divulged that the storm water drains around the landfill were deplorable. The storm water drains were filled with silt and litter, hence blockage. Therefore, the water from the landfill could not run through into the sumps constructed at the lower end of the

landfill. Additionally, there were no inspection records of the storm water drains. Therefore, it was apparent that the inspection and unblocking of drains was intermittent. This condition may create accumulation of contaminated sludge, hence generation of both health and environmental risks.

Accumulation of Slit in the Drains and other waste



A mixture of sludge

Drains being blocked by waste

FIGURE 7: Storm water drains filled with silt and litter

RECOMMENDATION

The OAG recommends that the CoFC should ensure that there is proper upkeep of the storm water drains. The CoFC should also have an appropriate approach that will ensure that the storm water drains will always be in good condition to alleviate blockage by sludge.

Management Comment

Management highlighted that cleaning of the storm water drains was a package under the Ipelegeng Programme and at the time of the audit, the

Ipelegeng crew was still unblocking storm water drains in town and afterwards the landfill was covered.

5.4 MAINTENANCE OF EQUIPMENT

Maintenance of equipment enhances the level of effectiveness of the equipment and prolongs their lifespan. Nonetheless, the OAG observed that equipment at the landfill had not been maintained accordingly. Contrary to the requirement, equipment remained idle at the landfill workshop. These included the tyre cutter, the steam jet cleaner, incinerator and the Hanomag.

(i) Compactor (Hanomag), Tyre Cutter and Steam Jet Cleaner

The documents review revealed that in 2010, the hanamog machine which is a compacting machine, tyre cutter and the steam jet cleaner remained non-functional for the entire year. Their downtime is detailed at **Annexure 5.** It was a challenge for the OAG to establish when all the above mentioned equipment stopped operating, because there was no documentary evidence to that effect. On the other hand, the other compacting machine, that is; the Bomag which was operating at the time, was not always functional and even during the times when it was operating; it would not be working efficiently to produce the desired results. According to the landfill plant equipment availability records for 2010, the bomag was in operation constantly for only 3 months, while for the other remaining months, it was operational for an average of 18 days, the worst and best months being for 3 days and 29 days respectively. At the time of audit, all the compacting machines were not operating and reliance was on one small loaned compactor which was also engulfed by the heap of waste, which had already exceeded the prescribed 500mm layer of thickness of waste, to be compacted at a time. In addition, the compactor was overwhelmed by the voluminous waste, hence could not compact the waste to the desirable size. Therefore, it would not have been possible to achieve high density in the site. This may increase the amount of leachate since low density in the site could enable channels to form and water to flow through.

Furthermore, the Operational Manual states that Management could use its discretion to place Council Mechanics who would be solely responsible for the maintenance of the landfill equipment, at the landfill workshop. However, the workshop remained unutilised, as the landfill equipment was referred to the Council Workshop and queued for service like any other Council equipment. Thus, the landfill equipment was not given emergency maintenance privilege. As a result, this could have aggravated the delay of maintenance of equipment.

On the other hand, the tyre cutter which was to be used for segmenting of tyres before being disposed of was out of order since 2003/2004. As a result, tyres were placed haphazardly within the landfill and this might be the basis for outbreak of fires and insects such as mosquitoes. The interviews with Landfill

Management, could not confirm when the tyre cutter would be repaired. In addition, the steam jet cleaner that was to be used for washing tyres for vehicles exiting the landfill was not operating. The OAG could not establish the downtime of the machine due to non-availability of records. As a result, the designated area where the tyres for vehicles entering the landfill were supposed to be washed was no longer in use. The interviews with the Landfill Manager and the Operators indicated that it had not been used for more than 5 years. The OAG could not obtain either substantial justification of non operation, or reassurance as to when the process would be revitalised.

(ii) **Incinerators**

The infractor door for the working incinerator was damaged. The interviews revealed that once the lining fell, then the incinerator would stop being operational, since combustion would not be effective. At the time of audit, there was another incinerator which had remained non-functional for over 2 years. Therefore, if the functioning incinerator was down, the landfill would be left with no incinerator operating. If the landfill equipment is not repaired and maintained, then there is likelihood that the necessary landfill operations would not be performed; hence the overall efficiency of the landfill would be jeopardised. The OAG acknowledges that at the time of audit, the CoFC was in the process of engaging a company which would repair both the functional and non-functional incinerators.

(iii) **Fence**

The Operational Manual states that *"In addition to the regular patrol by the security guards, boundary fences shall be inspected at least once a week by the Landfill Manager or Landfill Supervisor for any openings which shall be closed immediately."* Notwithstanding the above affirmation, the OAG observed that the fence around the landfill had been vandalised as the 5 big openings on the fence surrounding the landfill were noticed. It was evident that those openings had been in existence for a while without any mending. Moreover, the Landfill Manager did not have reports pertaining to inspection of the fence, and action taken to restore it to sound condition. These openings may exacerbate the situation where scavengers may enter the landfill illegally. They may lead to theft of different valuable assets at the landfill.

FIGURE 5: The pictorial presentation below shows the tyre cutter that had remained at the landfill workshop without being maintained or replaced. The picture also shows the designated place where the steam jet cleaner was to be placed, one of the openings at the landfill and Hanomag compactor.

The Tyre Cutter

The designated Area for Washing Tyres

One of the Openings on the Landfill Fence

The Compactor (Hanomag)

RECOMMENDATION

The OAG recommends that the CoFC Management should ensure that equipment is constantly repaired and maintained to enhance their capacity and availability. Regular maintenance will improve the operations of the landfill, hence enhancement in the entire landfill.

Management Comment

Management indicated that the Civil and Mechanical Division would put in place a maintenance plan for all the essential equipment at the landfill; and that a budget had been proposed for maintenance requirements of all mechanical equipment.

5.5 MAINTENANCE PLANS

Maintenance plans necessitate regular routine maintenance. Additionally, the OM requires the Landfill Manager to prepare a maintenance schedule of all facilities and infrastructure and ensures that it is strictly adhered to. The Manual further emphasises that the equipment operators are to service equipment daily in accordance with Manufactures' specifications. Despite the provisions on the importance of maintenance of landfill equipment, the OAG observed that there were no Maintenance Plans for the machinery at the landfill. There were no records which signified either the service or maintenance of the landfill equipment. Due to absence of records, it was also a challenge for the OAG to establish whether servicing of equipment was done according to manufacturers' specification. Absence of Maintenance Plans may exacerbate delay in maintenance of the landfill equipment, and may contribute negatively to the overall efficiency of the landfill.

RECOMMENDATION

The COF should come up with a viable maintenance strategy which will tackle all the maintenance issues at the landfill. This strategy will assist the CoFC to make informed decisions on maintenance of different landfill equipment and infrastructure.

Management Comment

Management highlighted that Maintenance would be put in place and that already, a Chief Technical Officer had been given the responsibility of taking care of all maintenance requirements at the landfill. Management however, also indicated that maintenance of the bulldozer and compactor (bomag) had been outsourced as a key maintenance strategy.

5.6 MONITORING OF GROUND WATER, LEACHATE AND GAS

A degree of monitoring is necessary both to determine the status and degradation of the environment and to detect any detrimental impacts on the surrounding environment. Therefore, monitoring of groundwater, leachate and landfill gas may qualify any operation on the environment, particularly on the water regime and serves as an early warning system so that any problems that arise can be identified and rectified.

5.6.1 Groundwater and Leachate

Sampling of leachate is carried out on quarterly basis and tested to determine whether there is any water contamination. Any such contamination will be referred to DWMPC for remedial action. On this aspect, the OAG appreciates that the City of Francistown Council engaged a Consultant, to sample

groundwater from 5 strategically placed boreholes and then monitored and analysed it, to determine the scale of any ground water contamination and the significance of the impact on the background water quality. Reports were available for all the tests that had been conducted and the analysis of the tests attested that the quality of groundwater was satisfactory. However, at the time of audit in February 2011, the contract had just expired and no consultant was yet engaged in that regard. The OAG encourages the COF to continue with groundwater monitoring in order to ascertain that groundwater was of the required quality.

5.6.2 Landfill Gas

The landfill gas is generated in a landfill site once a certain depth of organic-containing waste has been deposited for around two years. According to document review, the Landfill gas has the potential to cause harm to human health by explosion; and the local environment by causing crop failure due to reaction on the soil.[6] Since the main component, methane, is also a known contributor to the greenhouse effect, emission of the landfill gas to atmosphere has to be minimised by proper management. Therefore, the CoFC is supposed to monitor gaseous emissions once a cell has been landfilled with waste to the desired height above the ground. In addition after every 3 months, physical check of gaseous emissions through gas pipes has to be carried out by igniting at the top of the pipe and also measuring gas concentration. Notwithstanding the above provision, there was no documentary evidence that the CoFC had ever taken any tests since the landfill became operational. As a result, the extent of the landfill gas remained unknown. Since the gas had to be managed for environmental and safety reasons, if left uncollected and analysed, the gas which contains mainly methane and carbon dioxide, may create health and safety risks. According to the World Health Organisation, "*carbon dioxide may present asphyxiation risk in underground structures, and is a green house gas. Methane has been estimated to make a seven times greater contribution than the same volume of carbon dioxide to the green house effect. Methane is explosive, and any buildings around the perimeter of the site are at risk of methane seepage and subsequent explosion and fire."* Therefore, it is necessary that the CoFC gives the landfill gas management, the attention it deserves, to prevent the environmental and health risks.

RECOMMENDATION

The OAG recommends that the CoFC should;

- Appropriately make an effort to manage and monitor gaseous emissions at the landfill.
- Develop a plan on how these tests will be conducted.

[6] http://www..interwaste.co.za/landfill/landfill-management.html

- Devise a reporting mechanism for the tests, to enable informed decision.

Management Comment

Management indicated that the Council had made estimates in the 2011/2012 recurrent estimates for the purchase of the sampling equipment to monitor gaseous emissions at the landfill.

5.7 MONITORING OF THE LANDFILL

5.7.1 Monitoring by DWMPC

The landfill was monitored by the Department of Waste Management and Pollution Control (DWMPC) through quarterly inspections. These inspections were conducted to ensure that the City of Francistown Council complied with environmental and health policies, plans, procedures, laws and regulations. Reports containing observations and recommendations were submitted to the Council. Review of the reports indicated that the landfill operation was not satisfactory. Notwithstanding the adverse comments and recommendations made by the DWMPC, the OAG noticed that the CoFC had not implemented the recommendations therein at the time of audit. For example, no action had been taken regarding the following aspects; non- covering of waste and lack of maintenance of equipment. Hence the status of the landfill did not improve but rather deteriorated. Non compliance by the Council on the recommendations meant that the landfill would remain not only an occupational hazard but a threat to the entire community.

5.7.2 Monitoring by the Council

In addition to monitoring by DWMPC, there was to be monitoring by the Council through the CEHO. The CEHO was to visit the landfill once a week. However, interviews and document review highlighted that the CEHO had not diligently performed the duties of inspecting the landfill operations and performance of the staff on site. The Officer indicated that other administrative issues impeded negatively on the inspections aspect. Lack of monitoring by the CEHO meant that there was inefficient management of the landfill. As a result, there was likelihood that the inevitable conditions at the landfill would go unobserved and this could downgrade the efficiency of the landfill. In addition, there were no reports even for the visits that had been undertaken. The failure on the part of the CEHO on the monitoring of the landfill operations may lead to the negative environmental impact.

Management Comment

Management denoted that inspite of absence of written reports of the supervisory inspections; the CEHO undertook inspections at the landfill once a week. Management further indicated that the CEHO would intensify the inspections and produce written reports, in that regard.

5.7.3 Monitoring by the Landfill Manager

The Landfill Manager who is the head at the landfill is responsible for ensuring that the daily operation at the landfill is within the required standard. According to the Operational Manual, the Landfill Manager is to inspect and accordingly supervise the landfill sites on daily basis. The interviews with the Landfill Manager and the Operators revealed that the Landfill Manager had not been conducting site visits accordingly, unless there was a crisis which needed management's attention. The Landfill Manager reiterated that due to other administrative duties, the sites could not be inspected often. In addition, the OM stipulates that the Landfill Manager *"shall compile and consolidate on weekly basis all individual reports prepared by the operators and monthly reports to the Council."* At the time of audit, there was no documentary evidence for the years under review that the Landfill Manager ever complied with the OM requirements. This implied that the CoFC Management was not informed of the entire status of the landfill management issues. The lack of reporting may compromise accountability and therefore, lead to a situation where the Council could not make informed decisions about the landfill issues as a whole. Albeit the above observation, the interviews revealed that the Landfill Manager had been reporting verbally, until November 2010, when written reports containing the status of the landfill were availed. The OAG acknowledges that development.

RECOMMENDATION

The OAG recommends that the CoFC should strengthen the monitoring of the landfill operations. Adequate monitoring will assist the CoFC to address issues which hinder the landfill to operate efficiently. Most importantly, through monitoring the CoFC will be able to identify persistent problems which need immediate redress.

Management Response

Management highlighted that the Landfill Manager reported to the CEHO on the operations of the landfill on a weekly basis and that information would be the basis for Mondays' briefings of the Deputy Town Clerk (Technical in which identified persistent problems would be addressed).

5.8. LANDFILL MANAGEMENT INFORMATION

Landfill management information is an essential ingredient for efficient and effective monitoring and appropriate reporting of performance. This ensures that CoFC Management make informed decision in that regard. Nevertheless, management information had not been adequate to properly manage the landfill potential risks. The OAG noticed that this might be attributable at least in part to limited or lack of records management. For instance; Daily Landfill Day Book containing all daily incidents or occurrences, Waste Volume Registers and Records of daily cover material used, Weighbridge Computerised Records, Equipment pre-start Checklist, external and internal machinery used at the landfill, daily/monthly fuel control, and Weekly Site Reports were supposed to have been maintained; and reports accordingly issued, to assist the CoFC management make informed decisions. However, the OAG noticed that these records were not appropriately maintained. This was so, despite the fact that the OM had indicated different documents that had to be used to regularly collect data and systematically collate it to influence landfill management decisions. Management indicated that all the information for the landfill operations was kept by the Landfill Manager. Inspite of Management affirmation, not all the essential documentation was afforded to the OAG during the audit and that was clear indication that records were not maintained appositely.

The OAG considers that CoFC would benefit from management information that would allow landfill management, to record and easily maintain accessible information on landfill. It is therefore, essential that accurate and up-to date performance information is available to enable comparison overtime. As such sufficient, accurate and reliable information such as landfill status and maintenance of equipment therein and achievement as milestones is recorded and used as part of the landfill management and reporting system.

RECOMMENDATION

The COF should ensure that there is adequate landfill management information for all the landfill operations. This initiative will be essential for audit trail and will also be useful for future reference to critical landfill issues.

5.9 OTHER OBSERVATIONS

5.9.1 Security

Security is crucial for the protection of the landfill and equipment therein. Despite the availability of security at the landfill, there had been theft incidence more especially of diesel and vehicle or plant machinery **(Refer to Annexure 6 for evidence).** There was also an apprehension that scavengers entered the landfill in overwhelming numbers and came armed with sharp objects ready for attack. This situation overpowered the security personnel at the landfill. The documents review revealed that during 2008, 2009 and 2010, theft of diesel was consecutive

and no arrests were ever made. Reports made highlighted that theft could have been exacerbated by the security's laxity and lack of commitment. At the time of audit, the interviews revealed that theft had reduced but the scavenger issue was still prevalent. The landfill Manager indicated that theft of diesel had not taken place for over six months. This was said to be due to the fact that the CoFC had consulted the company responsible for providing security, on the issue of lack of security at the landfill, hence the improvement. However, there was still need for the CoFC to strengthen security at the landfill, to curb scavenging.

RECOMMENDATION

The CoFC should strive to secure the landfill at all times. The CoFC should put in place measures that will ensure that there is adequate security to curb instances of theft and illegal entry of the landfill.

Management Comment

Management indicated that the Council had engaged a private security to guard the premises and in instances where there was theft, the company was surcharged in accordance with the conditions of the contract.

5.9.2 **Cost Recovery**

Beyond using the weighbridge to weigh waste when entering the landfill, the CoFC was to generate revenue from the services it provided to the public. However, the revenue accrued from the disposal of waste for the years under review could not be established because all the sanitation services were collected under one general ledger. Observations were made to identify the number of vehicles that came to dispose of waste at the landfill and on average 105 vehicles which contained waste that was to be paid for, entered the landfill per day.

Under normal circumstances, revenue would have been collected for disposal of waste from the vehicles which would have qualified for that **(See Annexure 7).** Since the weighbridge was out of order, it was impossible, hence revenue forfeited. From the above state of affairs, it can be deduced that since 2008, the City of Francistown Council was not able to collect revenue for the services rendered at the landfill. Non-collection of revenue defeated Government's objective of cost recovery, hence the Council's low budget sustainability which may lead to lack of maintenance of equipment and its upkeep.

RECCOMENDATION

The CoFC should ensure that the weighbridge is always functional. This will enable the CoFC to collect revenue which may enhance the Council's ability in addressing issues of sanitation and waste.

Management Comment

Management highlighted that there was no budget provision for weighbridge maintenance for the current financial year. But since that was a critical matter the Department would establish the cost of maintenance of the weighbridge and do all it can to source out funds.

OVERALL CONCLUSION

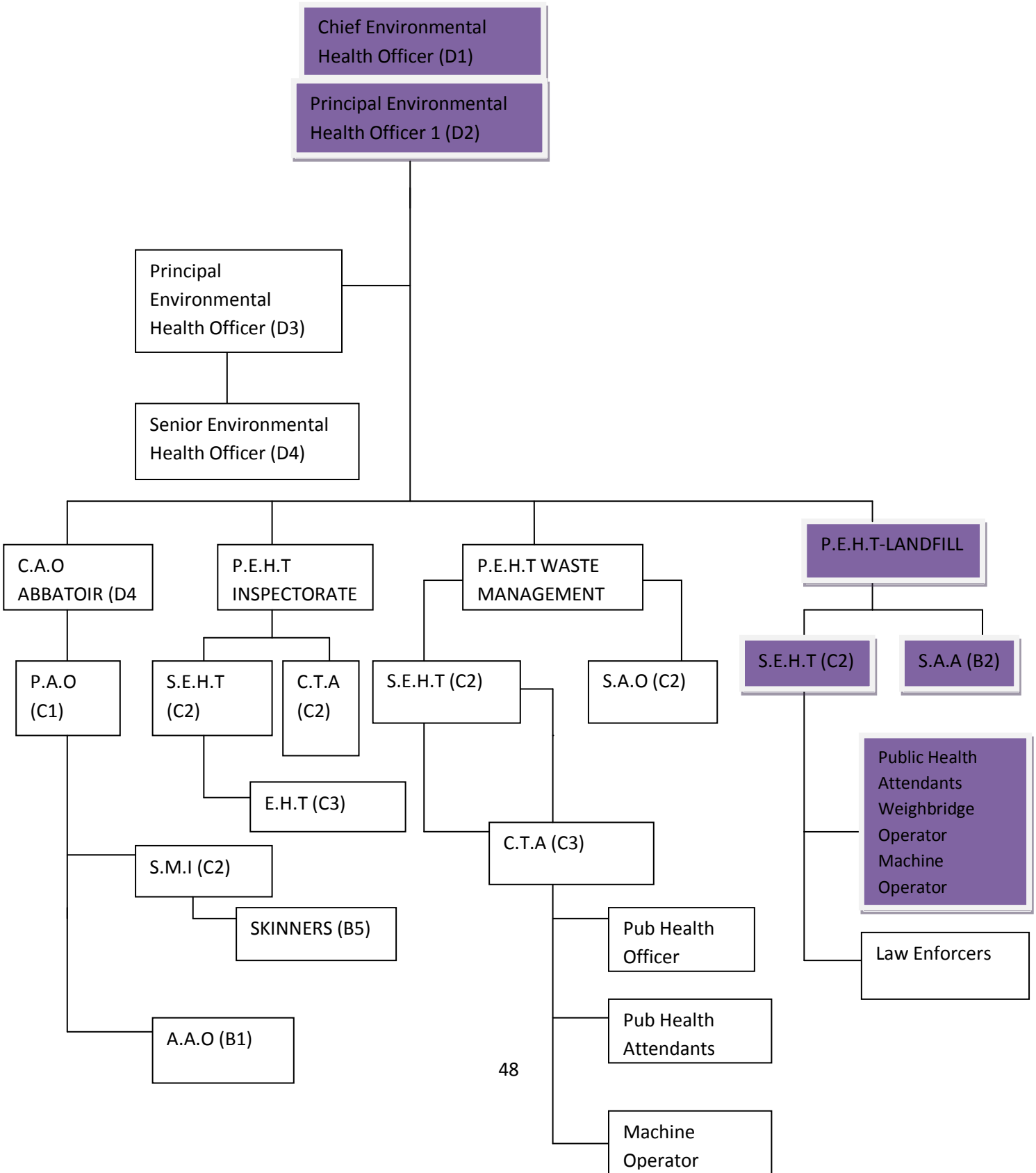
Handling, treatment and disposal of various types of waste are of critical importance to the general public, the surrounding communities and the environment. In addition, disposing of waste in a proper manner reduces the probability of contamination of the soil and groundwater with chemicals and microorganisms. The community living near landfill is exposed to toxic gases and susceptible to diseases. Efficient management of the landfill is important to minimise the adverse impacts and health risks. Therefore, if the landfill is properly managed, it is in an environmentally acceptable and low cost solution for the disposal of all types of waste; thus reducing adverse health effects. As such, landfilling is to be carried out in an efficient manner to prevent the environmental and health hazards. Furthermore, the New Sanitary Landfill for the City of Francistown Operational Manual (2000), the Guidelines for the Disposal of Waste by the Landfill (First Edition, 1997) and the WHO Standards provide a framework for efficient and effective management of the landfill. Resultantly, it is important for the CoFC to control and manage the landfill, according to the procedures and requirements of waste disposal. However, the OAG noticed deficiencies related to unsatisfactory methods of handling, treatment and disposal of waste, inefficient monitoring of the landfill and lack of maintenance of equipment which primarily were contributing factors of failure for the CoFC to be eligible for licencing requirements.

These observations deserve serious consideration. Therefore, it is critical that the City of Francistown Council guarantees that deficiencies at the landfill are addressed as this will improve the way the landfill is managed. If sound measures on ways of improvement of the status landfill are practised, the landfill may pose as a risk free environment which can be recognised nationally, regionally and internationally. In addition, proper management of the landfill will be a vehicle to promote environmental and public health in waste management regime.

ANNEXURE

Annexure 1

ENVIRONMENTAL HEALTH DIVISIONAL STRUCTURE



Annexure 2

Management of the Landfill Operation

Management of the landfill site and all landfill activities shall be under the responsibility of the Landfill Manager. He shall be responsible for planning, directing, controlling and monitoring all activities of the landfill site. He shall carry out these activities by delegating certain responsibilities to various personnel assigned to him though properly defined job descriptions and operating procedures. He shall be responsible for ensuring that the landfill is operating as required and as per these guidelines.

Specific Duties of the Landfill Manager

- Scheduling of activities for each section
- Preparing and issuing job description for each staff
- Procurement of items and stationery required for landfill activities
- Supervision of day to day activities
- Monitoring performance and recording daily activities, work outputs, any problems or accidents on site, equipment, breakdown
- Ensuring security of the landfill site
- Ensuring weighbridge record are taken correctly, recorded properly and stored securely
- Following un payments from various clients
- Overseeing that landfill equipment and facilities are operating and that maintenance is carried out as scheduled
- Following up payments from various clients
- Overseeing that landfill equipment and facilities are operating and that maintenance is carried out as scheduled
- Ensuring payment for services rendered to landfill site is made on time
- Ensuring monitoring of gas and leachate is carried out as scheduled
- Ensuring that hazardous waste is handled properly as required
- Clinical waste is incinerated as scheduled
- Ensuring that cover material is available material is available at all times
- Ensuring there is uninterrupted access to the landfill site and working face
- Suggesting improvements in landfill operations
- Preparing daily, weekly, monthly and annual reports on landfill operations
- Maintaining first aid kit
- Ensuring cleanliness of the landfill site

CORE RESPONSIBILITIES OF OTHER MEMBERS OF STAFF WHO ARE CENTRAL TO THE OPERATIONS OF THE LANDFILL

Landfill Supervisor

Assistant to Landfill Manager supervising on site landfill area operations, reporting to Landfill Manager the performance and problems, assigns tasks to spotters and operators and supervises them. He/she assists the Landfill Manager to plan Landfill operations, checks that waste brought in is the type accepted at the landfill, and supervises off loading and treatment of hazardous waste.

Weighbridge Operator

Operate weighbridges computers, receives payments on behalf of Cashier in his/her absence. He/she also checks the type of waste and records and rejects entry of the waste type that is not acceptable.

Incinerator Operators

Receive clinical waste and storing it in an orderly manner, operating incinerators, keeping record of clinical waste received and incinerated

Spotters

Direct trucks the route to waste tipping area, directs trucks during tipping, assists equipment operators during spreading, compacting and covering operations.

Equipment Operators

Operate equipment, cleaning the equipment after work, daily servicing of equipment in accordance with manufactures specifications.

Litter Pickers

Shall pick windblown litter within the landfill area, can be used as spotters, shall perform any duties as assigned to them by landfill supervisor including assisting in cleaning equipment, greasing equipment, checking sign boards in the landfill area, etc.

Security Guards

Maintain security within the landfill site, prohibit scavengers from entering landfill site and patrol the whole area to check any unauthorized intruders, keep record of security events at the landfill. During the day one guard shall man the gates and one guard shall patrol the landfill area.

Annexure 3

Documents Reviewed

- Proposed Sanitary Landfill for the City of Francistown (Draft Final Design Report).
- Operational Manual for the New Sanitary Landfill for the City of Francistown (June 2000).
- Guidelines for the Disposal of Waste by Landfill-First Edition, 1997.
- Study on the Management of Medical Wastes.
- Guidelines for Transportation of General Waste, Health Care Waste, Sewage and Hazardous Waste.
- Botswana's Strategy for Waste Management.
- Reports on Incidents at the landfill for 2006-2010.
- Landfill Operational Plan.
- Training Handout for Making Medical Injections Safer (MMIS) Project.
- Strategic Plan for 2010-2011.
- Reports of Landfill Inspections Conducted by the Department of Waste Management and Pollution Control (DWMPC) for 2006-2010.
- Reports on Sampling and Biochemical Analysis of Borehole Water Yield at the Old and New Landfill Sites in Francistown for 2006-2009.
- Invitation to Tender (ITT) for Service Maintenance Contract Repair of 2 Weighbridges Located at Francistown City Council Landfill (June 2010).
- Reports on Landfill Plant and Equipment Availability for January-December 2010.
- Study on Battery and Tyre Wastes, Report No. 29 of 1999. National Conservation Strategy (Co-ordinating) Agency.
- Environmental Health Planning Pamphlet series No.9: Solid Waste, Landfill for Local Authorities, health and Environment. World Health Organisation, Regional Office for Europe, 1995.

In addition to the documents, the audit relied on other sources for additional information on issues related to landfills. These documents include among others;

- Sen. D. 2010. *Importance of Trash Disposal.* http://www.ehow.com/facts_5886074_importance of –trash-disposal.html.
- Interwaste Environmental Solutions. 2010. *Landfill Management.* http://www..interwaste.co.za/landfill/landfill-management.html.
- Landfill Construction Quality Assurance Administration. 2008. *Why Landfill Construction Quality Assurance is so important to the Installation of Landfill Geomembrane Liners.* http://blog.landfillcqa.co.uk/landfill-design/landfill-construction-quality-assurance.

Annexure 4

DEFINITIONS OF DIFFERENT TYPES OF WASTE

BUILDER'S RUBBLE : Pieces of masonry, concrete etc resulting from construction, repair and demolition operations, uncontaminated with general waste and with a maximum particles size of 300mm

BULKY WASTE : Items, such as motor car bodies, fridges, etc, whose large size precludes or complicates their handling by normal collection, processing or disposal methods

GARDEN WASTE : Compostable waste derived from Garden Waste (garden and parks), which has not been mixed with other waste categories

COMMERCIAL WASTE : Solid waste generated by stores, offices and other activities not involved in manufacture.

DRY INDUSTRIAL/ NON HARZADOUS WASTE : Waste from industries which pause no health hazard

MEDICAL WASTE : Waste from clinics, dispensaries, hospitals, etc. This waste shall be incinerated.

DEAD ANIMALS : All dead animals' carcasses including accidental deaths of those condemned. These shall be incinerated on site

HAZARDOUS WASTE : All waste which is hazardous to human health

LEACHATE : An aqueous solution with a high pollution control potential, arising when water is permitted to percolate through decomposing waste. It contains final and intermediate products of decomposition, various solutes and waste residues.

LANDFILL GAS : Gasses (hazardous and explosive) emanating from landfill sites and related operations through the mixing of various wastes

Annexure 5

LANDFILL PLANT AND EQUIPMENT AVAILABILITY

YEAR	HANAMOG	BOMAG	WEIGHBRIDGE	INCINERATORS	TYRE CUTTER	STEAM JET CLEANER
JAN 2010	X	√	X	√ (1 working)	X	X
FEB	X	√ for 8 days	X	√ (1 working)	X	X
MAR	X	√ for 5 days	X	√ (1 working)	X	X
APR	X	√ for 13 days	X	√ (1 working)	X	X
MAY	X	√	X	√ (1 working)	X	X
JUN	X	√ but not for 2 days	X	√ (1 working)	X	X
JULY	X	√ but not for 5 days	X	√ (1 working but not for 9 days)	X	X
AUG (Record for only up to the 16th)	X	√	X	√ (1 working)	X	X
SEP	No record	No record	No record	No record	No record	No record
OCT	No record	√	X	√ (1 working)	X	X
NOV	X	√	X	√ (1working)	X	X
DEC	X	√	X	√ (1 working)	X	X
JAN 2011	X	√ for 6 days	X	√ (1 working)	X	X

X-Not Working

√**-**Working

ANALYSIS

The only equipment which was functioning (not necessarily all the time) for the entire period were 2 machines (Hanamog) and (1 incinerator out of the two that are at the incinerator room).

The only available record for the landfill plant and equipment and availability was for year 2010. Therefore there was no available information for the other years under review.

Annexure 6

INCIDENT	DATE OF INCIDENT	REMARKS
BOMAG-BC 672 RB-broken into, windows smashed, electrical cables cut; air filter pipe damaged and used oil poured into the exhaust pipe.	23/10/2006	Incident reported
HANAMOG-Battery stolen	11/07/08	Incident was reported to the Police as well as other Council departments
Diesel stolen from the main tank	09/12/08	Incident report was made
Attempted theft of truck batteries and diesel (B204 ANG)	17 April 2009	Incident report was made
Stolen diesel from two tipper trucks and JCB	04 June 2009	Incident report was made
Attempted theft of truck batteries and fuel (204 ANG)	02 July 2009	Incident report was made
Stolen batteries from HANAMOG machine CD 230	23 September 2009	Incident report was made
Diesel stolen from truck B204 ANG)	01 December 2009	Incident report made
Security personnel caught with condemned foodstuffs (2x 12.5Kg flour)	14 April 2010	Culprits verbally warned and the food stuffs were destroyed
Stolen Diesel from Dozer B673 ACP	29 April 2010	Cases were reported and 210 liters of diesel was stolen
Stolen diesel from dozer machine B673 ACP	02 May 2010	Cases were reported and 210 liters of diesel was stolen
Stolen diesel from Incinerator	23 May 2010	Incident was reported
Stolen Diesel from BOMAG	25 May 2010	Incident was reported

B672 RB		
Stolen diesel from Incinerator	06 July 2010	Incident was reported

Annexure 7

LIST OF WASTE CATEGORIES

CODE	DESCRIPTION	UNIT- CHARGE	UNIT- MASS	UNIT
01	General/Domestic Waste	0.00	0.0	Kg
02	Building Rubble-Soil-Ash (Free)	0.00	0.0	Kg
03	Gen/Domestic ≥1000kg (com.comp)	50.00	1 000	Kg
04	Industrial/Com. Waste (Companies)	40.00	1 000	kg
05	Compactable Waste	40.00	1 000	kg
06	Condemned Food Stuff	85.00	1 000	kg
07	Concrete Blocks ≥ Bricks (500mm)	20.00	1 000	Kg
08	Safe Disposal (e.g): Important Document)	40.00	1 000	Kg
09	Tyres =Rim Size ≤ 13”@ P1 ea	1.00	0.0	ea
10	Tyres=Rim Size≥ 13”@P2 ea	2.00	0.0	ea
11	Animals (e.g. dogs, cats etc)@P10ea	10.00	0.0	ea
12	Compost or Garden Refuse (companies)	15.00	1 000	Kg
13	Trees (Companies)	15.00	1 000	Kg
14	Abattoir Sludge	50.00	1 000	Kg
15	Medical Waste	100.00	100.0	Kg
16	Liquids Hazardous Material	180.00	100.0	Kg
17	Solid/Dry Hazardous Material	120.00	100.0	Kg
18	Recycling Shed (Apart) @1.00ea	100.0	0.0	ea
19	Salvation/ Operation Charges Only/Comp	50.00	0.0	ea
20	Medical Waste (External Sources)	50.00	100.0	Kg
21	Food Animals Products	0.50	1.0	Kg