

PR-10080-250  
Jan 27/94

**PRIVATE PROVISION  
OF  
SOCIAL SERVICES**

**Phase II-Implementation**

**City of Gaborne, Botswana**

**March 1994**

Prepared by:

**Jim Dohrman**

for:

**U.S. Agency for International Development  
and  
International City/County Management Association**

**Contract No. PDC-10080-C-00-9091-00**

*The views herein do not necessarily represent those of the  
U.S. Agency for International Development*

# DSM Environmental Services, Inc.

Jim Dohrman  
Ted Siegler  
George Murray

Thrasher Estate House  
Box 466  
Ascutney, Vermont 05030  
Telephone: 802-674-2840  
Fax: 802-674-6915

**MEMO TO:** Steve McCoy Thompson, Bob MacLeod, Tori Mills,

**FROM:** Jim Dohrman

**RE:** Botswana Debriefing

**DATE:** March 1, 1994

DS  
MAR 04 1994  
JIM DOHRMAN

The following memo is intended to update you on my latest TDY in Gaborone. In general the trip was successful but some areas still require close monitoring if we are to move into implementation prior to the September 31 deadline for project funding.

**Collection:** The award of the collection contract in Gaborone South was temporarily stalled by questions from the Ministry of Local Governments and Lands (MLGL) regarding the City budget line item which would fund the program. This was precipitated by a rather narrow assessment of the tenders by the City Engineer's Office which looked only at costs and not the improvements in service. In response to this analysis we met with all five tenders and requested further breakdowns of their base tender prices. My summary of these price breakdowns and a response to the City Engineer's analysis seems to have broken the log jam and we have been told by the City Clerk's office that the MLGL has now approved the budget line item and we should be back on track for contract award in March/April with start-up in June. Pushkar needs to keep on top of the budget approval process and Tender Panel to keep the momentum up. The budget will be released and adopted in early March. If all goes well they should award the contract in late April which would mean start-up in June/July. Ted is scheduled to return to Gabs for the collection contract Start-up.

**Landfill:** ARUP, the local landfill design Engineer, has completed the Site Development Plan which, along with my Operating Plan, is included in the Tender Documents. I had some problems with their design and suggested some changes which they have agreed to. At the first Steering Committee Meeting held on February 1, 1994 I was authorized to begin the landfill tender process. A prequalification meeting was advertised and held on February 23, two days before my departure. I was expecting a larger turnout but only 20 people showed up. Fortunately these included 5 or 6 good firms that showed strong interest in the project. Two large South African waste management firms, three local general contractors (expat controlled), and Daisy Loo/Sanitation Botswana, a local firm with Botswana ownership. Qualification statements are due March 18, which Pushkar will DHL to me. I will prepare a report and ranking of firms and fax back to Pushkar by April 1 or probably sooner. Allowing some time for the Tender Panel to review the prequalified list, and for ARUP to revise the Site Development Plan, we should be able to issue Tender Documents by the End of April.

We will also face a budget problem with this project since it will come in mid year. Earlier in the project when the MLGL was more involved, this was not considered a problem but now special appropriations are being looked at very carefully. Pushkar, again, needs to stay on top of this and perhaps bypass the GCC and get to someone at the ministry if we are to implement by September 31.

I experienced considerable frustration over trying to get Waste Paper Recovery back into the landfill. They are recycling approximately 300 tons per month of source separated material but the GCC is reluctant to let them back into the landfill.

Ordinances: At the request of the GCC I have separated the first draft ordinance into a separate Medical Waste Ordinance and a Solid Waste Ordinance. These are now being processed through the GCC legal system for implementation.

Medical Wastes: The GCC completed their inventory of medical waste which permitted me to prepare a brief report and proposal for utilizing the existing incinerators at the public hospital which have capacity, if operated efficiently to handle all medical waste generated in the city. I have also sized and prepared a cost estimate for a new dual chamber (USA) incinerator to handle all medical waste as well as infected meat from the abattoir. The attached report provides more details.

Sorting/Transfer facility: The GCC has requested a transfer of funds from the equipment fund to more technical assistance to perform a preliminary design of a sorting/transfer facility. This has become a more crucial issue since the recently completed Landfill Site Development Plan shows a relatively short 7 to 10 year life span for the new landfill. I have prepared an SOW for this work and would anticipate doing it in August/September during private landfill implementation.

Documents: I have attached copies of all correspondence produced during this TDY along with a computer disk including all files for your reference and files.

If anyone has any questions please do not hesitate to call.

(FINAL DRAFT)  
Revised 26 JAN 94

**GABORONE CITY COUNCIL (SOLID WASTE) BYE-LAWS**  
*(under regulations 30 and 31)*  
*(date)*

**ARRANGEMENT OF BYE-LAWS**

**Part I Preliminary**

**BYE-LAW**

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2. Interpretation

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4. Hazardous and Trade Waste Generators
5. Special Wastes
6. Sorting
7. Scavenging
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18. Burning of Refuse
19. Enforcement

## **Part I Preliminary**

*Citation* 1. These Bye-Laws may be cited as Gaborone City Council (Solid Waste) Bye-laws.

*Interpretations* 2. In these Bye-laws, unless context otherwise requires-

- "commercial/industrial waste" means solid waste materials originating in wholesale, retail, institutional, or service establishments such as office buildings, stores, markets, restaurants, theaters, hotels, warehouses, industrial operations and manufacturing processes;
- "council" means the Gaborone City Council;
- "council area" means the area under the jurisdiction of the council;
- "facility operating plan" means a written plan describing the operation of a council facility;
- "facility rules" means the rules established in a facility operating plan which carry the jurisdiction and enforcement of bye-laws;
- "hazardous waste" means any waste which by reason of chemical reactivity or toxic, explosive, corrosive, or other characteristics, cause danger or are likely to cause danger, to human health or the environment, whether alone or in combination with other wastes;
- "mechanical collecting vehicle" means a refuse collection vehicle equipped with devices to load refuse storage receptacles;
- "medical waste" means any wastes generated by hospitals, clinics, nursing homes, doctor's offices, medical laboratories, research facilities and veterinarians which are infectious or potentially infectious. Medical waste is further defined to include the following categories:
  - (a) microbial wastes including cultures and stocks of infectious wastes and associated biologicals that can cause disease in humans;
  - (b) human blood and blood products, including serum, plasma and other blood components;
  - (c) pathological wastes of human origin, including tissues, organs and body parts removed during surgery or autopsy;
  - (d) contaminated animal wastes including animal carcasses, body parts and bedding which have been exposed to infectious agents during medical research, pharmaceutical testing or production of biologicals;
  - (e) isolation wastes associated with animals or human beings known to be infected with "highly" communicable diseases;
  - (f) contaminated and uncontaminated sharps including hypodermic needles, scalpels and broken glassware;

- "occupier"** means, in relation to any lot or premises-
- (a) any person in actual occupation of such lot or premises and having charge or management thereof; or
  - (b) in the event of the lot or premises being occupied by anybody other than an employee of the person having charge or management thereof, any person having such charge or management;
- "official"** means any duly appointed official of the City Council;
- "owner"** means, in relation to any lot or premises, the person in whose name the title to such lot or premises is registered and includes an agent of the owner or any person receiving or entitled to receive rent in respect of such lot or premises;
- "premises"** means any building or part thereof, store, shop, tenement, or their erection above or below the ground and the land used or occupied in connection therewith;
- "recycling"** means the sorting, processing and transportation of materials, products or containers for the purpose of remanufacturing or refilling of products equal to or similar to those of the original material or container;
- "residential waste"** means solid waste materials generated by occupiers of single or multi-family dwellings;
- "scavenging"** means the unauthorized separation of waste for recyclable materials and food for human consumption;
- "solid waste"** means waste of a solid nature generated by a person, business or industry;
- "sorting"** means the authorized separation of solid waste materials for the purposes of recycling or disposal, either at the source of generation or at the disposal facility;
- "special wastes"** means wastes which due to their nature, require special or separate handling, including, but not limited to tires, brush, demolition debris, construction waste, motor oil and bulky metal items;
- "street"** means any street, square, road, lane, footpath, pavement, thoroughfare or public place extending in width from the boundary of any lot or area of land and includes any work or thing forming part of or connected with such street;
- "trade waste"** means a non-hazardous waste, generated in whole or in part in the course of a trade, industry, or research, other than normal solid waste generated by office workers or employees of said trade, industry or research facility;
- "yard waste"** - means grass clippings, leaves, brush or other plant waste generated on a residential or commercial plot.

## **Part II Solid Waste Generation and Storage**

### **Waste Storage and Receptacles**

3. (1) No person shall place, pour, throw or leave on any lot or premises or street or other public place, and no person shall permit to remain on any lot or premises under his control or any street or public place adjacent to such lot or premises within 10 meters of the boundary thereof, any refuse or waste in such place or in such manner or for such time as to endanger health, or to favor the breeding or harboring of flies, mosquitos or other insect pests, or to encourage rats or other vermin to frequent such lot, premises or street or other public place, or to become an eyesore or to cause any nuisance, or to be likely to interfere with the comfort of the inhabitants of the city.
- (2) Every occupier of premises in the council area shall, within 14 days of occupying said premises, provide sufficient and suitable refuse receptacles of the size and type stipulated below, for the reception and storage of refuse upon such premises.
- (3) Every occupier shall cause such receptacles to be covered at all times except when refuse is being deposited in or discharged therefrom.
- (4) Every occupier shall cause all refuse receptacles in use on his premises and covers thereof to be kept as clean as practicable and maintained in good order and condition.
- (5) Every occupier shall cause all refuse that has been spilled on the ground by overturning by animals or other cause to be returned to the receptacle as soon as practicable.
- (6) Every occupier shall provide refuse receptacles at a location on his premises which are easily accessible for collection.
- (7) Every occupier of a plot containing up to 4 residential dwelling units shall provide refuse receptacles not exceeding a capacity of 150 liters each, constructed of metal or high strength plastic.
- (8) Every occupier of a plot who generates commercial/industrial waste or a plot containing five (5) or more residential dwellings shall provide refuse receptacles not exceeding a capacity of 150 liters each. If, based on twice per week collection, the volume of waste exceeds 450 liters (three receptacles) and the plot is located in a council area using mechanical collection vehicles, the occupier of said plot shall provide receptacles not to exceed a capacity of 6.11 cubic meters, constructed of materials and configuration suitable for mechanical collection by the council or their designated collection contractor. Said receptacles may be provided by the council or their designated collection contractor. The council or designated collection contractor may charge a fee for providing the refuse receptacles which will be equal to the invoice cost of the receptacle plus reasonable cost of transporting and placing the receptacle at said plot.
- (9) In council areas not utilizing mechanical collection vehicles, occupiers of plots who generate commercial/industrial waste or a plot containing five

- (5) or more residential dwellings shall provide a sufficient number of receptacles not exceeding a capacity of 150 liters each.
- (10) Commercial generators of food waste shall provide for the secure storage of food waste to prevent scavenging.
- (11) Within one year after the effective date of this bye-law storage of solid waste in metal, 210 liter barrels shall be prohibited.

***Hazardous and Trade  
Waste Generators***

4. (1) Every owner or occupier of any plot or premises, on which a hazardous or trade waste is to be generated, and which is required to be disposed of at a council designated solid waste management facility, shall make application in writing to the council for permission to do so and shall submit to the council the following information:

- (a) the chemical composition, nature and volume of the waste;
- (b) a description of the industrial process or trade giving rise to the waste;
- (c) the number of persons employed on the premises; and
- (d) any other such information, including testing and laboratory analysis carried out by a laboratory recognized by the council which the council may consider necessary.

(2) Upon receipt and evaluation of an application to dispose of a hazardous or trade waste at a council solid waste management facility, the council may by written notice to the owner or occupier of the plot or premises from which the waste is generated, require him to execute at his expense any of the following;

- (a) dispose of the waste in the same manner as other solid waste;
- (b) dispose of the waste in refuse receptacles, using special containers or labeling as directed by the council;
- (c) transport the waste to a council disposal or processing facility as directed by the council, employing special containers and handling, using qualified drivers with emergency response training, carrying a manifest document signed by the council authorizing disposal, and placing the waste in a specific area of the facility as directed by the facility operating plan;
- (d) transport the waste to a facility specifically designed to dispose of hazardous waste;
- (e) cause the waste to be processed on the plot or premises of generation, thus rendering it non-hazardous;
- (f) any other measures relative to transportation and disposal of the waste determined by the council to be required to protect human health and the environment;
- (g) pay an additional fee for collection and disposal of said hazardous or trade waste;

(3) The determination of whether a particular waste is or is not hazardous rests solely with the council.

(4) All owners or occupiers of plots or premises generating a hazardous or trade waste on or before the effective date of this bye-law are granted interim permission to continue transporting and disposing of said waste in the manner utilized prior to the effective date of this bye-law. Within sixty (60) days after the effective date of this bye-law all generators of a hazardous or trade waste shall submit an application for disposal as stipulated in Section 4 (1) above. Failure to submit an application for disposal within the sixty day interim period will subject the generator to a fine or other action as stipulated herein.

(5) All authorizations issued by the council for the transportation and, or disposal of a hazardous or trade waste shall remain in effect for a period of five (5) years. Any significant change in the volume or nature of the waste during the permit period shall require written notification to the council by the person generating the waste. The council reserves the right to alter the authorization during the five (5) year period for cause, and to adjust the fee based on documented increases of the council's cost to transport or dispose of said waste.

### ***Special Wastes***

5. (1) All owners or occupiers of plots which generate special wastes shall provide storage in a manner that will not create a public nuisance or endanger the public health or environment.

(a) Not more than 25 tires may be stored on a plot and shall be stored in areas away from open fires or other ignition sources;

(b) brush, demolition debris and construction waste shall be transported to a council disposal or processing facility as soon after generation as practical and may be stored on the premises of generation up to thirty (30) days, after which it must be transported to a designated disposal facility;

(c) waste oil shall be stored in leakproof metal, plastic or concrete containments which are not subject to fire or accidental spillage. The storage or disposal of waste oil in earth pits or upon the ground of any plot, street or public area within the council area is prohibited.

(2) The storage or disposal of dead animals on any public street or right of way is prohibited.

### ***Sorting***

6. (1) The council shall support and encourage the sorting of refuse at the point of generation for the removal of materials from refuse which are recyclable or have value for other uses.

(2) Any person wishing to place specialized containers on any plot, council street or public place, for the purpose of sorting, storing and collecting recyclable materials such as paper, plastic, tins or glass bottles,

or food waste for animal consumption, shall make written application to the council including the following information:

- (a) description of materials to be sorted;
- (b) description of containers, bins or skips for storing said materials;
- (c) the specific locations of all sorting containers for which application is being made;
- (d) the schedule and method of collecting the materials;
- (e) a plan to be employed to control litter around the sorting container;

(3) Upon receipt and evaluation of an application for maintaining sorting containers, the council, may by written notice;

- (a) accept and approve of the application as submitted;
- (b) modify the request in terms of the number or type of containers to be placed;
- (c) reject the application and order the removal of any or all existing sorting containers;
- (d) require the applicant to perform other measures as determined by the council to protect human health or the environment;
- (e) require a fee for the location of sorting containers;

(4) All persons maintaining sorting containers within council areas on the effective date of this bye-law are granted an interim permit to continue maintaining said sorting containers for a period of sixty (60) days. Within sixty days (60) of the effective date of this bye-law, all persons maintaining sorting containers shall make application to the council as stipulated in Section 7(1) above.

***Scavenging***

7. The unauthorized scavenging or separation of waste for materials or food waste for any purpose is strictly prohibited.

***Violation of Storage Time***

8. Any owner or occupier of a plot or premises that allows refuse, special wastes or other solid waste to be stored on his plot or premises for longer than 30 days may be notified in writing of a violation of these bye-laws and given 15 days to remove said waste. If, at the end of 15 days after receiving the notice, the owner or occupier has not removed said waste the council may remove said waste and charge the owner or occupier of the plot or premises for the cost of removal, and assess other fines or penalties as stipulated herein.

***Part III Solid Waste Collection and Transport***

***Refuse***

9. (1) All refuse generated within all council areas shall be collected by the council or its assigned agents or licensed private haulers. In general,

for the purpose of refuse collection, refuse shall not include hazardous wastes, trade wastes or special wastes as defined herein unless a permit has been obtained in accordance with these bye-laws. Collection frequency shall be at least once per week in residential, commercial and industrial areas. Frequency of collection may vary depending on the volume and type of waste generated. Collection shall be in the manner designated by the council or its designated agent. The council may set fees from time to time for providing collection service in the council area.

(2) Refuse being transported by any person over any council street shall be securely tied or covered during the transportation thereof. No person shall allow refuse to leak, spill, blow off or drop from any vehicle on any council street during loading, unloading or transportation of said waste.

(3) Any person wishing to collect waste, other than their own waste and other than brush or clean demolition waste, within the council area shall make written application to the council including the following information:

- (a) description of wastes to be collected;
- (b) description of vehicles to be used for collecting said wastes;
- (c) the schedule and method of collecting the wastes;
- (d) a plan to be employed to control litter during collection and transport to the council disposal facility.

(4) Upon receipt and evaluation of an application the council may, by written notice;

- (a) accept and approve of the application as submitted;
- (b) modify the request in terms of the collection vehicles and plan;
- (c) reject the application;
- (d) require the applicant to perform other measures as determined by the council to protect human health or the environment;
- (e) require a fee for authorization of collecting waste.

#### *Other Wastes*

10. (1) All persons collecting and transporting demolition and construction wastes and brush shall do so in vehicles which are in good repair and meet all vehicle registration and inspection requirements. The manufacturers load limits shall not be exceeded. Any wastes which contain dust or which may spill, blow or otherwise become dislodged from the vehicle, shall be tied down or covered during transport.

#### **Part IV *Solid Waste Disposal***

#### *General*

11. (1) All solid waste generated, produced or collected within the council area shall be disposed of only at such disposal or processing facilities as may be designated by the council. Said designations may differentiate between types of waste materials, persons, refuse collectors,

waste sorters, as may be necessary to provide for the efficient and environmentally safe disposal or recycling of said waste. Waste generated, produced or collected outside of the council area shall not be disposed of at any council facility without written permission of the council.

(2) Storage or disposal of all solid waste within the council area other than at designated disposal facilities is strictly prohibited.

*Prohibited Materials* 12. The following materials are prohibited from all council disposal or processing facility:

- (a) liquid wastes including latrine pumpings, sewage or sludge;
- (b) waste oil;
- (c) burning or hot ashes;
- (d) Hazardous or trade wastes for which no council authorization has been issued;
- (e) derelict vehicles.

*Separation of Wastes* 13. All persons delivering waste materials to a council disposal or processing facility shall separate said materials into the types of materials as designated in the facility operating plan and rules in effect on the effective date of this bye-law or as revised from time to time.

*Facility Operating Plans and Rules* 14. The council shall prepare facility operating plans for all designated waste disposal and processing facilities which shall govern the operation of said facility. Each facility operating plan shall include a set of facility rules which are by reference included as part of these bye-laws, carrying the same weight of jurisdiction and enforcement. All facility rules shall be adopted by the council and may be revised from time to time in the same manner as bye-laws.

*Sorting* 15. (1) Any person wishing to perform sorting of inert materials, for the purpose of recycling, at any council disposal or processing facility shall make application in writing to the council for permission to do so and shall submit the following information:

- (a) a description of the material(s) he wishes to sort;
- (b) the anticipated volume of said materials;
- (c) a description of the manner of sorting so as not to disrupt the normal operation of the facility;
- (d) the number of employees to be utilized;
- (e) a description of storage containers to be used, their location and frequency of collection;
- (f) a health and safety plan for all sorting workers to include safety clothing and training;
- (g) all sorting activities shall conform to the facility operating

plan and facility rules;

(2) Upon receipt and evaluation of an application for sorting at a council disposal or sorting facility, the council may upon written notice:

(a) accept the application as submitted and issue a permit, or;

(b) amend the application after consultation with the facility operator, or;

(c) reject the application;

(d) if in the judgement of the council, the sorting activity will increase operating costs such as additional security, the council may impose a fee for the sorting permit;

(3) A permit issued by the council for sorting at a council facility shall be valid for a period of one (1) year, or until a formal sorting facility is operational, and may be revised or revoked by the council, for violation of permit conditions, at any time during that period.

*Scavenging*

16. The scavenging or separation of waste for materials or food waste for any purpose at any council disposal or processing facility is strictly prohibited.

**Part V Miscellaneous**

*Offenses and Penalties*

17. Any person who obstructs or hinders the council in the exercise of its duties under the provisions of these bye-laws or who fails to comply with any of the provisions of the bye-laws shall be guilty of an offence and shall be liable on first conviction to a fine not exceeding P100, or in default of payment thereof, to imprisonment for a term not exceeding 3 months, and on the second or subsequent conviction, to a fine not exceeding P200, or, in default of payment thereof, to imprisonment for a term not exceeding six months.

*Burning of Refuse*

18. The open burning of refuse is prohibited within the council area.

*Enforcement*

19. Health officers and Bye-Law Enforcement Officers are hereby authorized to enforce these bye-laws. The Council reserves the right to designate other agents to assist with enforcement as necessary.

(DRAFT 26 JANUARY 94)

**GABORONE CITY COUNCIL (MEDICAL WASTE) BYE-LAWS**  
*(under regulations 30 and 31)*  
*(date)*

**ARRANGEMENT OF BYE-LAWS**

**Part I Preliminary**

**BYE-LAW**

1. Citation
2. Interpretation

**Part II Medical Waste Generation and Storage**

3. Medical Waste Generation and Storage
4. Radioactive Waste

**Part IV Medical Waste Treatment and Disposal**

5. On-Site Sterilization
6. Off-Site Sterilization
7. Transportation
8. Disposal

**Part V Miscellaneous**

9. Offenses and Penalties
10. Enforcement

**Part I Preliminary**

- Citation** 1. These Bye-Laws may be cited as Gaborone City Council (Solid Waste) Bye-laws.
- Interpretations** 2. In these Bye-laws, unless context otherwise requires-
- "council" means the Gaborone City Council;  
"council area" means the area under the jurisdiction of the council;  
"hazardous waste" means any waste which by reason of chemical reactivity or toxic, explosive, corrosive, or other characteristics,

- cause danger or are likely to cause danger, to human health or the environment, whether alone or in combination with other wastes;
- "mechanical collecting vehicle"** means a refuse collection vehicle equipped with devices to load refuse storage receptacles;
- "medical waste"** means any wastes generated by hospitals, clinics, nursing homes, doctor's offices, medical laboratories, research facilities and veterinarians which are infectious or potentially infectious. Medical waste is further defined to include the following categories:
- (a) microbial wastes including cultures and stocks of infectious wastes and associated biologicals that can cause disease in humans;
  - (b) human blood and blood products, including serum, plasma and other blood components;
  - (c) pathological wastes of human origin, including tissues, organs and body parts removed during surgery or autopsy;
  - (d) contaminated animal wastes including animal carcasses, body parts and bedding which have been exposed to infectious agents during medical research, pharmaceutical testing or production of biologicals;
  - (e) isolation wastes associated with animals or human beings known to be infected with "highly" communicable diseases;
  - (f) contaminated and uncontaminated sharps including hypodermic needles, scalpels and broken glassware;
- "occupier"** means, in relation to any lot or premises-
- (a) any person in actual occupation of such lot or premises and having charge or management thereof; or
  - (b) in the event of the lot or premises being occupied by anybody other than an employee of the person having charge or management thereof, any person having such charge or management;
- "official"** means any duly appointed official of the City Council;
- "owner"** means, in relation to any lot or premises, the person in whose name the title to such lot or premises is registered and includes an agent of the owner or any person receiving or entitled to receive rent in respect of such lot or premises;
- "premises"** means any building or part thereof, store, shop, tenement, or their erection above or below the ground and the land used or occupied in connection therewith;
- "radioactive medical waste"** means any waste material, solid, liquid or gaseous resulting from a medical treatment or laboratory procedure using radiation, to the extent that said waste is considered a threat to human health or the environment;

## **Part II *Medical Waste Generation and Storage***

### ***Medical Waste Generation and Storage***

3. (1) All owners or occupiers of plots or premises generating a medical waste shall separate at the source all such medical wastes and place them in red colored heavy duty plastic bags or other suitable color coded containers as follows:

(a) all solid and containerized liquid or semi-liquid medical waste which has not been sterilized and rendered non-infectious shall be placed in heavy duty red plastic bags at the point of generation, regardless of whether the medical waste will be sterilized on-site, off-site or disposed of at a council disposal or processing facility;

(b) all sharps, including hypodermic needles, scalpels and broken glassware, whether sterilized or not, shall be placed in rigid, sealed, plastic containers clearly marked "Medical Waste - Sharps" in red lettering;

(c) All hypodermic needles or other sharp instruments which have been treated by electrical devices to remove sharp edges are not considered sterilized under this bye-law and shall be stored in medical waste containers as included under paragraph (b) above;

### ***Radioactive Wastes***

4. (1) All owners or occupiers of plots or premises who generate a radioactive waste during medical treatment or laboratory procedures shall make application in writing to the council for permission to perform said medical treatment or laboratory procedure and shall submit the following information:

(a) a description of the waste to be generated including its type, volume and radioactive level;

(b) a description of the treatment or procedure which generates the waste;

(c) a description of the storage facilities to be utilized to store radioactive wastes prior to shipment and disposal, which storage area shall offer protection of all workers in accordance with industry standards;

(d) a description of the transportation and disposal procedures to be utilized to dispose of the radioactive waste at an approved disposal facility in accordance with industry standards;

(e) any other information that the council deems necessary to complete its review and evaluation of the application;

(2) All generators of radioactive wastes are advised that as of the effective date of this ordinance there are no approved, permitted

radioactive disposal facilities in the republic of Botswana, thereby requiring all radioactive waste to be transported out of Botswana for disposal. Radioactive waste generators shall abide by all laws, regulations and guidelines of the country to receive said waste for disposal.

(3) Upon receipt and evaluation of an application to generate a radioactive waste, the council may by written notice to the generator:

- (a) approve the generation of said waste in accordance with the application;
- (b) deny the application;

#### **Part IV Medical Waste Treatment and Disposal**

##### **On-Site Sterilization**

5. (1) All owners or occupiers of plots or premises who generate less than two (2) kilograms of medical waste per day may sterilize said medical waste on-site without a council Permit, using one of the following methods:

- (a) autoclave
- (b) microwave
- (c) chemical treatment
- (d) incineration

(2) All on-site sterilization devices shall be operated in accordance with manufacturer's instruction and to the extent necessary to achieve complete sterilization of the waste;

(3) All owners or occupiers of plots or premises who generate more than two (2) kilograms of medical waste per day and who perform on-site sterilization of said waste, as defined in paragraph (1) above, shall make application in writing to the council for permission to do so and shall submit to the council the following information:

- (a) a description of the medical waste to be disposed of including its type and volume;
- (b) methods for handling and storing said waste prior to the sterilization process;
- (c) a description of the sterilization process including operating procedures;
- (d) any other such information as the council may request to complete its review of the application;

(4) Upon receipt and evaluation of an application to operate an on-site sterilization process, the council may by written notice to the owner or occupier of the plot or premises from which the waste is generated take the following actions:

- (a) accept the application as submitted and issue an authorization to operate an on-site sterilization process, or;
- (b) deny the application and direct the generator of the waste to arrange for sterilization and disposal at an off-site council approved medical waste treatment facility;

(5) All owners or occupiers of plots of premises generating more the two (2) kilograms per day of medical waste on or before the effective date of this bye-law are granted interim permission to continue treatment of said waste in the manner utilized prior to the effective date of this bye-law, for a period of 60 days. Within the 60 day period all operators of on-site sterilization processes handling two (2) or more kilograms per day shall submit an application as stipulated in Section 4 (3) above. Failure to submit an application within the sixty (60) day period will subject the generator to a fine or other action as stipulated herein.

(6) All authorizations issued by the council for operation of an on-site sterilization process shall remain in effect for a period of five (5) years. Any significant change in the volume or nature of the waste, or the method of sterilization, during the permit period shall require written notification to the council. The council reserve the right to inspect the sterilization facility during the permit period upon reasonable notice.

*Off-Site  
Sterilization*

6. (1) The council may authorize medical waste sterilization facilities, permitted as stipulated above to accept waste from off-site generators for sterilization. Any operator of a sterilization process who accepts for sterilization, medical waste which has been generated by others, shall make application in writing to the council for permission to do so, including the following information.

- (a) a description of the type and volume of off-site waste to be processed at the facility;
- (b) a description of the storage facility for storing said medical waste prior to processing;
- (c) contingency plans for processing and disposing of stored medical waste in the event of an equipment failure which prevents operation of the facility;
- (d) the basis of any fees to be charged for processing off-site medical waste. Said fee shall be based on the operators actual operating costs plus a reasonable profit;

(3) All waste accepted for sterilization from of-site generators, shall be sterilized within 24 hrs of receipt of said waste.

(4) All authorizations issued by the council for operation of a medical waste sterilization facility accepting off-site waste, shall remain in effect for a period of five (5) years. Any significant change in the volume and nature of the waste during the five (5) year period shall require written notification to the council.

*Transportation*

7. (1) any person who transports medical waste from the place of generation to an off-site sterilization facility shall make application to the council for permission to do so and shall submit the following information:

(a) a description of the volume, types and locations of the medical wastes to be transported;

(b) a description of the vehicle or vehicles to be used to transport said waste;

(c) a description of the contingency plan to be implemented in the event of an accident, spill or other incident that may release medical wastes to the environment;

*Disposal*

8. (1) All sterilization facilities other than incinerators, shall place the sterilized waste in yellow colored plastic bags for disposal. Sterilized medical waste contained in plastic bags may be disposed off as solid waste through normal waste collection procedures in an approved council disposal facility.

(2) Ashes from medical waste incinerators may shall be placed in metal containers and transported to an approved council disposal facility.

**Part V *Miscellaneous***

*Offenses and Penalties*

9. Any person who obstructs or hinders the council in the exercise of its duties under the provisions of these bye-laws or who fails to comply with any of the provisions of the bye-laws shall be guilty of an offence and shall be liable on first conviction to a fine not exceeding P100, or in default of payment thereof, to imprisonment for a term not exceeding 3 months, and on the second or subsequent conviction, to a fine not exceeding P200, or, in default of payment thereof, to imprisonment for a term not exceeding six months.

*Enforcement*

10. Health officers and Bye-Law Enforcement Officers are hereby authorized to enforce these bye-laws. The Council reserves the right to designate other agents to assist with enforcement as necessary.



# Agency for International Development

*Embassy of the United States of America*

## USAID Mission to Botswana

Post Office Box 2427

Gaborone, Botswana

Offices: Barclays House

Telephone 353382 Fax 313072

U.S. ADDRESS: USAID/GABORONE • DEPARTMENT OF STATE • WASHINGTON, D.C. 20521-2170

**MEMO TO: SOLID WASTE STEERING COMMITTEE**

**FROM: JIM DOHRMAN, USAID CONSULTANT**

**RE: MEDICAL WASTE UPDATE**

**DATE: 15 FEBRUARY 1994**

In my last report, dated 12 October 1993, we attempted to obtain a better estimate of the quantities and sources of medical waste being generated within the City of Gaborone. Since the medical waste inventory had not been completed, we made several assumptions regarding generation rates from various sources. Since the October 1993 update we have obtained more inventory information and have completed a 21 day record of actual waste incinerated at the Princess Marina incinerators.

**Waste Generation:** The staff at Princess Marina Hospital (PM) weighed all waste going to the incinerator from 5 Oct 93 through 27 Oct 93. Although the intent was to initiate a permanent weighing procedure, the hospital was not able to procure a scale for the long term program and the weighing program ceased after this period. The average daily weight of refuse incinerated during the period was 144.61 kg per day which equates to an hourly burning rate of 18.65 kg per hour. Dividing the 144.61 daily generation by the current number of beds, which is 350, we obtain a generation rate of .41 kg per bed which is slightly below industry standards. This lower rate may have been the result of an occupancy below the 350 bed capacity or an inefficient separation system which results in some medical waste still being disposed of with general refuse going to the landfill without sterilization.

Two inspections of the incinerator and a meeting with the hospital engineer indicate that the red bag separation system is still not fully implemented. Although the use of red bags has increased over my last inspection in October 1993, there is still a considerable amount of medical waste in black bags and miscellaneous other containers. The engineer indicated that although the red bags are now available, the hospital lacks the resources to properly educate the full staff regarding separation and handling procedures.

For the purposes of this update, we have assumed that all 350 beds are occupied and generating medical waste at a rate of .5 kg per bed per day. Our 10-year capacity estimates assumes that the new hospital expansion will add 25 beds per year for the next 6 years, reaching a maximum capacity of 500 beds in the year 1999. This will result in a daily generation rate of approximately 240 kg per day.

Nine doctor's offices and laboratories responded to the medical waste inventory questionnaire resulting in generation rates between 1 and 4 kg per day. For the purposes of this estimate we have assumed that 15 doctors and laboratories generate 1 kg per day and 10 of the larger offices generate 4 kg per day for a total of 55 kg per day from doctors offices, laboratories and veterinarians. The ten year estimate assumes that this waste will increase at the rate of 5% per year.

The inventory responses from the City Health Clinics continues to be disappointing with only four of 14 responding. The old Nadedi Clinic which is one of three clinics which offer maternity facilities, estimates 50 kg per day. Three other clinics responded to the questionnaire with the types and methods of disposal but were unable to provide a quantity of medical waste generation. For the purposes of this estimate we will assume 50 kg per day for each of the 3 clinics offering maternity services and 10 kg per day for the other 11 clinics for a total estimate from all clinics of 260 kg per day. This total was assumed to increase by 5% per year over the 10 year planning period.

In addition to traditional medical waste generation sources, there are periodic incidences of infected meat at the abattoir, butcheries and food wholesalers. This infected meat is either given to the lion park, located a few kilometers south of Gaborone or is taken to the landfill and buried. Although the landfilling of infected meat is less of a problem under the new, controlled operation, the problem of spreading disease still exists. Ideally this material should be incinerated along with medical wastes. The GCC Health Department estimates a capacity of 1 tonne (1,000 kg) per day should be considered for infected meat.

It should be noted that infected meat, as well as body parts or dead animals will burn slower than general medical waste and a factor must be applied to these materials in determining an incinerator size. Typical industry standards apply a 1.66 factor to body parts or other dense medical waste. For example, the 1,000 kg per day of infected meat would require an additional 1,660 kg per day in incineration capacity.

The above generation estimates are summarized in the following table and shown graphically in Figure 1.

**Incineration Capacity:** The PM hospital has two incinerators, a 50 kg/hr oil fired unit and a 40 kg/hr coal fired unit. Although both units are considered operational, the 50 kg/hr oil fired unit appears to be used more often due to its easier operation. The daily capacity of the incinerators depends on how many hours the incinerator can function. Total operating time is limited by the amount of ashes resulting from incinerating the waste. Incineration must be stopped when the ashes approach the oil burner location or impede the waste loading or supply of combustion air. The coal fired unit should be stopped when the ashes are sufficiently deep that they limit the heat released from the initial coal fire. Due to the limitations of the coal fired unit it will have a smaller daily capacity. Both incinerators must allow adequate time for the ashes to cool and be removed before beginning a new fire which should be 8 to 10 hours depending on the amount of ashes to be removed.

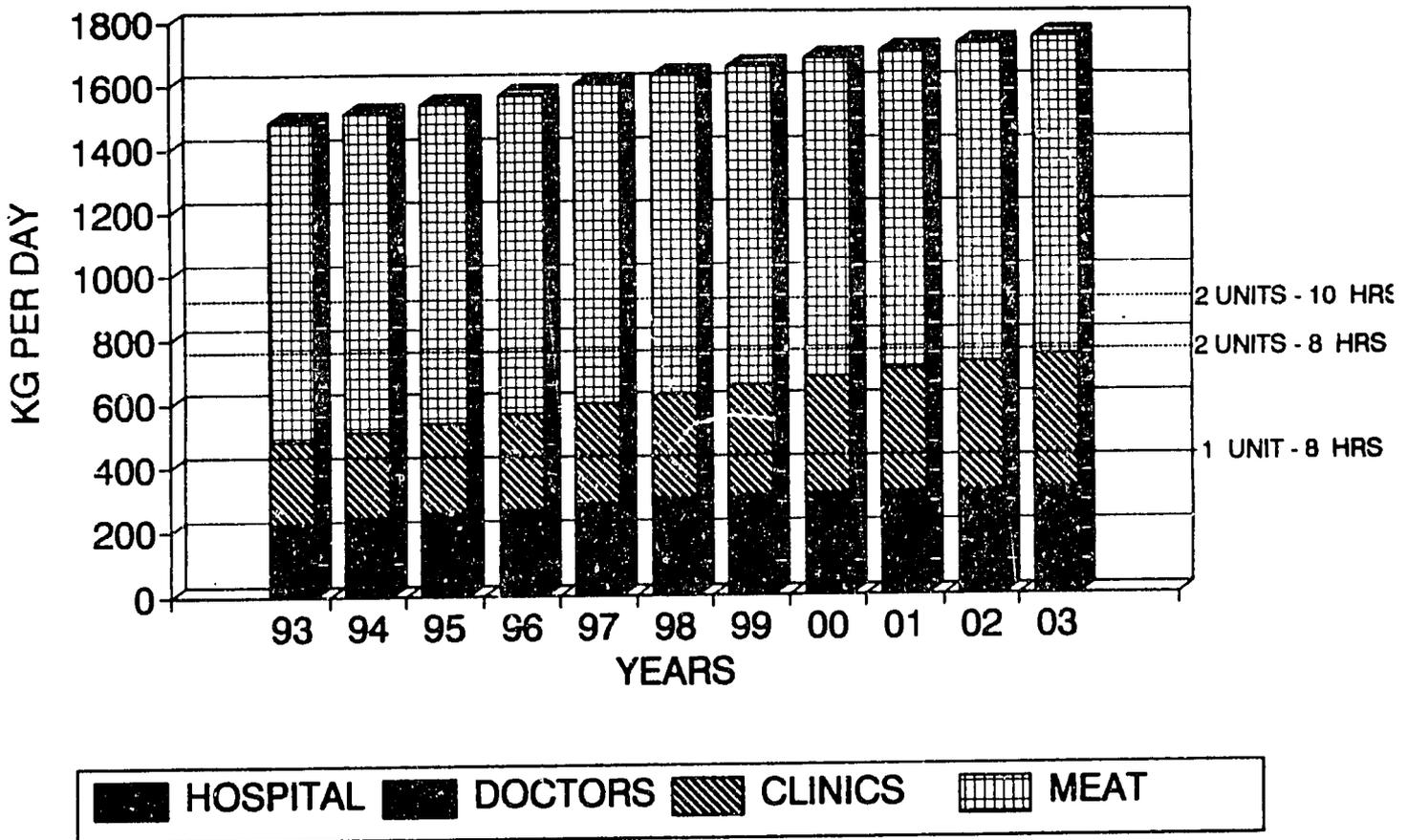
ESTIMATED GENERATION					
YEAR	PM HOSPITAL	DOCTORS OFFICES	CLINICS	INFECTED MEAT	TOTAL
1993	175	55	260	1000	1490
1994	188	58	273	1000	1518
1995	198	61	287	1000	1545
1996	208	64	301	1000	1573
1997	218	67	316	1000	1601
1998	229	70	332	1000	1631
1999	239	74	348	1000	1661
2000	240	77	366	1000	1683
2001	240	81	384	1000	1705
2002	240	85	403	1000	1729
2003	240	90	424	1000	1753

Figure 1 shows the capacity of the two incinerators under various operating combinations. If the 50 kg per hr oil fired unit is operated for 8 hours per day, it should have sufficient capacity to handle the PM hospital waste, all the doctors/laboratory wastes and the majority of the wastes from the clinics. The 40 kg/hr coal unit will have to be operated for several hours per day or one or two day per week to supplement the oil fired unit. The combination of both units should be adequate to handle all medical wastes, with the exception of infected meat, through the year 2003. The ability of the coal unit to operate for a full 8 hr period in an acceptable manner is questionable and renovations are suggested to convert this unit to also run on oil.

**Existing Conditions:** Although both incinerators are reported to be functional, they both are in need of repairs. Neither unit has a functioning thermometer to determine operating temperatures. The oil fired unit appears to have a functioning thermocouple, controlling the burner, but there is no readout for the operator to monitor. The temperature of the fire will in part determine when additional waste should be added.

The coal fired unit has two doors, one of which cannot be closed tight and there is evidence that the door smokes during operation. The thermometer located at the base of the stack is inoperable. Both units have missing refractory on the inside and on the doors which should be repaired to avoid damage to the outside steel shell.

## MEDICAL WASTE GENERATION (KILOGRAMS PER DAY)



The operation of the coal fired unit is restricted by the lack of a combustion burner in the upper combustion zone. Although the coal unit is more efficient in preheating the combustion chamber, once waste is added to the fire, the operator must maintain a steady supply of waste and coal to insure efficient operating temperatures. As the ash from the waste covers the coal fire and the coal begins to burn out, the unit is susceptible to temperature swings and smoking. In the oil fired unit, the oil burner is activated when the temperature falls below the set point to maintain efficient combustion. But in the coal unit, if the operator allows the fire to burn down, lowering temperatures, then a fresh charge of waste will smolder and burn inefficiently until temperatures rise. The most important aspect of operating the coal unit is to maintain an even supply of waste to maintain high temperatures and insure adequate combustion of the waste.

The operation of the smaller 40 kg per hour unit would be significantly improved by converting it to an oil fired unit. This could be done very easily by installing an oil burner in the primary combustion zone with the appropriate controls, similar to the existing oil fired unit. Timers should also be installed near each incinerator to assist the operator in loading.

**General Operating Recommendations:** Since the PM incinerators have excess capacity, the existing substandard disposal practices at the clinics should be discontinued and all clinic waste transported to the PM incinerators for disposal. The GCC may charge a fee for processing the clinic waste but this seems inappropriate since both are GCC facilities.

A notice should be sent to all private doctors offices, laboratories and veterinarians announcing that medical waste disposal services are available at the PM hospital. A cost per kilogram could be charged for the disposal services, which should be high enough to off-set some of the additional PM costs, but low enough to encourage use of the facility. The passage of the proposed medical waste bye-law should provide additional incentive for private medical waste generators to utilize the facility. All waste received from either the clinics or private generators should be contained in red plastic bags or other suitable containers which can clearly be identified as containing medical waste.

In addition to the improvements to the incinerators outlined above, the expanded use of the PM incinerators will require addition staff, receiving and storage facilities. At least 2 full time staff should be assigned to the incinerators, both trained as operators. During peak hours, one will be occupied receiving, weighing and storing waste, while the second will be operating the incinerator(s).

Although an unused office area exists for receiving and bookkeeping, a fenced storage area and scale will be required for the expanded operation. The covered storage area should be a chain link fence enclosure, at least 3 meters square with a locking gate. All medical waste received should be incinerated within 12 hours of its receipt. The scale should be located so that it can be used for receiving and storing waste and also used by the operator to weigh each load placed in the incinerators.

## **Incinerator Operations:**

1. **Cleanout:** Each morning the incinerator should have cooled enough to allow it to be cleaned. All incombustible material and ashes should be removed from the hearth area in the primary combustion chamber. Although this material will be sterilized it may still contain broken glassware and needles so the operator should use caution when removing the ashes. In addition to the primary chamber hearth, ashes should be removed from the ash pit, the secondary chamber and all other access ports. The ashes should be stored in metal containers until removal to the landfill. After removing all ashes, the incinerator shall be inspected to insure that it is in operating condition prior to use. This inspection shall include the interior refractory surfaces, all air and burner ports, and the charging door.

2. **Start-up:** Both incinerators must be preheated before burning of waste can begin. The oil burner on the 50 kg/hr incinerator should be turned on and operated until the temperature reaches 700° C which should be the operating set point. When the temperature has reached this temperature the operator can begin loading waste. A coal fire must be started in the 40 kg/hr unit until the 700° limit is reached.

3. **Loading Waste:** In the 50 kg/hr unit, the initial charge should consist of approximately 17 kilograms of general medical waste. It may be necessary to switch off the oil burner when loading the unit. Each load should be weighed and recorded on a daily log before placing it in the combustion chamber. The addition of the waste to the combustion unit should supply enough fuel to increase the temperature above the 700° set point, thereby shutting off the oil burner. If the manual thermometer reads above 700° C and the burner is still running, the burner control needs to be adjusted or serviced. After the initial load, another 17 kilograms of waste should be added to the combustion chamber every 20 minutes. After each load of waste, set the timer for 20 minutes and add the next load when the timer alarm sounds. Only sealed bags of waste shall be used to make up each load of waste going into the incinerator. The operator shall not open bags and separate waste under any circumstance.

Similar procedures should be followed for the 40 kg/hr coal fired unit except that the 20 minute load should be only 13 kilograms due to its smaller size. Since this unit does not have a temperature controlled burner, the operator must pay more attention to the operating temperature to maintain the 700° minimum. Since the coal fire cannot be turned on and off, the loading times may need to be adjusted during the day to maintain operating temperatures.

When loading the combustion chamber the burning waste should be pushed to the back of the chamber and the new waste load placed in front of it. The fire should never be smothered by the addition of new waste on top of burning waste. This will maintain operating temperatures and limit smoking.

4. **Low Fuel Waste:** Several types of medical waste such as body parts, organs, animal carcasses, infected meat or liquids have a much lower fuel value than general mixed medical waste. If these wastes have been received for incineration, the operator shall mix, as best he can without opening bags, these low fuel wastes with higher fuel general medical wastes. If a large load of low fuel waste is to be burned it should be burned only in the oil fired unit where the temperature can be kept high by the oil burner.

5. **Shutdown:** After the last load of waste has been placed in the combustion chamber, the oil burner will come on as the fire burns out. The burner should be allowed to burn for approximately 20 minutes to insure that the last load of waste has totally burned. After shutting off the burner the incinerator should be allowed to cool until the next morning when it will be cleaned prior to the next burn cycle. Opening of combustion air dampers will hasten the cool-down process, but these must be reset prior to the next day's operation.

6. **Protective Clothing:** When the operator is loading the incinerator or handling medical waste he shall wear heavy gloves, a face shield, rubber boots and coveralls.

**New Incinerator:** In addition to evaluating the capacity of the existing incinerators, the Steering Committee has requested a cost estimate for providing a new incinerator using USAID/PPSS project funds. Although this now appears premature, since the existing two incinerators have adequate capacity to handle the clinic waste and private doctors, I have prepared a preliminary sizing of such an incinerator and requested cost estimated from several United States firms who manufacture medical waste incinerators. On the date of my departure from the United States I had received only one response which forms the basis of my estimate.

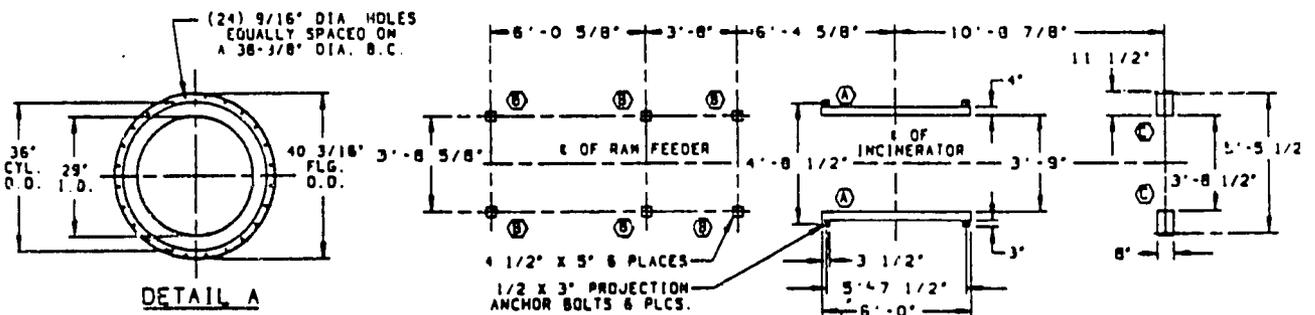
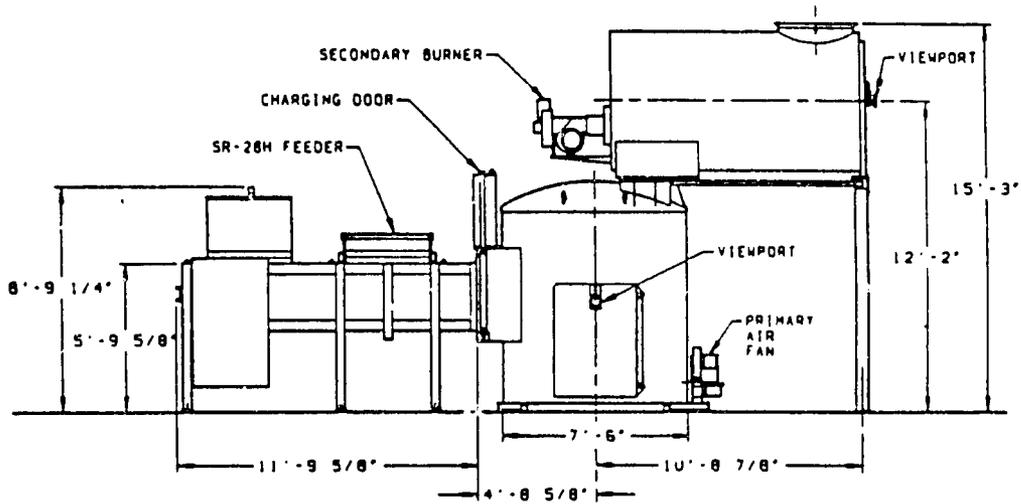
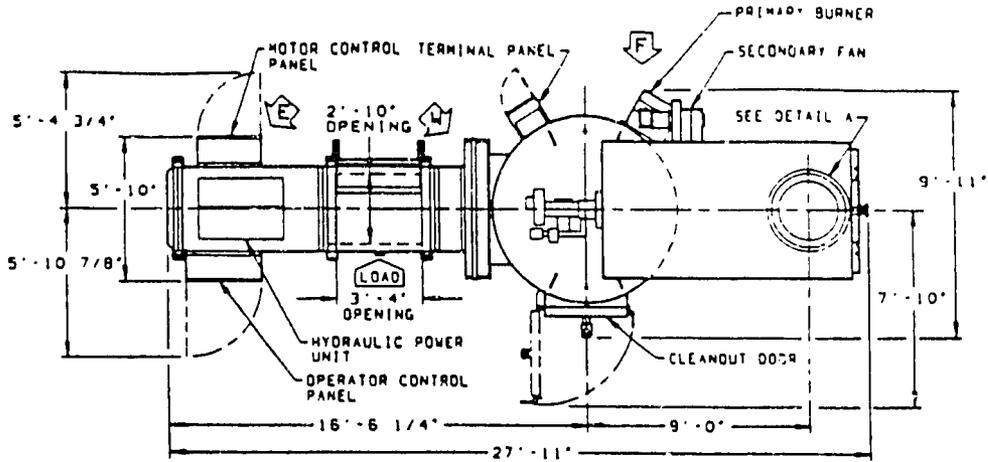
Based on the work performed in October 1993 I selected a 600 pound per hour incinerator which equates to 275 kg/hr and 2,200 kg per 8 hr day. A review of Figure 1 indicates that this size could handle all of the medical waste previously mentioned plus infected meat and the Private Hospital, should they decide to discontinue their small on-site incinerator.

This larger incinerator differs from the existing incinerates in two significant ways. First, the unit is equipped with a hydraulic ram feed which eliminates the need for the operator to open the fire door when feeding the combustion chamber. The waste is placed in the charging hopper which has a door. When the automatic controls call for an additional charge of waste, the charging door is opened and the feed ram pushes the waste charge into the primary combustion chamber and then retracts, allowing the charging door to close. This protects the operator from backfires through the charging door and takes much of the guess work out of when to add more waste.

The second major difference is that this unit has two separate combustion chambers, each with its own auxiliary burner and combustion air fan to insure complete and efficient operation. The larger size of the unit will reduce the temperature swings and inefficiencies of the smaller units.

A detailed drawing showing dimensions and utility connections is attached. The area needed to install such an incinerator is approximately 10 meters by 3 meters. Although this incinerator could physically fit in the location of the present 50 kg/hr oil fired incinerator at PM hospital, there is insufficient room for larger receiving and storage facilities. Our recommendation would be to locate the facility on higher ground in a less populated area of the city where new receiving and storage facilities could be constructed.

The budgetary price quotation that we received was from Joy Energy Systems in Charlotte, North Carolina. The estimate, including the unit as shown on the drawing plus standard stack, was \$145,000 F.O.B. Charlotte and export crating and shipping are estimated at an additional \$50,000, bringing the total cost to approximately \$200,000, or P500,000. Local costs to construct a new incinerator location with adequate receiving and storage facilities could add another P300,000 to the cost.



**LOAD BEARING AND ANCHOR PLAN**

\*STANDARD\* INCINERATOR/FEEDER  
GENERAL ARRANGEMENTS ARE AS SHOWN  
(RIGHT HAND) OR A COMPLETE MIRROR  
IMAGE(LEFT HAND).

**EST. SHIPPING WEIGHTS**

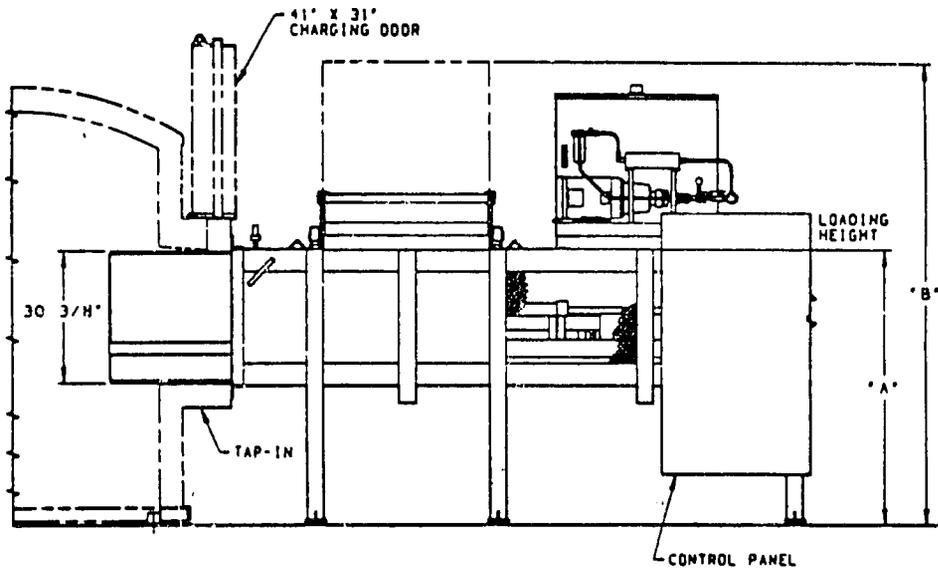
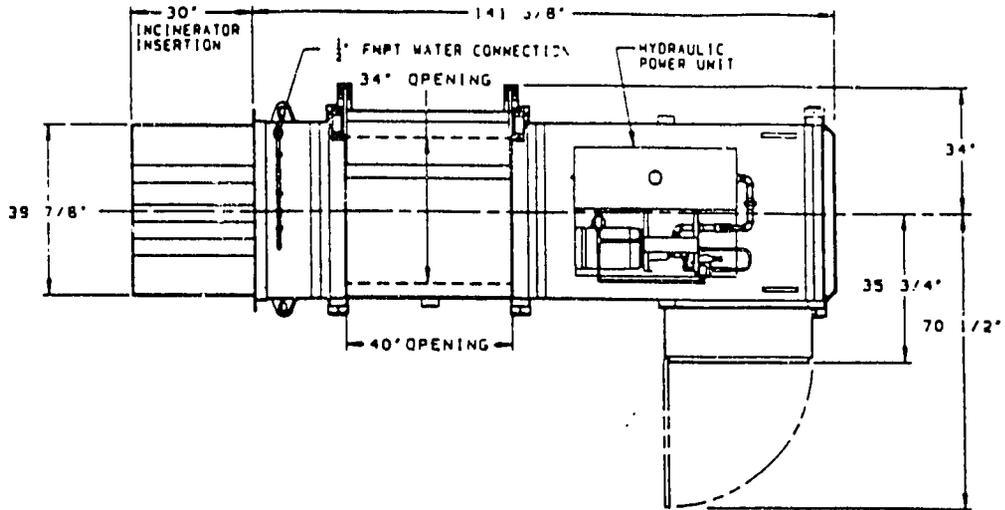
UPPER CHAMBER	13,000 LBS.
LOWER CHAMBER	22,000 LBS.
RAM FEEDER	4,700 LBS.

**FLOOR LOADINGS**

SYM	WEIGHT	AREA	LOAD
(A)	29,000 LBS	576 SQ. IN.	50 PSI
(B)	5,200 LBS	135 SQ. IN.	39 PSI
(C)	8,100 LBS	184 SQ. IN.	44 PSI

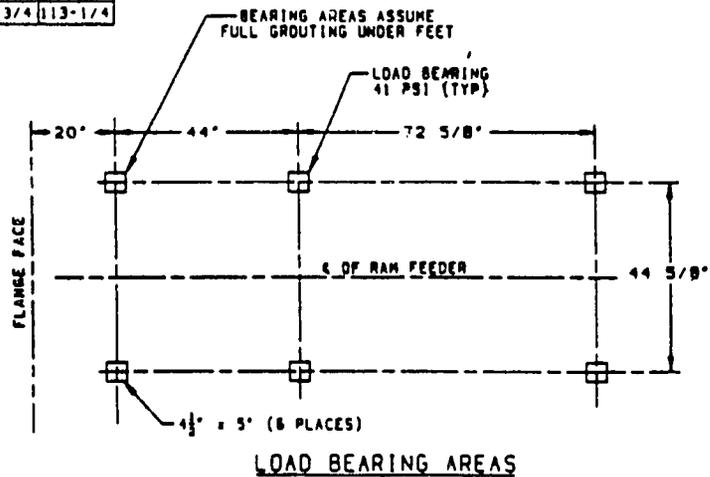
- E** ELECTRICAL CONNECTION: (SEE SPECS)
- F** NATURAL GAS CONNECTION: 2 1/2" MPT.(SEE SPECS)
- W** WATER CONNECTION: 1/2" MPT(SEE SPECS)

DWG# 51217C



UNIT	SILL HT.	'A'	'B'
480E	32"	83-1/4	108-3/4
650E	32-1/2"	83-3/4	107-1/4
780E	38-1/2"	88-3/4	113-1/4

SHIPPING WEIGHT:  
5,500 LBS



**GABORONE CITY COUNCIL**

**GABORONE, BOTSWANA**

**TENDER**

**FOR**

**LANDFILL OPERATION**

**ISSUED MARCH \_\_, 1994**

**TENDER NUMBER \_\_\_\_\_**

**This Tender Document Contains 12 pages of Text and the following Appendices:**

**Appendix A - 39 pages**

**Appendix B - 3 pages**

**Appendix C - 2 pages**

**Appendix D - 1 page**

**Appendix E - 1 page**

**Appendix F - 1 page**

**Appendix G - 2 pages**

**Appendix H - 1 page**

**REVISED 17 FEBRUARY 94**

# GABORONE CITY COUNCIL

## TENDER

### FOR

#### LANDFILL OPERATION

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## **APPENDICES**

**APPENDIX A - Landfill Operating Plan**

**APPENDIX B - Form of Tender**

**APPENDIX C - Subcontractor Declaration**

**APPENDIX D - Form of Insurance Coverage**

**APPENDIX E - Form of Intent for Performance Bond**

**APPENDIX F - Form of Performance Bond**

**APPENDIX G - Form of Agreement**

**APPENDIX H - Price Fluctuation Clause**

## DEFINITIONS

In the Tender Documents, as herein defined, the following definitions shall apply:

- "Tenderer" shall mean the person or firm who takes Tender Documents prepared by the GCC for the purpose of preparing a Tender to perform the services described therein.
- "Contractor" shall mean the person or firm whose Tender for the stipulated services has been accepted by the GCC to operate the landfill. Also referred to as the OPERATOR in the Landfill Operating Plan.
- "Landfill" shall mean the Gaborone City Landfill.
- "Operating Plan" shall mean the document completed by USAID in August 1993 and included as Appendix A.
- "Site Development Plan" shall mean the detailed engineering documents and design drawings of the landfill completed by the Engineering Department through ARUP Consulting Engineers and other consultants.
- "Refuse" shall mean solid waste generated by residential, commercial and industrial waste generators which shall not contain significant amounts of other wastes as herein defined.
- "Medical Waste" shall mean wastes generated by hospitals, clinics, nursing homes, doctor's offices, medical laboratories, research facilities, and veterinarians which are infectious or potentially infectious.
- "Hazardous Waste" shall mean waste which by reason of its chemical reactivity, toxic, explosive, corrosive or other characteristics, cause danger or are likely to cause danger to human beings or the environment, whether alone or in combination with other wastes.
- "Construction Waste" shall mean waste of an inert nature resulting from the demolition of structures, or in the construction of structures. These include stones, earth, masonry, concrete, unpainted wood, and similar solid material.
- "Yard Wastes" shall mean brush, grass cuttings, soil, leaves, clean wood, garden waste or other similar solid material.

- "Special wastes"** shall mean wastes, which due to their nature require special or separate handling and disposal practices, including but not limited to tires, motor oil and bulky waste items.
- "Recycling"** shall mean the authorized, organized separation of reusable materials from refuse either at the source of generation, or from the landfill by firms recognized and approved by the GCC.
- "Scavenging"** shall mean the unauthorized, unorganized searching of waste by individuals for reusable goods including food or other items. Scavenging is prohibited at the landfill.
- "Bin"** shall mean a receptacle intended for the storage and transfer of refuse, of various sizes up to 210 litres, suitable to be handled by manual labor.
- "Skip"** shall mean a receptacle intended for the storage and transfer of refuse, of various sizes greater than 210 litres, which requires mechanical equipment to empty into a refuse collection vehicle.

**NOTE:** Additional definitions are included in the Landfill Operating Plan found in Appendix A.

#### **ABBREVIATIONS**

- "GOB"** shall mean the Government of Botswana.
- "GCC"** shall mean the Gaborone City Council.
- "USAID"** shall mean the United States Agency of International Development.
- "ICMA"** shall mean the International City Management Association.
- "BHC"** shall mean the Botswana Housing Corporation.
- "VDC"** shall mean the Village Development Committee.

## **1.0 CONDITIONS OF TENDER AND INSTRUCTIONS TO TENDERERS**

### **1.1 GENERAL**

Tenders from prequalified Tenderers are invited by the Gaborone City Council (GCC) for operation of the Gaborone City Landfill as described in the Landfill Operating Plan. The selected Contractor shall perform the services as herein described.

All interested Tenderers shall complete and submit two (2) copies of the attached Tender Form and related documents to: City Clerk's Office, Room 66, Private Bag 0089, Independence Avenue, Gaborone, Botswana, prior to 4:00 pm local time, on the \_\_\_ day of \_\_\_ 1994, at which time the Tenders will be publicly opened and read aloud.

Tender Documents shall be enclosed in a plain sealed envelope clearly marked: **TENDER NO. \_\_\_\_\_ LANDFILL OPERATION.**

All mailed Tenders should be sent by registered post to ensure delivery. Telephone, telegraph, telex or facsimile Tenders will not be accepted.

All Tenderers shall provide a detailed statement of qualifications, including a list of references. Particular emphasis will be put on solid waste handling experience, landfill operation experience, organizational ability, existing equipment and business background.

Each Tender must be accompanied by a Tender Surety, in favour of the GCC, issued by an approved Insurance Company or Bank in the amount of P10 000.

The GCC may conduct personal interviews with selected Tenderers. The GCC expects that Tenderers selected for interviews will make available key personnel proposed to work on this project available for such interviews.

### **1.2 ~~PREQUALIFICATION MEETING AND LANDFILL INSPECTION~~**

A prequalification meeting and landfill inspection, were duly advertised and were held on 23 February 1994. The GCC made a presentation regarding the proposed privatization of the landfill and all interested parties were given the opportunity to ask questions. Prequalification questionnaires were distributed to all firms who requested them. Questionnaires were returned to the GCC on 18 March 94. After thorough evaluation and verification of information, the GCC, with the assistance of the USAID consultant prepared a list of prequalified firms who have received these Tender Documents. Tenders will be received only from those firms who have been determined to be prequalified by the GCC.

### **1.3 TENDER PERIOD**

The Tender shall remain valid for ninety (90) days from the final date for submission of Tenders stipulated above.

The GCC shall notify the successful Tenderer (if any) by letter written within the stipulated ninety (90) day Tender period, or such extension of the Tender Period as mutually agreed between the GCC and Tenderers. The successful Tenderer shall accept the notification within 30 days of the date of the GCC notification of offer and the Contractor's written acceptance thereof shall constitute a formal Contract until the signing of the Form of Agreement.

The GCC is not be bound to accept the lowest or any Tender or to assign any reason for its acceptance or rejection of any Tender and in no case shall any Tenderer be paid for any expense incurred in the preparation of this Tender.

### **1.4 REPRESENTATION OR INTERPRETATION OF DOCUMENTS**

Representation or interpretation of Contract Documents shall be done in writing by the GCC. If during the Tendering period, the GCC makes an interpretation, clarification or change in the Contract Documents, the GCC will issue a letter to all Tenderers explaining the interpretation, clarification or change. The Tenderer shall acknowledge the receipt of such letter in his submitted Tender.

### **1.5 REQUIRED TENDER INFORMATION**

Each Tender shall contain the following information:

1. Tender's Company name, address, telephone number, and contact individual.
2. Completed Tender form(s).
3. Tender Surety.
4. Statement of qualifications and list of references.
5. List of Staffing assumptions used to prepare the Tender.
6. List of Equipment assumptions used to prepare the Tender.
7. Implementation Schedule.
8. Subcontractor Declaration.
9. Form of Intent for Performance Bond.

### **1.6 SIGNATORY REQUIREMENTS**

Each Tender shall be accompanied by an original cover letter committing the Tenderer, if selected, to carrying out the proposed work at the Tender price. This price is to be valid for ninety (90) days from the date of the Tender. It must further state that all information submitted in support of the Tender is accurate. The cover letter must contain the signature of a person authorized to commit the firm(s) to a Contract.

All forms requiring signatures shall be signed by the same individuals signing the cover letter.

#### **1.7 PUBLIC POLICY**

It is the policy of GCC that during the performance of this contract, the Contractor will not discriminate against any employee or applicant for employment because of age, race, creed, colour, national origin, ancestry, martial status or sex.

#### **1.8 PROOF OF GENERAL LIABILITY INSURANCE**

The selected Tenderer will be required to obtain Liability Insurance of the limits and conditions stated in Appendix D. Proof of insurance in the form of a Certificate of Insurance will be required within 30 days of the notice of award and prior to Contract signing.

#### **1.9 PERFORMANCE BOND REQUIREMENTS**

A Performance Bond, in the amount of 10% of the base Tender price, shall be required of the successful Tenderer in the form stipulated in Appendix F, executed by a surety company duly authorized to do business in the Republic of Botswana. The Tender Documents shall include an Intent for Performance Bond as included in Appendix E.

The Performance Bond shall be executed for the first year of the Contract and shall be a condition precedent to the execution of any Contract and any renewal thereof. A Performance Bond shall be renewed annually for the work performed in the 2nd and 3rd years, increased accordingly. The Performance Bond shall be in the amount of ten (10) percent of the yearly total sum.

The Performance Bond shall be furnished within thirty (30) days after the date of notification to the selected Tenderer by GCC and his acceptance of the Tender and prior to Contract signing.

#### **1.10 TENDERER RESPONSIBLE TO LEARN LOCAL CONDITIONS**

All Tenderers submitting Tenders for this Contract are cautioned to examine carefully the conditions affecting the operation of the landfill and to acquaint themselves with the quantity and character of the materials to be handled under this Contract, and the Landfill Operating Plan. Appointments to inspect the landfill shall be made through the Chief Health Inspector's office.

Submission of a Tender shall be deemed conclusive evidence that the Tenderer has read and fully understands the Landfill Operating Plan and is fully acquainted with and shall be fully responsible for any restrictions, or constraints relative to operating the landfill.

All Tenderers interested in submitting Tenders for this Contract are encouraged to submit alternate Tenders where appropriate that achieve the same goals and results identified by GCC, its staff and its consultants.

## **2.0 BACKGROUND**

The City of Gaborone, Republic of Botswana is undergoing rapid growth in both its economy and population. This situation is having a significant impact on the delivery of public services, and on public facilities.

In addition, public management of these services does not keep pace with the urbanization of the population, and complex environmental problems associated with rapid growth and changing socio-economic conditions.

Recognizing these issues and their potential impact on its population, the Gaborone City Council (GCC) developed a solid waste management strategy in cooperation with the International City Managers Association (ICMA), with financial assistance provided by the United States Agency for International Development (USAID).

The solid waste management programme was developed over a two year period involving two phases.

Phase I, conducted in 1991, examined GCC's refuse collection and transport services, disposal and landfill operations. A detailed review and assessment of existing conditions was conducted and presented to a Steering Committee, that provided feedback on alternatives and recommendations that were developed for consideration by the GCC. The Steering Committee is composed of representatives from GCC and Central Government.

One of the recommendations considered and approved by GCC was the privatization of Landfill Operation.

Phase II of GCC's management plan is the implementation of these services through public Tender, public awareness and education, and an on-going programme of evaluation and monitoring.

## **3.0 DESCRIPTION OF EXISTING LANDFILL OPERATION**

The current landfill is being operated by the GCC through the Public Health and Engineering Departments. Landfilling began at this site in September of 1993. Prior to that date, landfilling was performed at a site in Mara Pula and at a former landfill, adjacent to the existing site and the sewage ponds. The landfill is being operated in accordance with the Landfill Operating Plan and Site Development Plan which were completed in late 1993.

### **3.1 SOLID WASTE GENERATION**

Based on actual weighbridge data from the first four months of operation, the landfill receives an average of 78 tonnes per day (7 day week) of refuse, 257 tonnes per day of clean cover soil and 96 tonnes a day of construction rubble. A more detailed description of waste quantities can be found in the Operating Plan.

The wastes to be included in the Landfill Operating Contract are all residential, commercial, industrial, medical and special wastes generated in the City of Gaborone with the exception of medical waste generated by the City's two hospitals, waste oil, latrine waste, sewage sludge and other problem wastes as described in the Operating Plan.

During the Term of this Contract, it is anticipated that the GCC will develop additional waste management procedures to eliminate several of the waste types currently being landfilled. In particular, the GCC is considering the alternative collection and disposal of waste oil and medical wastes.

### **3.2 RECYCLING AND SCAVENGING**

Scavenging has been practiced at former GCC landfills, but due to public health implications, is not permitted at the current landfill.

The GCC endorses the concept of recycling and will promote and encourage recycling through its public education efforts and the private sector.

Although recycling is most efficient when performed at the source of generation, waste being dumped at the landfill still contains significant quantities of recyclable materials. Realizing the overall benefits of removing these materials from the waste, the GCC permits organized recycling of select materials by approved companies at the landfill, to the extent that they do not conflict with landfill operations.

Materials currently being recycled in Gaborone include: corrugated cardboard, mixed office papers, newsprint and plastic film, by Waste Paper Recovery; beverage and food tins by Metal Box; returnable (deposit) bottles and plastic litre containers by Kgalagadi Breweries; and co-mingled glass bottles by Skip Hire. The only company approved to perform recycling at the landfill is Waste Paper Recovery.

### **4.0 SCOPE OF CONTRACT**

The work to be performed under this Tender request includes the total operation of the existing GCC landfill. This shall include the provision of all labor, equipment, supplies, utilities and all other incidental necessary to operate the landfill. The Tenderer is referred to the Operating Plan which is the official description of the services to be provided under this Tender.

#### **4.1 LENGTH OF CONTRACT**

The GCC is seeking a three (3) year Operating Contract, which may be renewed up to a maximum of three (3) additional years at the sole discretion of the GCC.

#### **4.2 CONTRACTOR RESPONSIBILITIES**

The Contractor shall operate the City Landfill in accordance with the Landfill Operating Plan included as Appendix A. This Plan consists of general information regarding landfilling of waste and specific requirements for the operation and maintenance of the landfill, including equipment and recommended staffing.

If the Tenderer wishes to deviate from the operating provisions in the Operating Plan and submit an alternative Tender, he must fully describe, in his Tender response, all areas where his Tender differs from the Operating Plan.

#### **4.3 CONTRACTOR'S OFFICE & HOURS OF OPERATION**

##### **4.3.1 Office**

The GCC will make available to the Contractor a portion of the current landfill office and weighbridge facilities at the landfill. The Contractor will be responsible for providing all office furniture and related supplies and office machines, for maintenance and repair during the term of the Contract, and to return occupancy of the buildings to the GCC at the conclusion of the Contract.

##### **4.3.2 Times of Operation**

As stated in the Operating Plan, the Contractor shall open the landfill to the general public Monday through Sunday, 7:30 am to 6:00 pm including all holidays.

In addition to the public hours stated above, the Contractor shall maintain security guards at the landfill 24 hours per day to prohibit scavenging and unauthorized access.

#### **4.4 IMPLEMENTATION SCHEDULE**

Each Tenderer shall include an implementation schedule with the Tender Documents. The Implementation Schedule shall include but not be limited to the following items:

1. Sign Contract and provide required bonding and proof of insurance within 30 days of notice and Contractor's acceptance of award.
2. Order and receipt of equipment and vehicles, and/or lease negotiations with the GCC.
3. Establish office and maintenance facilities.

**4. Hire employees.**

**5. The GCC anticipates full implementation of Landfill Operating services within 45 days of the Contract signing.**

## **4.5 PAYMENTS**

### **4.5.1 General**

The Contractor shall submit Payment Requests on the last working day of the month for services performed during that month. Payment shall be due and payable 15 days thereafter. The amount of the monthly payment will be computed based on the Base Tender Price entered on the Tender Form or as adjusted due to price fluctuations, divided by twelve (12).

The GCC may withhold any amount as a result of non-performance of the Scope of Contract as herein described.

### **4.5.2 Price Fluctuation Clause**

Due to the length of this Contract, the Contractor shall be entitled to an adjustment of the Base Tender price due to Statutory Fluctuations of any material or labor cost as a result of Customs Duty, Tax, Currency Exchange Rates, Minimum Labour Rates or any other governmental action, which shall occur after seven (7) days preceding the date of Tender. Price adjustments due to Statutory Fluctuations shall not include overhead or profit and will be considered only when fully documented.

If the Tenderer wishes to be protected against price fluctuations other than due to Statutory Fluctuations, he shall list those prices in Appendix H for which protection is requested and upon which he based his Tender. In support of these prices the Contractor shall furnish, either with his Tender or when requested, prior to acceptance, bona vide current merchants quotations.

### **4.5.3 Uncontrollable Events**

If the Contractor is unable to perform his responsibility under the conditions of the Contract due to circumstances beyond his control, which results in increased cost to the Contractor for overtime, or other increased costs, the Contractor shall be reimbursed for said additional cost. If the Contractor experiences an unforeseen and uncontrollable circumstance he shall give immediate notice to the GCC, prior to incurring any additional cost, who shall review the notice and, direct the Contractor accordingly.

## **4.6 SUBCONTRACTORS**

The Contractor may utilize the services of Subcontractors to perform specific portions of the Landfill Operations up to 50 percent of the Contract as herein described. The Contractor shall list all Subcontractors that he intends to use on this project in

Appendix E, along with the specific tasks to be performed. All subcontractors shall be subject to GCC review and approval.

## **5.0 LANDFILL EQUIPMENT**

### **5.1 GENERAL**

In general the Contractor shall supply the following equipment to be used to operate the landfill. Equipment may be owned by the Contractor or provided on a hire basis as the need arises. A full description of the equipment shall be submitted with the Tender.

1. Steel Wheeled Compactor
2. Track Bulldozer
3. Rubber Tired Loader
4. Tipper Truck
5. Water Bowser

### **5.2 USED EQUIPMENT**

The Contractor may utilize used equipment to operate the landfill, provided he makes a full disclosure of the condition of each piece of used equipment and assumes the responsibility of all maintenance, repair, and provision of standby equipment if required.

### **5.3 STANDBY EQUIPMENT**

The Contractor shall be responsible for arranging for standby equipment and vehicles in the event that the primary vehicles are removed from service for extended maintenance or repairs. Equipment used for daily compaction and covering shall be available every day of operation. The Contractor shall schedule his maintenance and repair of vehicles so as not to interrupt the operation of the landfill.

### **5.4 EQUIPMENT MAINTENANCE**

The Contractor shall be required to maintain all equipment in accordance with manufacturer's recommendations.

The Contractor shall be required by GCC to develop a preventive maintenance policy and service schedule for all equipment and vehicles, and be responsible for all maintenance and timely repairs.

## **6.0 PERSONNEL**

### **6.1 COMPETENT LABOUR**

The Contractor shall use all diligence in arranging for sufficient and competent labour at all times during the term of this Contract. Competent supervisory and managerial staff shall be employed to oversee the Contract operations and to ensure that the services are performed as stipulated in Scope of Contract.

### **6.2 RECRUITMENT OF GCC LABOUR**

The GCC shall require that the Contractor provide employment opportunities, to those GCC staff currently employed by the GCC that may be displaced as a result of this privatization project.

### **6.3 EMPLOYEE TRAINING**

The Contractor shall provide all hired staff with the appropriate training in the use of all equipment, safety gear and uniforms. Training shall include sanitary and environmental practices for handling waste materials.

### **6.4 EMPLOYEE APPEARANCE**

The Contractor personnel shall be representing GCC and the proposed programme. As such, they shall be neatly dressed, well-groomed, courteous, and knowledgeable about the programme. All collection workers shall wear uniforms, dissimilar to existing GCC uniforms, bearing the name or logo of the Contractor.

### **6.5 WORKMEN'S COMPENSATION**

The Contractor shall comply with the Workmen's Compensation Act (CAP 43:1977) and any amendments thereto. The Contractor shall obtain the required insurance from a registered insurer under the Act. Proof of insurance will be a requirement of Contract signing.

### **6.6 CONDUCT OF CONTRACTOR'S EMPLOYEES**

The Contractor shall comply with existing local labor laws, regulations and labor standards.

The Contractor shall formulate and enforce an adequate safety programme with respect to all work under this Contract, whether performed by the Contractors or subcontractors. The Contractor has the assurance from the GCC of cooperation where the implementation of these safety measures requires joint cooperation.

Upon written request of the GCC, the Contractor will remove or replace any of its employees employed under this Contract.

All Contractor and subcontractor employees shall at all times conduct themselves within the laws of Botswana.

## **7.0 CONDITIONS OF CONTRACT**

### **7.1 ARBITRATION**

If any dispute or difference of any kind shall arise between the GCC and the Contractor in connection with or arising out of the Contract or performance of the specified services, it shall in the first place be fully documented in writing and negotiated amongst the two parties. If these negotiations do not produce a settlement within 90 days, from the date of written notice of a dispute or difference by either party, the matter shall be referred to arbitration. The arbitrator shall be selected from a list of arbitrators agreeable to both parties. The matter may be referred to arbitration prior to expiration of 90 days upon mutual consent of both parties.

If the dispute or difference involves payments to the Contractor, only that portion of the payment which is in dispute shall be withheld during the arbitration period and all other payments due the Contractor shall be paid as stipulated under the payment provisions of this document. Submission of a dispute or difference to arbitration shall not relieve the Contractor from his obligations to perform the services as specified herein.

The said arbitrator/s shall have full power to open up, review and revise any decision, opinion, any decision, direction, or valuation of either party and neither party shall be limited in the proceedings before the arbitrator to the evidence or arguments for the purpose of obtaining a decision. The decision of the arbitrator shall be binding upon both parties.

### **7.2 TERMINATION**

#### **7.2.1 By GCC for Cause**

If at any time during the Contract Term, the Contractor is deemed by law unable to pay his debts or enters into voluntary or involuntary bankruptcy, liquidation or dissolution, or without reasonable excuse has failed to perform the stipulated services after due notice and reasonable time to correct the area of non-performance, the GCC may, issue a written termination notice, terminating the Contractor.

The termination notice shall stipulate the conditions of termination including the time of termination and the disposition of equipment. The GCC shall have the option of purchasing the Contractor's equipment based on the fair market values as determined by a third party appraiser agreed to by both parties. The time of termination may be a period of up to 90 days to allow the GCC to arrange for another contractor to perform the services. The Contractor shall continue to provide refuse collection services during the termination period and be paid as stipulated herein.

The dispute of any component of the termination notice, or the submission of any dispute to arbitration, shall not relieve the Contractor of his responsibility to perform the collection services during the termination period.

#### **7.2.2 By Contractor for Cause**

If at any time during the Contract term, the GCC is unable to make payments to the Contractor or otherwise is unable to perform its obligations under the Contract without cause, after written notice and reasonable time to correct said area of non-performance, the Contractor may upon 14 days written notice, terminate the Contract. Upon termination, the Contractor shall be paid all sums that are payable to him for providing services under the Contract, plus damages suffered by the Contractor due to the premature termination of the Contract.

#### **7.2.3 Termination by GCC for Convenience**

If at any time before the completion of the Contract Term, it shall be found by the GCC that for reasons beyond the control of the parties render it impossible or against the interest of the GCC to continue the Contract, the GCC at any time, by 90 day written notice to the Contractor may discontinue work and terminate the Contract in whole or in part. Upon service of such notice of termination, the Contractor shall discontinue to work in such manner, sequence and at such times as the GCC may direct, continuing and doing after said notice only such work and only until such time or times as the GCC may direct. The Contractor shall have no claim for damages for such discontinuance or termination of the Contract but the Contractor shall receive compensation for reasonable expenses incurred in good faith for the performance of the Contract and for reasonable expenses associated with termination of the Contract. The GCC will determine the reasonableness of such expenses. The Contractor shall have no claim for anticipated profits on the work thus terminated, nor any claim, except for the work actually performed at the time of complete discontinuance.

### **7.3 INDEMNIFICATIONS**

The Contractor shall indemnify, protect and save harmless the GCC against all losses and claims for death of or injury to any person, or loss or damage to any property, which may arise out of or in the consequence of the Contractor's performance under this Contract, except those that are due to willful or negligent acts, or omissions by the GCC.

The GCC shall indemnify, protect and save harmless the Contractor against all losses and claims for death of or personal injury to any person, or loss or damage to any property which may arise out of or in the consequence of the GCC's obligations under this Contract, except those that are due to the willful or negligent acts or omissions of the Contractor.

#### **7.4 GCC REPRESENTATION**

The GCC's authorized representative shall be the Town Clerk, who may in whole or in part, delegate such authority to one or more persons appointed to carry out such duties and exercise such authority as may be delegated to them by the Town Clerk. The GCC will inform the Contractor on or before Contract signing the identity of the GCC representatives and will outline their duties and authority to represent the GCC during the term of the Contract.

#### **7.5 NOTICES**

All notices, including payment requests, disputes and other correspondence given to the GCC shall be sent by post, facsimile or delivered in person addressed to the City Clerk, Private Bag 0089, Room 66, Gaborone, Botswana.

All notices, or instructions given to the Contractor by the GCC under the terms of the Contract, shall be sent by post, cable, telex or facsimile to or left at the Contractor's principal place of business or other such address as the Contractor shall nominate for that purpose.

#### **7.6 ACCESS TO CONTRACTOR'S FACILITIES AND RECORDS**

Upon reasonable notification, the GCC shall have access to the Contractor's offices, maintenance depot, other facilities and records for the purpose of determining the Contractor's compliance with the Contract conditions.

**APPENDIX A**

**OPERATING PLAN**

**(Provided under Separate Cover)**

**APPENDIX B**

**GABORONE CITY COUNCIL**

**LANDFILL OPERATION**

**FORM OF TENDER**

(Note: Appendices A to H form part of the Form of Tender)

The City Clerk  
Gaborone City Council  
Private Bag 0089  
GABORONE

1. Having examined the written Landfill Operating Plan, the Scope of Contract, the Appendices and the existing landfill site which describe the work to be performed under the Landfill Operation Contract, we offer to perform the Landfill Operation Services in conformity with the Scope of Contract, the Operating Plan and Appendices for the following Costs:

**BASE TENDER PRICE:**

For performance of the Landfill Operation as described in the Scope of Contract and Operating Plan, with all labor, supplies, equipment and vehicles supplied by the Contractor, for a base annual price of:

\_\_\_\_\_ (P )  
(Pula in words)

Contractor is required to provide the following breakdown of his Base Tender Price:

Labor:	(P _____)
Administration:	(P _____)
Equipment:	(P _____)
Operation & Maintenance:	(P _____)
Fuel:	(P _____)
TOTAL BASE PRICE:	(P _____)

**FORM OF TENDER  
PAGE 2**

2. We acknowledge that Appendices A to H to the Form of Tender form part of this Tender.
3. We undertake if our Tender is accepted to commence work in accordance with the Scope of Work and the Implementation Schedule.
4. If our tender is accepted, we will within thirty (30) days, execute the formal Contract Agreement and obtain the guarantee of a Bank or acceptable insurance company (subject to your approval) to be jointly and severally bound to the City of Gaborone in the sum of 10% of the Base Tender Cost and as stipulated Appendix F hereto, for due performance of the Contract under the terms of a Performance Security in the form appended hereto.
5. We agree to abide by this Tender for the period of ninety (90) days from the date fixed for receiving the same and it shall remain binding upon us and may be accepted at any time before the expiration of that period, or such other extended period that may be agreed between ourselves and the Gaborone City Council.
6. Unless and until a formal Agreement is prepared and executed, this Tender with our written acceptance shall constitute a binding Contract between us, and shall be deemed for all purposes to be the Contract Agreement.
7. We understand that you are not bound to accept the lowest or any Tender you may receive and that you will not defray any expenses incurred by us in tendering.

**FORM OF TENDER  
PAGE 3**

DATED this \_\_\_\_\_ day of \_\_\_\_\_ 19 \_\_\_\_\_

SIGNATURE: \_\_\_\_\_

(Name of Signatory Printed): \_\_\_\_\_

In the Capacity of: \_\_\_\_\_

Duly authorised to sign Tenders for and on behalf of: \_\_\_\_\_

\_\_\_\_\_  
(Block Capitals)

ADDRESS: \_\_\_\_\_

**(N.B.): Board Resolution authorising signatory must be attached**

SIGNATURE OF WITNESS: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

NAME OF WITNESS (Printed): \_\_\_\_\_

OCCUPATION: \_\_\_\_\_

DATE: \_\_\_\_\_

**APPENDIX C**

**SUB-CONTRACTOR DECLARATION**

If the Tenderer wishes to sub-contract any portion of the work described in the Scope of Work under any heading, he shall be free to do so but must give full details of the Sub-Contractors he intends to employ for each portion of the Work.

Failure to declare subcontractor information may invalidate the Tender.

1. Portion of the Work: \_\_\_\_\_

i Sub-contractor: \_\_\_\_\_

Address: \_\_\_\_\_

ii Experience in \_\_\_\_\_

similar work: \_\_\_\_\_

2. Portion of the Work: \_\_\_\_\_

i Sub-contractor: \_\_\_\_\_

Address: \_\_\_\_\_

ii Experience in \_\_\_\_\_

Similar Work: \_\_\_\_\_

3. Portion of Work: \_\_\_\_\_

i Sub-contractor: \_\_\_\_\_

Address: \_\_\_\_\_

ii Experience in \_\_\_\_\_

Similar Work: \_\_\_\_\_

**SUBCONTRACTOR DECLARATION**  
**PAGE 2**

4. **Portion of the Work:** \_\_\_\_\_

i **Sub-contractor:** \_\_\_\_\_

**Address:** \_\_\_\_\_

\_\_\_\_\_

ii **Experience in** \_\_\_\_\_

**similar work:** \_\_\_\_\_

5. **Portion of the Work:** \_\_\_\_\_

i **Sub-contractor:** \_\_\_\_\_

**Address:** \_\_\_\_\_

\_\_\_\_\_

ii **Experience in** \_\_\_\_\_

**Similar Work:** \_\_\_\_\_

**Signature:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Name of Signatory:** \_\_\_\_\_

**In the Capacity of:** \_\_\_\_\_

**Duly Authorized on behalf of:** \_\_\_\_\_

## **APPENDIX D**

### **FORM OF INSURANCE**

The selected Tender shall be required to obtain general liability insurance as a condition of Contract signing within thirty (30) of notice of award. The selected Tenderer shall provide an Insurance Certificate at Contract Signing as proof of insurance coverage for the following amounts:

For liability for bodily injury, including accidental death, Pula 500 000,00 on account of any one occurrence, and Pula 1 000 000,00 aggregate limit.

For liability for property damage, Pula 200 000,00 on account of any one occurrence and Pula 500 000,00 aggregate limit.

An umbrella policy in the amount of Pula 500 000,00 covering underlying policies.

The contractor shall also be required to secure the following insurance:

1. Motor vehicle on equipment and vehicles.
2. Workmen's Compensation Insurance.

**APPENDIX E**

**FORM OF INTENT FOR PERFORMANCE BOND**

It is hereby agreed that a Performance Bond as defined in the Tender Documents and Appendix F, will be provided by the sureties, Insurance Company or Bank named hereunder.

NAME OF TENDERER: \_\_\_\_\_  
(Printed)

SIGNATURE OF TENDERER OR AUTHORIZED REPRESENTATIVE:  
\_\_\_\_\_

NAME OF ABOVE SIGNATORY: \_\_\_\_\_  
(Printed)

NAME OF BOND GUARANTOR: \_\_\_\_\_  
(Printed)

SIGNATURE OF GUARANTOR OR AUTHORIZED REPRESENTATIVE:  
\_\_\_\_\_

NAME AND POSITION OF ABOVE SIGNATORY: \_\_\_\_\_  
(Printed)

DATED \_\_\_\_\_ DAY OF \_\_\_\_\_ 19\_\_\_\_

**APPENDIX F**

**FORM OF PERFORMANCE BOND**

We the undersigned \_\_\_\_\_  
of \_\_\_\_\_  
and \_\_\_\_\_  
of \_\_\_\_\_  
\_\_\_\_\_

do hereby bind ourselves as sureties in solidum and co-principal debtors for the due performance of the Contract by the Contractor named therein, and for all losses, damages and expenses that may be suffered or incurred by the Gaborone City Council as a result of non-performance of the Contract by the Contractor, renouncing all benefits from the legal exceptions ordinis seu excussionis et divisionis "No value received" and all other exceptions which might or could be pleaded against the validity of this guarantee, with the meaning and effect of which exceptions we declare ourselves to be fully acquainted; provided that the liability of the undersigned under this guarantee is limited to and shall not exceed:

\_\_\_\_\_ (P )  
(Pula in words)

and will lapse thirty days after the conclusion of the Contract Term, unless the Sureties are advised in writing by the Gaborone City Council before the expiration of said thirty days of their intention to institute claims and particulars thereof, in which event this guarantee shall remain in force until all such claims are paid or settled.

**FOR AND ON BEHALF OF THE SURETIES:**

**AT** \_\_\_\_\_ **on this** \_\_\_\_\_ **Day of** \_\_\_\_\_ **19** \_\_\_\_\_

**AS WITNESS:**

1. \_\_\_\_\_ 2. \_\_\_\_\_

**ADDRESS:**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**APPENDIX G**

**GABORONE CITY COUNCIL**

**LANDFILL OPERATION**

**CONTRACT No. \_\_\_\_\_**

**FORM OF AGREEMENT**

## **ARTICLE OF AGREEMENT**

**MADE AND ENTERED INTO BY AND BETWEEN:**

**THE GABORONE CITY COUNCIL**  
(hereinafter called the Employer)

of the one part and \_\_\_\_\_  
(hereinafter called the Contractor)

**WHEREAS** the Employer is desirous to provide private Landfill Operation of the City Landfill;

**AND** has caused documents describing the Landfill Operation to be prepared;

**AND WHEREAS** the said documents entitled, **LANDFILL OPERATING PLAN and TENDER FOR LANDFILL OPERATION**, and consisting of **SCOPE OF CONTRACT**, Section 1.0 through 7.C and Appendices A through H;

**AND WHEREAS** the Contractor has executed by signature the Tender Documents and entered Tender costs to perform the described services on the Form of Tender;

**NOW IT IS HEREBY AGREED AS FOLLOWS:**

1. For the consideration as stipulated by the Contractor on the Form of Tender, the Contractor will upon and subject to the Conditions annexed hereto, execute and perform the Services in accordance with the above referenced documents.
2. The Employer will pay the Contractor the sum of payments as stipulated in the Form of Tender, in accordance with the payment provisions included in the Tender Documents, hereinafter referred to as the Contract Sum.
3. The Term of this Agreement shall be for a period of three (3) years, with adjustment and escalation of the Contract Sum as stipulated in the Tender Documents.
4. This Agreement may be extended beyond the initial three (3) year term at the Employer's option subject to negotiation of the Contract Sum, satisfactory performance by the Contractor and availability of funds.
5. This Agreement may be terminated by the Employer, without notice, for cause as a result of non-performance of this agreement or non-compliance with local or national regulations and by-laws. In the event of Termination for cause, the Contractor shall reimburse the Employer for any reasonable increased costs incurred in arranging for alternate landfill operations services.
6. This Agreement and its performance shall be construed and governed in accordance with the Laws, Acts and Regulations of the Republic of Botswana.

**AGREEMENT  
PAGE 2**

This Agreement represents the entire Agreement of the parties hereto and supersedes all prior negotiations, representations or agreements either written or oral. This Agreement may be amended only in writing signed by both the Employer and the Contractor. This agreement shall be binding upon and inure to the benefit of the parties hereto and their respective successors and permitted assigns.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement.

SIGNED BY THE CONTRACTOR: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

on this the \_\_\_\_\_ day of \_\_\_\_\_ 19 \_\_\_\_\_

at \_\_\_\_\_ in the presence of the undersigned witnesses

AS WITNESS:

1. \_\_\_\_\_ ADDRESS: \_\_\_\_\_

2. \_\_\_\_\_ ADDRESS: \_\_\_\_\_

SIGNED BY THE EMPLOYER: \_\_\_\_\_  
(City Clerk)

on this the \_\_\_\_\_ day of \_\_\_\_\_ 19 \_\_\_\_\_

at \_\_\_\_\_ in the presence of the undersigned witnesses

AS WITNESS:

1. \_\_\_\_\_ ADDRESS: \_\_\_\_\_

2. \_\_\_\_\_ ADDRESS: \_\_\_\_\_





# Agency for International Development

*Embassy of the United States of America*

## USAID Mission to Botswana

Post Office Box 2427

Gaborone, Botswana

Offices: Barclays House

Telephone 353382 Fax 313072

U.S. ADDRESS: USAID/GABORONE • DEPARTMENT OF STATE • WASHINGTON, D.C. 20521-2170

**MEMO TO:** William Von Hoffen, ARUP  
**FROM:** Jim Dohrman, USAID Consultant  
**RE:** Site Development Plan Comments  
**DATE:** 14 February 1994

One of my first tasks upon returning to Gaborone was to review the actual scale data for the first 4 months of operations at the new landfill. I prepared a computer spread sheet and graphed each month's activity. The results are a typical good news / bad news story. The good news is that the amount of refuse being received is considerably less than our original estimate. The original estimate from our first report was 102 tonnes per day in 1993. Based on the last four months of 1993, the actual amount of refuse received averaged 78 tons per day.

The bad news is that the landfill has received an enormous amount of clean soil for cover material and construction rubble. For the four months of record, the landfill received an average 257 tonnes per day of cover soil and 96 tonnes per day of construction rubble and rocks. Although the cover material is being stored for later use, the rubble and rocks are being placed in areas designated for future refuse landfilling. This will have a significant impact on landfill life estimates.

I have attached my monthly data obtained from the landfill scale records, graphs of each month's quantities and a recalculation of landfill life. I revised the landfill life calculation assuming two basic scenarios. The first scenario assumes that both cover material and construction waste continue at the same daily rate as experienced in the last four months of 1993. The second scenario assumes that the current construction boom will subside over the next few years and reoccur at five year intervals. In both calculations, I have reduced the in-place density of the refuse to 500 kg/m based on my recent observations of poor compaction and frequent equipment breakdowns. These new figures will obviously have an impact on the landfill life projections contained in your Site Development Plan.

In addition to updating the landfill life calculations, I have several other comments regarding the Site Development Plan and the Pollution Control Works.

1. The first comment is in regards to the finished landform elevations which are shown on the plan as "level" at elevation 983. Since refuse will lose 5 to 10 percent of its volume as it decomposes, a level landfill cap will settle and develop low spots and will

not drain properly, which will promote infiltration of rainwater into the completed landfill, adding to leachate formation. I suggest that the Plan be revised to grade the top of the landfill at a minimum 5% grade. I have taken the liberty of preparing a sketch of the landfill (enclosed for your consideration) with 5% grades which results in a maximum elevation of 988.

2. The plan should call for the base of the landfill to pitch toward the polluted water drains. Standard practice would be to hold this pitch at a minimum 3%. Figure 10 appears to show a portion of the landfill base, in the vicinity of Stage III as flat. This area should be noted to have a minimum 3% pitch toward the polluted water drains.

3. Figure 10 contains a note relative to the maximum excavation level of 971 and other figures show an elevation of 969.5 for the bottom of the pollution control dam. The drawings from the pollution control works, however, show an elevation of 971.5 for the bottom of the pollution control dam, or .5 meters above the lowest level of the landfill. Details of the pump installation suggest that the pump will not be able to pump polluted water below approximate elevation 972 based on the pump suction arrangement. This suggests that up to a meter of leachate could accumulate on a portion of the landfill base and not be able to be drained into the pumping facilities. The landfill base should either be raised or the pollution dam lowered so that the landfill base can drain to the pollution dam and pumping works. Leachate should not be allowed to pond on the landfill base.

4. Figure 5 shows a pollution control drain along the edge of Stage III but the pollution control works show only one pipe entering the pollution control dam. How will this drain enter the pollution control dam?

5. The detail of the polluted water drains show a concrete lined drain filled with stone and wrapped with filter fabric. Filter fabric used in similar situations in the United States has been discontinued because the filter fabric becomes an ideal growth medium for biological organisms found in leachate and quickly becomes clogged, rendering the drain useless. Therefore the filter fabric on the top of the drain should be eliminated. I would also prefer to see a perforated pipe within the stone drain. This would enhance the hydraulic operation of the drains and allow the drains to be cleaned with a high pressure water jet should they become clogged with silt or organic growth.

6. If perforated pipe is used for the drains, manholes should be provided at all intersections to monitor flow and to allow access to the pipes for cleaning.

7. The existing berms have been placed directly adjacent to the fence and will be graded up at a 1:3 pitch. This will prove very difficult to accomplish without destroying the fence. The berms should be started at least 3 to 4 meters from the fence line to allow the compactor and dozer adequate room to shape the sideslopes.

8. Section 5.3, Cellular Management suggests daily cell dimensions of 15m x 10m x 1m thick and section 6.0 suggests even shallower cells of 600 and 800 mm. These dimensions are far too thin and will result in wasted cover soil and inefficient use of landfill volume. Landfill cells of 2 to 3 meters thick would be a better design.

9. As mention above the landfill is receiving a large amount of cover soil, rubble and rocks. Although we have recommended not placing refuse over bedrock, for environmental reasons, there is no reason why these inert materials could not be placed on bedrock or in other environmentally sensitive areas. Specifically, the area along the south eastern side of the landfill, between Phases III and IV should be designated to receive inert rock and rubble waste and integrated into the site grading and drainage plan. A mixture of construction rubble and cover soil could also be used to construct the berms around each landfill phase.

The GCC is continuing to move toward privatization of landfill operation. The current schedule calls for a prequalification meeting to be held on 23 February 94 with qualification statements due approximately 2 weeks thereafter. Tender documents would be issued to prequalified firms in late March or early April. Since the Site Development Plan will be part of the Tender documents, we need to discuss the above items with the GCC and how and who will make revisions to the Plan.



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**MEMO TO: TENDER PANEL  
GABORONE CITY COUNCIL**

**FROM: JIM DOHRMAN, USAID/ICMA CONSULTANT**

**RE: SUPPLEMENTAL TENDER INFORMATION**

**DATE: 14 FEBRUARY 1994**

In response to the Estimates Meeting held with the Ministry of Local Governments and Lands (MLGL) and comments made by the City Engineer suggesting that the tender documents should have requested more detailed cost information from the tenders, we have met with each of the five tenders and obtained additional breakdowns of their base tender prices.

Each of the tenderers were informed via fax to meet on 3 February 1994 with the Chief Health Inspector for the purpose of presenting a cost breakdown of their base tender price. Since the meeting notice was very general, and did not provide a format of the data being requested, most of the tenderers did not bring adequate documentation to the meeting and they were given until 9 February 1994 to submit a cost breakdown. During the 30 minute interview with each tenderer, we stated that the more detailed cost documentation was needed to justify the project to the MLGL and the GCC. The interviews were attended by Francis Masenya, Chief Health Inspector; M.C. Sekgomanyane, Assistant City Engineer and Jim Dohrman, USAID consultant.

In general we requested additional cost breakdowns into categories of labour, equipment purchase, operation and maintenance, administration, subcontracts and profit. Since each tenderer had his own accounting methods and procedures for preparing tenders, the information received was not in a form that could be directly compared and the USAID Consultant prepared a summary table which attempts to convert the detailed data into a common format. In preparing the table, the consultant used the written documentation received from each tenderer, statements made by the tenderers during the 3 February meeting and logical assumptions, to group costs into the various cost categories. Therefore the values presented may not, in all cases, reflect the exact data presented by each tenderer. *Daisy Loo* and *Kgalagadi Trucking* provided very detailed breakdowns while *Unitrans* submitted only a general breakdown by percentages, stating that detailed cost data was confidential and would not be released. All correspondence received as a result of this request is on file with the chief health inspector.

As you are aware some tenderers elected to provide a separate tender price, as requested for supplying skips, while others included them in their base bid. This is indicated on the table. The tenderers also varied in their calculation of profit. While two of the tenderers provided a line

item for their profit assumption, the other three stated that their profit was included in the various other costs categories. Wade Refuse stated that they considered their profit to be the residual value of the vehicles after capitalizing them over the three year contract period.

Three of the five tenders stated that they have capitalized their equipment over the three year term of the contract. *Waste Tech* capitalized their collection vehicles over eight years and the skip haul truck over six years. These longer capitalization periods are reflected in their low equipment cost in their breakdown. *Unitrans* stated that they were capitalizing their equipment for more than three years but would not provide any additional information since they considered this information to be confidential.

The additional cost data and interviews with each tenderer have highlighted several aspects of the tendering process and how some of the tenderers prepared their tender. Several of the tenderers included extensive depot facilities to house and maintain equipment and as a base for contract administration. Those companies without a current presence in Gaborone had much higher depot costs than those that already have established facilities here. For instance *Waste Tech* had very high depot and administrative costs while *Unitrans* had relatively lower costs since they already have a major administration and maintenance facility in Gaborone.

There was also an apparent difference in the degree of risk that the larger, more experienced companies took in preparing their tenders. *Waste Tech*, for instance took a very conservative low risk position in tendering this project which resulted in their relatively high tender price. *Wade Refuse*, on the other hand, took a higher risk position and reduced their profit margins and absorbed some of the project administrative costs within their larger South African operations. They have stated that they are very interested in expanding their operations beyond South Africa and look at Gaborone as a starting point for that expansion. Therefore their lower tender price reflects more a desire to win the tender rather than their actual costs.

Although the additional cost documentation has provided a better insight into each tender, the information has not changed our ranking of the tenders as presented in our 27 October 1993 report. Therefore we urge the Tender Panel and the GCC to support an award of this Tender in the near future so that implementation can begin as soon as possible. As stated in a separate memo to the Steering Committee, the statement made by the City Engineer regarding the higher costs of the private operation, fail to account for the increased level of service of the proposed contract and the pilot nature of the project.

We feel that enough time and evaluation have been spent on justifying this project and it is time for action. USAID is disappointed in the tardiness of the GCC and MLGL in failing to finalize and award the collection contract and approve the appropriate budget allocation. USAID assistance to this activity is focussed on GCC/MLGL privatizing refuse collection and landfill operation, and failure to show progress in these areas may impact future assistance. It should be noted that the project assistance completion date is September 30, 1994, at which time all USAID funding will cease.

**BASE TENDER PRICE BREAKDOWN**

	<b>EXISTING GCC</b>	<b>WADE REFUSE</b>	<b>UNITRANS</b>	<b>DAISY LOO</b>	<b>WASTE TECH</b>	<b>KGALAGADI TRUCKING</b>
<b>LABOUR</b>						
DRIVERS/LABOURERS	795,466	180,000	333,713	164,600	294,000	280,149
ADMINISTRATION	119,319	120,000	94,448	228,000	227,204	183,786
<b>EQUIPMENT</b>						
COLLECTION TRUCKS	679,084	792,000	367,942	591,068	172,759	639,840
TRACTORS/TRAILERS	55,879	120,000	0	0	0	0
SKIPS	0	120,000	(INCLUDED)	(SEPARATE)	618,777	(SEPARATE)
(CAPITALIZATION PERIOD)	(3)	(3)	(3+)	(3)	(8/6)	(3)
<b>OPERATION &amp; MAINTENANCE</b>						
OFFICE/ADMINISTRATION	5,500	120,000	207,333	208,640	310,000	255,597
EQUIPMENT	194,500	228,000	496,372	263,880	417,804	376,198
<b>SUBCONTRACT</b>		0	0	150,000	0	0
<b>PROFIT</b>	0	(INCLUDED)	(INCLUDED)	233,522	(INCLUDED)	72,000
<b>TOTAL</b>	<b>1,849,748</b>	<b>1,680,000</b>	<b>1,499,160</b>	<b>1,839,710</b>	<b>2,040,544</b>	<b>1,807,570</b>
<b>(GCC CAPITALIZE 6 YRS)</b>	<b>(P1 482 254)</b>					



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**MEMO TO: GABORONE CITY COUNCIL  
FRANCIS MASENYA, CHIEF HEALTH INSPECTOR**

**FROM: JAMES DOHRMAN, USAID CONSULTANT**

**RE: COST COMPARISON UPDATE**

**DATE: 14 FEBRUARY 1994**

**Introduction:** We are in receipt of a memo prepared by the City Engineer, dated 24 December 93 which presents a cost comparison of GCC refuse collection versus private collection in Gaborone South, at both the pre-tender and post-tender phases. We have been asked by the Chief Health Inspector to comment on the referenced memo.

These comparisons are very "narrow" and consider only the cost implications of privatization while ignoring the many other issues that have been evaluated over the past three years. From the outset we must clarify that the proposed private service is "not" the same service currently being provided by the GCC. Three years of evaluation have identified the many inefficiencies and technical problems with the current system, which are being addressed through the proposed private contract. This is particularly evident in the conversion from individual dust bins to larger skips in many of the industrial, commercial and multifamily areas and a new approach to collection in Old Naledi.

**Collection Efficiency:** The current GCC system uses 9 trucks and 2 tractors to service approximately 8 356 units in Gaborone South, consisting of residential, commercial and office plots. Assuming an average of 2 collections per 6 day work week, this results in an average collection efficiency of 253 collection units per vehicle per day. This is very low by industry standards. For example, a similar evaluation performed in the cities of Mbabane and Manzini in Swaziland found collection efficiencies between 600 and 800 units per day per truck. The majority of the private tenders for Gaborone South will use 3 modern compaction trucks to service the same areas, which equates to an efficiency of 928 collections per truck per day. This increased efficiency is a combined result of larger collection crews in the more densely populated areas, new collection vehicles, better management, and the use of skips to service commercial areas and multifamily flats. These improvements in the level of service from GCC to private operation are not included in the City Engineer's evaluation.

**Pre-Tender Cost Comparison:** The City Engineer criticizes the consultant for using a 3 year capitalization rather than a 6 year capitalization in the pre-tender cost comparison. It is standard

practice in preparing cost comparisons to assume that the private contractor will capitalize his equipment over the life of the contract, in this case 3 years. The consultant is fully aware that the GCC capitalizes equipment over 6 years but in making a comparison, it is more appropriate to use the shorter capitalization period so as not to underestimate the cost of the privatized service. The recent interviews with all of the tenders, which are summarized in a separate document to the Tender Panel, determined that, in fact, 3 of the 5 tenders used a 3 year capitalization period which seems to support the 3 year period used by the consultant in his pre-tender estimates. In any event the use of a 6 year capitalization for both the GCC and private contractor results in a P 19 644 increase in the difference between the two pre-tender estimates which is 1.3 percent of the total estimated cost, which in our opinion, is not a significant difference.

In making his evaluation of the pre-tender estimate, the City Engineer fails to indicate that the estimate for the private contractor includes a P 419 190 item for new skips that is not included in the GCC's equipment estimate. If he had subtracted this from the private estimate, in order to make an equal comparison, the private contract estimate would have been much lower than the GCC's estimate. As stated above, the City Engineer's evaluation also fails to adjust for improvements in the level of service to be provided through the privatization contract.

Post-Tender Cost Comparison: In comparing the actual tenders with the pre-tender estimates, the City Engineer makes the same mistake in not accounting for the increased level of service, in particular, the changeover from bins to skips in many areas. It is interesting to note that the top rated tenderer, Wade Refuse, submitted an alternate tender without the use of skips of P 1 440 000 which is approximately P 42 000 per year less than the existing GCC costs and offers a better comparison of GCC costs versus contractor costs than that offered by the City Engineer.

The tender documents were very clear that the 285 skip estimate was not a condition of the contract and that each tenderer should make his own evaluation of the areas to be serviced and determine when and where skips are to be used. It is our opinion that the 285 number of skips determined by a preliminary evaluation is conservative and that fewer skips will actually be required. That is why a separate price was requested for skip placement. Some tenderers approached this cost item differently and a final cost for placement of skips will be negotiated with the successful contractor.

Tender Format: The City Engineer adds a concluding paragraph that in his opinion, the tender format was in part to blame for the high tender prices and that it should have required a greater cost breakdown and perhaps a tender based on tons collected rather than a lump sum price. The collection tender was a joint effort between the consultant and the steering committee which includes the City Engineer, and was thoroughly discussed, revised, discussed again and further revised before a final version was prepared. The issue of cost breakdowns, unit costs and cost per ton was thoroughly discussed with input from the City Engineer.

**Summary: In summary, it is our opinion that the tenders received adequately reflect the cost of service that was specified in the tender documents and are valid.** Yes, the costs are higher than current GCC costs and pre-tender estimates but the level of service is also greater than the current system. And, we will have accountability for performance which currently is lacking in the GCC service and is a primary reason for the inefficient operation.

This is also a pilot project and the first privatization effort by the GCC, with many questions and issues to be worked out during contract negotiations and the implementation phase. If things do not work out and it can be documented that private costs are indeed significantly higher than GCC costs for the same level of service, then the contract can be terminated at the end of the 3 year pilot period and the area returned to GCC operation.

However, it is our opinion that the pilot project will clearly demonstrate the many advantages of privatization and additional areas will be privatized in the near future.

It is our hope that the Ministry of Local Government and Lands and the GCC will act quickly and approve this budget item so that contract negotiations may progress toward an implementation within the next three months.



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**MEMO TO: Solid Waste Steering Committee**

**FROM: Jim Dohrman, USAID Consultant**

**RE: Waste Oil Storage Tank**

**DATE: 24 February 94**

Apparently the original drawings of the Old Lobatse Road pumping station could not be located and a new drawing was prepared from field measurements. The inside dimensions of the tank are approximately 15m x 10m and 3.5m deep. Assuming a .75m headroom and 2.75 liquid depth, the total capacity of the tank, including internal walls is 412.5 cubic meters or 412,500 liters.

Based on the drawing, the tank includes two bisecting internal walls, which divide the tank into 4 equal compartments of approximately 100,000 liters each. The two sections, A-A and X-X, indicate that the longer internal wall is a partial wall, while the shorter internal wall is a full bearing wall for the roof slab. Openings are indicated in the bottom of the partial wall and at the top of the full wall. Since this would make it difficult to dewater compartments 3 and 4, I suspect that there are other openings in the internal walls which have been missed by the surveying crew, which is understandable, given the circumstances. Although the bottom is not shown as a concrete slab, we assume that it is. If the bottom is earth, then the tank should not be used for waste oil storage.

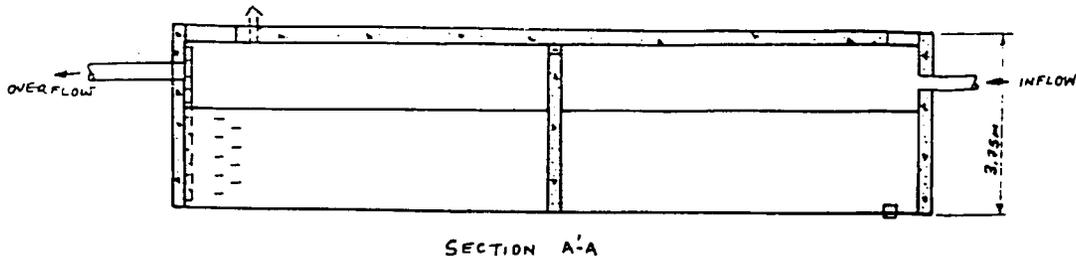
There are four pipe connections shown on the drawing, a single inflow pipe, a lower pipe to the pump sump, an upper overflow pipe to the pump screens and a high overflow pipe, which is assumed to flow to the drainage channel.

From an environmental viewpoint, there are two issues that need to be addressed before considering its use as a waste oil storage tank. First, several of the connecting pipes should be plugged including the overflow to the drainage channel and the overflow to the pump screens. Assuming that the pipe to the pump sump has a gate valve between the tank and the pump sump, it could be used to drain water and sludge from the oil storage tank which will build up over time. If this pipe does not contain a gate valve, one should be installed. The inflow pipe could be converted to accept waste oil from tank trucks. A further evaluation of the inflow piping would be necessary before this conversion.

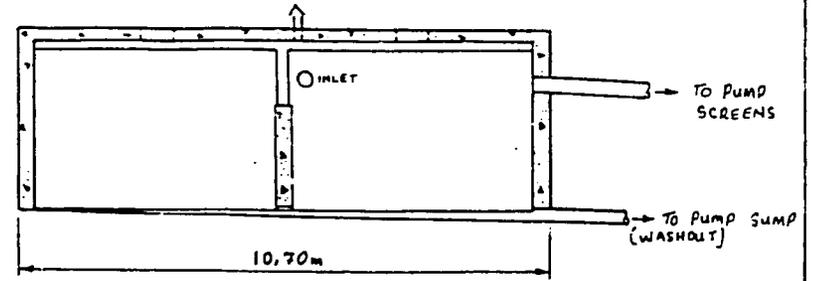
The second environmental point will be to check the tank for water tightness. Since we do not have the drawings that show the details of the construction, including slab/wall joints or expansion joints, the interior surfaces should be thoroughly inspected for structural defects. After insuring that there are no structural defects, the tank should be filled with 2.75m of water and monitored for leakage. This can be done by measuring the water level over a period of several days. If the water level drops, then there is a leak somewhere. After draining the tank, finding and repairing the leak, the leakage test should be repeated until the tank level remains constant for two days. If there are leaks and they cannot be located and repaired, the tank should not be considered for waste oil storage. If the tank is used for waste oil storage, the leak test should be repeated at periodic intervals and a detailed inventory kept of all oil being added or pumped from the tank.

Monitoring wells should be installed adjacent to the tank walls to a depth of at least 10 meters to monitor the soil and groundwater below the tank for leakage. These wells should be constructed with screens in order to test either the water level or gas concentrations within the soil.

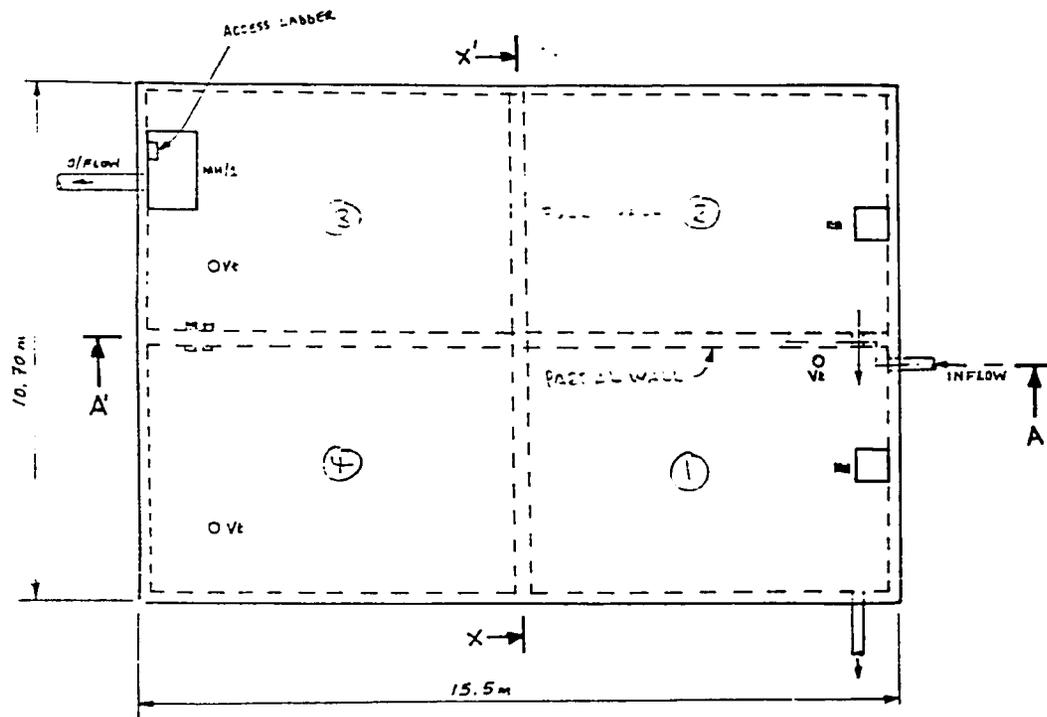
Prior to performing any work on the tank, the GCC should determine whether the private sector companies are still interested in its use. Although there was interest expressed several years ago, that was during the time when oil tankers would come to Gaborone to pick up oil for the Zimbabwe refineries. I understand this is no longer the case. I would suggest that a meeting be held with all interested oil companies to assess their input regarding use of the tank and the best procedure for making it available to them. Environment Watch Botswana sponsored a workshop on waste oil in May 1992 which was quite productive in identifying the problems and potential solutions. They may be a good organization to sponsor another workshop on utilizing the large storage tank. The University resources could also be called upon to help monitor the tank after it begins accepting oil.



SECTION A-A



SECTION X-X



PLAN

NOTES

MH = Manhole size 650 x 650mm

MH/2 = Manhole size 2000 x 1600mm

Wall thickness = 300mm

200mm Slab thickness = 250mm

Ve = Vent pipes

This drawing may be read in conjunction with the old Lobatse road pump house details.

DRAWING: OLD LOBATSE ROAD PUMP STATION SUMP

DRAWN BY: E.M. Sikaala - STO Sewerage

DATE: 22/2/94

SCALE: 1:100 Approx.

**STATEMENT OF WORK  
PRIVATE PROVISION OF SOCIAL SERVICES  
GABORONE CITY COUNCIL**

**PHASE II - SUPPLEMENTAL  
SORTING/TRANSFER FACILITY  
PRELIMINARY DESIGN**

**1.0 BACKGROUND**

The Private Provision of Social Services program (PPSS) includes several potential privatization projects, and the Gaborone City Council (GCC) is currently moving forward with the privatization of refuse collection and operation of the City landfill. In addition to these two on-going programs, the Phase I report, which was completed in 1991, identified a need for additional sorting and recycling of waste in order to extend the limited life of the current landfill and to reduce transfer costs to the next landfill which will be located outside the current city limits.

The PPSS Phase II report included a conceptual design of a sorting/transfer facility based on the estimated quantities determined in Phase I and the status of recycling at that time (1991). Since that time, the new landfill has begun operation which includes the weighing of all refuse entering the landfill. The initial three months of operation have indicated that the amount of refuse actually being received is nearly 25% below the Phase I projections. In addition to the lower refuse disposal rate, the new landfill Site Development Plan has been completed by ARUP which has produced new volume estimates and a reduced landfill life due to geologic site constraints.

Due to new landfill operating procedures, Waste Paper Recovery (WPR) has not been able to resume its sorting operation of paper and plastic film at the landfill. In response to this action by the GCC, WPR has increased its sorting at the sources of generation throughout the city by placing additional paper/plastic storage cages. Although the GCC intends to permit WPR to return to sorting at the landfill they have not done so. Therefore the efficiency of WPR's operation at the new, upgraded landfill has not been determined.

There have also been new developments in other recycling areas. Metal Box dramatically increased their price paid for sorted cans from P3.40 per full sack to P6.00 per full sack (approximately 800 cans). Unfortunately they have not upgraded their transportation of full sacks and the can collector must arrange his own transportation to the Metal Box facility in Gaborone West. It is anticipated that the high price paid by Metal Box will eventually increase the collection of cans at the source of generation. Several environmental groups are also lobbying Metal Box to convert the price paid per full sack, to a price paid per can or other smaller unit, to encourage households and smaller generators to begin collecting and recycling their cans.

In 1993, Kalagahdi Breweries introduced the returnable glass bottle for some soft drink brands. Although the returnable bottle offers more drink for less money, its use is still limited and has

not been a significant factor in reducing the use of bi-metal cans. Government support for uniform deposit legislation is still lacking and the use of returnable glass bottles is likely to remain of little impact until that support is obtained.

All of the above factors point to the potential of greater recycling at the source of generation, and any consideration of a central sorting facility must take this into account.

## **2.0 SCOPE OF WORK**

### **2.1 General**

The GCC has requested that USAID prepare a preliminary design of a sorting/transfer facility from PPSS project funds that were targeted for equipment purchase. This request has been made in order to maximize the sorting and recycling of materials from the landfilled refuse and to begin planning for the future landfill which will be located outside the Gaborone City limits.

### **2.2 Task 1 - Review, Update Previous Reports**

As stated above, several things have changed since the Phase I and Phase II reports were completed that may impact the design of the facility. Under this task, the consultant will review and update all previous information, using actual weigh data from the new landfill and updated data from WPR and Metal Box. The primary output of this task will be a set of new waste projections, including material components to be used in preparing the preliminary designs.

### **2.3 Task 2 - Market Analysis**

Previous reports have relied on rough estimates of market prices to determine prices paid for sorted materials. Under this task, the Consultant will perform a detailed market analysis of all existing and potential materials within the waste stream. This shall include both local and international markets in South Africa and Zimbabwe and their transportation costs. Several local companies have expressed interest in materials that are not currently being sorted, such as rigid HDPE containers. Although the Phase I study showed a low interest in waste derived compost, this should also be reviewed and updated under this task. This task may require field trips to South Africa and Zimbabwe to assess current markets.

In addition to the traditional recycle materials, the market study shall also include the potential disposal facilities for receiving small quantities of hazardous waste originating in Botswana. Only those facilities licensed by their appropriate governmental authorities shall be considered. This portion of this task shall include a review of import/export regulations which might impact shipment of hazardous waste across international borders.

## **2.4 Task 3 - Equipment Analysis**

Assuming that funding for actual construction of the facility will come from local sources, the consultant shall assess the availability of local or regionally available equipment and waste handling practices prior to preparing preliminary designs. This shall include, but not be limited to; sorting conveyors, magnetic separators, balers, bins and skips, waste compaction and transfer equipment.

This task shall also include an evaluation of the paper and metal balers at WPR and Metal Box and shall assess each company's interest and capacities for receiving sorted materials from the proposed facility.

## **2.5 Task 4 - Preliminary Designs**

Based on the outputs of Tasks 1 through 3, the consultant will prepare preliminary design alternatives for the GCC's consideration. The designs shall include both sorting and transfer components and be flexible in being able to adjust for changing market conditions and variable material quantities. The designs shall include transfer as the main component with the potential addition of material sorting. The following is a suggested list of preliminary design alternatives:

- 1. Transfer Station Only.**
- 2. Transfer with high volume material sorting only, including paper, plastic film, and bi-metal cans.**
- 3. Transfer with comprehensive sorting of the above high volume materials, plus three colors of glass and plastic containers.**

Based on the assessment made in Task 3, preliminary designs shall incorporate existing processing facilities at WPR and Metal Box, up to their design capacity. If WPR and Metal Box are not interested in a joint effort with a GCC sorting facility, then baling or other processing equipment should be added to the design.

Although the current collection system is a mixed system, the consultant, in preparing his designs should consider the possibility of source separated recyclable collection, and include both types of waste collection systems in his designs.

Subject to the outcome of Task 2, the designs shall incorporate facilities for the receipt and storage of toxic and hazardous waste, in preparation for shipment to an approved hazardous waste disposal facility.

Each preliminary design alternative shall include schematic diagrams and a general building layout with dimensions and equipment sizing.

## **2.6 Task 5 - Cost Estimates**

The consultant shall prepare a preliminary cost estimate for each alternative including capital as well as operating costs. The costs shall be summarized as unit costs per tonne of material transferred or recycled so that the GCC can determine the "cost effectiveness" of each alternative. Market prices and anticipated revenues shall be identified with each alternative. Each cost estimate shall include a life cycle analysis of at least 10 years, taking into account the growth of waste generation in Gaborone and trends in recycled materials.

Since the site of the new landfill will not be determined until a thorough study of new sites is performed, the cost estimates shall include transfer costs, assuming various travel distances from Gaborone at 5 kilometer increments. If the new landfill is located relatively close to the City, all compactor collection vehicles would most likely drive directly to the landfill and the transfer station would be used by tractor hauled skips and self haul waste generators.

## **2.7 Task 6 - Conclusions and Recommendations**

The Consultant shall summarize all his work into a final report which presents conclusions and recommendations for consideration by the GCC. These shall include a discussion, comparing the sorting of materials from a central receiving station and increased source separation of selected materials.

## **3.0 Steering Committee**

As was the case for previous Phase I and II projects, all work under this SOW shall be performed in close cooperation with the GCC Solid Waste Management Steering Committee. An initial meeting shall be held with the committee during the first week of the assignment to finalize the SOW and establish a progress schedule. Additional meetings shall be held at the mid-point of the project and a final meeting and presentation of the final report.

## **4.0 Level of Effort**

We anticipate that the above tasks can be accomplished within an eight week period.

## **5.0 Consultant Qualifications**

The consultant selected to perform the preliminary designs shall be a professional engineer with at least five years experience in the design or operations of solid waste processing facilities. Previous experience in Africa is preferred.



# Agency for International Development

*Embassy of the United States of America*

## USAID Mission to Botswana

Post Office Box 2427

Gaborone, Botswana

Offices: Barclays House

Telephone 353382 Fax 313072

U.S. ADDRESS: USAID/GABORONE • DEPARTMENT OF STATE • WASHINGTON, D.C. 20521-2170

**MEMO TO:** Solid Waste Steering Committee

**FROM:** Jim Dohrman, USAID Consultant

**RE:** Pre-Qualification Meeting

**DATE:** 24 February 94

As you are aware, the mandatory prequalification meeting for private operation of the landfill, was held on Wednesday, 23 February 1994. Although the overall response was disappointing we expect that 5 or 6 well qualified firms will submit qualification statements, based on the discussions held during the meeting and during the site inspection. The attached sign-in sheet identifies the firms who attended the meeting and who have expressed interest in tendering for the landfill operation. These firms included 2 experienced waste management firms from South Africa, Daisy Loo/Sanitation Botswana and several large general construction firms with good excavation experience. Two of these firms were involved with the closure of the old landfill.

Qualification Questionnaires are due on 18 March 94. Upon receipt of the completed questionnaires, Mr. Masenya will deliver one copy of each questionnaire to Mr. Brahmhatt at the USAID office, who will DHL them to Mr. Dohrman at his office in the United States. Mr. Dohrman will review the questionnaires, prepare a comparative spreadsheet of each firm's qualifications and a brief report to the Tender Panel, with his recommendations. This report will be completed and faxed to Mr. Brahmhatt by 1 April 94 who will deliver the report to Mr. Masenya who will distribute it to the Tender Panel. Upon approval of the pre-qualified firms, full Tender Documents will be sent to each firm with confirmation of receipt by return fax. Revisions to the Site Development plan are required before the Tender Documents can be released.

As a result of the Pre-Qualification meeting, several issues were discussed that have resulted in changes to the Tender Document and Operating Plan. These include the following:

1. Sections 1.1 and 1.2 of the Tender Document were revised to include a Pre-Tender meeting.
2. Section 2.7.2 of the Operating Plan was revised to require the Operator to conduct periodic methane gas monitoring.
3. Section 3.5.10 was added to clarify the GCC position on accepting hazardous waste at the landfill.

GABORONE CITY COUNCIL

PRIVATIZATION OF LANDFILL OPERATIONS

CONTRACTOR REGISTRATION FORM

INDIVIDUALS REPRESENTING FIRMS INTERESTED IN SUBMITTING PROPOSALS FOR THIS PROJECT MAY SIGN THIS FORM.

PLEASE PRINT CLEARLY, THANK YOU.

NAME	COMPANY	ADDRESS
K. de Meyer	Waste Reuse	Tel 011 422-256 P.O. Box 22001 Benoni
H. GROBBELAAR	WASTE-TECH	BRICKFIELD ROAD SERMISTON, SOUTH-AFRICA
Z. V. KOLGRENBLER	WASTE-TECH	P.O. Box 1547 BEDFORDVIEW 2008.
G. DAVIES	SKIP HIRE/WASTE-TECH.	P.O. Box 2394 GASOLANE 371707 (TEL & FAX)
ZHU BIAO	CAITEC BOTSWANA	P.O. Box 402674, Gaborone Tel/Fax 303275
A. HOLSLEY	L. J. WHYLE	Fax 356531 Box 1301 GABS. PH. 312311
D. CLANNIDINNING	RXC. HIRE	Box 2402 GABORONE 7 373992 F 357406
G. M. DJENG	DAISY/PO	PKAG ROAD, GBE (357361) DAISY/PO FIRM 18. HAS
E. LEFAPHANE	ZOKA TRANSPORT	Box 1867 GABORONE TEL 302576
B.R. SEGOKOSI	SANITATION BOTSWANA	Box 41159 GASOLANE 359578

# SEPTEMBER

## DAILY LANDFILL DISPOSAL

DAY	REFUSE	COVER MATERIAL	RUBBLE/ROCKS	TOTALS
1	176.18	89.98	0	266.16
2	86.14	330.44	8.7	425.28
3	108.50	301	81.72	491.22
4 S	84.40	250.34	24.57	359.31
5 S	30.94	12.36	4.02	47.32
6	117.00	82.84	63.72	263.56
7	102.50	51.14	81.28	234.92
8	102.70	190.6	63.22	356.52
9	104.49	527.6	86.78	718.85
10	65.40	514.96	13.28	593.64
11 S	64.19	244.43	125.71	434.33
12 S	69.16	10.26	30.06	109.48
13	106.42	179.55	78.63	364.6
14	103.60	228.82	157.38	489.78
15	81.15	362.11	114.78	558.04
16	50.04	232.65	65.96	348.65
17	46.31	214.42	51.7	312.43
18 S	19.14	78.84	50.23	148.21
19 S	1.12	35.54	30.8	67.46
20	61.10	138.83	206.88	406.84
21	57.05	164.73	378.64	600.42
22	16.38	888.45	192.54	897.37
23	23.30	606.72	118	748.02
24	25.56	346.62	68.42	438.6
25 S	35.32	556.5	65.98	657.78
26 S	5.02	109.57	19.14	133.73
27	27.98	358.39	108.44	492.81
28	19.20	428.68	605.88	1053.74
29	47.32	229.88	73.64	350.84
30	5.58	0	0	5.58
<b>TOTAL</b>	<b>1,843.19</b>	<b>7,564.28</b>	<b>2,968.02</b>	<b>12,375.49</b>
<b>AVG(7)</b>	<b>63.56</b>	<b>260.84</b>	<b>102.35</b>	<b>426.74</b>
<b>AVG(5)</b>	<b>64.65</b>	<b>294.12</b>	<b>124.64</b>	<b>483.41</b>
<b>AVG(SAT)</b>	<b>50.76</b>	<b>282.53</b>	<b>66.62</b>	<b>399.91</b>
<b>AVG(SUN)</b>	<b>26.56</b>	<b>41.93</b>	<b>21.01</b>	<b>89.50</b>

# OCTOBER

## DAILY LANDFILL DISPOSAL (1)

DAY	REFUSE	COVER MATERIAL	RUBBLE/ROCKS	TOTALS
1	10.16	0	2.22	12.38
2 S	9.18	0	5.14	14.32
3 S	8.26	0	16.26	24.52
4	136.16	347.32	96.02	579.5
5	80.32	33.92	122.74	236.98
6	67.40	49.44	37.6	154.44
7	141.78	455.5	68.92	666.2
8	169.06	66.33	67.48	302.87
9 S	53.86	633.98	56.66	744.5
10 S	22.29	351.84	10.56	384.69
11	24.08	470.64	170.78	665.5
12	12.58	514.29	99.96	628.83
13	106.56	383.77	255.74	746.07
14	91.26	241.54	87.78	420.58
15	105.30	232.84	32.6	370.74
16 S	62.76	211.98	23.4	298.14
17 S	9.78	131.54	51.32	192.64
18	140.38	197.3	93.48	431.14
19	146.54	432.76	59.04	638.34
20	116.87	72.6	98.6	286.07
21	131.88	157.84	100.58	390.3
22	47.18	130.24	86.48	263.9
23 S	41.60	176.34	93.16	311.1
24 S	29.48	65.48	83.9	178.86
25	111.60	126.82	184.82	423.24
26	124.22	95.44	69.22	288.88
27	98.84	84.28	93.7	276.82
28	87.54	23.62	21.8	132.96
29	98.78	52.16	56.66	207.6
30 S	58.28	144.28	66.52	269.08
31 S	24.98	106.5	87.56	219.04
<b>TOTAL</b>	<b>2,368.96</b>	<b>5,990.59</b>	<b>2,398.68</b>	<b>10,758.23</b>
<b>AVG(7)</b>	<b>76.42</b>	<b>193.24</b>	<b>77.38</b>	<b>347.04</b>
<b>AVG(5)</b>	<b>97.55</b>	<b>198.51</b>	<b>90.68</b>	<b>386.73</b>
<b>AVG(SAT)</b>	<b>45.14</b>	<b>233.32</b>	<b>48.98</b>	<b>327.43</b>
<b>AVG(SUN)</b>	<b>18.96</b>	<b>131.07</b>	<b>49.92</b>	<b>199.95</b>

1) DOES NOT INCLUDE YARD WASTE, BRUSH OR BREWERY WASTE.

(1) DOES NOT INCLUDE YARD WASTE, BRUSH OR BREWERY WASTE.

# NOVEMBER

DAILY LANDFILL DISPOSAL (1)

DAY	REFUSE	COVER MATERIAL	RUBBLE/ ROCKS	TOTALS
1	114.22	0	40.94	155.16
2	81.86	29.62	83.36	194.84
3	102.36	73.8	91.64	267.8
4	125.78	165.7	124.22	415.7
5	100.16	20.4	67.64	188.2
6 S	84.70	363.86	58	506.56
7 S	22.34	204.41	41.42	268.17
8	112.30	68.18	79.12	259.6
9	96.84	325.84	165.36	588.04
10	120.30	596.06	88.76	805.12
11	108.07	180.5	281.66	570.23
12	95.68	135.06	99.5	330.24
13 S	60.54	41.1	153.74	255.38
14 S	19.74	16.28	46.04	82.06
15	130.78	129.36	201.32	461.46
16	84.02	592.54	197.4	873.96
17	107.21	669.5	64.12	840.83
18	8.98	923.43	42.06	974.47
19	58.96	222.26	94.78	376
20 S	58.78	114.48	88.98	262.24
21 S	46.07	625.84	4.41	676.32
22	93.89	184.83	68.67	347.39
23	SCALE INOPERABLE			
24	72.24	158.24	24.5	254.98
25	107.17	115.57	81.02	303.76
26	157.47	641.33	25.91	824.71
27 S	64.54	297.09	23.27	384.9
28 S	29.17	482.79	2.6	514.56
29	110.21	788.69	87.48	986.38
30	149.33	964.7	75.31	1189.34
TOTAL	2,523.71	9,131.46	2,503.23	14,158.40
AVG(7)	87.02	314.88	86.32	488.22
AVG(5)	101.80	332.65	99.27	533.72
AVG(SAT)	67.14	204.13	81.00	352.27
AVG(SUN)	29.33	332.33	23.62	385.28

(1) DOES NOT INCLUDE YARD WASTE, BRUSH OR BREWERY WASTE.

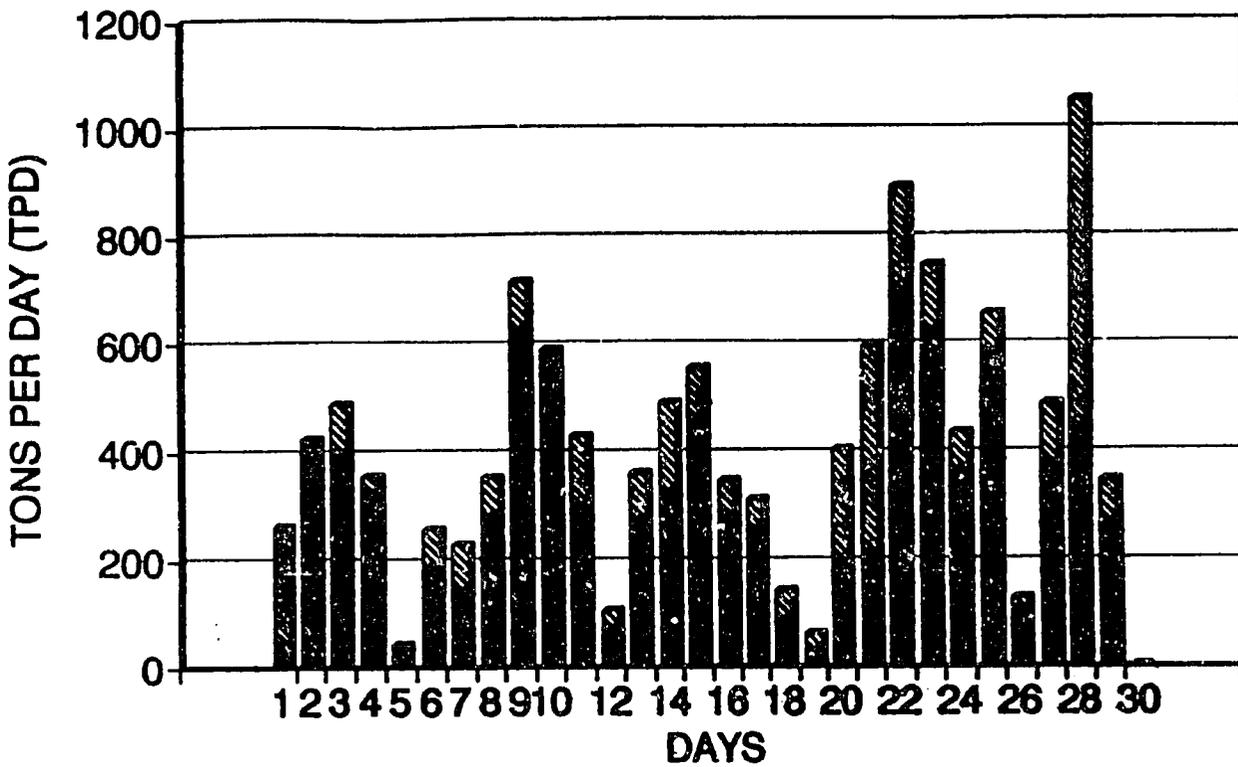
# DECEMBER

DAILY LANDFILL DISPOSAL (1)

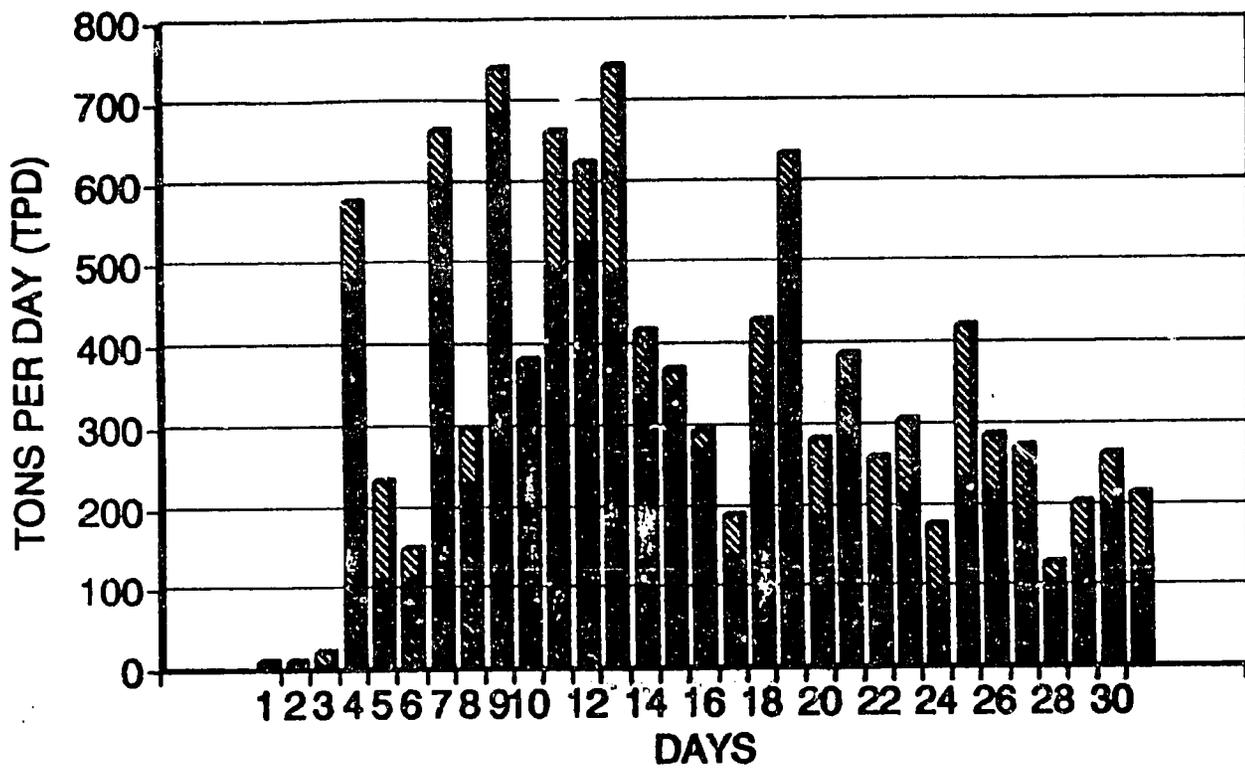
DAY	REFUSE	COVER MATERIAL	RUBBLE/ ROCKS	TOTALS
1	122.46	428.44	82.66	633.56
2	102.62	281.52	267.85	651.99
3	85.67	710.31	400.12	1196.1
4 S	47.84	290.8	274.58	613.22
5 S	23.14	235.1	226.55	484.79
6	123.01	752.67	146.1	1021.78
7	100.25	756.19	134.09	990.53
8	127.31	313.54	327.13	767.98
9	115.59	759.58	278.34	1153.51
10	90.51	336.16	203.98	630.65
11 S	68.38	202.61	93.39	364.38
12 S	26.44	330.2	35.9	392.54
13	132.06	412.41	125.55	670.02
14	111.15	525.26	189.69	826.1
15	113.62	422.12	90.96	626.7
16	92.16	282.45	98.3	472.91
17	101.65	31.33	26.7	159.68
18 S	56.79	6.3	8.8	71.89
19 S	18.21	228.96	2.25	249.42
20	108.31	97.2	84.1	287.61
21	105.51	393.12	193.85	692.48
22	102.83	33.3	198.05	334.18
23	136.50	10.65	47.2	194.35
24	96.24	13.45	53.1	162.79
25 S	36.32	0	24.48	60.8
26 S	15.69	0	54.65	70.34
27	59.96	0	0	59.96
28	74.37	5.96	0	80.32
29	75.82	20.98	17.85	114.65
30	86.10	24.16	9.2	119.46
31	75.10	8.85	0.8	84.75
TOTAL	2,629.61	7,913.61	3,696.22	14,239.44
AVG(7)	84.83	255.28	119.23	459.34
AVG(5)	101.60	287.81	129.37	518.79
AVG(SAT)	52.33	124.93	100.31	277.57
AVG(SUN)	20.87	198.57	79.84	299.27

(1) DOES NOT INCLUDE YARD WASTE, BRUSH OR BREWERY WASTE.

# DAILY DISPOSAL SEPTEMBER

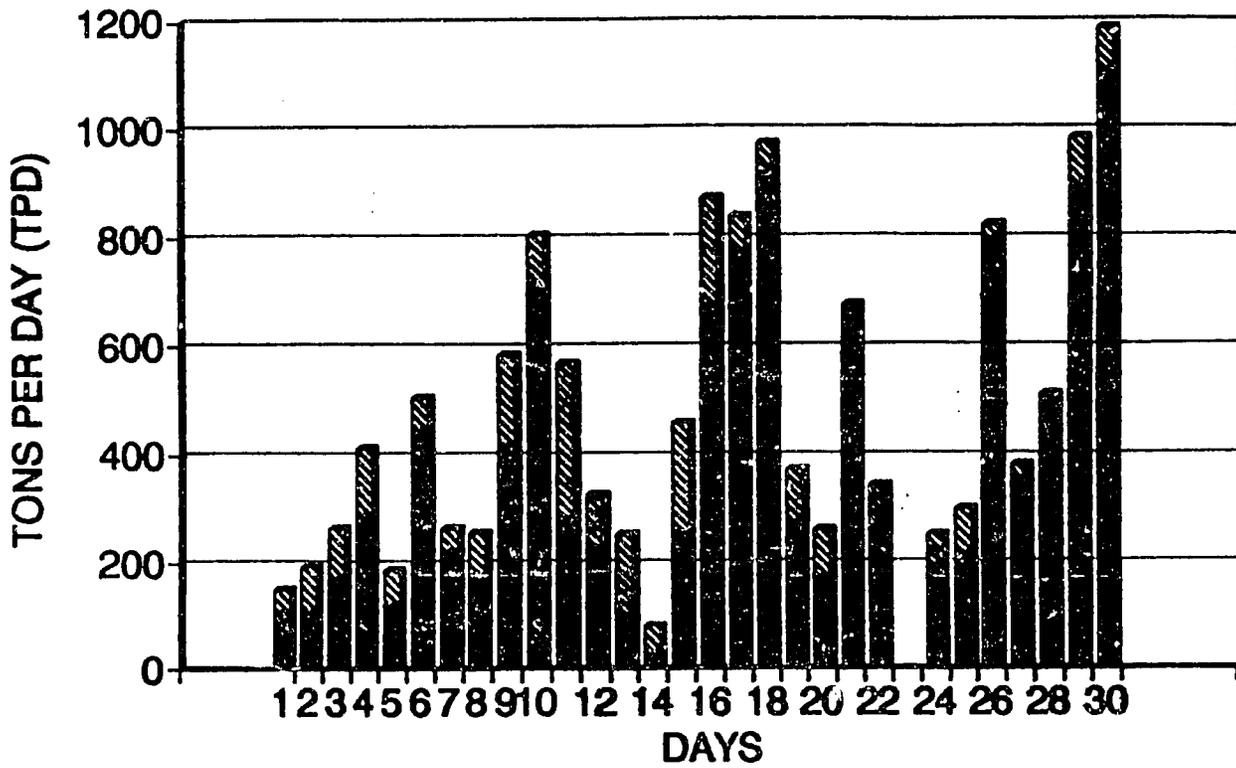


# DAILY DISPOSAL OCTOBER



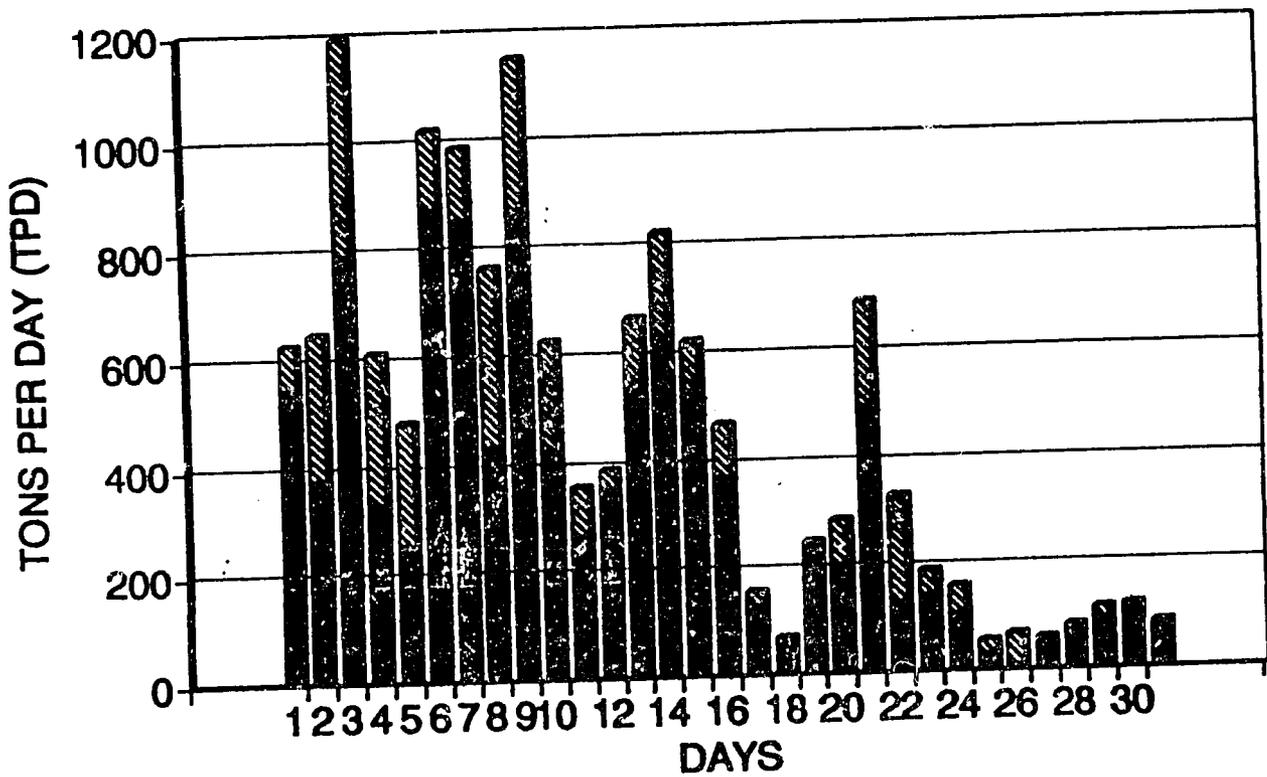
REFUSE      COVER MATERIAL      RUBBLE & ROCKS

# DAILY DISPOSAL NOVEMBER



REFUSE      COVER MATERIAL      RUBBLE & ROCKS

# DAILY DISPOSAL DECEMBER



REFUSE      COVER MATERIAL      RUBBLE & ROCKS

**LANDFILL LIFE WITHOUT PROCESSING**  
 (REVISED 31/1/94 WITH CURRENT COVER AND RUBBLE DISPOSAL)

YEAR	REFUSE (TPD)	COVER MATERIAL (TPD)	RUBBLE/ ROCKS (TPD)	TOTAL (TPD)	ANNUAL MATERIAL RECEIVED (TPY)	ANNUAL IN-PLACE VOLUME (CU.M/YR)	CUMULATIVE IN-PLACE VOLUME (CU. M)	LANDFILL LIFE (YEARS)
1993(1)	78	257	96	431	52,582	54,919	54,919	1
1994	86	257	96	439	160,162	170,001	224,919	2
1995	94	257	96	447	163,294	176,264	401,183	3
1996	104	257	96	457	166,739	183,154	584,337	4
1997	114	257	96	467	170,528	190,732	775,069	5
1998	126	257	96	479	174,696	199,069	974,138	6
1999	138	257	96	491	179,281	208,239	1,182,378	7
2000	152	257	96	505	184,325	218,326	1,400,704	8
2001	167	257	96	520	189,873	228,422	1,630,127	9
2002	184	257	96	537	195,976	241,628	1,871,755	10
2003	202	257	96	555	202,689	255,054	2,126,809	11
2004	223	257	96	576	210,073	269,823	2,396,632	12
2005	245	257	96	598	218,198	286,069	2,682,701	13
2006	269	257	96	622	227,131	303,939	2,986,639	14
2007	296	257	96	649	236,960	323,596	3,310,236	
2008	326	257	96	679	247,771	345,219	3,655,455	
2009	358	257	96	711	259,664	369,004	4,024,459	
2010	394	257	96	747	272,746	395,168	4,419,627	
2011	434	257	96	787	287,136	423,943	4,843,576	
2012	477	257	96	830	302,965	455,605	5,299,182	
2013	525	257	96	878	320,377	490,430	5,789,612	

- (1) Based on Sept thru December 1993 actual results. (4 months)
- (2) Total landfill volume based on 1985 calculation of 3,26 million cubic meters
- (3) In-place density assumes 500 kg per cubic meter for refuse and 1 200 kg per cubic meter for cover soil, and rubble.
- (4) Estimated volumes assume all materials received are placed in the landfill.

## LANDFILL LIFE WITHOUT PROCESSING

(REVISED 31/1/84 WITH 5 YEAR CONSTRUCTION PERIODS)

YEAR	REFUSE (TPD)	COVER MATERIAL (TPD)	RUBBLE/ ROCKS (TPD)	TOTAL (TPD)	ANNUAL MATERIAL RECEIVED (TPY)	ANNUAL IN-PLACE VOLUME (CU.M/YR)	CUMULATIVE IN-PLACE VOLUME (CU. M)	LANDFILL LIFE (YEARS)
1993(1)	78	257	96	431	52,582	54,919	54,919	1
1994	86	100	60	246	89,717	111,299	166,218	2
1995	94	75	40	209	76,424	103,875	270,093	3
1996	104	75	40	219	79,869	110,765	380,858	4
1997	114	75	40	229	63,658	118,344	499,201	5
1998	126	200	100	426	155,351	182,949	682,150	6
1999	138	100	60	298	106,836	149,537	831,688	7
2000	152	75	40	267	97,455	145,938	977,625	8
2001	167	75	40	282	103,003	157,034	1,134,659	9
2002	184	75	40	299	109,106	169,239	1,303,898	10
2003	202	200	100	502	183,344	238,834	1,542,832	11
2004	223	100	60	383	139,628	211,121	1,753,953	12
2005	245	75	40	360	131,326	213,680	1,967,633	13
2006	269	75	40	384	140,261	231,550	2,199,183	14
2007	296	75	40	411	150,090	251,277	2,450,391	15
2008	326	200	100	626	228,426	329,099	2,779,490	16
2009	358	100	60	518	189,219	310,302	3,089,792	17
2010	394	75	40	509	185,876	322,779	3,412,571	
2011	434	75	40	549	200,266	351,559	3,764,131	
2012	477	75	40	592	216,095	383,218	4,147,349	
2013	525	200	100	825	301,032	474,310	4,621,659	

(1) Based on Sept thru December 1993 actual results. (4 months)

(2) Total landfill volume based on 1985 calculation of 3,28 million cubic meters

(3) In-place density assumes 500 kg per cubic meter for refuse  
and 1 200 kg per cubic meter for cover soil, and rubble.

(4) Estimated volumes assume all materials received are placed in the landfill.