Office of Internal Audit

Performance Audit 15-08: Landfill Sustainability

August 2016

City Auditor
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OFFICE OF INTERNAL AUDIT

Stan Sewell, City Auditor

August 17, 2016

To: Mayor Andy Berke
City Council Members

Subject: Landfill Sustainability (Report #15-08)

Dear Mayor Berke and City Council Members:

The attached report contains the results of our audit of Landfill Sustainability. Our audit found the Public Works Department is doing a good job of managing the landfill and the estimated remaining life compares favorably to other landfills. We also found there is value in exploring alternatives to handling municipal solid waste. In order to address the noted areas for improvement, we recommended actions to ensure compliance with the *City Code* as it relates to the tipping fee exemption for non-profits and to consider hauling the City's municipal solid waste to another landfill.

We thank the management and staff of the Public Works Department for their cooperation and assistance during this audit.

Sincerely,

Digitally signed by Stan Sewell
DN: cn=Stan Sewell, o=City of Chattanooga, ou=Office of Internal Audit, email=sewell_stan@chattanooga.gov, c=US
Date: 2016.08.17 14:38:33 -04'00'

Stan Sewell, CPA, CGFM, CFE
City Auditor

Attachment

cc: Audit Committee Members
Stacy Richardson, Chief of Staff
Maura Sullivan, Chief Operating Officer
Justin Holland, Public Works Administrator
Jim Templeton, Director of City-Wide Services
Erik Schmidt, Director of Sustainability

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TABLE OF CONTENTS

AUDIT PURPOSE

This audit was conducted in accordance with the Office of Internal Audit's 2015 Audit Agenda. The objectives of this audit were to determine:

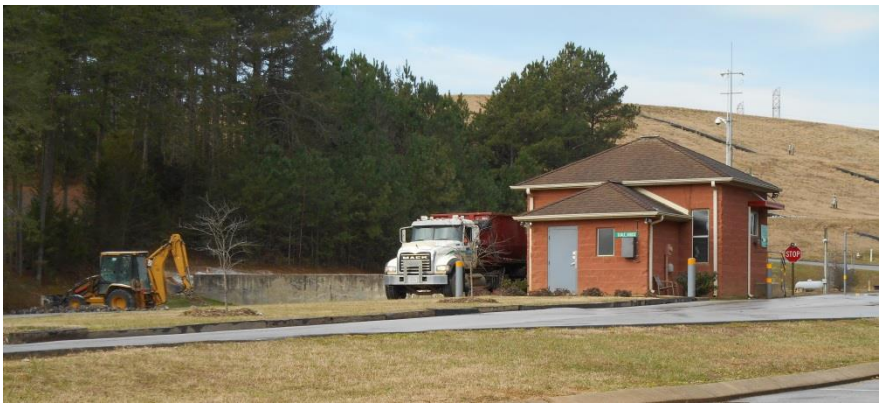
- If the City's landfill is being managed to ensure a maximum lifespan;
- The remaining life of the landfill; and,
- If the City's current use of the landfill is the most cost effective method to dispose of solid waste.

BACKGROUND

The City of Chattanooga's Public Works Department is responsible for operation of the City's landfill located on Birchwood Pike in Harrison, TN. Traditionally, government-owned facilities have provided landfill services to community residents. Currently, most municipal solid waste goes to privately-owned landfills. Of the four largest cities in Tennessee, Chattanooga is the only municipality that operates its own landfill.

The City acquired the landfill from Hamilton County in 1995. In previous years the City operated other landfills which are now closed. The scope of this audit only includes the Birchwood landfill.

Exhibit 1: Landfill Scale House



The operations of the landfill and accounting for post-closure costs related to closed landfills are included in the City's Solid Waste Fund. The Fund also includes revenues and expenses related to the operation of recycling, composting, refuse and household hazardous waste activities. These activities contribute to the minimization of waste going to the landfill.

The function of the landfill is to store and dispose of solid waste. The landfill provides an area where waste can be disposed and managed properly to reduce health and environmental risk. Two important issues related to the landfill are capacity and cost effectiveness. Capacity, or airspace, is the volume of space in the landfill which is permitted for the disposal of municipal solid waste (MSW).

Cost effectiveness, as with any other activity, relates to obtaining the best value for the lowest possible cost. Control of cost is key, because the waste management process must make economic sense. Given the cost of infrastructure, we need to extend the landfill life as long as possible to serve the citizens and minimize future capital expenditures.

Sustainable landfilling has become a key concept in waste management. Internationally, there are several definitions of a "sustainable landfill". For the purposes of this audit, we focused on landfill management and the maximized use of the capacity of the landfill. No matter how successful the City is diverting waste from the landfill, there will always be a need for landfills in the waste management process.

Financial Information

In fiscal year ending 2015, the Solid Waste Fund had operating revenues of $700,000 and transfers of $6.5 million from the City's General Fund, totaling $7.2 million. With operating expenses of $3.8 million, the resulting operating income was $3.4 million.

It's all about airspace

Airspace is the most important variable in operating a landfill. It can be described as the volume of space in a landfill where solid waste can be disposed. Typically, the landfill site is initially engineered and prepared to create a depression in the ground to generate airspace according to engineering plans based on the topography of the site. As planning, construction and operation of the landfill can be extremely expensive, optimization of air space is a priority.

Two fundamental practices of maximizing airspace are compaction and control of MSW entering the landfill. Compaction can be described as compressing the waste so more of it can be stored in the same area to conserve valuable airspace. Obtaining the smallest possible size of waste volume is most desirable. Technology can be utilized to maximize the City's investment by extending the life of the facility.

Management is considering using Global Positioning System (GPS) technology to increase compaction and monitor compaction in real time. Using GPS on landfill equipment gives feedback on the equipment's position, relative to landfill design, in order to maximize the compaction and use of airspace.

Control of MSW entering the landfill simply means monitoring and minimizing what goes into the landfill. Whatever municipal solid waste is coming into the landfill is occupying valuable airspace. The most common landfill minimization or diversion technique is recycling, partnered with an effective material recovery facility. The City currently contracts with an outside vendor for recovery services.

Exhibit 2: Landfill Space Available for Expansion

The amount of waste entering a landfill and the airspace remaining determine the lifespan of the landfill. During our work, we determined the City's Public Works Department is effectively managing the City's landfill to ensure maximum utilization. Landfill personnel continually monitor the compaction of MSW at the landfill. Additionally, the City effectively diverts waste from the landfill mainly through recycling, green waste recovery and biosolids treatment.

How much airspace do we have?

Annually, landfill management initiates a survey to create a contour map determining the remaining cubic yards of airspace remaining in the landfill. The remaining life of the landfill is a function of the remaining cubic yard space available and the estimated cubic yards of waste disposed in the landfill per year. The calculated remaining life is

an indicator of how soon arrangements for future waste will need to be made, such as expansion or a new landfill.

As previously mentioned, in addition to airspace and the amount of incoming waste, compaction is an important element in estimating the remaining life of the landfill. Reducing the municipal solid waste to the smallest possible size helps maximize the use of the landfill's airspace. Management estimates the City's current landfill density is 1,460 pounds of waste per cubic yard of airspace.

Exhibit 3: Current Cell of Landfill (Area 3 – Phase 1)

According to the latest survey (April 2016), the estimated fill volume for the City's landfill was 5,072,899 cubic yards. Based on the landfill receiving an approximate 69,677 tons per year, this results in an estimated remaining life of 53 years. Based on our work, the estimated remaining life compares favorably to other landfills and has not been materially affected by changes in Chattanooga's population.

How do we compare to other landfills?

Tipping fees are charged per ton of waste deposited at the landfill. The fees typically are used to cover operating costs of the landfill[1]. The City of Chattanooga currently charges $30.50 per ton at its Birchwood Landfill.

[1] Megan Greenwalt, "Landfill Tipping Fees See Minimal Increases", *www.waste360.com*, Penton (Publisher), January 5, 2016.

During our work, we found the approximate operating expense for the City's Birchwood landfill to be $29.56 per ton for Fiscal Year 2015.

This cost per ton is relatively close to the tipping fee charged. As a result, we used the tipping fee of $30.50 as a basis to compare the City's landfill to other landfills.

Exhibit 4: Tip Fees for U.S. Landfills

Region	Average Fee	Minimum Fee	Maximum Fee
Pacific	61	24	108
Northeast	58	17	114
Southeast	44	20	119
Mountains/Plains	43	21	110
Midwest	40	14	85
South Central	36	16	72
National Average	48	14	119
City of Chattanooga	**31**	**31**	**31**

Source: www.waste360.com/operations/west-coast-boasts-highest-average-tip-fees-nation (January 2016)

As shown in Exhibit 4, the City's tipping fee is one of the lowest when compared to the average tipping fee of $44.46 for the southeast and national average of $48.27 per ton[2].

FINDINGS AND RECOMMENDATIONS

Think Outside the Landfill

The City's landfill is subject to the oversight of Tennessee Department of Environment and Conservation (TDEC).[3] TDEC's *2015-2025 Solid Waste and Materials Management Plan* seeks to maintain a comprehensive solid waste management system through sound solid waste collection treatment and disposal through source reduction, reuse, recycling, composting and other methods.[4] Additionally, from an economic standpoint, operation of the landfill must be cost-effective. One objective of a city is to operate effectively and efficiently.[5]

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[2] Waste360 Staff, "West Coast Boasts Highest Average Tip Fees in Nation", *www.waste360.com*, Penton (Publisher), March 8, 2016.
[3] www.tennessee.gov/environment/section/about-tdec

[4] *2015-2025 Solid Waste and Materials Management Plan* (April 2015): Page 1.
[5] *Internal Control and Compliance Manual for Tennessee Municipalities* (June 2010): Title 1, Introduction.

Based on our work, the Public Works Department is cost effectively operating the landfill and using traditional landfill management techniques to ensure a maximum lifespan. According to our calculation, the approximate diversion rate is 56%, mainly through biosolid treatment at Moccasin Bend Wastewater Plant. Sewage is processed to make it safe for agriculture land application.

Even with good performance results, the increasing awareness of environmental stewardship and shrinking financial resources make it necessary for local government landfill managers to search for alternatives when handling MSW. One possible alternative would be to haul the City's MSW to another landfill. Currently the City's Construction and Demolition (C&D) waste is hauled to another landfill.

The active landfill cell (Area 3 – Phase 1), if it continued at the current rate, would be filled in approximately 3.75 years. Scaling back to an estimated 15,000 tons per year would extend the lifespan of the current cell to approximately 17.4 years. Management estimates expanding the landfill could cost as much as $8.5 million.

Premised on scaling back the operations of the landfill and currently available opportunities, we estimate hauling the City's MSW to another landfill would be cash flow neutral on a year-to-year basis. Over the next several years, this action could result in a substantial cash flow benefit due to delayed capital expenditures. Reductions in the annual allocation of closure/post-closure costs would add to the potential financial benefits to the city.

More important than financial benefits, this action would extend the life of the landfill. Conserving landfill airspace now could potentially benefit the city in the future when there is likely to be a shortage of nearby landfill space. It is very likely future generations will be appreciative of all efforts to extend the life of our landfill.

Recommendation 1:

We recommend Public Works consider scaling back the operations of the landfill and hauling the City's MSW to another landfill.

Auditee Response: *We concur with the audit finding and recommendation.*

Tipping Fee Exemption Should Be Reviewed

The *City Code*[6] indicates "…non-profit corporations that are generating municipal solid waste through their thrift store operations may be allowed to dispose thusly generated waste free of charge…" Each entity must be individually approved through City Council action and the waste must be "delivered in a vehicle owned by the non-profit". The exemption's purpose is to offer relief on waste disposal tipping fees to charitable non-profit organizations.

During our work, we found some non-profit organizations were mistakenly approved for the exemption even though they did not operate a thrift store. Additionally, one non-profit organization significantly exceeded their approximate incoming tonnage set forth in their City Council approval resolution and did not use a vehicle owned by the organization as required by the ordinance. Public Works is aware of issues with the non-profit tipping fees exemptions and is actively working to resolve them.

Recommendation 2:

We recommend the Public Works Department initiate a review to ensure compliance with *City Code*.

Auditee Response: *We concur with the audit finding and recommendation.*

Recommendation 3:

We recommend the Public Works Department create an annual application form and approval process for the tipping fee exemption.

Auditee Response: *We concur with the audit finding and recommendation.*

[6] *Chattanooga City Code*: Article VI. – Sanitary Landfills, Section 18-105 Fees (d).

APPENDIX A: SCOPE, METHODOLOGY AND STANDARDS

Based on the work performed during the preliminary survey and the assessment of risk, the audit covers landfill operations from July 1, 2014 to June 30, 2015. When appropriate, the scope was expanded to meet the audit objectives. Source documentation was obtained from Public Works and Finance Departments. Original records as well as copies were used as evidence and verified through physical examination.

To evaluate the sustainability of the landfill, we examined landfill records and conducted interviews with key stakeholders. We also reviewed the landfill process, operating cost and the remaining life calculation.

To develop our recommendations, we reviewed the *City Code* and industry best practice documents. We also compared the City's landfill tipping fees and remaining life to other landfills.

Sampling was not used in order to infer the conclusions of test work performed on a sample to the population from which it was drawn and to obtain estimates of sampling error involved.

To achieve the audit's objectives, reliance was placed on computer-processed data contained in the WasteWORKS software system. We assessed the reliability of the data contained in the system and conducted sufficient tests of the data. Based on these assessments and tests, we concluded the data was sufficiently reliable to be used in meeting the audit's objectives.

We conducted this performance audit from December 2015 to July 19, 2016 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

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