Ada County Landfill
Cost of Service Study Summary Report

September 2019
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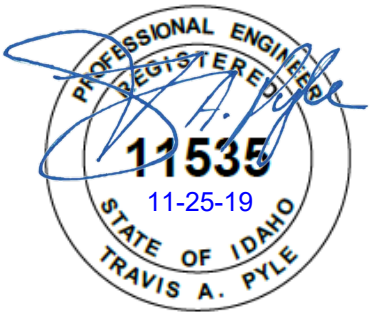
Prepared for

Ada County Solid Waste Management

Prepared by



This document was prepared under the direct supervision of Travis A. Pyle, a registered Professional Engineer in the State of Idaho, employed at Great West Engineering, Inc.

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1.0 Executive Summary

A Cost of Service Study (COSS) was conducted for the Ada County Landfill (ACLF) in accordance with Great West Engineering's agreement with Ada County. The goal of this project is to provide a comprehensive review of the County's Solid Waste Management Department Enterprise Fund. In addition to reviewing the Fund, Great West prepared an operations assessment with field observations and recommendations for possible areas of improvements along with a cost model.

The project was conducted over a four-month period. It began with a project initiation meeting and data gathering step, followed by an assessment of the landfill operations, development of a comprehensive budget and financial model, and finally preparation of this report with presentation to the Board of County Commissioners.

The field assessment evaluated operations at the landfill to determine where and how expenses are incurred and if there are actions the County or its operations contractor, Republic Services, might consider taking to decrease costs. The assessment also compared the ACLF operations to two other similar type arid landfills – the Pickles Butte Landfill in nearby Canyon County (Nampa, Idaho) and the Cerro Colorado Landfill (CCL) located in Albuquerque, New Mexico. As a result of the study, several observations and generalities were made for possible improvements to consider at the ACLF. These actions include adding spotters at the public/residential tipping area of the landfill, pushing waste with a dozer rather than using a compactor, increasing the size of the working face to increase distance between public customers and heavy equipment, removing soil cover to reduce the amount of airspace lost to soil, and improving traffic control for safety at the working face.

With budget information for FY2020 and scale transaction data, a cost model was developed to assist the County in setting the rate structure. The model established a minimum universal fee of **$29.00/ton** in FY2020 for all waste types and customers. This fee is comprised of $24.70/ton for operations, 3.00/ton for capital reserves, and $1.30/ton for closure and post-closure (financial assurance).

Establishing one single, universal tipping fee is the simplest way to set a rate structure. However, the rate can be dissected based on the actual cost of providing service to the different types of customers. This report explores the assessment of the cost of service for the two types of customers – commercial and residential – but is meant with several caveats that need to be considered in establishing the rate structure for the ACLF. How rates are appropriated among the different waste sources will need to be decided by the Board of County Commissioners with input from County staff. Other considerations in setting the rate schedule, such as a reduced fee to divert materials from the landfill and preserve airspace, should also be considered.

2.0 Introduction

Ada County retained Great West Engineering, Inc. to perform a comprehensive review and analysis of the County's Solid Waste Management Department rates and recommend a 10-year rate schedule for the various components of the Solid Waste Management Department Fund. The recommendations provided herein by Great West Engineering, in collaboration with our specialty solid waste accountant, Chris Bell, CPA with Bell & Associates, are supported by an overall financial planning strategy that was developed in conjunction with Ada County Solid Waste Department management. This assessment provides a simplified rate model and financial plan that allows County staff to run hypothetical scenarios, track the health of the Solid Waste Department Enterprise Fund, and produce financial reports with graphs.

2.1 Project Goals and Scope

The goal of this project is to provide a comprehensive review of the County's Solid Waste Management Department Enterprise Fund as it relates to historical and projected revenues, expenses, reserve policies, billing and collection procedures, rates and charges, the rate structures, fiscal year (FY) 2020 budgets, the master plan for the landfill, the landfill's 10-year capital improvement plan, and future growth potential.

The specific scope of this project includes:

- Assessing the current landfill rate structure's performance as a baseline for comparing the recommended changes.
- Recommending a rate structure that allows the County to meet its financial obligations, while ensuring long-term financial stability of the Solid Waste Department Enterprise Fund.
- Developing a rate structure where revenues adequately fund system maintenance to accepted industry standards by incorporating variables such as age and condition of infrastructure, future replacement costs, and cost of inflation.
- Developing rate structures that conform to the existing and anticipated County ordinances and Idaho statutory requirements.
- Developing a rate structure that conforms to the County's reserve requirements and generally accepted guidelines for responsible financial management of the Solid Waste Enterprise Fund.
- Developing rate structures that fully fund necessary fleet replacements, capital replacements, new cell development, and landfill closures [and post-closure care] through a combination of rates and reserve funds.
- Developing a Solid Waste Department rate model using operational data to reflect current status and future forecasts to 2030, to include but not limited to:
- Budgetary items including revenue, operation and maintenance (O&M) expenses, capital expenses, capital reserves, and cash analysis.
- Personnel wages and benefits
- Capital replacement projections

- Verification and update of the closure/post-closure fund to ensure closure/post-closure activities are adequately funded.
- Creating a comprehensive cost of service study with the following features:
    - An Excel model with an interface to allow for charting and graphs and "what-if" scenarios and model outputs with easy to understand tables.
    - Final report summarizing the analysis that was completed, including findings, recommendations on the rate adjustments, capital funding strategies, reserve policies, and operational and service changes.
    - Presentation of the draft version of the cost of service model to the County's Solid Waste Advisory Committee (SWAC).
    - Presentation the findings and recommendations to the Solid Waste Management Department Staff and the Board of County Commissioners (BOCC).

3.0 Facility Information / Waste Generation

Ada County owns the Ada County Landfill (ACLF), a municipal solid waste landfill (MSWLF), located in northwest foothills of Boise. The landfill facility has a physical address of 10300 N Seamans Gulch Road, Boise, Idaho. The ACLF began accepting waste in 1972 in the Hidden Hollow Cell (HHC). The HHC closed in 2018 with active landfilling currently taking place in the North Ravine Cell (NRC), which opened in 2008.

The ACLF includes an administrative building near the facility entrance, entrance facilities (scalehouse/scales), a Household Hazardous Waste (HHW) facility, a maintenance shop building west of the NRC, the closed HHC, the active NRC (Stages 1 through 3), two leachate ponds, and other supporting buildings and infrastructure.

The landfill is permitted through the Idaho Department of Quality and the Central Health District. An overall site map of the ACLF is shown in **Exhibit 1**.

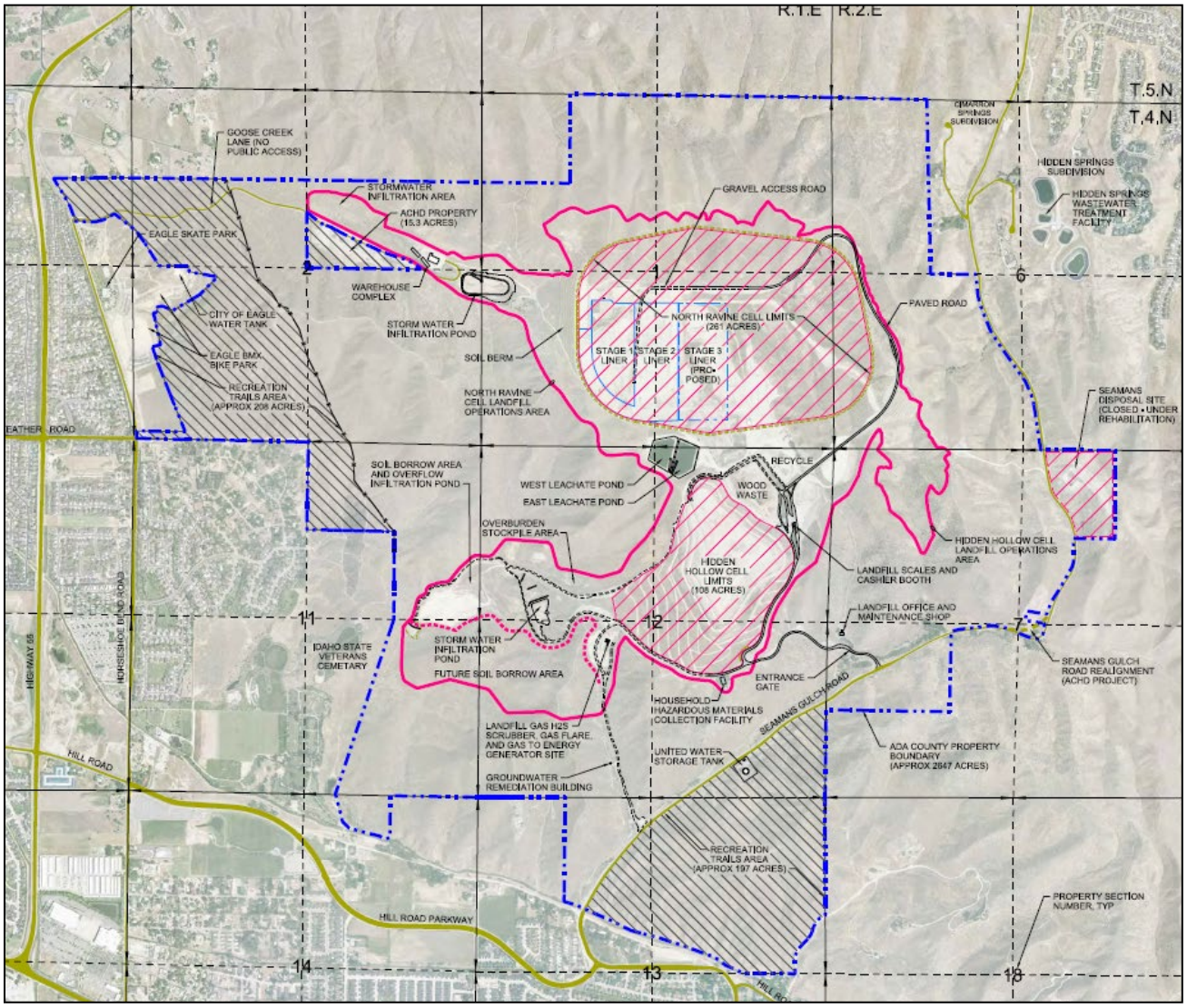

Exhibit 1 – Overall Site Map

3.1 Ada County Population

According to the U.S. Census Bureau, the population of Ada County in 2017 was approximately 456,000 (refer to **Exhibit 2**), with an estimated 470,000 people in 2018. Between 2010 and 2018, the population of Ada County grew by a reported 19.8% according to the U.S. Census Bureau. The Idaho Statesman reported in March 2019 that Ada County grew by 3.6% in 2018. The City of Boise, the largest city in Ada County and the capitol of Idaho, reported a population of approximately 227,000 in 2017. The City of Boise experienced an estimated 9.3% population increase between 2010 to 2018.

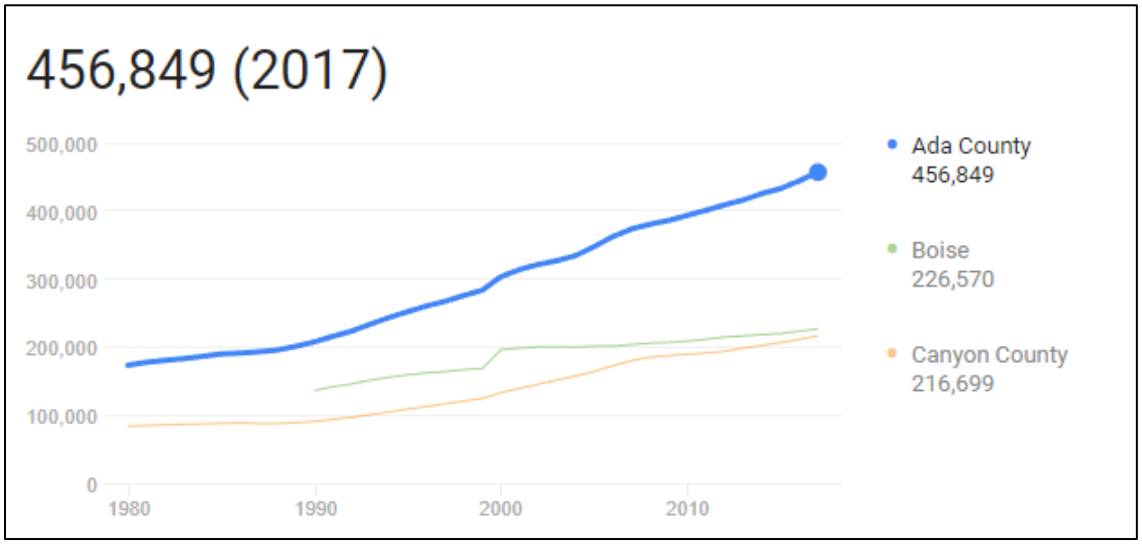

Exhibit 2 – Ada County Population Growth (1980– 2017) (Source: United States Census Bureau)

3.2 Waste Tonnage Estimates

Incoming waste quantities were based on volumetric estimates up until 2011 when the entrance scales were installed. Until 2017, waste was being placed into two different landfill cells – the Hidden Hollow Cell (the old/original landfill cell) and the North Ravine Cell (the new lined cell). The North Ravine cell was originally permitted and designed in the early 2000's as a 100-year cell with a combination of lateral and vertical expansions.

3.2.1 Landfill Waste

Landfill wastes include municipal solid waste (MSW), sludge, and construction and demolition (C&D) debris. At this time, C&D and sludge (biosolids) from community wastewater treatment plants are comingled with MSW.

Waste customers are separated into two main categories - commercial and residential customers. Commercial customers include garbage trucks from daily collection routes (Route Trucks) and waste hauled in from the transfer stations (Transfer Trucks), located in Boise and Meridian. Residential customers are both general public (self-haulers) and contractors. These sources are considered revenue waste streams. Non-revenue waste streams include street sweepings, animal mortalities (from the humane societies in the

County), and waste from the Ada County Sheriff Inmate Litter Detail Service (SILDS). Table 1 summarizes the incoming waste tons by source and revenue type for FY2018.

Table 1 – Incoming Waste Tons by Source (FY2018)

Landfill Waste	FY2018 Waste (tons)
REVENUE WASTES	
Commercial:	
Route Trucks (1)	121,575
Transfer Trucks	201,081
Sludge (Biosolids)	8,550
Subtotal Commercial	**331,206**
Residential:	
Self-haul/Contractors (2)	93,527
Asbestos (3)	162
Subtotal Residential	**93,689**
Total Revenue Wastes	**424,895**
NON-REVENUE WASTES	
Mortality (Animal)	129
SILDS	506
Street Sweepings	24,759
Total Non-Revenue Wastes	**25,394**
Total Landfill Waste(4)	**450,289**

Table Notes:

1. Route Trucks include a combination of C&D, compacted MSW, and non-compacted MSW types/sources as tracked by gate transactions.
2. Self-haulers include contractors and non-account customers and are tracked by compacted waste, C&D, mixed load wastes, and non-compacted wastes.
3. This is total asbestos and is categorized at the gate as commercial or residential asbestos.

The national average MSW generation rate in the U.S. has increased over the years from 2.68 lbs per person per day (0.49 tons per person per year) in 1960 to 4.48 pounds per person per day in 2015 (0.82 tons per person per year), as shown in Exhibit 3. The estimated per capita MSW generation rate in Ada County is 0.89 tons per person per year (416,000 tons / 470,000 people) accounting for the MSW waste that was landfilled at the ACLF. The 416,000 tons accounts for all commercial and residential wastes including C&D wastes, which skews the per capita generation rate slightly higher than the national average. This number does not include sludge or non-revenue wastes.

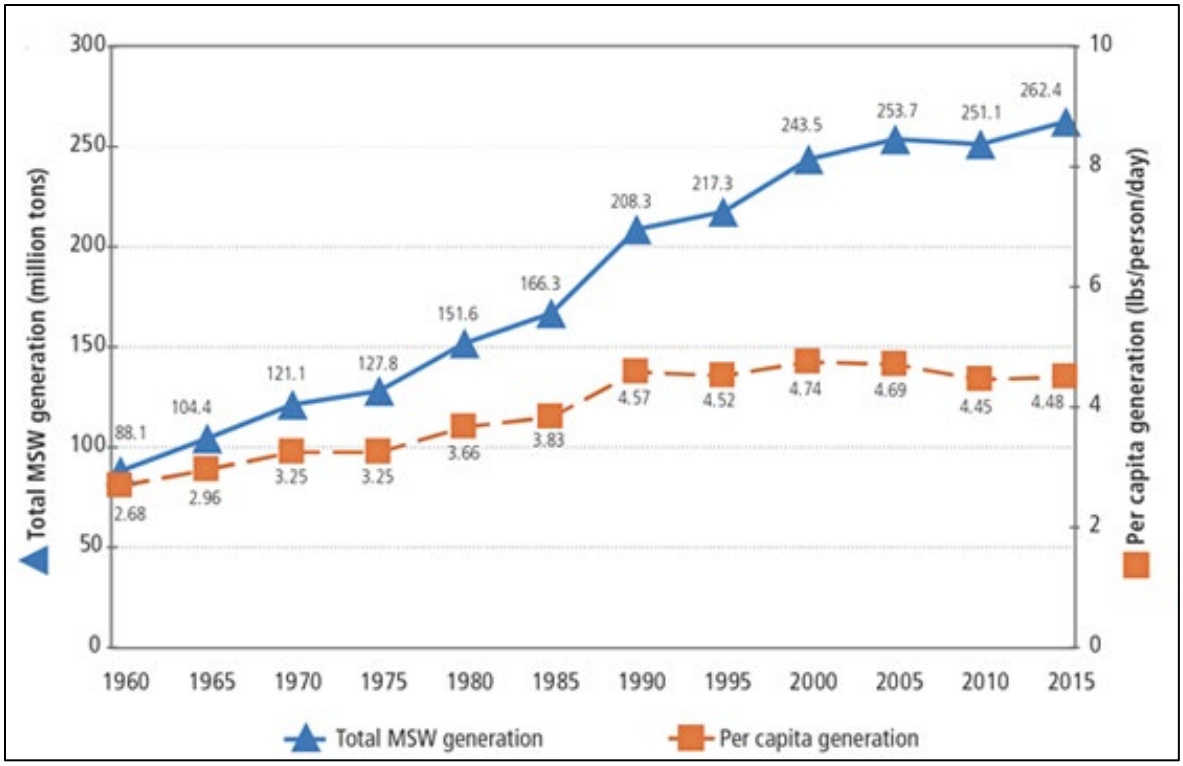

Exhibit 3 – National MSW Generation Rates, 1960-2016 (Source: USEPA)

3.2.2 Other Wastes

Other waste types that are managed at the ACLF, but are not disposed inside the landfill, include wood waste and organics (leaves), hazardous wastes, Christmas trees, televisions (electronics), metals and tires. These wastes are tracked separately and are included as part of the general operational costs for the ACLF.

4.0 Operations Assessment Study

The operations assessment study assessed the primary operations at the landfill to determine where and how expenses are incurred and if there are steps the County or its operations contractor, Republic Services, might consider taking to decrease costs, while also making some generalities of comparison to other landfills of similar type and size.

Observations that were conducted may not cover all "typical" work practices conducted at the site. The work practices that were observed may differ from those on very busy days, weather extremes, and other factors. As such, these "snapshot" observations and conclusions reported in the study need to be considered with the understanding of the extent of this work assignment in accordance with Great West's contracted scope of services.

4.1 Work Approach

The observational assessment study was conducted using the following work approach:

- Reviewing the Republic Services contract for "push and pack" and interviewing staff to segregate the County's contracted costs and the contractor's personnel and equipment requirements and costs.
- Staffing levels to determine the sufficiency of operations staff.
- Equipment levels in conjunction with the fleet inventory to determine if there is adequate equipment to conduct efficient operations.
- Daily cover operations and waste to soil ratios to determine if the amount of daily cover soil in relation to waste disposal volumes is appropriate.
- Waste compaction densities to determine if the right equipment is being utilized in the right areas to adequately meet optimum waste compaction levels.
- Review of hours of operation to ensure cost efficiency while providing convenience to users and minimizing impacts on the local community.
- Review of site safety to identify obvious practices that could cause injuries to employees or patrons bringing waste to the sites.
- Impact of commercial haulers to the overall operation of the landfill.
- Impact of self-haulers to the overall operation of the landfill.

4.2 Overview of Landfill Operations

The ACLF is open Monday through Friday from 7:00 am to 6:00 pm and on Saturdays from 8:00 am to 6:00 pm, except for observed holidays. Operations are administered in shifts to cover the 11 hours of daily operations from when the facility is open to closed, as well as operations required before and after operating hours. The ACLF is operated by a staff of 20 full-time and part-time employees in conjunction with various contractors' employees. These contractors include

- Republic Services for landfill operations.
- M&M Demolition for processing wood and yard waste (brush) operations.

- Pacific Recycling for scrap metal hauling and recycling services
- Stericycle for running and maintaining the HHW facility and hauling and disposal of HHW
- Hidden Hollow Energy for operating the landfill gas to energy (LFGTE) system

4.2.1 Landfill Operations

The "push and pack" components of operation at the ACLF are administered by Republic Services under contract with Ada County. Services performed by Republic Services include landfilling, spreading and compacting MSW, and other miscellaneous service items included in the *Ada County Landfill North Ravine Cell and Hidden Hollow Cell Operation Plan* (CH2M HILL, February 2017).

Waste is hauled into the landfill by both public and commercial haulers (route trucks) as well as transfer trucks bringing waste from the Meridian and Boise transfer stations.

The division of responsibilities for operating the ACLF was determined by reviewing the Operation Plan, the original Landfill Services Request for Proposal (RFP), and through interviews with key staff from Republic Services and Ada County.

Republic Services is responsible for the following operational services:

- Placing and compacting waste according to the published operating plan and provided fill plan
- Excavating, hauling and spreading soil for daily and interim cover
- Providing and maintaining tipping (unloading) area(s) for garbage
- Maintaining public access road from the end of the pavement to the working face of the landfill through grading potholes and ruts and adding rock as needed (supplied by Ada County)
- Removing snow from the paved and gravel portions of the public access road from Seamans Gulch Road to the active working face of the landfill
- Suppressing dust on the gravel portion of the public access road via water truck(s)
- Supplying and maintaining office and break area for Republic's employees including supplying power, water, and restrooms.
- Maintaining and dust suppression on the parking lot and access road to the Republic office
- Installing and maintaining stormwater ditches and structures on active landfill areas (NRC Stages 1-3), road ditches, storm ponds, and concrete ditch
- Supplying (10 fences), moving and cleaning moveable litter fences and moving and cleaning County supplied litter fences (20 fences)
- Installing and maintaining (cleaning) temporary litter fencing around the active face

Table 2 presents a list of Republic Services' landfill equipment and personnel as observed during the field assessment work.

Table 2 - Republic Services Heavy Equipment & Personnel

Equipment [1]	Quantity
D-6 Dozer	1
D-8 Dozer	1
CAT 836 Compactor	2
CAT IT24 Loader	1
CAT Tarp Unit	1
Kenworth Water Truck	2
CAT 140 Road Grader	1
Peterbilt Lube Truck	1
CAT Loader	1
Ingersoll-Rand SD-100D Roller	1
CAT 7350 Articulated Dump Truck	2
CAT Excavator	1
Total	**15**
Personnel	**Quantity**
Spotter	3
Maintenance/Service Technician	2
Operator	7
Supervisor	1
Manager [2]	0.25
Total	**13.25**

Table Notes:
1. Republic Services also provides and maintains 10 bull litter fences and two light plants.
2. One Manager is responsible for ¼ of his/her time for landfill operations.

The responsibilities of Ada County for operating the ACLF are:

- Installing horizontal and vertical landfill gas wells
- Collecting disposal fees
- Administering all environmental permitting, compliance, and reporting
- Administering all environmental monitoring and testing
- Conducting all work associated with groundwater remediation
- Supplying materials (rock, culverts, cover soil, etc.) for installation/construction of stormwater controls, roads and daily and interim landfill cover
- Maintaining the paved portion of the public access roads
- Operating and maintaining the recycling area, which includes the collection of white goods (appliances), tires, electronic waste (e-waste), and scrap metal
- Supplying the HHW Facility
- Facilitating public outreach
- Conducting periodic waste screening
- Hauling unsuitable waste identified and removed by Republic Service from the active face of the landfill

- Supplying and maintaining all equipment, fuel, and personnel required to perform the County's operational responsibilities.
- Providing vector (bird) control

Table 3 presents a list of Ada County's equipment and personnel operating and managing the ACLF.

Table 3 – Ada County Heavy Equipment & Personnel

Equipment [1]	Quantity
John Deere Loader/Backhoe	1
Hasco Dump truck	3
Harsh Dump Truck	2
Dozer	1
CAT Forklift	2
John Deere Excavator	1
Bobcat Mini Excavator	1
Bobcat Compact Excavator	1
Bobcat Track Loader	2
Brushcat Mower	2
Road Grader	1
Pull-Behind Sweeper	1
Freightliner Water truck	1
Freightliner Tractor	1
Lube/Service Truck	2
Total	**22**
Personnel	**Quantity**
Director	1
Deputy Director	1
Operations Supervisor	1
Environmental Compliance Coordinator	1
Landfill Technician	6
Office Supervisor	1
Account Clerk	2
Scalehouse Operator	6
Automotive Service Technician	1
Total	**20**

Table Notes:

1. Ada County also provides 20 bull litter fences, two gas analyzer units, 3 John Deere UTVs and 9 fleet vehicles.

4.2.2 Wood Recycling Area Operations

The wood recycling area is operated by M&M Demolition. M&M is responsible for collecting, grinding, and hauling away wood and yard waste (brush) material hauled into the ACLF by both public and commercial haulers.

Based on observations made during site visits, M&M Demolition is responsible for the following operations:

- Maintaining an area for recycling of wood products
- Providing a spotter at all time the wood recycling area is open
- Periodic grinding of collected wood waste
- Hauling to active working face and disposal of any unsuitable materials dropped at the wood waste area
- Removal of ground wood waste
- All equipment, fuel, and personnel required to performed operational responsibilities.

The responsibilities of Ada County for the Wood Waste Area are:

- Providing initial gravel-surfaced pad for collecting, storing, and grinding of wood waste
- Providing and maintaining a road for accessing the wood waste area

Table 4 presents a list of M&M Demolitions equipment and personnel.

Table 4 – M&M Demolition Heavy Equipment & Personnel

Equipment (1)	Quantity
Loader	1
Excavator	1
High Speed Grinder	1
Total	**3**
Personnel	**Quantity**
Spotter/Operator	2
Operator (2)	3
Total	**5**

Table Notes:

1. Timber Creek Recycling, a sister company of M&M, has several transfer trailers and trucks that they use for back-haul of wood chips after dropping off MSW at the ACLF from the transfer stations.
2. Operators are on-site during grinding operations.

4.2.3 Recycling Area Operations

The Recycling Area is operated by Ada County personnel. Operations of this area include:

- Providing and maintaining an area for receiving scrap metal from the public
- Providing and maintaining an area for receiving tires from the public
- Loading tires into a tire trailer utilizing a forklift
- Providing and maintaining an area for receiving appliances (whitegoods) from the public
- Refrigerants are evacuated from the appliances by the hazardous waste contractor, Stericycle.

In addition to the County supplied operations, the following contracted operations occur periodically in the Recycling Area:

- Loading and hauling of scrap metals, including refrigerant-evacuated appliances. This operation is contracted out and performed by Pacific Recycling.
- Once the tire trailer is full, it is hauled away by the disposal contractor. Once emptied, the trailer is returned to the landfill for ongoing operations.
- HHW collected in this area, along with the evacuated refrigerant from appliances, is taken to the onsite HHW area by Stericycle. These materials are disposed as part of the HHW contract with Stericycle.

4.2.4 Supporting Systems Operations

Landfill Gas Operations

The landfill gas collection (LFG) system and flare is operated by Ada County. The materials for the wellfield are purchased and installed by Ada County personnel. The system includes horizontal gas collector lines in the NRC, vertical gas wells in the HHC, a blower skid, two flares, and a hydrogen sulfide (H_2S) scrubber unit. Approximately 1,250 standard cubic feet per minute (scfm) of scrubbed landfill gas is delivered by the County to Hidden Hollow Energy (HHE) to produce electricity on a continuous basis. The balance of the LFG that is collected is burned in the County-owned and operated flares.

HHE is responsible for providing and maintaining all infrastructure for burning a portion of the LFG, generating electricity and routing electricity to the power grid.

Ada County is responsible for:

- Installing and maintaining horizontal gas collectors and vertical gas wells
- Monitoring and adjusting the flow of gas wells
- Installing, maintaining and operating the H_2S scrubber
- Removing condensate from the LFG system
- Supplying and maintaining LFG blower skid for collecting LFG
- Supplying, operating, and maintaining flare stack(s) for the destruction of excess LFG
- All air permitting, monitoring, and reporting associated with the landfill gas

Leachate System Operations

The leachate system operations are also the responsibility of Ada County. This includes the collection systems in the landfill, liquid injection lines, the two leachate ponds, aeration system, and other supporting infrastructure.

HHW Facility Operations

The HHW Facility is owned by Ada County; however, the County contracts out the operations of the HHW Facility to Stericycle. The facility is open every Friday and Saturday, except for observed holidays.

Based on observation made during site visits and interviews with Ada County personnel, Stericycle is responsible for:

- Receiving materials and operating the HHW facility when open.
- Sorting, bulking, and storing collected HHW materials.
- Transporting the HHW materials from the Recycling Area to the HHW Facility.
- Hauling and disposal of HHW material collected.

Ada County is responsible for:

- Providing an HHW building and receiving area including utilities.
- Maintenance of the HHW building.
- Providing an HHW collection area in the recycling area of the landfill.

4.3 Operational Assessment

The County's and Contractor's operations were compared to typical industry operations and operational practices at a similar landfill. Selection of comparable landfills is based on the following criteria:

- Landfill with a similar arid climate
- Landfill lined, permitted, and operated in accordance with Subtitle D regulations
- Landfill with a landfill gas collection and control system
- Landfill that is publicly owned
- Service area of similar size to Ada County
- Incoming tonnages and scaling operations of similar size and configuration

Various landfills in our database were reviewed and the Cerro Colorado Landfill (CCL) located in Albuquerque, New Mexico was selected for comparison of operations to the ACLF. The CCLF is a Subtitle D landfill owned and operated by the City of Albuquerque's Solid Waste Department. The landfill is located 13 miles from downtown Albuquerque on the southwest slope of the Rio Grande River at an elevation of 5,800 feet. The climate is arid/ high desert that averages 9.4 inches of annual rainfall. The average summer temperature is 87 degrees while the winter averages 46 degrees Fahrenheit. Soils at the landfill are classified as sandy. Cerro Colorado is regulated and monitored by the State of New Mexico's Environment Department.

The CCLF accepts on average approximately 541,000 tons of residential and commercial trash and has an estimated 56 years of capacity. The CCLF is only open to commercial haulers and does not accept public traffic. The landfill uses a combination of alternative daily covers (tarps and spray covers) and soil cover.

Although the CCLF is comparable to ACLF, there are some notable differences. The CCLF does not accept waste from public/residential customers and does not have separate wood waste collection and grinding operations onsite.

The nearby Pickles Butte Landfill in Canyon County, Idaho was also used as a comparison for waste to soil ratios and effective waste densities. The Pickles Butte Landfill accepts waste from both commercial and public haulers; however, the public is not allowed at the active face and unloads at a tipping area near the entrance of the landfill. The landfill uses only soil cover (native sandy materials) for daily cover material.

4.3.1 Staffing Levels

Staffing levels for both County and Republic Services are summarized in **Table 5** with a comparison to CCLF. Typical jobs across landfills (equipment operators, mechanics, compliance technicians, spotters, etc.) were included in this comparison.

Table 5 – Staffing Levels & Comparison for General Landfill Ops

Position	Ada County	Republic Services	Total ACLF	Cerro Colorado Landfill (1)
Director/Manager	1	0.25	**1.25**	1
Deputy Director	1	---	**1**	1
Superintendent	--	---	**0**	1
Operations Supervisor	1	1	**2**	2
Environmental Compliance Officer / Technicians	4	---	**4**	2
Office Supervisor	1	---	**1**	---
Account Clerk/Administration	2	---	**2**	1
Scalehouse Operator	6	---	**6**	5
Automotive Service Technician / Mechanic	1	2	**3**	---
Spotter	---	3	**3**	6
Landfill Operator / Landfill Technician	3	7	**10**	12
Total Staff	**20**	**13.25**	**33.25**	**31**

Table Notes:

1. The CCLF does not accept public/residential customers. It is only open to commercial haulers. The CCLF also does not collect and grind wood waste, and so for comparison, those operations are not included in this table for comparison.

4.3.2 Heavy Equipment

Heavy Equipment (rolling stock) inventories for both the County's and Republic's push and pack operations are listed in Table 6. The heavy equipment inventory for CCLF is also shown for comparison. Due to the division of operations between the Ada County and its Contractors, there is overlap in equipment. For example, between the County, M&M Demolition and Republic Services, there are three excavators used for operations at the ACLF, whereas a landfill of this size typically utilizes one to two excavators depending on the number of operational areas and how far apart they are from one another.

Table 6 – Heavy Equipment Inventories & Comparison for General Landfill Ops

Equipment	Ada County	Republic Services	Total ACLF	Cerro Colorado Landfill
Dozer	1	2	**3**	4
Compactor	---	2	**2**	5
Tarper	---	1	**1**	1
Water Truck	1	2	**3**	2
Road Grader	1	1	**2**	2
Lube/Service Truck	2	1	**3**	2
Loader	1	1	**2**	2
Roller	---	1	**1**	--
Articulated Dump Truck	---	2	**2**	---
Excavator / Scraper	1	1	**2**	3
Dump Truck	5	---	**5**	2
Lube/Oil Truck	---	1	**1**	0
Forklift	2	---	**2**	---
Mini/Compact Excavator	2	---	**2**	---

Equipment	Ada County	Republic Services	Total ACLF	Cerro Colorado Landfill
Mower	2	---	**2**	---
Pull-Behind Sweeper	1	---	**1**	---
Tractor (Truck)	1	---	**1**	---
Backhoe	---	---	**0**	1
Spray Applicator	---	---	**0**	1
Total Heavy Equipment	**20**	**15**	**35**	**25**

Even though the CCLF accepts more annual waste than ACLF, it uses less heavy equipment and staff. This is likely a result of the CCLF only accepting commercial waste (no public/residential), which can add the need for additional spotters (per ton basis) and additional equipment and staff to run separate fill area operations.

4.3.3 Waste to Soil Ratio

Daily cover at the ACL is comprised of native sandy soil and tarps that are used as an alternative daily cover (ADC). Soil is excavated onsite from the nearby, future Stage 4 development area. Removing soil in the area of the next proposed construction stage is a common practice to save money for construction of the next landfill cell and an efficient and cost-effective method of landfill operations.

In FY2018, the ACLF accepted approximately 450,289 tons (not including wood waste, HHW, leaves, and Christmas trees and other wastes that were not landfilled). This amount of waste utilized approximately 659,700 cubic yards (cy) of airspace in the landfill, including 47,344 cy of soil for daily cover and 39,700 cy for interim cover (87,044 cy total, from *Republic Services*). The balance of the airspace taken up by waste was 572,656 cy. This equates to a waste-to-soil volumetric ratio of approximately 6.6:1 (572,656 cy waste / 87,044 cy soil). The soil utilized approximately 13% (87,044 cy soil / 659,700 cy total) of the total airspace volume. By comparison, the county's landfill engineer, Jacobs Engineering, approximates the amount of soil utilized to be on the order of 25% based on their measurements, or a volumetric waste-to-soil ratio 3:1 (494,775 cy waste to 164,925 cy soil).

Landfills of similar size that use soil for daily cover tend to operate with waste-to-soil ratios of 3:1 or higher. Those that use ADCs exclusively operate with ratios of 5:1 or higher. The percentage of soil use depends on several factors, including the type of waste, weather conditions, odor control, type of soil, supplemental use of ADCs, removal and reuse of soil, and other factors. The higher the ratio the more efficient use of the airspace occupied by waste. With varying degrees of soil use estimated at the ACLF, the waste to soil ratio is between 3:1 to 6.6:1, falling somewhere in the low to upper echelon of waste-to-soil ratios.

By comparison, the reported waste to soil ratio for nearby Pickles Butte Landfill in Canyon County, Idaho was 2.2:1 with a soil utilization rate of 31% (2015 figures). The current reported waste-to-soil utilization rate is approximately 27% for the CCLF. A comparison of landfill waste-to-soil ratios and soil utilization rate are shown in Table 7.

Table 7– Landfill Waste-To-Soil Ratios and Soil Utilization Rates Comparisons

Location	Waste-To-Soil Ratio	Soil Utilization Rate
Ada County Landfill (NRC) (1)	3:1 to 6.6:1	25% to 13%
Pickles Butte Landfill (Canyon County) (2)	2.2:1	31%
Cerro Colorado Landfill (Albuquerque, NM) (3)	2.6:1 (est)	27%

Table Notes:

1. The Ada County Landfill uses a combination of tarps and soil for daily and interim cover. The 6.6:1 waste-to-soil ratio is based on soil figures provided by Republic Services. Jacobs Engineering, the County's landfill engineer, estimates this ratio to be closer to 25% soil or 3:1 waste to soil ratio.
2. Pickles Butte Landfill uses only soil cover.
3. Cerro Colorado Landfill uses a combination of ADCs (tarps and spray cover) and soil cover.

4.3.4 Waste Densities and Compaction

The effective waste density, with typical units of pounds per cubic yard (lbs/cy), is a measure of the weight of waste that can be placed in a unit volume of airspace inside the landfill. This measurement considers the volume lost through daily and interim soil cover, and the volume gained through settlement and waste decomposition. This density ratio is termed "effective" because it gives the landfill operator/owner an understanding of how much waste has been placed in a given volume, even though other materials such as soil cover can be present within the same volume. The higher the effective density value, the better the efficiency of airspace utilization.

In FY2018, a total of 450,289 tons of waste were disposed of in the NRC. Based on aerial mapping by Jacobs between September 2017 and September 2018, approximately 659,700 cy of airspace were utilized. The effective waste density over this period is calculated at 1,365 lbs/cy (450,289 tons x 2,000 lbs/ton / 659,700 cy). A comparison of effective waste densities is shown in **Table 8**.

Table 8 – Landfill Effective Waste Densities Comparison

Location	Waste Density (lbs/cy)
Ada County Landfill (NRC)(1)	1,365
Pickles Butte Landfill (Canyon County)(2)	1,167
Cerro Colorado Landfill (Albuquerque, NM)(3)	1,118

Table Notes:

1. The Ada County Landfill uses a combination of tarps and soil for daily cover.
2. Pickles Butte Landfill uses only soil cover.
3 Cerro Colorado Landfill uses a combination of ADC and soil cover.

Effective waste densities for similar landfills in arid climates range from the low-1,000 lbs/cy to as high as 1,500 lbs/cy. Several factors, such as the fill slopes (steeper slopes are more challenging to compact), compactor size (weight), compactor cleats, depth of waste, and the amount of soil cover influence the effective density value. The ACLF is in the upper range of the level for these effective waste density numbers in arid climates.

The effective density should continue to increase as the waste settles and consolidates under its own weight and through decomposition processes. It is assumed that the effective density will eventually reach **1,400 lbs/cy** for long-term planning estimates of life expectancy of the NRC.

4.3.5 Operating Hours

The ACLF is open 11 hours a day, five days a week (Monday-Friday), and 10 hours on Saturday (total of 65 hours per week). In order to cover the open hours, Republic Services runs two shifts of operators and Ada County covers the scalehouse building with rotating days of 11-hour shifts. Typical landfill operating hours vary greatly depending on geography, season, access to transfer stations, other disposal options, and/or whether the landfill is open to the general public for dumping. Many landfills will stagger open and closing times for commercial and public customers and/or for commercial customers equipped with radio-frequency identification (RFID) card readers and tared truck weights utilizing unattended scales. This allows for shifts of operators and scalehouse attendants to cover a larger window of open time.

4.3.6 Safety

Detailed assessments of safety procedures and practices were not completed as part of this study and are beyond the scope of this assessment. Site observations were conducted over a brief widow of time and only a snapshot of overall operations was taken. However, during the site visits, general safety was observed limited to the following:

- Traffic Congestion/Spotters – Generally appropriate
- Personal Protective Equipment (PPE) – Generally appropriate
- Equipment Speeds – Generally appropriate
- The proximity of Equipment to Public – Generally Poor. Both the compactor and dozer were observed at times to be operating within 10 feet of the public unloading (refer to **Exhibits 4 and 5**). This is generally too close and does not provide adequate separation space between the heavy equipment and customers.

Exhibit 4 – Dozer Running on Stage 1 Unloading Deck (Public) to Push Waste from Unloading Area (June 15th)

Exhibit 5 – Compactor Pushing Waste on Unloading Deck in Stage 1 Public (June 15th)

- Traffic Control – Generally Fair. A stop sign and spotter were successful in controlling the general traffic flow for public/contractors. However, when busy, the single spotter could not keep up and adequately control traffic or people. Multiple instances of cross traffic pulling in and out at the same time occurred. Additionally, children were observed out of vehicles standing on top of unloaded waste.

4.3.7 Impact of Commercial Haulers

According to the timing of commercial (route and transfer trucks) customers, a transfer truck takes on average 28.5 minutes to position and unload. Commercial route trucks (and sludge trucks) take on average only 5.7 minutes to unload. The average payload of the transfer trucks is 25.7 tons for route trucks and 28.9 tons for sludge trucks.

The average waste payload of commercial route trucks is 8.5 tons. Given the size of the commercial deck, a total of 6 trucks can be accommodated at a single time and 63 trucks could be cycled through in one hour for a total tonnage of 536 tons (63 trucks x 8.5 tons/ truck). Table 9 (next section) shows the summary of average loads and trucks and tons per hour for commercial haulers.

4.3.8 Impact of Public Customers

According to the timing of public and contractor customers, a public customer takes on average 9 minutes to unload, and contractors take on average 8 minutes to unload. Public and contractor customers are not differentiated at the scales; therefore, public customers and contractors are grouped together in this assessment. The average unloading time for public/contractors is 8.2 minutes with an average weight of 0.91 ton. Given the size of the public tipping deck, up to 10 vehicles can be accommodated at one time with up to a total of 73 customers per hour.

Table 9 summarizes the average payloads and tons per hour that can be serviced for commercial and residential haulers (self-haul).

Table 9 – Average Serviceable Tons Per Hour for Each Customer Type

Customer Type	Average Payload (tons)	Service Level (Trucks/Hour)	Average Serviceable Tons/hr
Route Truck	8.5	63	536
Transfer Truck	25.7	10	257
Sludge (Biosolids)	28.9	NA(1)	NA(1)
Residential (Self-Haul)	0.91	73	66.4

Table Notes:

1. Not Applicable (NA) – Sludge haul trucks are included with the service levels of Route and Transfer Trucks with an average 1 to 2 trucks per day.

4.3.9 Operational Improvements to Consider

Based on the observations and generalities of this study, the following were noted as possible improvements to consider at the ACLF:

- Require a spotter at all times at the tipping area, with two spotters during peak public usage times, especially where the public is unloading. Having a full-time spotter does not only improve the safety of the working face, but it can decrease unloading and waiting times. Spotters can also be used to hold traffic back from areas where the dozer needs to clear waste from the unloading areas. This allows the dozer to operate at a safe distance from customers and vehicles. Cost savings can be realized here by decreasing wait times and increasing throughput.
- With the amount of waste being disposed of at ACLF, pushing waste with a dozer (rather than a compactor) will reduce the amount of wear on the compactor (especially the cleats), reduce fuel consumption, reduce soil usage from the compactor maneuvering outside the working face, help to keep the compactor working on flatter areas as intended (the compactor was observed operating on slopes upwards of approximately 4H:1V) to increase compaction effort, and keep the compactor further away from customers unloading.
- Increase the size of the working face for the public unloading area. Having a working face sized appropriately for the amount of traffic will help increase the unloading area for customers, increase the distance between customers and equipment, decrease waiting times, and allow the dozer pushing waste from the unloading area to remain within the active fill. Keeping the dozer within the active fill area will also reduce the amount of time and soil spent on both road and deck repairs while also enhancing safety.
- Remove intermediate soil cover prior to placing new waste. Although it is difficult to cleanly remove soil cover over waste, removed intermediate cover can be reused as the base layer of daily or intermediate cover soil. This reduces air space lost due to soil, reduces soil usage, and most importantly, removes lower permeable layers that can lead to leachate seeps (refer to Exhibit 6).

Exhibit 6 – Commercial Route Truck Unloading on Top of Soil Covered Area

- Add GPS devices to the "push and pack" equipment (dozers and compactors). Create and utilize engineered fill plans for each stage of fill and import the fill plan surfaces into GPS for the equipment to utilize. This industry best practice will help ensure outside slopes are built properly while also increasing compaction and reducing airspace utilization rates.
- Keep equipment off areas covered with intermediate cover, decks, and haul roads (refer to **Exhibit 7**). Horizontal surfaces (decks) are designed to be sloped to shed stormwater away from the slopes. Large depressions and torn up areas from equipment tracks and ruts trap this stormwater. This increases infiltration and leachate production and softens these areas making them more susceptible to damage. Additionally, smooth and compacted decks and haul roads provide more safe and efficient unloading areas for customers.

Exhibit 7 – Compactor running on deck to push waste

- If keeping equipment off the commercial deck is not enough to maintain a smooth and compact deck, add road fabric and rock. Another option is to accept separated asphalt and concrete and crush this material to use for road/deck base. Pulling vehicles into and out of unloading positions increases unloading times, reduces the time the dozer can be used to push garbage, increases wear on the dozer, and exacerbates ruts in the soft areas of the deck. A rock covered deck can alleviate this issue. The rock can also be salvaged and reused as base layers for new decks as needed.
- Decrease the slope of working face. Running compacting operations on slopes up to 3H:1V causes over-working of compactors, increases wear of the machine and cleats, and increases fuel consumption.
- Track effective waste density semi-annually. Airspace is the most valued commodity for a landfill. Knowing in-place waste densities provides an opportunity to better track the effectiveness of compaction efforts and the life cycle of the landfill. To accurately track density, all incoming waste should continue to be weighed, and customers charged according to weight. This will have the added benefit/cost savings as a result of simpler scalehouse transactions and accounting.

5.0 Waste Forecasts

Rates (tipping fees) for the ACLF are based on a mixture of weight (tons) and volume (cubic yards); however, the projected amount of waste over the next 10 years is based on tons for this study. Incoming customer information from scalehouse transaction records between 2014 to June 2019 was aggregated and analyzed to establish trends for the tonnage forecast.

There are three primary waste types accepted at the ACLF: (1) wastes that are landfilled; (2) wood and organic waste that is processed on-site and diverted for other uses such as cattle bedding and composting; and (3) and recyclable materials (such as metals and tires) that are aggregated and diverted for additional processing or to end markets. Revenue generating wastes includes MSW and wood waste.

5.1 Revenue Generating Landfill Waste

As presented in **Table 10**, the ACLF received a total of 450,289 tons of waste in FY2018. Of the 450,289 tons, 424,895 were revenue tons and 25,394 were non-revenue tons (from street sweepings, SILDS, and animal mortalities). **Table 10** provides an estimate of the projected FY2019 revenue tons in comparison to the FY2018 revenue tons for planning purposes. The FY2019 tons set the basis for projections in the cost of service model (refer to **Section 6**).

Table 10 – Incoming Revenue Waste Tons (FY2018 & FY2019)

Customer Type	FY2018 (tons)	FY2019 (est.) (tons)(1)	FY2019 Stream%	▲ from 2018
Route Trucks(2)	121,575	107,429	25%	(15,126)
Transfer Trucks(2)	201,081	209,412	50%	9,311
Residential	93,689	96,664	23%	2,975
Sludge (Biosolids)	8,550	9,270	2%	720
Total	**424,895**	**422,775**	**100%**	**(2,120)**

Table Notes:

1. The amounts of non-revenue tons (street sweepings, SILDS, and animal mortalities) in FY2018 and projected for FY2019 are 25,395 tons and 24,399 tons, respectively. These are not shown.
2. The amounts in FY2018 for Route Trucks and Transfer Trucks reflect adjustments that were made during the FY2018 coding of these trucks starting in January 2018. Transfer Trucks include both Boise and Meridian transfer stations.

The trend from FY2018 shows that route truck tons are decreasing while transfer tons are increasing, which was confirmed during the August 30th SWAC Meeting. Republic Services is consolidating more loads at the Meridian Transfer Station rather than trucking to the landfill in route trucks. Overall, the volume of waste tons appears to be slightly decreasing when compared to the prior year; however, the FY2019 forecast is based on actual data through May, when the information was provided for the project, with estimates for June-September 2019. The amount of waste that is projected to be generated in Ada County is derived from a combination of escalators as presented in **Table 13** in the next section. **Table 11** presents the estimated amounts of waste for FY2020-FY2029.

Table 11 – Project Amounts of Incoming Landfill Waste Revenue Tons (FY2020-FY2029)

Customer Type/Waste Source	Escalator(1)	FY2020	FY2021	FY2022	FY2023	FY2024	FY2025	FY2026	FY2027	FY2028	FY2029
Residential	Population	98,804	100,992	103,228	105,513	107,849	110,236	112,677	115,171	117,721	120,327
Route Trucks	Household	110,219	113,081	116,018	119,031	122,122	125,294	128,548	131,886	135,311	138,825
Transfer Trucks	Population	214,048	218,787	223,631	228,582	233,642	238,815	244,102	249,506	255,030	260,676
Sludge	Household	9,475	9,685	9,899	10,118	10,342	10,571	10,805	11,045	11,289	11,539
Total(2)		**432,546**	**442,545**	**452,775**	**463,244**	**473,955**	**484,916**	**496,132**	**507,608**	**519,351**	**531,367**

Table Notes:

1. The Population Escalator is 2.21% and the Household Escalator is 2.60%. Refer to Section 6.
2. This does not include the tons of non-revenue wastes (street sweepings, SILDS, and animal mortalities).

5.2 Wood Waste

Incoming wood waste and organic wastes (such as leaves) are ground up onsite and transported to end-users; therefore, these materials are recycled/repurposed and do not take up valuable airspace in the landfill. Incoming wood and organic waste are expected to increase by the same proportion as the landfill waste. Table 12 presents the estimated amounts of wood waste for FY2020-FY2029.

Table 12 – Project Amounts of Incoming Wood/Organic Waste Tons (FY2020-FY2029)

Customer Type/Waste Source	Escalator(1)	FY2020	FY2021	FY2022	FY2023	FY2024	FY2025	FY2026	FY2027	FY2028	FY2029
Wood Wastes	Population	14,961	15,292	15,631	15,977	16,330	16,692	17,061	17,439	17,825	18,220
Leaves/Organics	Population	4,529	4,629	4,732	4,836	4,943	5,053	5,165	5,279	5,396	5,515
Total		**19,490**	**19,921**	**20,362**	**20,813**	**21,274**	**21,745**	**22,226**	**22,718**	**23,221**	**23,735**

Table Notes:

1. The Population Escalator is 2.21%. Refer to Section 6.

6.0 Landfill Operating Costs

The operating costs for the ACLF are broken out as operational costs, capital project costs, and financial assurance costs. The Ada County Treasurer manages an Enterprise Fund for the Solid Waste Department. The fund is broken out into three accounts. Account 116 is the "Solid Waste Management" account and accrues funds for ongoing operations and capital expenditures (including post-closure care of the HHC). Account 117 is the "Landfill North Ravine Cell" account and is set up to accrue funds for engineering and construction of future landfill phases in the NRC. Account 126 is the "Landfill Closure" account and accrues funds for closure and post-closure care (financial assurance) for the north ravine cells. At the time of this study, the County had a balance of over $22 million in Account 116, $488,000 in Account 117, and approximately $2.3 million in Account 126.

Incoming waste tons disposed of in the landfill govern the daily operations effort as well as the costs. Landfills establish and maintain operations within an expected range of incoming waste amounts. While there are daily fluctuations in waste and customer counts, the number of onsite personnel and equipment are scaled to provide a level of service at the high-end of the expected ranges. Therefore, most of the operational expenses at the landfill behave as "fixed" costs.

The starting point for the disposal fee calculation is the FY2020 budget. Line item costs provided in the County's FY2020 budget were reviewed and escalated by the factors /Consumer Price Index (CPI) in Table 13 from FY2021-FY2029. The table also includes the population and household escalators that were used for forecasting waste tonnages and estimating the life expectancy that remains in the NRC for waste disposal.

Table 13 – Operating Cost and Incoming Waste Escalators

Escalator	Amount	Source
CPI	2.20%	BLS.gov, All Urban Consumer from 2010 to 2018, Series ID CUUR0400SA0
Non-CPI	1.50%	Consultant's Recommendation
Labor Escalator	2.04%	BLS.gov, Earnings Data from f2010 to 2018, Series ID LEU0254681300
Health Insurance	5.00%	Consultant's Recommendation
Fuel Escalator	6.05%	BLS.gov, PPI for No. 2 Diesel from 2005 to 2018, Series ID WPU057303
Inter Fund Escalator	4.00%	Consultant's Recommendation
Population Escalator	2.21%	Community Planning Association of Southwest Idaho
Household Escalator	2.60%	Community Planning Association of Southwest Idaho

6.1 Operating Costs

Projected expenses over the planning period were classified as either operational, capital, or closure costs. Operational expenses are the daily cost of operating the landfill and are comprised of County personnel, equipment maintenance, contracted services, recycling programs, post-closure costs for the Hidden Hollow Cell, and administration services.

Table 14 on the following page summarizes the projected operational costs from FY2020–FY2029.

Table 14 – Projected Ada County Landfill Operating Costs (FY2020-FY2029)

Operational Cost Item	FY2020	FY2021	FY2022	FY2023	FY2024	FY2025	FY2026	FY2027	FY2028	FY2029
County Operations	$2,125,334	$2,178,105	$2,232,484	$2,288,532	$2,346,309	$2,405,887	$2,467,335	$2,530,723	$2,596,127	$2,663,629
Republic Services	$4,041,720	$4,130,724	$4,221,688	$4,314,656	$4,409,671	$4,506,778	$4,606,024	$4,707,455	$4,811,120	$4,917,068
Admin Costs	$2,081,855	$1,103,857	$1,126,338	$1,149,307	$1,172,780	$1,196,764	$1,221,273	$1,246,323	$1,271,922	$1,298,087
Recycling Costs	$983,470	$982,526	$992,392	$1,000,681	$1,023,689	$1,079,157	$1,135,171	$1,191,767	$1,248,989	$1,325,099
HHW Costs	$726,100	$742,090	$758,432	$775,133	$792,203	$809,648	$827,478	$845,700	$864,323	$883,356
HHC Post-Closure	$974,503	$1,487,963	$1,517,276	$1,547,183	$1,577,695	$1,608,826	$1,640,589	$1,672,995	$1,706,060	$1,739,796
Total Ops Costs	**$10,932,982**	**$10,625,265**	**$10,848,610**	**$11,075,492**	**$11,322,347**	**$11,607,060**	**$11,897,870**	**$12,194,963**	**$12,498,541**	**$12,827,035**

6.2 Capital Costs

Capital costs include replacement of equipment and infrastructure as well as landfill cell construction, following the County's 2019 Strategic Management Plan (Ada County, January 2019). Cell construction includes engineering, landfill gas systems, earthwork, capping, and drainage infrastructure. As cells are filled with waste, the County needs to accumulate funds to close out (cap) the existing cells and to construct the next cell. Accruing for future construction is fiscally responsible and standard within the waste industry.

Table 15 – Capital Cost Outlay Schedule (FY2020-FY2029)

Capital Project	2018 Cost Estimate	Year of Expenditure	Year of Expenditure Cost Estimate
Tipping Floor – NRC	$256,000	2020	$257,000
Central Office Building	$1,000,000	2020	$1,045,000
Central Recycling Center	$810,000	2021	$865,000
Expanded HHW Facility	$750,000	2021	$801,000
LFG Generator Set	$3,000,000	2022	$3,273,000
LFG Flare	$250,000	2022	$273,000
Scale Replacement	$480,000	2023	$535,000
Road Replacement (5 miles)	$308,000	2029	$391,000
NRC Phase 4 Engineering	$1,800,000	2023	$2,007,000
NRC Phase 4 Build	$8,500,000	2024	$9,667,000
NRC Phase 5 Engineering	$1,800,000	2028	$2,238,000
NRC Phase 5 Build	$8,500,000	2029	$10,801,000

Capital costs also include purchasing and replacing equipment used at the ACLF. An asset replacement schedule is included for equipment that is used by County staff. This includes heavy equipment such as loaders and backhoes, forklifts, road grader, drum roller, and other large equipment, fleet cars, the scale system, and litter screens.

6.3 Closure and Post-Closure Costs/Financial Assurance

When the NRC reaches capacity, it will need to be closed and monitored as part of post-closure care. Ada County is required to comply with §39-7417, the Idaho Solid Waste Facilities Act (and in accordance with the landfill's closure and post-closure plans and Idaho Department of Environmental Quality's approval) to collect and encumber funds in a trust account when the landfill is in operation to pay for its closure and long-term maintenance. These are referred to as financial assurance costs for closure and post-closure care.

The HHC is closed and under post-closure care. The expenses for post-closure care are funded by the operations account (Account 116), which are annually approximately $800,000.

The NRC has a reported airspace capacity of 70 million cubic yards. With the ACLF using a combination of volume and weight-based tracking systems over the years and both the HHC and the NRC accepting waste, waste tracking rates have been conducted using annual fly-over surveys each September. The last report was prepared in FY2018 and calculated the

total volume utilized at that time in the NRC to be 4,436,604 cy, with a remaining airspace volume of 65,563,396 cy. Using the estimated 2019 effective waste density of approximately 1,400 lbs/cy, the NRC is projected to close in 54 years or in FY2073.

According to the *Ada County Landfill North Ravine Cell and Hidden Hollow Cell Operations Plan, Closure Plan and Post-Closure Plan* (Jacobs, September 2018), the engineer's estimated cost for closure and post-closure of the NRC was approximately $27,325,935 and $14,213,526, respectively. These cost estimates were used in the cost schedule to set aside funds in Account 126 when the landfill closes in FY2073.

Accounting for inflation at 2.2% over the next 54 years, the estimated cost for closure/post-closure will increase to approximately $138 million. Because inflation will impact closure and post-closure costs, the County should account for inflation in the calculation of the amount required to be collected from each ton of incoming waste to ensure that the balance in the closure/post-closure account is adequate at the time of need.

While costs are expected to increase over time, the impact of inflation can be mitigated by interest earned on safely invested closure/post-closure funds. The assumed annual return on invested funds is 1.5%; therefore, the net impact of inflation on closure/post-closure costs is 0.7% (2.2% - 1.5%). Earnings on invested funds will reduce the amount the County has to collect from $138 million to $59 million.

7.0 Cost of Service Model

A cost of service model was developed for Ada County using Microsoft Excel as the platform. The model is a cost accounting tool that tracks expenses (operational costs, capital costs, and financial assurance costs) and revenues that are generated from the tipping fee. Aside from fees charged for disposal, there are three other sources of revenue generated at the ACLF. These include interest earned on fund balances, recyclable material sales, and landfill gas royalties.

Interest earned on the average balance in the primary landfill fund (Fund 116) is retained by the fund to maintain the County's minimum requirement of 3.5 months of expenses plus 15% of operational revenue. Revenues generated from the sale of metal and other recyclable materials are minimal and unpredictable; therefore, these commodities were not included in the revenue calculation for the model. Recycling revenues are retained within Fund 116. Royalties from the conversion of landfill gas to electricity are typically $250,000 each year. The current agreement is through 2026 with some measure of revenue anticipated each year. However, given that these royalties are variable they are assumed to be $0 in the rate model beyond FY2020 (beyond the current budget year). The model is set-up with a "what-if" analysis to adjust the rate depending on the amount of landfill gas royalties that are realized each year.

The base cost of the model uses the County's FY2020 budgets for operational costs, account balances, and scale transactions. Separate tabs in the model are set up to track these expenses. The costs are arranged on a cost per ton basis, with the tonnage growing at the rate of the household and population escalators as previously described. The closure/post-closure cost schedule is presented in **Exhibit 8** (next page), which shows an estimated cost per ton of $1.30 to be contributed to Account 126 to fully fund these activities when it is time to close the NRC.

With budget information for FY2020 provided by the County and historical scale transaction data, the cost model established a minimum universal tip fee rate of **$29.00/ton** in FY2020 for all waste types and sources. This fee is comprised of $24.70/ton for operations, $3.00/ton for capital reserves, and $1.30/ton for closure and post-closure (financial assurance). This equates to a total revenue needed for the landfill to cover costs of approximately $12,544,000 in FY2020.

Notes:
A: Source: Jacobs Engineering (Craig Caldwell, 8/21/19)
B: Incoming tons in FY 2018 x 2,000 lbs/ton and divided by MSW effective density (Item D)
C: North Ravine CY Capacity less the Expended Capacity
D: Estimated effective density of waste as estimated by the total tons disposed divided by the total airspace utilized in 2018.
E: Remaining Tonnage as of FY2019 (C x D) / 2,000 pounds per ton
F: Ratio of waste tons disposed of that are charged a fee
G: Assumed CPI
H: Assumed interest earned on invested closure funds
I: Net CPI is the G + H
J: Estimated closure cost for North Ravine - Jacobs - Sept 2018
K: Estimated closure cost escalated for inflation
L: Calculated closure year for North Ravine
M: Calculated closure cost in the year following the end of the North Ravine Cell (J * (1+I) ^ (L - 2018)
N: Current fund balance in Account 126 – "Landfill Closure"
O: Future Value Closure Cost less Current Closure Balance (O - N)
P: Balance to Accrue divided by Remaining Tonnage Capacity is the cost per ton that Ada County needs to collect from every revenue ton and encumber monthly in their closure trust account (O / E)

Description	Amount	Note
North Ravine Cell Acres	260	
Cubic Yard Capacity	70,000,000	
Expended CY to 2018	(4,436,604)	A
Expended in 2019 (est.)	(640,249)	B
Remaining CY Capacity	64,923,147	C
Pounds of MSW per CY	1,400	D
Remaining Tonnage Capacity	45,446,203	E
Revenue Tons	94.3%	F
Assumed Annual CPI	2.20%	G
Return on Invested Funds	-1.50%	H
Net Impact on Closure Costs	0.70%	I
North Ravine		
Closure	$ 27,325,935	J
Post Closure	$ 14,213,526	J
Total Closure Cost (Sept 2018)	$ 41,539,461	J
Total Cost at Closure	$ 137,645,003	K
Closure Year	2073	L
Future Value Closure Cost	$ 61,465,047	M
Current Closure Balance	$ (2,368,210)	N
Balance to Accrue	$ 59,096,837	O
North Ravine Cost per Ton	$ 1.30	P

Exhibit 8 – Closure Cost Model Calculation Per Ton

Table 16 (next page) is the combination of the projected operational costs from **Table 14**, which are divided by the expected inbound waste tons from **Table 11** to calculate the operational cost per ton.

In FY2021, the universal tip fee is projected to increase to a minimum of **$29.31/ton**, comprised of $4.00/ton for capital reserves (increase of $1.00/ton over FY2020), and keeping the financial assurance at $1.30/ton. The financial assurance cost per ton is subject to change based on the re-calculated life cycle each year remaining in the NRC.

Table 17 (next page) combines the three rate components over the 10-year rate study planning period, which include operational costs from **Table 16**, capital cost accrual from **Table 15**, and the closure costs from **Exhibit 8**.

Table 16 – Landfill Operational Revenues and Operational Cost Per Ton

Incoming Tons by Source	FY2020	FY2021	FY2022	FY2023	FY2024	FY2025	FY2026	FY2027	FY2028	FY2029
Residential	98,804	100,992	103,228	105,513	107,849	110,236	112,677	115,171	117,721	120,327
Route	110,219	113,081	116,018	119,031	122,122	125,294	128,548	131,886	135,311	138,825
Transfer	214,048	218,787	223,631	228,582	233,642	238,815	244,102	249,506	255,030	260,676
Sludge	9,475	9,685	9,899	10,118	10,342	10,571	10,805	11,045	11,289	11,539
Total Revenue Tons	**432,546**	**442,545**	**452,775**	**463,244**	**473,955**	**484,916**	**496,132**	**507,608**	**519,351**	**531,367**
County Ops	$2,125,334	$2,178,105	$2,232,484	$2,288,532	$2,346,309	$2,405,887	$2,467,335	$2,530,723	$2,596,127	$2,663,629
Republic Contract	$4,041,720	$4,130,724	$4,221,688	$4,314,656	$4,409,671	$4,506,778	$4,606,024	$4,707,455	$4,811,120	$4,917,068
Admin Costs	$2,081,855	$1,103,857	$1,126,338	$1,149,307	$1,172,780	$1,196,764	$1,221,273	$1,246,323	$1,271,922	$1,298,087
Recycling Costs	$983,470	$982,526	$992,392	$1,000,681	$1,023,689	$1,079,157	$1,135,171	$1,191,767	$1,248,989	$1,325,099
HHW Costs	$726,100	$742,090	$758,432	$775,133	$792,203	$809,648	$827,478	$845,700	$864,323	$883,356
HHC Costs	$974,503	$1,487,963	$1,517,276	$1,547,183	$1,577,695	$1,608,826	$1,640,589	$1,672,995	$1,706,060	$1,739,796
Total Ops Costs	**$10,932,982**	**$10,625,265**	**$10,848,610**	**$11,075,492**	**$11,322,347**	**$11,607,060**	**$11,897,870**	**$12,194,963**	**$12,498,541**	**$12,827,035**
Less LFG Royalties[1]	-$250,000	$0	$0	$0	$0	$0	$0	$0	$0	$0
Est. Total Ops Cost	**$10,682,982**	**$10,625,265**	**$10,848,610**	**$11,075,492**	**$11,332,348**	**$11,607,060**	**$11,897,870**	**$12,194,963**	**$12,498,541**	**$12,827,035**

Table Notes:

1. LFG Royalties from the conversion of landfill gas to electricity are typically $250,000 each year. The current agreement is through 2026 with some measure of revenue anticipated each year. However, given that these royalties are variable they are assumed to be $0 in the rate model beyond FY2020 (beyond the current budget year).

Table 17 – Landfill Disposal Cost Calculation

Cost Per Ton	FY2020	FY2021	FY2022	FY2023	FY2024	FY2025	FY2026	FY2027	FY2028	FY2029
Operational	$24.70	$24.01	$23.96	$23.91	$23.89	$23.94	$23.98	$24.02	$24.07	$24.14
Capital Reserve	$3.00	$4.00	$4.00	$4.00	$4.00	$5.50	$5.50	$5.50	$5.50	$5.50
Financial Assurance	$1.30	$1.30	$1.30	$1.30	$1.30	$1.30	$1.30	$1.30	$1.30	$1.30
Min Disposal Fee	**$29.00**	**$29.31**	**$29.26**	**$29.21**	**$29.19**	**$30.74**	**$30.78**	**$30.82**	**$30.87**	**$30.94**

7.1 Estimated Cost of Service by Customer Type

Two main types of customers are serviced at the ACLF – commercial customers (route trucks, transfer trucks, and sludge hauling trucks) and residential customers (public self-haulers and contractors). Contractors are considered commercial customers by scale transaction and are currently charged by volume. However, during the operations assessment, it was observed that these customer types unloaded (typically by-hand) at the public working face. For this reason, contractors are grouped together with the public for this cost of service analysis.

7.1.1 Limitations

The cost per ton estimates that follow in this section are based only on snapshots in time from the very limited field assessments that were conducted as part of this study. Landfill operations are dynamic and ever changing, and as such, the cost distribution for servicing the two different customer types will also change over the course of time. One example of this is the working faces for the landfill operations will move and change. At the time of the study, two separate working faces were operated. One in Phase 3 of the NRC for the commercial customers and one in the Phase 1/2 are for residential customers, splitting the operational areas. Therefore, for this analysis, the cost breakdown between customer types is exaggerated by the use of two separate working faces in two separate areas of the landfill. Additionally, large operational influences were not accounted for in this snapshot such as daily and seasonal incoming waste peaks and inclement weather impacts.

It is also important to note that the landfill is owned and operated by Ada County as a public service for its County residents. The mission of the landfill is to provide affordable and environmentally responsible management of solid waste for the citizens of Ada County. As part of providing this service, residents should not be discouraged from direct hauling their waste to the landfill through higher tipping fees than what would be charged from curbside collection. A single, universal tip fee is the simplest approach to set a rate schedule. This is common practice for most landfill programs, which are not charged according to the actual operating costs to service different waste types/customer. The cost to provide programs such as recycling, diversion, education and outreach, and HHW management also need to be factored into the rate setting structure and are typically subsidized by the tipping fee.

7.1.2 Observed Operations

At the time of the operations assessment study, two working faces were being utilized at the NRC. At that time, during the workweek (M-F), the “push and pack” contractor, Republic Services, was directing commercial trucks to unload in Phase 3 of the NRC while residential customers were unloading in the Phase 1/2 area. On Saturdays, only the Phase 1/2 area was open for residential customers. As fill progresses and the Phase 1/2 area fills up, both commercial and public customers will be eventually unloading in the Phase 3 area and the observed breakdown of effort (equipment and personnel) will change accordingly.

FY2020 waste contributions from customers are projected to be 107,429 tons from route trucks, 209,412 tons from transfer trucks, and 96,689 tons from residential customers (refer to Table 11 for estimated FY2020 figures). For this exercise, sludge delivery trucks (9,475 tons) were retained at the minimum estimated (universal) tip fee of $29/ton because of the extra handling that occurs with this material per County staff. The total operational costs estimated for FY2020 is $10,932,982 (or an average daily cost of

$35,846 assuming an average 305 days of operation) and a total revenue incoming waste forecast amount of 432,546 tons. This equates to $24.70/ton to operate the landfill (accounting for landfill gas royalties of $250,000 in FY2020 only per the County's FY2020 budget). Note that these annual royalties are variable and are reduced to $0 beyond FY2020 in the cost model as a conservative measure. This $24.70/ton does not include the costs for capital reserves or financial assurance (closure and post-closure costs), assuming that each ton contributes the same amount to these accounts regardless of the source. Adding in these costs, the tip fee increases to the $29/ton amount.

Based on the observational assessment, the "typical" equipment and staff that are used to service the commercial working face and residential (self-haul) working face during the workweek and residential face only on a Saturday are shown in **Table 18**.

Table 18 – Equipment and Staff Counts for Commercial & Residential Working Faces

Equipment/Staff	Commercial Face Weekday	Residential (Self-Haul) Face Weekday	Residential Face Saturday
Dozer	1	0.5	1
Compactor	1	0.25	0.5
Excavator	0.25	0.25	0.5
Dump Truck	0.25	0.25	0.5
Roller	0.5	0	0
Water Truck	0.25	0.25	0.25
Total Equipment	**3.25**	**1.50**	**2.75**
Operators	2.75	1.75	2.5
Spotters	1	0.5	1.5
Total Staff	**3.75**	**2.25**	**4.00**

In order to estimate the relative cost of servicing the different waste sources/customer types, the average amount of incoming waste tons per day needed to be estimated. **Table 19** provides this information for FY2020 using the last full year of scalehouse data in FY2018 to calculate the average payloads.

Table 19 – Source/Customer Types Tons & Payload Estimates for FY2020

Source/Customer Type	Estimated Waste Amount (Tons)	Average Payload (tons)(1)	Average Vehicles/Week	Average Vehicles/Day
Route Trucks	110,219	8.5	249	50
Transfer Trucks	214,048	25.7	160	32
Total Commercial(4)	**324,267**	**15.2(2)**	**409**	**82**
Residential (Self-Haul)	98,804	0.91	2,088	348(3)
Grand Total			**2,504**	**431**

Table Notes:

1. Average Payload is based on FY2018 scale transaction reports.
2. The average payload for total commercial trucks is a weighted average of each type of commercial truck payload times the total tonnage amount divided by the total vehicle count.
3. The average weekend (Saturday) customer count for residential customers is 969 vehicles.
4. Does not include sludge as it will be charged at the minimum rate of $29/ton for extra handling as service costs per County staff, including capital reserves and financial assurance.

7.1.3 Cost of Service for Commercial Customers

Applying relative costs to each type of equipment and staff (**Table 18**), the estimated percentage of cost associated with the commercial working face during the weekdays equates to 67% while the residential working face cost split is 33%. **Note that this is based on limited information as discussed above in the Limitations section.** On an average basis, the cost to service commercial customers is $19.27/ton (67% x $35,856 per day / 82 vehicles per day / 15.2 average tons per vehicle). This does not include the cost per ton for capital reserves or financial assurance and is simply the cost of operations. Adding in the estimated cost for FY2020 for capital reserves ($3.00/ton) and financial assurance ($1.30/ton), the total tip fee is $23.57/ton ($24/ton rounded to the nearest dollar) plus $29/ton for sludge equates to a total revenue of approximately $8,057,000 that is needed from commercial customers to cover the service cost.

7.1.4 Cost of Service for Residential Customers

Similarly, the cost to service residential (self-haul) customers on the weekdays is approximately $37.36/ton (33% x $35,856 per day / 348 vehicles per day/0.91 tons per vehicle). The cost to service residential customers on Saturdays is approximately $56.60/ton ($35,856 per day / 969 vehicles per day / 0.91 ton per vehicle). The revenue from residential customers, however, needs to be no less than the total revenue ($12,544,000) minus revenue from commercial ($8,057,000) from commercial, or $4,487,000. The tipping fee would not change for self-haulers whether they are hauling on weekdays or on Saturdays, and so the blended rate for residential would be $45.41/ton ($4,487,000 / 98,804 tons), or $46/ton (rounded to the nearest dollar) – see **Limitations** section above.

8.0 Recommendations

Based on this study and the development of the cost of service model, the following recommendations are provided for consideration. These recommendations are based on information and data that were available at the time of the study and include some generalities and opinions from staff input and the operational assessments that were conducted as part of this study. As such, additional studies and assessments may be warranted to further evaluate the impact of these recommendations.

8.1 General

Airspace is the single most important commodity that the ACLF has to offer the community of Ada County. The more waste that is diverted away from the landfill the longer the landfill will last. Community reduction programs such as waste source reduction, diversion of re-useable goods, recycling, wood waste diversion, and organics diversion will help to conserve the finite airspace volume that remains in the NRC. The ACLF might consider implementing a waste diversion program for C&D waste by opening a separate landfill cell for non-MSW waste that is significantly less expensive to build and operate than an MSW landfill. The County also may consider collecting concrete and asphalt separately and crushing this material to use for road base and to reinforce and stabilize their tipping decks.

Continuing to work closely with the County's waste partners with community outreach and waste diversion programs also is extremely important. Encouraging cities to implement organic waste diversion programs like the City of Boise will only help to divert these materials from the landfill and conserve airspace. Waste characterization studies are also a valuable to evaluate the waste profile. The County will be embarking on a waste study over the next year that will be shared with their waste partners to show how programs are working and additional ways to increase recycling and diversion.

8.2 Flow Control

Currently, all waste that is delivered to the Boise Transfer Station, which is owned and operated by Republic Services, is consolidated at the station in top-load trailers and transported to either Ada County Landfill or Idaho Waste Systems (IWS), a private landfill in Elmore County. Because of capacity limitations, the private collections and hauling contractor for the City of Kuna, J&M Sanitation, is not allowed to use the Boise Transfer Station, and as a result, directly hauls waste to IWS to provide cost-effective service for the community of Kuna. The new unincorporated collections and hauling contractor, Hardin Sanitation, will commence services in FY2020. Hardin Sanitation has been informed by Republic Services that the Boise Transfer Station does not have capacity to take waste from unincorporated Ada County. As such, they will be forced to direct haul to the landfill in route trucks.

In order to reduce trips to the landfill and provide better flow control on the solid wastestream, it is recommended that the County evaluate the possibility of building a

transfer station in the south/southwest portion of the County. A partnership with J&M Sanitation and Hardin Disposal may aid with capital investment costs and their respective service costs while flowing waste to the Ada County Landfill.

8.3 Administrative

A Landfill Capital Project Account (LCPA) is a method of planning, budgeting, and funding for landfill infrastructure that provides a systematic approach to managing operations. Prudent financial planning requires organizations to assure funds are readily available for replacement of structures, whether the expenditure is planned or unplanned. By establishing the LCPA where resources can be budgeted and encumbered regularly, the County can greatly reduce the risk and rate impacts associated with landfill capital projects. Payment of extraordinary repairs, planned infrastructure, and capital assets for the landfill would be made from this account. The current cell construction fund, Fund 117, should be renamed and designated as the LCPA starting in FY2020.

The current balance in Fund 116 is approximately $22.5 million. The minimum fund requirement by County policy for an enterprise fund is 3.5 months of expenses plus 15% of operational revenue. For FY 2020, the approximate balance requirement in Fund 116 is $5.2 million ($10,932,982 x (3.5/12)) + ($13,400,000 x 15%)). Therefore, $17 million should be transferred from Fund 116 to Fund 117.

The capital cost accrual will vary from $3.00/ton in FY2020 to $5.50/ton in FY2025. At the end of each month or quarter, finance should multiply the total incoming tons by the capital accrual rate and transfer that amount of money to the LCPA. Additionally, as part of the month-end close, a balance sheet reconciliation should be completed to account for the monthly activity in the fund. Over the 10-year planning period, the balance fluctuates from $16.9 million to $5 million. Therefore, a minimum balance should be established for this fund.

Transfer the financial assurance account contributions from Fund 116 to Fund 126 on a regular basis, either monthly or quarterly.

The County currently provides Republic Services allocated disposal costs by collection area from customer route data entered at the scalehouse by the Republic's drivers. While this is a benefit to Republic, it obscures the transaction and tonnage data used by the County for internal and external reporting and planning. Matching and allocation of collected waste tons on-route is an internal function that is best completed by Republic and not the County.

8.4 Rates

The following are recommendations for adjusting the rate structure:

- Use only tonnage base pricing by eliminating all volume-based pricing for landfill disposal.
- Round the disposal fee up to the nearest whole dollar when setting rates.

- Increase the minimum disposal charge to $15, which is approximately 900 pounds on average.
- Incrementally increase the rate for wood waste by $4 per year until the rate matches the amount charged by the County's contractor for processing and managing this waste stream.
- Eliminate the discounted sludge disposal rate and set at the minimum base rate for waste disposal.
- Perform a cost assessment for the "push and pack" operations

Based on the cost of service model, the minimum charge for waste disposal in FY2020 should be a universal rate of **$29/ton for all customers**. A single disposal rate for all customers is the simplest way to set rates and track waste. However, this may not reflect the actual cost of servicing each type of customer or program as discussed in the previous section. How the rate schedule is set and appropriated among the different waste sources/customers will need to be decided by the Board of County Commissioners with input from County managers. Discount rates for materials such as wood waste that are diverted from the landfill might be considered as well to incentivize people to segregate these wastes and conserve airspace while repurposing the materials.