KENAI PENINSULA BOROUGH
Solid Waste Department
47140 East Poppy Lane, Soldotna, Alaska 99669
1-800-478-4441, Ext. 2004 • 907-262-9667 • Fax 907-262-6090
www.borough.kenai.ak.us/SolidWaste

MIKE NAVARRE
BOROUGH MAYOR

MEMORANDUM

TO: Dale Bagley, Assembly President
Kenai Peninsula Borough Assembly Members

THRU: Mike Navarre, Mayor MN

FROM: Jack Maryott, Solid Waste Director JM

DATE: November 12, 2014

SUBJECT: Central Peninsula Landfill, Solid Waste Management White Paper

The Kenai Peninsula Borough's solid waste management has evolved in both scope and purpose over the past 40 years since the Borough assumed solid waste disposal authority in 1974. Originally managed under the Public Works Department purview, solid waste disposal occurred at many locations scattered about the aerial extent of the Borough's geographic boundaries.

With the advent of new federal and state regulations, and subsequent budget funding change to a special revenue, numerous sites were closed and disposal options consolidated to comply with the law and be cost effective. A Solid Waste Department was created to solely manage waste management and address ongoing challenges.

The Central Peninsula Landfill (CPL) is now the regional landfill accepting 98% of the solid waste in the Borough. The history of this site is presented in this white paper to provide a means to educate the population about how we got to where we are today – a state-of-the-art facility planning for innovative technologies that best meet the needs of the taxpayers.

Central Peninsula Landfill (CPL)
Solid Waste Management White Paper
Kenai Peninsula Borough

I. Introduction

CPL is the regional landfill located in Soldotna, Alaska and serves 98% of the Kenai Peninsula Borough's (KPB/Borough) population of ~57,000 with an estimated annual tonnage of 65,000. Daily tonnage ranges from 16 to 400 tons/day. Landfilling in combination with diversion, leachate recirculation and thermal leachate evaporation is the current long term management means planned to serve the community through 2034. Controlled landfilling is the most cost effective and environmentally responsible option to manage solid waste in accordance with KPB code and federal and state requirements. The Borough has a large geographic area to serve and CPL has ideal site characteristics to support an Environmental Protection Agency (EPA) Subtitle D Class 1 landfill permitted by the State of Alaska Department of Environmental Conservation (ADEC).

CPL Aerial View (June 2014)

II. Background

The Kenai Peninsula Borough assumed solid waste disposal authority in 1974 and took over solid waste sites throughout the Borough. Federal regulations promulgated in the late 1980s resulted in a change in approach with many solid waste sites being closed and resources being consolidated for more cost effective solid waste management through a thorough multifaceted evaluation to determine the most economically feasible option for waste management for the entire Borough.

A Waste Disposal Commission, appointed by the Assembly in 1986, evaluated options and recommended continued long term use of the Soldotna Landfill due to its geological and hydrogeological suitability for long term waste burial. Borough staff, in conjunction with two independent professional consulting companies, performed a subsequent evaluation in 1989 of four management options (landfilling, baling, composting and incineration). A combination of landfilling and baling was the decided option.

CPL Bales Stacked in Landfill (2004)

CPL Lined Cell #1 Construction (2005)

The Borough's legislative body, the Borough Assembly, adopted a Resolution in 1990 designating the site (formerly the Soldotna Landfill) as a regional landfill to serve all communities on the road system in the Kenai Peninsula Borough. Shortly thereafter, properties adjacent to the existing landfill were acquired to assure that a development and operational area would be available for at least thirty years. The Borough owns 620 acres of which 320 are designated as waste management and buffer areas. Subsequently the Kenai and Seward Landfills closed. Transfer facilities were upgraded and waste from all areas along the road system was routed to Soldotna. The Central Peninsula Baling Facility/Landfill (CPBF) was constructed at the site in 1992 and a combination of baling waste and recyclables, and landfill burial of commingled baled waste and loose debris commenced.

CPBF Main Baler Building (2002)

With the design and construction of a phased series of lined cells and transition from a balefill to a loose fill operation in 2005, the CPBF was renamed the Central Peninsula Landfill (CPL). CPL began receiving MSW from Homer after closure of their MSW landfill in 2013 and now receives all waste generated on the Kenai Peninsula road system. An estimated 25% of the total waste volume (~16,000 tons) is inert and not biodegradable.

The Borough aggressively diverts 25% of the waste stream from the lined landfill cell with shipment offsite for recycling, management of wood waste on-site by burning, disposal in the unlined inert waste/construction & demolition debris cell, or disposal in the asbestos cell.

CPL Inert Waste/Construction & Demolition Debris Unlined Cell

Long-term planning by the Borough has been successful, resulting in an efficient means to manage solid waste that meets the needs of Peninsula residents in south central Alaska.

III. Need

The Borough needed to identify a long-term cost effective solid waste management option that protects human health and the environment and provides a waste disposal option to all Kenai Peninsula residents. Landfill location, development, operations, monitoring, closure and long-term post-closure care has become more stringent and costly throughout the years as state and federal regulations continue to evolve.

Long-term planning led to the design of a lined landfill with five separate cells with an estimated life of five years for each cell, estimated to last 30 years. Leachate and gas management plans were also included in the design. The Borough taxpayers approved issuance of $12M in solid waste general obligation bonds that funded construction of the first lined landfill cell (Cell 1) and related appurtenances (leachate recirculation system – storage tank, lagoon) in 2005 and construction of Cell 2 in 2013.

Leachate Management

An emerging technology in the late 1990s was leachate recirculation in the waste mass rather than historical "dry tomb" technique that minimized waste contact with leachate. ADEC allowed introduction of liquids into the waste mass under a permitting process separate from, and in addition to, the solid waste disposal permit called a Research, Development and Demonstration Project permit which the Borough obtained in 2008.

Leachate recirculation has many benefits that include:

- accelerated waste biostabilization;
- extension of landfill life through recapture of airspace (waste density and settlement increase);
- potential for increased landfill gas (LFG) recovery due to shorter gas production period
- reduction of leachate treatment costs;
- reduction of post closure care costs; and
- minimizes long term environmental risk.

Original lined landfill design and operation planned to employ leachate recirculation with minimal potential to exceed the on-site holding capacity of 1,000,000 million gallons between a storage tank (250,000 gal.) and a lined lagoon (750,000 gal.). An agreement between the KPB and the City of Kenai was executed to allow off-site disposal of leachate through their waste water treatment system. That agreement was terminated in 2012 when the City determined that it could no longer accept the leachate.

CPL Leachate Storage Tank and Lagoon

The Borough recognized that the leachate management strategy (onsite recirculation and offsite transport for disposal) was not a long-term, sustainable solution as the lined landfill expands. CPL generates a minimum of 3,000,000 gallons in its lined cell and that will only increase as the phased lined landfill expands. The Borough contracted with HDR and Conestoga-Rovers & Associates, Inc. in 2012 to evaluate leachate management options and selected the preferred option of thermal evaporation of leachate. This is one of the only treatment technologies that actually rids the water component from the leachate.

Leachate Evaporator System & Building (2014)

Leachate quality and quantity vary over the landfill service life and post-closure period so the leachate management system was sized to allow for sufficient long-term flexibility to treat varied influent stream and to assure compliance with future regulations and discharge standards. The current system installed is an E-Vap brand Leachate Evaporation System capable of managing 12,000 gallons per day and uses natural gas to fuel the unit. The leachate evaporation system reduces the volume of leachate in a simple submerged combustion process to evaporate 95-97% of the water, leaving waste by-products of a leachate-residual slurry (returned to the landfill), and products of combustion and water vapor discharged directly to the atmosphere. The unit was designed with components to flare LFG if the Borough transitions to an active gas collection and use this combustion device to manage the gas.

Landfill Gas Management

Landfill gas collection systems are categorized into two basic types: (1) active collection systems; and (2) passive collection systems.

The CPL closed cell has a passive collection system that relies on naturally occurring pressure gradients to extract landfill gas, operating as a venting system. The vents are enhanced pathways that reduce the potential for offsite subsurface LFG migration and allow the gas pressure dissipation under the final closure system

CPL Closed Cell Passive Vent (2014)

The CPL lined cell was designed with a passive landfill gas system consisting of horizontal gas collection wells tied into a perimeter gas header with the potential for future connection of horizontal gas collection wells and other proposed collection system components.

Based on the projection of increased gas production resulting from accelerated waste biostabilization, the Borough contracted with HDR Alaska Inc. 2010 to develop a Landfill Gas Management Plan (LFGMP) that included a Baseline Assessment Report, Greenhouse Gas (GHG) Management Plan, and a *conceptual* design of a LFG Collection and Control System (LGCCS). The LFGCCS will collect, transmit and dispose of LFG generated in the lined landfill. The unlined landfill cell that closed in 2007 has a passive LFG venting system that is emitting high quality LFG but was not designed or intended to be retrofitted for use in an active collection system.

Implementation of an active gas management system is triggered by the design capacity of a landfill and CPL is not forecasted to exceed regulatory thresholds until the Cell 5 expansion is permitted, estimated for 2026. When the design capacity exceeds the regulatory threshold the CPL becomes a New Source Performance Standards (NSPS) site, the Borough will be required to apply for a Title V permit with the ADEC Division of Air Quality in compliance with 18 AAC 50.326. The conceptual design of the LFGCCS for the lined landfill is based on a conservative estimate of the maximum LFG generation flow rate expected in the year 2035.

Conversion of LFG into profitable and environmentally friendly beneficial end-use is highly dependent on LFG generation rate and the market availability for recovered energy and environmental impacts. Currently there are generally three end-use options: (1) landfill gas to electricity (LFGTE); (2) direct use; (3) and gas stream modifications.

The next step will be for the Borough to conduct feasibility study and economic analysis to explore the possibility of end-use opportunities for landfill gas at CPL.

IV. Solution & Benefits

Long-term lined cell design and phased construction, inert waste diversion and construction of a leachate evaporation system at CPL increased landfill longevity and cost effectiveness of operations. The Borough received a $3.5M State of Alaska legislative grant in 2013 for design and construction of a thermal leachate

evaporation system that was brought on-line in May 2014 is anticipate for use to manage leachate beyond final closure of the five-cell waste disposal unit.

The Borough was able to extend the life of lined Cell 1 through aggressive inert waste diversion programs that include burial in the unlined inert waste cell or transport offsite for recycling (e.g. scrap metal, white goods, junk vehicles). Projected life of each of the five cells was five years back in the planning stage but an *additional* three years of use was realized for Cell 1. The projected landfill life of the entire five phased lined cell area could be extended through additional years, well beyond the 2034 closure date.

V. Evaluation

The Borough strives to balance the needs and safety of its residents, businesses and environment with sound, cost effective waste management with new technologies and long-term goals being analyzed and implemented on an ongoing basis. The current solid waste management plan provides direction for the next 30 years, and area to expand for many more.

Emerging conversion technologies (CT) that process MSW into fuels, chemical products, energy sources, organic soil conditioners or other useful products are viable options in some environments. Emerging technologies include, but are not limited to, plasma gasification, anaerobic and aerobic digestion, and thermal depolymerization. They offer the potential of managing a portion of the waste stream for recovery of marketable materials or energy but need to be carefully evaluated to determine if it will be able to successfully complement the local integrated solid waste management system. To date, the Borough has determined that none of these CTs demonstrated the ability to consistently operate on a waste feedstock (quality and quantity) consistent with the adopted solid waste management plan, in an environmental sound and fiscally responsible manner.

VI. Cost

The solid waste program is budgeted through a special revenue fund. This fund was established to account for the activities of the Borough's solid waste program and is included in the Borough's General Fund for financial statement purposes to comply with Governmental Accounting Standards Board pronouncements. *On average*, less than 7% of revenues needed to fund the solid waste program are generated by user fees, the balance is paid for by the Borough's General Fund. Annual budget for the FY15 program (July 1, 2014 – June 30, 2015) is ~ $7.8M.

User fees were implemented in 1993 for solid waste disposal of commercial/business waste when delivered in vehicles with carrying capacity of five (5) cubic yards or more. Waste requiring special handling also began to be charged at his time. Fees are charged only for specific waste items, which include, but are not limited to, construction & demolition debris, landclearing/wood waste, junk vehicles, asbestos, tires and special wastes. Solid waste disposal fee revenue in 2013 at CPL was $1,352,765.

Prepared November 2014
Lanie Hughes, Environmental Coordinator
KPB Solid Waste Department