

EXECUTIVE SUMMARY

Burns & McDonnell developed the Central Landfill Development Plan (Plan) for the Matanuska-Susitna Borough (MSB) to provide an evaluation and update of the current landfill development plan and any recommended changes, incorporating conceptual design of leachate and landfill gas (LFG) management systems, and the feasibility of select leachate treatment and LFG reuse options. The Plan provides a summary of the data, assumptions, and approaches that were used in the conceptual layout and cell sequencing for the Central Landfill (CLF).

ES.1 Landfill Development Plan Update

There are three major development phases in the conceptual cell layout for the Plan. Each phase includes multiple individual landfill cells. Phase 1 includes the developed landfill area (Cells 2A, 2B, 3, and 4) and future Cell 5. Phases 2 and 3 are divided into corridors, which may contain two or three landfill cells each, depending on operational preferences as phasing progresses (e.g., cell life). Phase 2 is located south of Phase 1 and includes seven corridors. Phase 3 is located east of Phases 1 and 2 and includes eight corridors. This corridor orientation throughout the Landfill development takes advantage of piggybacking airspace over existing waste.

The base grades of the Landfill were developed so that bottom grades provided a minimum 10-foot separation from the historic high groundwater table, in accordance with Alaska Administrative Code (AAC) regulations, and provide a minimum one-percent slope for leachate collection trenches. Leachate from Phase 1 will drain to a sump located at the southwest corner of Cell 5. Leachate from existing Cells 2B, 3, and 4 will also be rerouted to drain into Cell 5 when constructed. Cell 5 design has been modified from previous plans to maximize the Phase 1 disposal volume.

To maximize disposal volume, the final grading plan for Phases 1 through 3 was developed with a main ridge running generally north-south from the northern boundary of Phase 1 and Phase 3 down to the southern boundary of Phase 2. The elevation of this ridge is 348.5 ft above mean sea level, which is the maximum elevation permitted by the Alaska Department of Environmental Conservation (ADEC) permit, adjusted to North American Vertical Datum (NAVD) 88 datum. Final cover crown grades slope down from either side of these ridges at four percent with side slopes at 3:1. ADEC has requested that a stability analysis be completed with the future closure of each individual cell to confirm that 3:1 final cover slopes are stable.

The sequencing of corridors allows for eliminating the need for rerouting leachate collection as future cells are developed and an optimization of landfill airspace and tie-ins while allowing the Crevasse

Moraine Trail System to remain open for as long as possible. The current trail system should not be impacted for at least the next 40 years.

Based on the base grades and final cover surfaces developed herein, waste disposal projections, and the 2019 top of waste surface provided by MSB:

- Remaining Phase 1 capacity for waste and daily/intermediate cover soil is 2.6 million cubic yards with an estimated life of over 20 years.
- Phase 2 capacity for waste and daily/intermediate cover soil is 23.1 million cubic yards.
- Phase 3 capacity for waste and daily/intermediate cover soil is 24.0 million cubic yards.
- Overall MSW Landfill disposal capacity is approximately 51.5 million cubic yards.
- The estimated remaining life of the Landfill is approximately 130 years.

ES.2 Leachate Management Plan

Phases 1 and 2 are designed with base grades that “stair-step” downward to the south, mirroring the slope of the groundwater table while maintaining a minimum 10-foot separation. Cell 5 and each corridor within Phase 2 will be sloped to direct leachate to the west, with sump discharge into a forcemain which directs leachate to the storage lagoons or future treatment option.

This Plan evaluated three options to treat and dispose of collected leachate. Costs based on a 20-year planning period are provided for each option below:

- Continued hauling to, and disposal at, the Anchorage Water and Wastewater Utility.
 - NPV \$7.3 million; \$0.095 per gallon
- Evaporation using either LFG or natural gas, with residual disposal in the Landfill.
 - NPV \$6.1 million; \$0.080 per gallon
- Membrane filtration with residual disposal in the Landfill.
 - NPV \$9.0 million; \$0.117 per gallon

Note that the cost of evaporation becomes prohibitive if operation is fueled with natural gas (NPV of \$15.6 million, with per gallon cost of \$0.204). Whichever leachate management method MSB selects, leachate recirculation should be incorporated into Landfill operation.

ES.3 Landfill Gas Management Plan

During 2020, gas monitoring results have led to the MSB initiating an active system to control migration at the northern property boundary. Later in 2020, construction will include installation of vertical

extraction wells in Cells 1 and 2A, condensate management systems, and an enclosed blower/flare skid to combust the collected landfill gas (LFG). The gas collection and control system (GCCS) is designed for year-round operation. The Plan provides the phased development of the LFG collection field as landfill cells close. Each closure (next projection is Cells 2B and 3 in 2023) would include installation of additional extraction wells that would direct LFG to the collection system and flare. Construction of Cell 5 will trigger Federal air permitting compliance requirements in accordance with 40 CFR 60, Subpart XXX.

Active collection of the projected gas volumes provides an opportunity to beneficially reuse the energy in the LFG. This Plan evaluated four such opportunities. Costs based on a 20-year planning period are provided for each option below along with the projected simple payback:

- LFG to electrical generation with energy sale to Matanuska Electric Association (MEA).
 - NPV \$5 million; 9.7 years
- Use of waste heat from electrical generation for leachate evaporation.
 - NPV \$2.9 million; 13.3 years
- LFG Pipeline to Mat-Su Regional Medical Center for combined heat and power.
 - NPV \$6.4 million; 10.8 years
- LFG Pipeline to Mat-Su Regional Medical Center for direct heating.
 - NPV \$1.9 million; 11.9 years

Burns & McDonnell recommends that MSB begin discussion with MEA on developing the electric generation concept.

ES.4 C&D Development Plan

The disposal airspace between the 2019 existing C&D base grade and the proposed C&D final intermediate contours is 2.8 cubic yards. The remaining life of the C&D Landfill as developed in this Plan, and as currently operated, is about 42 years or until 2062. If MSB purchases a compactor to improve disposal density, the remaining life of the C&D Landfill as developed in this Plan could increase by almost 40 percent.

ES.5 Asbestos Site Development Plan

The disposal airspace between the existing grade and the proposed asbestos final contours is about 520,000 cubic yards, excluding final cover. Using the life projection assumptions outlined in the report, the remaining life of the Asbestos Cell as developed is approximately 57 years, or until 2077.

ES.6 Financial Assurance Plan

The Matanuska-Susitna Borough has a long-term plan for its Landfill that includes three phases as described herein. Based on current tonnage levels and an estimated two percent tonnage growth, Phase 1 is expected to reach capacity in FY 2043. Therefore, the focus of the financial assurance liability is Phase 1, with total liability at the end of FY 2019 calculated at \$5,073,571 (capacity consumed multiplied by total financial liability). The Borough recognized a financial liability of \$5,463,707 at the end of FY 2018. Therefore, the decrease in liability for FY 2019 is \$390,136.

ES.7 Soil Balance Plan

The volume balance computations for the entire site development (i.e., Municipal Solid Waste Landfill, C&D Landfill, and the Asbestos Cell) take into account quantities of onsite soil requirements for cell construction, daily and intermediate cover, and final cover. The soil balance model results in a net gravel surplus of over 2.4 million cubic yards. Note that if the waste to soil cover ratio is increased to 5:1 for the MSW Landfill, the gravel surplus increases to 4.1 million cubic yards. This volume could be removed for offsite use and sale for revenue.