Supplemental Information for Web Application:

Environmental Criterion

As part of this research, a streamlined life cycle assessment (SLCA) was developed for the three scenarios using a matrix system which was completed by solid waste experts. All three scenarios assume that MSW is collected and managed the same way prior to reaching the end of life waste management facility. The SLCA processes include 5 life cycle stages:

1. Collection of Waste: Collection of MSW from residential locations utilizing standard side and rear collection trucks. Once trucks are full, they transport waste to transfer station within the metropolitan area.
2. Management at Transfer Station: Once at the transfer station, collection trucks dump MSW on the tipping floor at the transfer station. MSW is then transferred into trailers for transport to end of life management facilities. The facility is completely enclosed, and any leachate produced is pumped to a municipal wastewater treatment facility for additional treatment.
3. Transportation to End of Life Management Facility: Upon loading the MSW into trailers, it is transported by truck to the end of life management facility. It is assumed that the end of life management facility is located no more than 30 miles from the transfer station.
4. Management at End of Life Facility: Once the MSW has arrived at the end of life facility it is processed and managed. For Scenario 1, MSW is dumped from trailers into the landfill, where it is compacted and covered per regulations. For Scenario 2, MSW is processed and incinerated to produce steam and electricity. Residual materials are disposed at an onsite permitted landfill. For Scenario 3, MSW is processed, separated and composted. Residual materials are disposed at an onsite permitted landfill
5. Long Term Management at End of Life Facility: For Scenarios 1, 2, and 3, long term management includes the collection of landfill leachate and gas per regulatory requirements. This also includes maintenance of the facility to maintain existing structures such as collection systems and cap/cover. It is assumed that the landfill has a minimum 20-year post closure period.

Environmental Impact Assessment:

The five environmental impact categories evaluated include (1) solid waste managed, (2) energy, (3) air emissions, (4) water emissions, and (5) land impacts. Each impact category relates to the impact, potentially negative or positive, expected to be encountered at each life cycle stage. The impacts are defined as:

1. Solid Waste Managed: the impact relates to the amounts of MSW managed at each life cycle stage. This considers how much waste is disposed of at each life cycle stage. Diverted materials such as recyclable or organic tree waste are not considered in this study are considered separate streams from the MSW.
2. Energy: the impact relates to the amount of energy needed for each life cycle stage, as well as considers any energy production, energy use minimization, or any energy efficiency methods used.
3. Air emissions: the impact relates air emissions for each life cycle stage including effects to air quality based on the emissions produced or avoided.
4. Water emissions: the impact relates water emission for each life cycle stage including effects on water quality (surface and groundwater) based on the emissions produced or avoided.
5. Land Impacts: the impact relates land impacts for each life cycle stage including short term and long term land uses.

Table 1: Option 1 SLCA Average

Life Cycle Stage	Solid Waste Managed	Energy	Air Emissions	Water Emissions	Land Impacts	Sum
Collection of Waste	2	2	2	1	3	10
Management at Transfer Station	3.5	2	1	3	3.5	13
Transportation to End of Life Management Facility	3.5	2	2	2.5	3.5	13.5
End of Life Management	3.5	2	2	2.5	3.5	13.5
Long Term Management at End of Life	3.5	2	3.5	2	2.5	13.5
Sum	16	10	10.5	11	16	63.5

Table 2: Option 2 SLCA Average

Life Cycle Stage	Solid Waste Managed	Energy	Air Emissions	Water Emissions	Land Impacts	Sum
Collection of Waste	2	2	2	1	3	10
Management at Transfer Station	3.5	2	1	3	3.5	13
Transportation to End of Life Management Facility	3.5	2	2	2.5	3.5	13.5
End of Life Management	3.5	3	3	3	3.5	16
Long Term Management at End of Life	3.5	3.5	3	3	3.5	16.5
Sum	16	12.5	11	12.5	17	69

Table 3: Option 3 SLCA Average

Life Cycle Stage	Solid Waste Managed	Energy	Air Emissions	Water Emissions	Land Impacts	Sum
Collection of Waste	2	2	2	1	3	10
Management at Transfer Station	3.5	2	1	3	3.5	13
Transportation to End of Life Management Facility	3.5	2	2	2.5	3.5	13.5
End of Life Management	3	1.5	2.5	3	2.5	12.5
Long Term Management at End of Life	3	2	2.5	3	3	13.5
Sum	15	9.5	10	12.5	15.5	62.5

As part of this research, a full life cycle assessment (LCA) was developed for the three scenarios using the software package MSW-DST. The LCA was developed using the composition of residential waste collected in Metropolitan Nashville/Davidson County (CDM Smith, 2018). The LCA provided data on cost and energy usage when optimized energy, cost, and CO_2 emissions for each scenario.

The Economics Criteria involves the financial elements involved with the short and long term operations of the MSW management system. The attributes of the criteria include capital investments, operations and maintenance costs necessary for day to day operations of the facility and infrastructure, economic incentives that may be provide to communities located in the vicinity of the facility, and property values of land located around the facility. Below are several economic indicators that calculated during the LCA evaluation for the three scenarios. Operational costs were developed for the optimized system scenarios and are presented in Table 4.

Table 4: Annual Operation Costs			
Scenario	Annual Operation Cost (US Dollar per Year per 1 ton MSW)		
	Optimized for Energy	Optimized for Cost	Optimized for CO_2 Emissions
Scenario 1	97	89	107
Scenario 2	137	89	148
Scenario 3	162	102	107

The Technical Feasibility Criteria considers of several attributes such as the availability of land/land use, energy efficiency, distance from community/transfer station, beneficial reuse/resource conservation, and available infrastructure. Table 5 below presents the annual energy usage that was calculated during the LCA evaluation. The operational costs were developed for the optimized system scenarios and are shown in Table 5.

Table 5: Annual Energy Usage			
Scenario	Energy Usage (one million British Thermal Units (MMBTU) 1 ton MSW per year)		
	Optimized for Energy	Optimized for Cost	Optimized for CO_2 Emissions
Scenario 1	-2.5	0.1	-1.6
Scenario 2	-8.1	0.1	-7.8
Scenario 3	-2.7	-1.7	-1.6

Note: Negative value indicated energy production for scenario and optimized condition