Durham/York Residual Waste Study

Annex E-4:

Supporting Technical Document on Financial Analysis and Cost Estimates

Report on Selection of Preferred Residuals Processing System

May 30, 2006

MacViro

Jacques Whitford

Durham/York Residual Waste Study

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Report on

Selection of Preferred Residuals Processing System

May 30, 2006

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Annex E-4: Financial Analysis and Cost Estimates

Annex E-4 provides the estimated costs associated with the four (4) Durham/York Residual Waste Study residuals processing systems. Portions of this report are based on information and methodologies developed by the Niagara-Hamilton WastePlan Study. These costs are estimated in real terms (i.e. excluding inflation) at constant 2006 price levels. Two sets of estimates are provided for each item – one set prepared under a set of low cost assumption and the other set under a set of high cost assumption.

The key low cost assumptions are:

- Facility financing at a real cost of capital at 5%. With a 2% inflation assumption, this corresponds to a nominal public sector financing interest rate of 7%.
- Residual material, including bottom ash or char, disposal at a cost for haul and landfill disposal of $70/tonne.
- Net energy from thermal treatment facilities sold at a price of $85/MWh on the assumption that it is partially renewable and warrants a premium price.

The key high cost assumptions are:

- Facility financing at a real cost of capital at 10%. With a 2% inflation assumption, this corresponds to a nominal before tax private sector financing rate of 12%.
- Residual material, including bottom ash or char, disposal at a cost for haul and landfill disposal of $100/tonne.
- Net energy from thermal treatment facilities sold at the estimated commodity price of $60/MWh.

System Alternatives share a number of common assumptions as appropriate:

- Land costs of $1,250,000 per hectare
- A planning and approvals cost of $2,000,000 in additional to the Residual Waste Study costs.
- The following prices for recovered recyclable materials based on typical current prices, discounted by 20% to account for assumed lower quality – compared to source separated materials:

Material	Price per Tonne
Gable Top	50
Aseptic	50
PETE	360
HDPE	530
Aluminum	1500
Ferrous	100
Other Material	50

- An air pollution control system (APC) residual disposal cost of $300 per tonne.

The disposal system cost estimates include all direct initial capital, annual operating costs, and revenues from the assumed sale of energy and recovered materials.

No collection or transfer/haul costs for the delivery of waste to the disposal system facilities have been assumed. In general, waste will be generated fairly uniformly across the study area relative to the potential locations for facilities. For the purpose of comparison of alternative systems, it is assumed that the effect of site location on collection or transfer haul would be generally the same for all systems. The potential costs associated with specific potential locations will be addressed in the evaluation of 'Alternatives Methods' (i.e., sites).

The inputs to this financial analysis include; the quantity estimates provided in Annex E-1, the site land requirements provided in Annex E-2, and the output electrical energy estimates provided in Annex E-3. Engineering estimates of the capital and operating costs for the various facilities required for each of the alternatives were developed. In addition, several technology vendors provided budgetary estimates of capital and operating costs. These estimates are provided on the various tables in Appendix A along with the other required unit price assumptions.

In the "*Report on Additional At-Source Diversion and Residual Quantities to be Managed*" (see Annex C-1), a range of waste quantity projections was provided. These projections were based on a variety of assumptions including diversion rates growing from 60% to 75%.

On the basis of this analysis, a facility with an initial capacity of 250,000 tonnes per year with the possibility of expansion to 400,000 tonnes per year was deemed to be reasonable.

With diversion holding constant at 60%, it was estimated that the quantities requiring management would grow to 400,000 tonnes per year by the 25th year of the planning period. If diversion rates prove to be higher, then the requirement to expand to 400,000 tonnes per year would be delayed. On the other hand, if diversion rates do not meet these levels, then a larger facility will be required sooner.

Based on this quantity analysis, the cost analysis of the system alternatives assumes the following:

- A facility with initial capacity of 250,000 tonnes, but flexibility to expand to 400,000 tonnes per year assumed.
- A 25-year financial life cycle planning period.
- An initial diversion rate of 60%, growing to 75% over the planning period.
- The landfilling of generated quantities in excess of the facility capacity.

The quantities resulting from these assumptions are presented tables in Appendix A.

The resulting cost estimates are deemed to be reasonably conservative, as they do not assume the economies of scale associated with a larger facility.

The tables in Appendix A illustrate the financial analysis of each of the alternatives under both the low and the high cost assumption. On the top portion of each table, the estimates of the capital and operating costs of the facilities along with any revenue estimates are provided. On the

mid portion, these costs are laid out over an assumed 25-year operating period and the present value of the life cycle costs associated with each alternative is provided.

To make the cost of each alternative more easily understood, a levelized cost per tonne is provided. This cost, if charged on every tonne managed, covers all the costs, capital, operating (net of revenues) and financing associated with the alternative.

This calculation is illustrated at the bottom of each table. The calculation assumes that the alternative is financed with a line of credit - or savings account - that changes interest when the account is in a deficit position and earns interest when the account has a surplus.

Over the project life cycle this financing account starts with a zero balance, goes into a deficit to cover the initial capital cost of the facilities, and ultimately closes with a zero balance at the end of the 25-year financial life cycle period. In each year, an amount equal to the cost per tonne multiplied by the quantity managed is paid into the account and an amount equal to the annual costs (operating net of revenues plus period capital) is withdrawn from the account. Annual deficits incur an interest expense, while annual surpluses earn interest.

The four (4) Durham/York Residual Waste Study System Alternatives are:

- 1 – Mechanical and Biological Treatment with Biogas Recovery
- 2a – Thermal Treatment of Mixed Waste with Recovery of Materials from the Ash/Char
- 2b – Thermal Treatment of Solid Recovered Fuel
- 2c – Thermal Treatment of Solid Recovered Fuel with Biogas Recovery

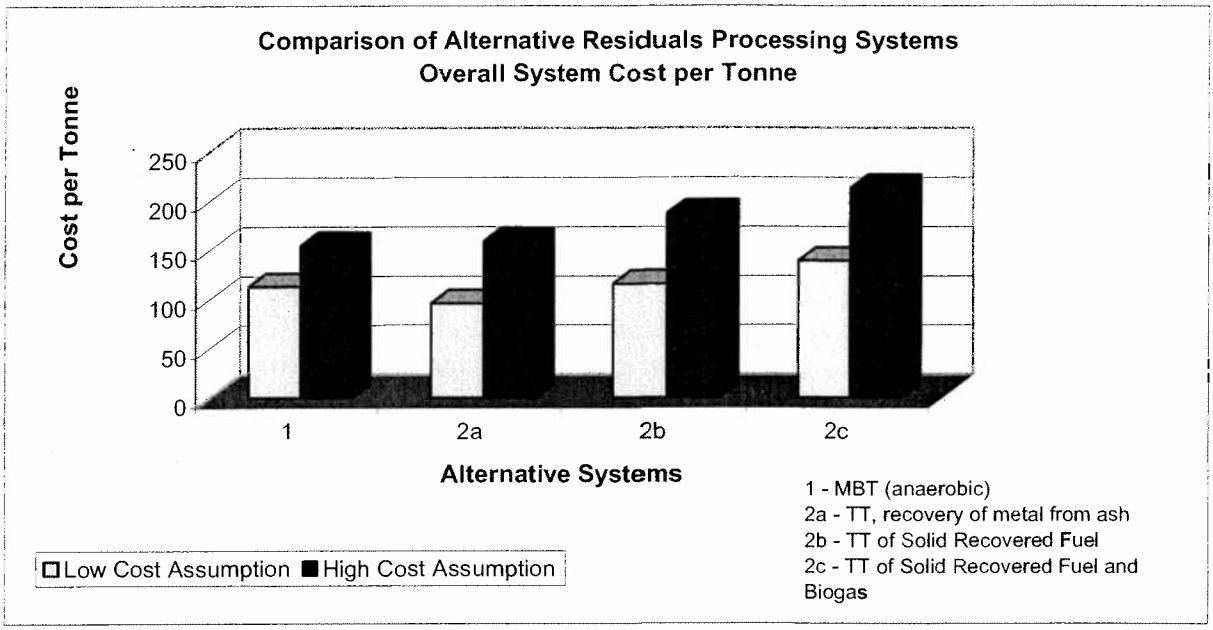
The levelized cost per tonne associated with these alternatives are summarized in Table 1 below.

Table 1 Range of Costs per Tonne

System Alternative	1	2a	2b	2c
Low Cost Assumptions ($)	114	97	116	140
High Cost Assumptions ($)	155	160	188	213

This range of costs is illustrated in the following graph.

Figure 1 Overall System Cost per Tonne



Additional cost estimates associated with these alternatives are summarized in Table 2. The costs associated with both the low and high cost assumptions are provided in each of the cells of this table.

Table 2 Summary of System Costs ($ X 1,000)

System Alternative		1	2a	2b	2c
Initial Capital Costs	Low	109,000	245,000	274,100	283,900
	High	111,600	251,000	280,800	290,800
Avarage Annual Operating Costs	Low	24,900	20,300	24,400	26,800
	High	30,800	22,500	26,900	30,200
Average Annual Revenue	Low	(3,890)	(14,780)	(15,350)	(12,600)
	High	(3,890)	(11,000)	(11,700)	(9,700)
Average Annual Costs Net of Revenues	Low	21,000	5,600	9,000	14,100
	High	26,900	11,500	15,200	20,500
Present Value of Lifecycle System Costs	Low	381,200	324,100	390,000	468,200
	High	319,800	329,600	387,300	440,100
Revenue as % of Annual Costs	Low	16%	73%	63%	47%
	High	13%	49%	43%	32%

The details associated with the development of with these estimates for each system are provided below.

1. Mechanical and Biological Treatment

1.1 System 1 Mechanical Biological Treatment (MBT) with Biogas Recovery

In this system, incoming post diversion waste is assumed to be received on a tipping floor and materials that are unacceptable for mechanical processing (e.g., mattresses) are removed. Some of these unacceptable materials such as large metal parts may be set aside for recycling, but most of the materials are assumed to be sent directly to landfill disposal.

The balance of the post diversion waste stream is assumed to be processed – mechanically treated - to remove recyclables, primarily metal and plastic containers. A relatively small quantity of these recyclable materials remain in the post diversion waste as the vast majority of these materials are assumed to be recovered through at-source diversion programs (e.g., blue box recycling). Mechanical treatment separates the waste stream into a number of fractions, from which some recyclables are removed. A large portion of the material is sent to landfill after removal of recyclables. A portion of the material is sent to biological treatment.

The portion of the remaining material stream that contains the highest percentage of organic materials (heavy, fines) is biologically treated via anaerobic digestion (AD) to breakdown organic materials. This process converts carbon-containing compounds to biogas (primarily methane and carbon dioxide), which in turn can be used to produce energy for in-plant consumption and sold to external users.

The residual materials, including stabilized organic material – digestate from the AD process – are assumed to be landfilled.

The estimated cost for the MBT facility and the landfill site under the low and high cost assumptions are provided in Tables 1 – i and ii of Appendix A. The additional key assumptions used in developing these estimates are as follows:

- Renewable energy produced from the biogas is sold at a premium price of $110/MWh.
- It is not possible to market compost from biological processing or inert materials; this is landfilled.
- Biological treatment component includes in-vessel anaerobic digestion with biogas recovery and energy generation, digestate is landfilled.

2. Thermal Treatment

2.1 System 2a) Thermal Treatment of Mixed Waste with Recovery of Materials from Ash/Char

There are two main types of commercially available thermal treatment technologies: combustion and gasification. Depending on the technology, incoming waste may be received on either a flat tipping floor or into a receiving pit. The waste is inspected and any unacceptable items are removed.

In combustion technologies, hydrocarbons in the waste stream are converted to thermal energy, carbon dioxide, and water. Ash is discharged from the bottom of the grate and is quenched.

Exhaust gases from combustion are cleaned prior to being emitted to the atmosphere. The process is exothermic (i.e., requires little to no external energy once combustion has been initiated).

Gasification technologies involve the thermal breakdown of solid materials into a synthetic gas (syngas) and a solid char residue. The process is endothermic (i.e., requires external energy). The syngas (mainly comprised of hydrogen, carbon monoxide, carbon dioxide, and nitrogen) must undergo a cleaning process before it is utilized. After cleaning, the syngas may be used as fuel for reciprocating engines or gas turbines, or it can be combusted in a steam boiler to generate steam.

After thermal treatment, mechanical treatment is utilized to recover metals (aluminium and ferrous) from the ash or char.

The residual materials, including materials unacceptable for thermal processing and ash or char, are assumed to be landfilled. In addition, residue from the flue gas or syngas cleanup process also requires management.

For costing purposes, a combustion facility is assumed as there is more information available on the cost of this technology. The estimated costs for the assumed incineration facility under the low and high cost assumptions are provided in Tables 2a – i and ii of Appendix A.

2.2 System 2b) Thermal Treatment of Solid Recovered Fuel

This system combines mechanical, biological (aerobic), and thermal treatment.

After removal of some unacceptable materials (similar to 2a) the incoming post diversion waste is processed and a portion of the material is separated into "large, dry, light" streams of plastic and paper materials. The other portion of the material includes more "small, wet, heavy" material including food waste residue, which is sent to biological treatment (aerobic composting) for bio-drying.

The waste is then processed mechanically to remove non-combustable materials and to recover some recyclable resources. A solid fuel is recovered and is fed into the thermal process to produce energy.

As mentioned under System 2a, the main thermal technologies are combustion or gasification. Combustion is an exothermic reaction in which hydrocarbons in the waste stream are converted to thermal energy, carbon dioxide, and water. The exhaust gases are cleaned prior to release into the atmosphere and the ash is discharged and quenched. Gasification is an endothermic reaction in which solid material is thermally broken down into syngas and a solid char residue. The syngas is cleaned before it is utilized for the generation of energy.

The materials requiring landfill disposal include the residuals from the recovery of solid fuel, the unacceptable waste and the ash/char from the thermal treatment. In addition, residue from the flue gas or syngas cleanup process also requires management.

The estimated costs for this facility under the low and high cost assumptions are provided in Tables 2b – i and ii of Appendix A.

2.3 System 2c) Thermal Treatment of Solid Recovered Fuel with Biogas Recovery

This system is a variation of System 2b that involves the separation of the organic material (e.g., food waste) from the rest of the post diversion waste and the subsequent anaerobic digestion of this organic fraction of the waste stream to produce biogas. Energy is thus produced from both the solid recovered fuel and the biogas.

The residuals from anaerobic digestion, ash/char from the thermal treatment process and the residues from the mechanical treatment process all require landfilling. A small amount of waste from the air pollution control/gas clean-up system also requires management.

The estimated costs for the facility assumed under this alternative are provided in Tables 2c – i (low cost assumptions) and 2c – ii (high cost assumption) of Appendix A.

Appendix A

Annex E-4: Table 1 - 1

System 1: Mechanical, Biological (Anaerobic Digestion) Treatment with Biogas Recovery and Landfill of Stabilized Residuals

Low Cost Estimate at Constant 2006 Price Levels

Initial Capital Costs 250,000 tpy Facility ($ X 1,000)																													
Planning & Approvals	2,000	(in addition to Residual Waste Study)																											
Land (site & large buffer)	14,250	(114 Ha of land @ $125,000 / Ha)																											
General Site Works	3,800					Recycling Material Revenue																							
Buildings	17,750																												
Mechanical Process Equipment	12,350						Tonnes	Price /Tonne	Revenue																				
Biological Process Equipment	15,800					Gable Top	586	50	29,400																				
Biogas Recovery & Utilization	5,750					Aseptic	88	50	4,400																				
Odour Control	1,750					PETE	1,500	360	540,000																				
Rolling Equipment	500					HDPE	904	530	479,120																				
Sub Total	74,350					Aluminum	772	1500	1,158,000																				
						Ferrous	3,937	100	393,700																				
Contingency @ 30%	22,305					Other Mat	2,986	50	148,300																				
Engineering @13%	9,666																												
Interest During Const @ 2.5%	2,558					Totals	10,775		2,753,920																				
Total Initial Capital	108,979																												
					Average Price per Tonne			$ 256																						
Annual Operating Costs & Prices																													
Labour	1,800																												
Fuel & Utilities	90																												
Maintenance & Operations	6,000																												
Other	620																												
Sub total Annual Operating	8,510																												
Contingency @ 30%	2,553																												
Annual Operating Cost	11,063	($ X 1,000)																											
Electricity Sales	$ 110	per Mwh	(Ranewatts Energy)																										
Recovered Recyclables Sales	$ 256	per tonne																											
Landfill Residue Disposal	$ 70	per tonne																											
Interest Rate/Cost of Capital	5%		0.0058333																										
System Cost per Tonne	$ 114																												
	Time 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25			
		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035			
Annual Quantities (tonnes)																													
Total Material Generated		837,300	852,392	867,841	883,657	899,847	916,800	723,967	739,465	755,301	771,482	780,900	796,241	811,901	827,889	844,211	865,400	871,215	887,346	903,801	820,584	924,500	939,031	953,805	968,828	984,103			
At-Source Diversion Rate		60.0%	60.6%	61.2%	61.8%	62.3%	62.9%	63.5%	64.1%	64.7%	65.3%	65.8%	66.4%	67.0%	67.8%	68.2%	68.8%	69.3%	69.9%	70.5%	71.1%	71.7%	72.3%	72.8%	73.4%	74.0%			
Portion to Disposal		40.0%	39.4%	38.8%	38.3%	37.7%	37.1%	36.5%	35.9%	35.3%	34.8%	34.2%	33.6%	33.0%	32.4%	31.8%	31.3%	30.7%	30.1%	29.5%	28.9%	28.3%	27.8%	27.2%	26.6%	26.0%			
Total Material for Disposal		254,920	257,151	259,345	261,499	263,609	262,847	264,248	265,591	266,873	268,090	266,808	267,404	267,927	268,374	268,741	267,313	267,173	266,943	266,621	266,202	261,942	260,581	259,117	257,547	256,867			
Total Material to Facility		250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000			
Surplus Material to Landfill		4,920	7,151	9,345	11,489	13,609	12,847	14,248	15,591	16,873	18,090	16,808	17,404	17,927	18,374	18,741	17,312	17,173	16,943	16,621	16,202	11,942	10,581	9,117	7,547	5,867			
Total Waste to Facility (tonnes)	-	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000			
Recovered Materials		10,775	10,775	10,775	10,775	10,775	10,775	10,775	10,775	10,775	10,775	10,776	10,775	10,775	10,775	10,775	10,775	10,775	10,775	10,775	10,775	10,775	10,775	10,775	10,775	10,775			
Facility Residue to Landfill		192,365	192,365	192,365	192,365	192,365	192,365	192,365	192,365	192,365	192,365	192,365	192,365	192,365	192,365	192,365	192,365	192,365	192,365	192,365	192,365	192,365	192,365	192,365	182,365	192,365			
Total Residue to Landfill		197,285	199,516	201,710	203,864	205,974	205,212	206,613	207,956	209,238	210,455	209,173	209,769	210,292	210,739	211,106	209,678	209,538	209,308	208,886	208,567	204,307	202,946	201,482	199,912	198,232			
Electricity Output Mwh		10,313	10,313	10,313	10,313	10,313	10,313	10,313	10,313	10,313	10,313	10,313	10,313	10,313	10,313	10,313	10,313	10,313	10,313	10,313	10,313	10,313	10,313	10,313	10,313	10,313			
Life Cycle Costs (X 1,000)																													
Intial Capital	108,979																												
Net Electricity Sales Revenue		(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	(1,134)			
Recovered Recyclables Sales Revenue		(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	(2,754)			
Facility Operating Costs		11,063	11,063	11,063	11,063	11,063	11,063	11,063	11,063	11,063	11,063	11,063	11,063	11,063	11,063	11,063	11,063	11,063	11,063	11,063	11,063	11,063	11,063	11,063	11,063	11,063			
Residue Disposal Cost		13,810	13,466	13,466	13,466	13,466	13,466	13,466	13,466	13,466	13,466	13,466	13,466	13,466	13,466	13,466	13,466	13,466	13,466	13,466	13,466	13,466	13,466	13,466	13,466	13,466			
Total Annual Cost	108,979	20,985	20,640	20,640	20,640	20,640	20,640	20,640	20,640	20,640	20,640	20,640	20,640	20,640	20,640	20,640	20,640	20,640	20,640	20,640	20,640	20,640	20,640	20,640	20,640	20,640			
PV Costs	381,151																												
Levelized Quantity	3,358																												
Total All Costs	625,328																												
Total Quantity	6,250																												
Average Cost per Tonne	$ 100																												
	Time 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25			
Annual Quantity		250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000			
Annual Tip Fee Revenue	114	28,396	28,396	28,396	28,396	28,396	28,396	28,396	28,396	28,396	28,396	28,396	28,396	28,396	28,396	28,396	28,396	28,396	28,396	28,396	28,396	28,396	28,396	28,396	28,396	28,396			
Levelized Cost Calculation (X 1,000)																													
Open Balance	-	108,979	107,016	104,612	102,087	99,435	96,651	93,728	90,659	87,437	84,053	80,500	76,770	72,852	68,740	64,421	59,886	55,125	50,126	44,877	39,365	33,578	27,501	21,120	14,421	7,386			
Annual Net Costs	108,979	20,985	20,640	20,640	20,640	20,640	20,640	20,640	20,640	20,640	20,640	20,640	20,640	20,640	20,640	20,640	20,640	20,640	20,640	20,640	20,640	20,640	20,640	20,640	20,640	20,640			
Annual Tip Fee Revenue	-	(28,396)	(28,396)	(28,396)	(28,396)	(28,396)	(28,396)	(28,396)	(28,396)	(28,396)	(28,396)	(28,396)	(28,396)	(28,396)	(28,396)	(28,396)	(28,396)	(28,396)	(28,396)	(28,396)	(28,396)	(28,396)	(28,396)	(28,396)	(28,396)	(28,396)			
Annual Interest	-	5,449	5,351	5,231	5,104	4,972	4,833	4,686	4,533	4,372	4,203	4,025	3,838	3,643	3,437	3,221	2,994	2,756	2,506	2,244	1,968	1,679	1,375	1,056	721	368			
Closing Balance	108,979	107,016	104,612	102,087	99,435	96,651	93,728	90,659	87,437	84,053	80,500	76,770	72,852	68,740	64,421	59,886	55,125	50,126	44,877	39,365	33,578	27,501	21,120	14,421	7,386	(0)			

Annex E-4: Table 1 - ii

System 1: Mechanical, Biological (Anaerobic Digestion) Treatment with Biogas Recovery and Landfill of Stabilized Residuals

High Cost Estimate at Constant 2006 Price Levels

Initial Capital Costs 250,000 tpy Facility ($ X 1,000)																											
Planning & Approvals	2,000	(in addition to Residual Waste Study)																									
Land (site & large buffer)	14,250	(11.4 Ha of land @ $1,250,000 / Ha)																									
General Site Works	3,800				Recycling Material Revenue																						
Buildings	17,750																										
Mechanical Process Equipment	12,350					Tonnes	Price /Tonne	Revenue																			
Biological Process Equipment	15,800				Gable Top	588	50	29,400																			
Biogas Recovery & Utilization	5,750				Aseptic	88	50	4,400																			
Odour Control	1,750				PETE	1,500	360	540,000																			
Rolling Equipment	900				HDPE	904	530	479,120																			
Sub Total	74,350				Aluminum	772	1500	1,158,000																			
					Ferrous	3,937	100	393,700																			
Contingency @ 30%	22,305				Other Mat	2,956	50	147,800																			
Engineering @ 13%	9,666																										
Interest During Const @ 5%	5,316				Totals	10,775		2,753,920																			
Total Initial Capital	111,637																										
				Average Price per Tonne		$ 256																					
Annual Operating Costs & Prices																											
Labour	1,800																										
Fuel & Utilities	90																										
Maintenance & Operations	6,000																										
Other	620																										
Sub total Annual Operating	8,510																										
Contingency @ 30%	2,553																										
Annual Operating Cost	11,063	($ X 1,000)																									
Electricity Sales	$ 110	per Mwh	(Renewable Energy)																								
Recovered Recyclables Sales	$ 256	per tonne																									
Landfill Residue Disposal	$ 100	per tonne																									
Interest Rate/Cost of Capital	10%		0.0058333																								
System Cost per Tonne	$ 155																										
	Time 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	
		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	
Annual Quantities (tonnes)																											
Total Material Generated		637,390	652,392	667,841	683,857	699,847	708,800	723,967	739,465	755,301	771,482	780,900	796,241	811,901	827,889	844,211	855,400	871,215	887,346	903,801	920,584	924,500	939,031	853,808	868,826	884,103	
At-Source Diversion Rate		60.0%	60.6%	61.2%	61.8%	62.3%	62.9%	63.5%	64.1%	64.7%	65.3%	65.8%	66.4%	67.0%	67.6%	68.2%	68.8%	69.3%	69.9%	70.5%	71.1%	71.7%	72.3%	72.8%	73.4%	74.0%	
Portion to Disposal		40.0%	39.4%	38.8%	38.3%	37.7%	37.1%	36.5%	35.9%	35.3%	34.8%	34.2%	33.6%	33.0%	32.4%	31.8%	31.3%	30.7%	30.1%	29.5%	28.9%	28.3%	27.8%	27.2%	26.6%	26.0%	
Total Material for Disposal		254,920	257,151	259,345	261,499	263,809	262,847	264,248	265,591	266,873	268,090	266,808	267,404	267,827	268,378	268,741	267,313	267,173	266,943	266,821	266,202	261,942	260,581	259,117	257,547	255,967	
Total Material to Facility		250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	
Surplus Material to Landfill		4,920	7,151	9,345	11,499	13,809	12,847	14,248	15,591	16,873	18,090	16,807	17,404	17,827	18,378	18,741	17,312	17,173	16,943	16,821	16,202	11,942	10,581	9,117	7,547	5,967	
Total Waste to Facility (tonnes)		250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	
Recovered Materials		10,775	10,775	10,775	10,775	10,775	10,775	10,775	10,775	10,775	10,775	10,775	10,775	10,775	10,775	10,775	10,775	10,775	10,775	10,775	10,775	10,775	10,775	10,775	10,775	10,775	
Facility Residue to Landfill		192,365	192,365	192,365	192,365	192,365	192,365	192,365	192,365	192,366	192,365	192,365	192,365	192,365	192,365	192,365	192,365	192,365	192,365	192,365	192,365	192,365	192,365	192,365	192,365	192,365	
Total Residue to Landfill		197,285	199,516	201,710	203,864	205,974	205,212	206,613	207,956	209,238	210,455	209,173	209,769	210,292	210,739	211,106	209,678	209,538	209,308	208,986	208,567	204,307	202,946	201,482	199,912	198,232	
Electricity Output Mwh		10,313	10,313	10,313	10,313	10,313	10,313	10,313	10,313	10,313	10,313	10,313	10,313	10,313	10,313	10,313	10,313	10,313	10,313	10,313	10,313	10,313	10,313	10,313	10,313	10,313	
Life Cycle Costs (X 1,000)																											
Initial Capital	111,637																										
Net Electricity Sales Revenue		(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	(1,134)	
Recovered Recyclables Sales Revenue		(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	(2,754)	
Facility Operating Costs		11,063	11,063	11,063	11,063	11,063	11,063	11,063	11,063	11,063	11,063	11,063	11,063	11,063	11,063	11,063	11,063	11,063	11,063	11,063	11,063	11,063	11,063	11,063	11,063	11,063	
Residue Disposal Cost		19,729	19,237	19,237	19,237	19,237	19,237	19,237	19,237	19,237	19,237	19,237	19,237	19,237	19,237	19,237	19,237	19,237	19,237	19,237	19,237	19,237	19,237	19,237	19,237	19,237	
Total Annual Cost	111,637	26,903	26,411	26,411	26,411	26,411	26,411	26,411	26,411	26,411	26,411	26,411	26,411	26,411	26,411	26,411	26,411	26,411	26,411	26,411	26,411	26,411	26,411	26,411	26,411	26,411	
PV Costs	319,835																										
Levelized Quantity	2,063																										
Total All Costs	772,407																										
Total Quantity	6,250																										
Average Cost per Tonne	$ 124																										
	Time 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	
Annual Quantity		250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	
Annual Tip Fee Revenue	155	38,759	38,759	38,759	38,759	38,759	38,759	38,759	38,759	38,759	38,759	38,759	38,759	38,759	38,759	38,759	38,758	38,759	38,759	38,759	38,759	38,759	38,759	38,759	38,759	38,759	
Levelized Cost Calculation (X 1,000)																											
Open Balance	-	111,637	110,944	109,690	108,311	106,795	105,126	103,291	101,271	99,051	96,608	93,920	90,964	87,713	84,136	80,201	75,873	71,113	65,876	60,116	53,779	46,809	39,142	30,708	21,431	11,226	
Annual Net Costs	111,637	26,903	26,411	26,411	26,411	26,411	26,411	26,411	26,411	26,411	26,411	26,411	26,411	26,411	26,411	26,411	26,411	26,411	26,411	26,411	26,411	26,411	26,411	26,411	26,411	26,411	
Annual Tip Fee Revenue	-	(38,759)	(38,759)	(38,759)	(38,758)	(38,759)	(38,759)	(38,759)	(38,759)	(38,759)	(38,759)	(38,759)	(38,759)	(38,759)	(38,759)	(38,759)	(38,759)	(38,759)	(38,759)	(38,759)	(38,759)	(38,759)	(38,759)	(38,758)	(38,759)	(38,759)	
Annual Interest	-	11,164	11,094	10,969	10,831	10,678	10,513	10,329	10,127	9,905	9,661	9,392	9,096	8,771	8,414	8,020	7,587	7,111	6,588	6,012	5,378	4,681	3,914	3,071	2,143	1,123	
Closing Balance	111,637	110,944	109,690	108,311	106,795	105,126	103,291	101,271	99,051	96,608	93,920	90,964	87,713	84,136	80,201	75,873	71,113	65,876	60,116	53,779	46,809	39,142	30,708	21,431	11,226	0	

Annex E-4: Table 2a - i

System 2a: Thermal Treatment of Mixed Waste With Recovery of Metals from Ash / Char

Low Cost Estimate at Constant 2006 Price Levels

Initial Capital Costs 250,000 tpy Facility ($ X 1,000)					Recycling Material Revenue																						
Planning & Approvals	2,000	(in addition to Residual Waste Study)																									
Land (site & large buffer)	12,000	(9.6 Ha of land @ $1,250,000 / Ha)																									
Thermal Process Facility	225,000																										
							Tonnes	Price /Tonne	Revenue																		
					Gable Top	-	50	-																			
					Aseptic	-	50	-																			
					PETE	-	360	-																			
					HDPE	-	530	-																			
Sub Total	239,000				Aluminum	856	1500	1,287,000																			
					Ferrous	6,905	100	690,500																			
Contingency (Included)					Other Met		50	-																			
Engineering (Included)																											
Interest During Const @ 2.5%	5,975				Totals	7,763		1,977,500																			
Total Initial Capital	244,975																										
					Average Price per Tonne		$ 255																				
Annual Operating Costs & Prices																											
Annual Operating Cost	13,500	($ X 1,000)																									
Electricity Sales	$ 85	per Mwh																									
Recovered Recyclables Sales	$ 255	per tonne																									
Landfill Residue Disposal	$ 75	per tonne																									
APC Residue Disposal	$ 300	per tonne																									
Interest Rate/Cost of Capital	5%		0.0058333																								
System Cost per Tonne	$ 97																										
	Time 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25
		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Annual Quantities (tonnes)																											
Total Material Generated		637,300	652,392	667,841	683,657	699,847	708,800	723,967	739,485	755,301	771,482	780,900	796,241	811,901	827,889	844,211	855,400	871,215	887,346	903,801	920,584	924,500	939,031	953,805	968,828	984,103
At-Source Diversion Rate		60.0%	60.6%	61.2%	61.8%	62.3%	62.9%	63.5%	64.1%	64.7%	65.3%	65.8%	66.4%	67.0%	67.6%	68.2%	68.8%	69.3%	69.9%	70.5%	71.1%	71.7%	72.3%	72.8%	73.4%	74.0%
Portion to Disposal		40.0%	39.4%	38.8%	38.3%	37.7%	37.1%	36.5%	35.9%	35.3%	34.8%	34.2%	33.6%	33.0%	32.4%	31.8%	31.3%	30.7%	30.1%	29.5%	28.9%	28.3%	27.8%	27.2%	26.6%	26.0%
Total Material for Disposal		254,920	257,151	259,345	261,499	263,609	262,847	264,248	265,591	266,873	268,090	266,808	267,404	267,927	268,374	268,741	267,313	267,173	266,943	266,521	266,202	261,942	260,581	259,117	257,547	255,867
Total Material to Facility		250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000
Surplus Material to Landfill		4,920	7,151	9,345	11,499	13,609	12,847	14,248	15,591	16,873	18,090	16,807	17,404	17,927	18,374	18,741	17,312	17,173	16,943	16,521	16,202	11,942	10,581	9,117	7,547	5,867
Total Waste to Facility (tonnes)	-	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000
Recovered Materials		7,763	7,763	7,763	7,763	7,763	7,763	7,763	7,763	7,763	7,763	7,763	7,763	7,763	7,763	7,763	7,763	7,763	7,763	7,763	7,763	7,763	7,763	7,763	7,763	7,763
Facility Residue to Landfill		56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131
APC Residue to Disposal		7,500	7,500	9,700	9,700	9,700	9,700	9,700	9,700	9,700	9,700	9,700	9,700	9,700	9,700	9,700	9,700	9,700	9,700	9,700	9,700	9,700	9,700	9,700	9,700	9,700
Total Residue to Landfill		61,051	63,282	65,476	67,630	69,740	68,978	70,379	71,722	73,004	74,221	72,938	73,535	74,058	74,505	74,872	73,443	73,304	73,074	72,752	72,333	68,073	66,712	65,248	63,678	61,998
Electricity Output Mwh		150,570	150,570	150,570	150,570	150,570	150,570	150,570	150,570	150,570	150,570	150,570	150,570	150,570	150,570	150,570	150,570	150,570	150,570	150,570	150,570	150,570	150,570	150,570	150,570	150,570
Life Cycle Costs (X 1,000)																											
Initial Capital	244,975																										
Net Electricity Sales Revenue		(12,798)	(12,798)	(12,798)	(12,798)	(12,798)	(12,798)	(12,798)	(12,798)	(12,798)	(12,798)	(12,798)	(12,798)	(12,798)	(12,798)	(12,798)	(12,798)	(12,798)	(12,798)	(12,798)	(12,798)	(12,798)	(12,798)	(12,798)	(12,798)	(12,798)
Recovered Recyclables Sales Revenue		(1,978)	(1,978)	(1,978)	(1,978)	(1,978)	(1,978)	(1,978)	(1,978)	(1,978)	(1,978)	(1,978)	(1,978)	(1,978)	(1,978)	(1,978)	(1,978)	(1,978)	(1,978)	(1,978)	(1,978)	(1,978)	(1,978)	(1,978)	(1,978)	(1,978)
Facility Operating Costs		13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500
Residue Disposal Cost Including APC		6,829	6,996	7,821	7,982	8,141	8,083	8,188	8,289	8,385	8,477	8,380	8,425	8,464	8,498	8,525	8,418	8,408	8,391	8,366	8,335	8,015	7,913	7,804	7,686	7,560
Total Annual Cost	244,975	5,553	5,720	6,545	6,706	6,865	6,807	6,912	7,013	7,109	7,201	7,104	7,149	7,188	7,222	7,249	7,142	7,132	7,115	7,090	7,059	6,739	6,637	6,528	6,410	6,284
PV Costs	324,084																										
Levelized Quantity	3,356																										
Total All Costs	415,457																										
Total Quantity	6,250																										
Average Cost per Tonne	$ 66																										
	Time 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25
Annual Quantity		250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000
Annual Tip Fee Revenue	97	24,144	24,144	24,144	24,144	24,144	24,144	24,144	24,144	24,144	24,144	24,144	24,144	24,144	24,144	24,144	24,144	24,144	24,144	24,144	24,144	24,144	24,144	24,144	24,144	24,144
Levelized Cost Calculation (X 1,000)																											
Open Balance	-	244,975	238,632	232,140	226,147	220,017	213,738	207,088	200,210	193,090	185,709	178,051	169,914	161,415	152,530	143,234	133,501	123,174	112,320	100,906	88,898	76,257	62,665	48,292	33,090	17,010
Annual Net Costs	244,975	5,553	5,720	6,545	6,706	6,865	6,807	6,912	7,013	7,109	7,201	7,104	7,149	7,188	7,222	7,249	7,142	7,132	7,115	7,090	7,059	6,739	6,637	6,528	6,410	6,284
Annual Tip Fee Revenue	-	(24,144)	(24,144)	(24,144)	(24,144)	(24,144)	(24,144)	(24,144)	(24,144)	(24,144)	(24,144)	(24,144)	(24,144)	(24,144)	(24,144)	(24,144)	(24,144)	(24,144)	(24,144)	(24,144)	(24,144)	(24,144)	(24,144)	(24,144)	(24,144)	(24,144)
Annual Interest	-	12,249	11,932	11,607	11,307	11,001	10,687	10,354	10,011	9,654	9,285	8,903	8,496	8,071	7,626	7,162	6,675	6,159	5,616	5,045	4,445	3,813	3,133	2,415	1,654	850
Closing Balance	244,975	238,632	232,140	226,147	220,017	213,738	207,088	200,210	193,090	185,709	178,051	169,914	161,415	152,530	143,234	133,501	123,174	112,320	100,906	88,898	76,257	62,665	48,292	33,090	17,010	(0)

Annex E-4: Table 2a - li

System 2a: Thermal Treatment of Mixed Waste With Recovery of Metals from Ash / Char

High Cost Estimate at Constant 2006 Price Levels

Initial Capital Costs 250,000 tpy Facility ($ X 1,000)					Recycling Material Revenue																					
Planning & Approvals	2,000	(in addition to Residuel Waste Study)																								
Land (site & large buffer)	12,000	(9.6 Ha of land @ $1,250,000 / Ha)																								
Thermal Process Facility	225,000																									
						Tonnes	Price /Tonne	Revenue																		
					Gable Top	-	50	-																		
					Aseptic	-	50	-																		
					PETE	-	360	-																		
					HDPE	-	530	-																		
Sub Total	239,000				Aluminum	858	1500	1,287,000																		
					Ferrous	6,905	100	690,500																		
Contingency (Included)					Other Mat		50	-																		
Engineering (included)																										
Interest During Const @ 5%	11,950				Totals	7,763		1,977,500																		
Total Initial Capital	250,950																									
					Average Price per Tonne		$ 255																			
Annual Operating Costs & Prices																										
Annual Operating Cost	13,500	($ X 1,000)																								
Electricity Sales	$ 60	per Mwh																								
Recovered Recyclables Sales	$ 255	per tonne																								
Landfill Residue Disposal	$ 100	per tonne																								
APC Residue Disposal	$ 300	per tonne																								
Interest Rate/Cost of Capital	10%		0.0058333																							
System Cost per Tonne	$ 160																									
	Time 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25
		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Annual Quantities (tonnes)																										
Total Material Generated		637,300	652,392	667,841	683,657	699,847	708,800	723,967	738,465	755,301	771,482	780,900	796,241	811,901	827,888	844,211	855,400	871,215	887,346	903,801	920,584	924,500	939,031	953,805	968,828	984,103
At-Source Diversion Rate		60.0%	60.6%	61.2%	61.8%	62.3%	62.9%	63.5%	64.1%	64.7%	65.3%	65.8%	66.4%	67.0%	67.6%	68.2%	68.8%	69.3%	69.8%	70.5%	71.1%	71.7%	72.3%	72.8%	73.4%	74.0%
Portion to Disposal		40.0%	39.4%	38.8%	38.3%	37.7%	37.1%	36.5%	35.9%	35.3%	34.8%	34.2%	33.6%	33.0%	32.4%	31.8%	31.3%	30.7%	30.1%	29.5%	28.9%	28.3%	27.8%	27.2%	26.6%	26.0%
Total Material for Disposal		254,920	257,151	259,345	261,499	263,609	262,847	264,248	265,581	266,873	268,090	266,808	267,404	267,927	268,374	268,741	267,313	267,173	266,943	266,621	266,202	261,942	260,581	259,117	257,547	255,867
Total Material to Facility		250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000
Surplus Material to Landfill		4,920	7,151	9,345	11,499	13,609	12,847	14,248	15,581	16,873	18,090	16,807	17,404	17,927	18,374	18,741	17,312	17,173	16,943	16,621	16,202	11,942	10,581	9,117	7,547	5,867
Total Waste to Facility (tonnes)	-	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000
Recovered Materials		7,763	7,763	7,763	7,763	7,763	7,763	7,763	7,763	7,763	7,763	7,763	7,763	7,763	7,763	7,763	7,763	7,763	7,763	7,763	7,763	7,763	7,763	7,763	7,763	7,763
Facility Residue to Landfill		56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131
APC Residue to Disposal		9,700	9,700	9,700	9,700	9,700	9,700	9,700	9,700	9,700	9,700	9,700	9,700	9,700	9,700	9,700	9,700	9,700	9,700	9,700	8,700	9,700	9,700	8,700	9,700	8,700
Total Residue to Landfill		61,051	63,282	65,476	67,630	69,740	68,978	70,379	71,722	73,004	74,221	72,938	73,535	74,058	74,505	74,872	73,443	73,304	73,074	72,752	72,333	68,073	66,712	65,248	63,678	61,998
Electricity Output Mwh		150,570	150,570	150,570	150,570	150,570	150,570	150,570	150,570	150,570	150,570	150,570	150,570	150,570	150,570	150,570	150,570	150,570	150,570	150,570	150,570	150,570	150,570	150,570	150,570	150,570
Life Cycle Costs (X 1,000)																										
Initial Capital	250,950																									
Net Electricity Sales Revenue		(8,034)	(9,034)	(9,034)	(9,034)	(9,034)	(9,034)	(9,034)	(9,034)	(9,034)	(9,034)	(9,034)	(9,034)	(9,034)	(9,034)	(9,034)	(9,034)	(9,034)	(9,034)	(9,034)	(9,034)	(9,034)	(9,034)	(8,034)	(9,034)	(9,034)
Recovered Recyclables Sales Revenue		(1,978)	(1,978)	(1,978)	(1,978)	(1,978)	(1,978)	(1,978)	(1,978)	(1,978)	(1,978)	(1,978)	(1,978)	(1,978)	(1,978)	(1,978)	(1,978)	(1,978)	(1,978)	(1,978)	(1,978)	(1,978)	(1,978)	(1,878)	(1,978)	(1,878)
Facility Operating Costs		13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500
Residue Disposal Cost including APC		8,015	9,238	9,458	9,673	9,884	9,808	9,946	10,082	10,210	10,332	10,204	10,264	10,316	10,361	10,397	10,254	10,240	10,217	10,165	10,143	9,717	9,581	9,435	9,278	9,110
Total Annual Cost	250,950	11,503	11,727	11,946	12,161	12,372	12,296	12,436	12,571	12,699	12,820	12,892	12,752	12,804	12,849	12,885	12,743	12,729	12,706	12,674	12,632	12,206	12,070	11,923	11,766	11,598
PV Costs	329,565																									
Levelized Quantity	2,063																									
Total All Costs	560,508																									
Total Quantity	6,250																									
Average Cost per Tonne	$ 90																									
	Time 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 8	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25
Annual Quantity		250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000
Annual Tip Fee Revenue	160	39,938	39,938	39,938	39,938	39,938	39,938	39,938	39,938	39,938	39,938	39,938	39,938	39,938	39,938	39,938	39,938	39,938	39,938	39,938	39,938	39,938	39,938	39,938	39,938	39,938
Levelized Cost Calculation (X 1,000)																										
Open Balance	-	250,950	247,610	244,159	240,583	236,864	232,985	228,641	224,003	219,035	213,699	207,951	201,500	194,484	186,776	178,364	169,147	158,868	147,543	135,065	121,307	106,131	89,011	70,044	49,033	25,764
Annual Net Costs	250,950	11,503	11,727	11,946	12,161	12,372	12,296	12,436	12,571	12,699	12,820	12,692	12,752	12,804	12,849	12,885	12,743	12,729	12,706	12,674	12,632	12,206	12,070	11,823	11,766	11,598
Annual Tip Fee Revenue	-	(39,938)	(39,938)	(39,938)	(39,938)	(38,938)	(39,938)	(38,938)	(38,938)	(39,938)	(38,938)	(39,938)	(39,938)	(39,838)	(39,938)	(39,938)	(39,938)	(38,938)	(38,938)	(38,938)	(38,938)	(38,938)	(39,938)	(39,838)	(39,938)	(38,938)
Annual Interest	-	25,095	24,761	24,416	24,058	23,686	23,298	22,864	22,400	21,904	21,370	20,795	20,150	19,446	18,678	17,836	16,915	15,887	14,754	13,507	12,131	10,613	8,901	7,004	4,903	2,576
Closing Balance	250,950	247,610	244,159	240,583	236,864	232,985	228,641	224,003	219,035	213,699	207,951	201,500	194,484	186,776	178,364	169,147	158,868	147,543	135,065	121,307	106,131	89,011	70,044	49,033	25,764	0

Annex E-4: Table 2b - i

System 2b: Thermal Treatment of Solid Recovered Fuel

Low Cost Estimate at Constant 2006 Price Levels

Initial Capital Costs 250,000 tpy Facility ($ X 1,000)					**Recycling Material Revenue**																							
Planning & Approvals	2,000	(in addition to Residual Waste Study)																										
Land (site & large buffer)	18,250	(14.6 Ha of land @ $1,250,000 / Ha)																										
Thermal Process Facility	220,500																											
Mechanical Process	14,700						Tonnes	Price /Tonne	Revenue																			
Bio-dry Process	11,950				Gable Top	588	50	29,400																				
					Aseptic	88	50	4,400																				
					PETE	1,500	360	540,000																				
					HDPE	904	530	479,120																				
Sub Total	267,400				Aluminum	772	1500	1,158,000																				
					Ferrous	3,937	100	393,700																				
Contingency (included)					Other Mat	5,380	50	269,000																				
Engineering (included)																												
Interest During Const @ 2.5%	6,685				Totals	13,169		2,873,620																				
Total Initial Capital	274,085																											
					Average Price per Tonne		$	218																					
Annual Operating Costs & Prices																												
Annual Operating Cost	16,875	($ X 1,000)																										
Electricity Sales	$ 85	per Mwh																										
Recovered Recyclables Sales	$ 218	per tonne																										
Landfill Residue Disposal	$ 70	per tonne																										
APC Residue Disposal	$ 300	per tonne																										
Interest Rate/Cost of Capital	5%		0.0058333																									
System Cost per Tonne	$ 116																											
	Time 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25		
		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035		
Annual Quantities (tonnes)																												
Total Material Generated		637,300	652,392	667,841	683,657	699,847	708,800	723,967	739,465	755,301	771,482	780,900	796,241	811,901	827,889	844,211	855,400	871,215	887,346	903,801	920,584	924,500	939,031	953,805	968,828	984,103		
At-Source Diversion Rate		60.0%	60.6%	61.2%	61.8%	62.3%	62.9%	63.5%	64.1%	64.7%	65.3%	65.8%	66.4%	67.0%	67.8%	68.2%	68.8%	68.3%	68.9%	70.5%	71.1%	71.7%	72.3%	72.8%	73.4%	74.0%		
Portion to Disposal		40.0%	39.4%	38.8%	38.3%	37.7%	37.1%	36.5%	35.9%	35.3%	34.8%	34.2%	33.6%	33.0%	32.4%	31.8%	31.3%	30.7%	30.1%	29.5%	28.9%	28.3%	27.8%	27.2%	26.6%	26.0%		
Total Material for Disposal		254,920	257,151	259,345	261,499	263,609	262,847	264,248	265,591	266,873	268,090	266,808	267,404	267,827	268,374	268,741	267,313	267,173	266,943	266,621	266,202	261,942	260,581	259,117	257,547	255,867		
Total Material to Facility		250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000		
Surplus Material to Landfill		4,920	7,151	9,345	11,499	13,609	12,847	14,248	15,591	16,873	18,090	16,807	17,404	17,927	18,374	18,741	17,312	17,173	16,943	16,621	16,202	11,942	10,581	9,117	7,547	5,867		
Total Waste to Facility (tonnes)	-	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000		
Recovered Materials		13,169	13,188	13,169	13,169	13,169	13,169	13,169	13,169	13,169	13,189	13,168	13,168	13,169	13,169	13,168	13,169	13,169	13,169	13,169	13,169	13,169	13,169	13,169	13,169	13,169		
Facility Residue to Landfill		79,340	79,340	79,340	79,340	79,340	79,340	79,340	79,340	79,340	79,340	79,340	79,340	79,340	79,340	79,340	79,340	79,340	79,340	79,340	79,340	79,340	79,340	79,340	79,340	79,340		
APC Residue to Disposal		5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300		
Total Residue to Landfill		84,260	86,491	88,685	90,839	92,949	92,187	93,588	94,931	96,213	97,430	96,147	96,744	97,267	97,714	98,081	96,652	96,513	96,283	95,961	95,542	91,282	89,921	88,457	86,887	85,207		
Electricity Output Mwh		146,800	146,800	146,800	146,800	146,800	146,800	146,800	146,800	146,800	146,800	146,800	146,800	146,800	146,800	146,800	146,800	146,800	146,800	146,800	146,800	146,800	146,800	146,800	146,800	146,800		
Life Cycle Costs (X 1,000)																												
Initial Capital	274,085					-					-										-							
Net Electricity Sales Revenue		(12,478)	(12,478)	(12,478)	(12,478)	(12,478)	(12,478)	(12,478)	(12,478)	(12,478)	(12,478)	(12,478)	(12,478)	(12,478)	(12,478)	(12,478)	(12,478)	(12,478)	(12,478)	(12,478)	(12,478)	(12,478)	(12,478)	(12,478)	(12,478)	(12,478)		
Recovered Recyclables Sales Revenue		(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)		
Facility Operating Costs		16,675	16,875	16,875	16,875	16,875	16,875	16,875	16,875	16,875	16,875	16,875	16,875	16,875	16,875	16,875	16,875	16,875	16,875	16,875	16,875	16,875	16,875	16,875	16,875	16,875		
Residue Disposal Cost Including APC		7,488	7,644	7,798	7,949	8,096	8,043	8,141	8,235	8,325	8,410	8,320	8,362	8,399	8,430	8,456	8,356	8,348	8,330	8,307	8,278	7,990	7,884	7,782	7,672	7,554		
Total Annual Cost	274,085	9,012	9,168	9,321	9,472	9,620	9,566	9,665	9,758	9,848	9,933	9,844	9,885	9,922	9,953	9,978	9,879	8,869	9,853	9,831	9,801	9,503	9,408	9,305	8,195	9,078		
PV Costs	389,973																											
Levelized Quantity	3,356																											
Total All Costs	514,756																											
Total Quantity	6,250																											
Average Cost per Tonne	$ 82																											
	Time 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25		
Annual Quantity		250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000		
Annual Tip Fee Revenue	116	29,053	29,053	29,053	29,053	29,053	28,053	29,053	29,053	29,053	29,053	29,053	28,053	29,053	28,053	29,053	29,053	29,053	29,053	29,053	29,053	29,053	28,053	29,053	29,053	29,053		
Levelized Cost Calculation (X 1,000)																												
Open Balance	-	274,085	267,748	261,250	254,581	247,729	240,682	233,230	225,503	217,483	209,153	200,491	191,306	181,704	171,658	161,141	150,124	138,457	126,196	113,306	99,749	85,484	70,209	54,074	37,030	19,024		
Annual Net Costs	274,085	9,012	9,168	9,321	9,472	9,620	9,566	9,665	9,759	9,848	9,933	9,844	9,885	8,922	9,953	9,979	9,879	9,869	8,853	9,831	9,801	9,503	9,408	9,305	8,195	9,078		
Annual Tip Fee Revenue	-	(29,053)	(29,053)	(29,053)	(29,053)	(29,053)	(29,053)	(29,053)	(29,053)	(29,053)	(29,053)	(29,053)	(29,053)	(29,053)	(28,053)	(29,053)	(29,053)	(29,053)	(29,053)	(29,053)	(28,053)	(29,053)	(28,053)	(29,053)	(29,053)	(29,053)		
Annual Interest	-	13,704	13,387	13,062	12,729	12,386	12,034	11,661	11,275	10,874	10,458	10,025	9,565	9,085	8,583	8,057	7,506	6,923	6,310	5,665	4,987	4,274	3,510	2,704	1,852	951		
Closing Balance	274,085	267,748	261,250	254,581	247,729	240,682	233,230	225,503	217,483	209,153	200,491	191,306	181,704	171,658	161,141	150,124	138,457	126,196	113,306	99,749	85,484	70,209	54,074	37,030	19,024	0		

Annex E-4: Table 2b - Ii

System 2b: Thermal Treatment of Solid Recovered Fuel

High Cost Estimate at Constant 2006 Price Levels

Initial Capital Costs 250,000 tpy Facility ($ X 1,000)					Recycling Material Revenue																							
Planning & Approvals	2,000	(in addition to Residual Waste Study)																										
Land (site & large buffer)	18,250	(14.6 Ha of land @ $1,250,000 / Ha)																										
Thermal Proces Facility	220,500																											
Mechanical Process	14,700						Tonnes	Price /Tonne	Revenue																			
Bio-dry Process	11,950				Gable Top	588	50	29,400																				
					Aseptic	88	50	4,400																				
					PETE	1,500	360	540,000																				
					HDPE	904	530	479,120																				
Sub Total	267,400				Aluminum	772	1500	1,158,000																				
					Ferrous	3,837	100	393,700																				
Contingency (Included)					Other Mat	5,380	50	269,000																				
Engineering (included)																												
Interest During Const @ 5%	13,370				Totals	13,169		2,873,620																				
Total Initial Capital	280,770																											
					Average Price per Tonne			$ 218																				
Annual Operating Costs & Prices																												
Annual Operating Cost	16,875	($ X 1,000)																										
Electricity Sales	$ 60	per Mwh																										
Recovered Recyclables Sales	$ 218	per tonne																										
Landfill Residue Disposal	$ 100	per tonne																										
APC Residue Disposal	$ 300	per tonne																										
Interest Rate/Cost of Capital	10%		0.0058333																									
System Cost per Tonne	$ 188																											
	Time 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25		
		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035		
Annual Quantities (tonnes)																												
Total Material Generated		637,300	652,382	667,841	683,657	699,847	708,800	723,967	739,465	755,301	771,482	780,900	788,241	811,901	827,889	844,211	855,400	871,215	887,348	903,801	920,584	924,500	938,031	953,805	968,828	984,103		
At-Source Diversion Rate		60.0%	60.6%	61.2%	61.8%	62.3%	62.9%	63.5%	64.1%	64.7%	65.3%	65.8%	66.4%	67.0%	67.6%	68.2%	68.8%	69.3%	69.9%	70.5%	71.1%	71.7%	72.3%	72.8%	73.4%	74.0%		
Portion to Disposal		40.0%	39.4%	38.8%	38.3%	37.7%	37.1%	36.5%	35.9%	35.3%	34.8%	34.2%	33.6%	33.0%	32.4%	31.8%	31.3%	30.7%	30.1%	29.5%	28.8%	28.3%	27.8%	27.2%	26.6%	26.0%		
Total Material for Disposal		254,920	257,151	258,345	261,499	263,609	262,847	264,248	265,581	266,873	268,090	266,808	267,404	267,927	268,374	268,741	267,313	267,173	266,943	266,821	266,202	261,942	260,581	259,117	257,547	255,867		
Total Material to Facility		250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000		
Surplus Material to Landfill		4,920	7,151	9,345	11,499	13,609	12,847	14,248	15,591	16,873	18,090	16,807	17,404	17,927	18,374	18,741	17,312	17,173	16,943	16,821	16,202	11,942	10,581	9,117	7,547	5,867		
Total Waste to Facility (tonnes)	-	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000		
Recovered Materials		13,169	13,169	13,169	13,168	13,169	13,169	13,169	13,168	13,189	13,169	13,169	13,169	13,168	13,188	13,189	13,169	13,168	13,188	13,169	13,168	13,169	13,169	13,189	13,169	13,169		
Facility Residue to Landfill		79,340	78,340	79,340	79,340	79,340	79,340	79,340	79,340	79,340	79,340	79,340	79,340	79,340	79,340	79,340	79,340	79,340	79,340	79,340	78,340	79,340	79,340	78,340	79,340	79,340		
APC Residue to Disposal		5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300		
Total Residue to Landfill		84,260	86,491	88,685	90,839	92,949	92,187	93,588	94,931	96,213	97,430	96,147	88,744	97,267	97,714	98,081	96,652	96,513	96,283	95,961	95,542	81,282	88,921	88,457	86,887	85,207		
Electricity Output Mwh		146,800	146,800	146,800	146,800	146,800	146,800	146,800	146,800	146,800	146,800	146,800	146,800	146,800	146,800	146,800	146,800	146,800	146,800	146,800	146,800	146,800	146,800	146,800	146,800	146,800		
Life Cycle Costs (X 1,000)																												
Initial Capital	280,770					-					-					-					-							
Net Electricity Sales Revenue		(8,808)	(8,808)	(8,808)	(8,808)	(8,808)	(8,808)	(8,808)	(8,808)	(8,808)	(8,808)	(8,808)	(8,808)	(8,808)	(8,808)	(8,808)	(8,808)	(8,808)	(8,808)	(8,808)	(8,808)	(8,808)	(8,808)	(8,808)	(8,808)	(8,808)		
Recovered Recyclables Sales Revenue		(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)		
Facility Operating Costs		16,875	16,875	16,875	16,875	16,875	16,875	16,875	16,875	16,875	16,875	16,875	16,875	16,875	16,875	16,875	16,875	16,875	16,875	16,875	16,875	16,875	16,875	16,875	16,875	16,875		
Residue Disposal Cost including APC		10,016	10,239	10,458	10,674	10,885	10,809	10,949	11,083	11,211	11,333	11,205	11,264	11,317	11,361	11,398	11,255	11,241	11,218	11,186	11,144	10,718	10,582	10,436	10,279	10,111		
Total Annual Cost	280,770	15,209	15,432	15,652	15,867	16,078	16,002	16,142	16,276	16,405	16,526	16,398	16,458	16,510	16,555	16,591	16,449	16,435	16,412	16,380	16,338	15,812	15,775	15,628	15,472	15,304		
PV Costs	387,255																											
Levelized Quantity	2,063																											
Total All Costs	682,978																											
Total Quantity	6,250																											
Average Cost per Tonne	$ 109																											
	Time 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25		
Annual Quantity		250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000		
Annual Tip Fee Revenue	188	48,929	46,929	46,929	46,829	46,929	46,829	46,829	46,929	46,928	46,929	46,929	48,929	48,829	46,929	46,929	46,929	48,929	46,929	46,829	46,929	46,929	46,829	46,929	46,929	46,928		
Levelized Cost Calculation (X 1,000)																												
Open Balance	-	280,770	277,127	273,343	269,399	265,277	260,953	256,121	250,948	245,388	238,402	232,839	226,701	217,800	209,160	199,701	189,334	177,786	165,070	151,059	135,615	118,594	99,425	78,213	54,734	28,750		
Annual Net Costs	280,770	15,209	15,432	15,652	15,867	16,078	16,002	16,142	16,276	16,405	16,526	16,398	16,458	16,510	16,555	16,591	16,449	16,435	16,412	16,380	16,338	15,912	15,775	15,629	15,472	15,304		
Annual Tip Fee Revenue	-	(46,928)	(46,928)	(46,929)	(46,929)	(46,929)	(46,929)	(46,929)	(46,929)	(46,929)	(46,929)	(48,829)	(46,929)	(46,929)	(46,929)	(46,929)	(48,929)	(46,929)	(46,929)	(46,929)	(48,829)	(46,929)	(48,929)	(46,929)	(46,929)	(46,929)		
Annual Interest	-	28,077	27,713	27,334	26,940	28,528	26,095	25,612	25,095	24,539	23,940	23,284	22,570	21,780	20,916	19,970	18,933	17,778	16,507	15,106	13,561	11,858	9,942	7,821	5,473	2,875		
Closing Balance	280,770	277,127	273,343	269,399	265,277	260,953	256,121	250,946	245,388	239,402	232,939	225,701	217,800	209,160	199,701	189,334	177,786	165,070	151,059	135,615	118,594	99,425	78,213	54,734	28,750	(0)		

Annex E-4: Table 2c - i

System 2c: Thermal Treatment of Solid Recovered Fuel with Biogas Recovery

Low Cost Estimate at Constant 2006 Price Levels

Initial Capital Costs 250,000 tpy Facility ($ X 1,000)						Recycling Material Revenue																						
Planning & Approvals	2,000	(in addition to Residual Waste Study)																										
Land (site & large buffer)	16,875	(13.5 Ha of land @ $1,250,000 / Ha)																										
Thermal Process Facility	220,500						Tonnes	Price /Tonne	Revenue																			
Mechanical Process Facility	14,250					Gable Top	588	50	29,400																			
Biological Process Facility	23,310					Aseptic	88	50	4,400																			
						PETE	1,500	360	540,000																			
						HDPE	904	530	479,120																			
Sub Total	276,935					Aluminum	772	1500	1,158,000																			
						Ferrous	3,937	100	393,700																			
Contingency (Included)						Other Mat	5,380	50	268,000																			
Engineering (included)																												
Interest During Const @2.5%	6,923					Totals	13,186		2,873,620																			
Total Initial Capital	263,658																											
					Average Price per Tonne			$ 218																					
Annual Operating Costs & Prices																												
Annual Operating Cost	17,550	($ X 1,000)																										
Electricity Sales	$ 65	per Mwh																										
Recovered Recyclebles Sales	$ 218	per tonne																										
Landfill Residue Disposal	$ 70	per tonne																										
APC Residue Disposal	$ 300	per tonne																										
Interest RateCost of Capital	5%		0.0058333																									
System Cost per Tonne	$ 140																											
	Time 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25		
		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035		
Annual Quantities (tonnes)																												
Total Material Generated		637,300	652,392	667,841	683,657	699,847	708,800	723,967	738,465	755,301	771,482	780,900	796,241	811,901	827,889	844,211	855,400	871,215	887,346	903,801	920,584	924,500	939,031	953,805	968,828	984,103		
Al-Source Diversion Rate		60.0%	60.6%	61.2%	61.8%	62.3%	62.9%	63.5%	64.1%	64.7%	65.3%	65.8%	66.4%	67.0%	67.6%	68.2%	68.8%	69.3%	69.9%	70.6%	71.1%	71.7%	72.3%	72.8%	73.4%	74.0%		
Portion to Disposal		40.0%	39.4%	38.8%	38.3%	37.7%	37.1%	36.5%	35.9%	35.3%	34.8%	34.2%	33.6%	33.0%	32.4%	31.8%	31.3%	30.7%	30.1%	29.5%	28.9%	28.3%	27.8%	27.2%	26.6%	26.0%		
Total Material for Disposal		254,920	257,151	259,345	261,499	263,609	262,847	264,248	265,591	266,673	266,090	266,808	267,404	267,827	268,374	268,741	267,313	267,173	266,943	266,821	266,202	261,942	260,581	258,117	257,547	255,867		
Total Material to Facility		250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000		
Surplus Material to Landfill		4,920	7,151	9,345	11,499	13,609	12,847	14,248	15,591	16,673	16,090	16,807	17,404	17,827	18,374	18,741	17,312	17,173	16,943	16,821	16,202	11,942	10,581	9,117	7,547	5,867		
Total Waste to Facility (tonnes)	-	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000		
Recovered Materials		13,169	13,169	13,169	13,169	13,169	13,169	13,169	13,169	13,169	13,169	13,169	13,169	13,169	13,169	13,169	13,169	13,169	13,169	13,169	13,169	13,169	13,169	13,169	13,169	13,169		
Facility Residue to Landfill		111,563	111,563	111,563	111,563	111,563	111,563	111,563	111,563	111,563	111,563	111,563	111,563	111,563	111,563	111,563	111,563	111,563	111,563	111,563	111,563	111,563	111,563	111,563	111,563	111,563		
APC Residue to Disposal		3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500		
Total Residue to Landfill		116,463	116,714	120,908	123,062	125,172	124,410	125,611	127,154	128,436	129,653	126,371	128,967	129,490	129,937	130,304	128,876	128,736	128,506	128,184	127,765	123,505	122,144	120,680	119,110	117,430		
Electricity Output Mwh		114,500	114,500	114,500	114,500	114,500	114,500	114,500	114,500	114,500	114,500	114,500	114,500	114,500	114,500	114,500	114,500	114,500	114,500	114,500	114,500	114,500	114,500	114,500	114,500	114,500		
Life Cycle Costs (X 1,000)																												
Initial Capital	263,659																											
Net Electricity Sales Revenue		(9,733)	(9,733)	(9,733)	(9,733)	(9,733)	(9,733)	(9,733)	(9,733)	(9,733)	(9,733)	(9,733)	(9,733)	(9,733)	(9,733)	(9,733)	(9,733)	(9,733)	(9,733)	(9,733)	(9,733)	(9,733)	(9,733)	(9,733)	(9,733)	(9,733)		
Recovered Recyclables Sales Revenue		(2,674)	(2,674)	(2,674)	(2,674)	(2,674)	(2,674)	(2,674)	(2,674)	(2,674)	(2,674)	(2,674)	(2,674)	(2,674)	(2,674)	(2,674)	(2,674)	(2,674)	(2,674)	(2,674)	(2,674)	(2,674)	(2,674)	(2,674)	(2,674)	(2,674)		
Facility Operating Costs		17,550	17,550	17,550	17,550	17,550	17,550	17,550	17,550	17,550	17,550	17,550	17,550	17,550	17,550	17,550	17,550	17,550	17,550	17,550	17,550	17,550	17,550	17,550	17,550	17,550		
Residue Disposal Cost Including APC		9,204	9,360	9,514	9,664	9,812	9,759	9,857	9,951	10,041	10,126	10,036	10,076	10,114	10,148	10,171	10,071	10,061	10,045	10,023	9,994	8,695	8,600	8,498	8,388	8,270		
Total Annual Cost	263,658	14,148	14,304	14,457	14,608	14,756	14,703	14,801	14,895	14,984	15,070	14,980	15,022	15,058	15,089	15,115	15,015	15,005	14,989	14,967	14,937	14,639	14,544	14,441	14,332	14,214		
PV Costs	466,222																											
Levelized Quantity	3,356																											
Total All Costs	852,932																											
Total Quantity	8,250																											
Average Cost per Tonne	$ 104																											
	Time 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25		
Annual Quantity		250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000		
Annual Tip Fee Revenue	140	34,883	34,883	34,883	34,883	34,883	34,883	34,883	34,883	34,883	34,883	34,883	34,883	34,883	34,883	34,883	34,883	34,883	34,883	34,883	34,883	34,883	34,883	34,883	34,883	34,883		
Levelized Cost Calculation (X 1,000)																												
Open Balance	-	263,658	277,316	270,604	263,709	256,620	249,324	241,610	233,609	225,301	216,668	207,688	198,170	188,216	177,804	166,901	155,479	143,386	130,678	117,316	103,268	88,487	72,668	55,962	38,319	19,684		
Annual Net Costs	263,658	14,148	14,304	14,457	14,608	14,756	14,703	14,801	14,895	14,984	15,070	14,980	15,022	15,058	15,089	15,115	15,015	15,005	14,989	14,967	14,937	14,639	14,544	14,441	14,332	14,214		
Annual Tip Fee Revenue	-	(34,883)	(34,883)	(34,883)	(34,883)	(34,883)	(34,883)	(34,883)	(34,883)	(34,883)	(34,883)	(34,883)	(34,883)	(34,883)	(34,883)	(34,883)	(34,883)	(34,883)	(34,883)	(34,883)	(34,883)	(34,883)	(34,883)	(34,883)	(34,883)	(34,883)		
Annual Interest	-	14,193	13,866	13,530	13,185	12,831	12,466	12,081	11,680	11,265	10,833	10,384	9,909	9,411	8,890	8,345	7,774	7,169	6,534	5,866	5,163	4,424	3,633	2,798	1,916	984		
Closing Balance	263,658	277,316	270,604	263,709	256,620	249,324	241,610	233,609	225,301	216,668	207,689	198,170	188,216	177,804	166,901	155,479	143,386	130,678	117,316	103,268	88,487	72,668	55,962	38,319	19,684	(0)		

Annex E-4: Table 2c - ii

System 2c: Thermal Treatment of Solid Recovered Fuel with Biogas Recovery

High Cost Estimate at Constant 2006 Price Levels

Initial Capital Costs 250,000 tpy Facility ($ X 1,000)						**Recycling Material Revenue**																						
Planning & Approvals	2,000	(in addition to Residuel Waste Study)																										
Land (site & terge buffer)	16,875	(13.5 Ha of land @ $1,250,000 / Ha)																										
Thermal Process Facility	220,500																											
Mechanical Process Facility	14,250						Tonnes	Price /Tonne	Revenue																			
Biological Process Facility	23,310					Gable Top	588	50	29,400																			
						Aseptic	88	50	4,400																			
						PETE	1,500	360	540,000																			
						HDPE	904	530	479,120																			
Sub Total	276,935					Aluminum	772	1500	1,158,000																			
						Ferrous	3,937	100	393,700																			
Contingency (included)						Other Met	5,380	50	269,000																			
Engineering (included)																												
Interest During Const @ 5%	13,847					Totals	13,189		2,873,620																			
Total Initial Capital	290,782																											
					Average Price per Tonne			$ 218																					
Annual Operating Costs & Prices																												
Annual Operating Cost	17,550	($ X 1,000)																										
Electricity Sales	$ 60	per Mwh																										
Recovered Recyclables Sales	$ 218	per tonne																										
Landfill Residue Disposal	$ 100	per tonne																										
APC Residue Disposal	$ 300	per tonne																										
Interest Rate/Cost of Capital	10%		0.0058333																									
System Cost per Tonne	$ 213																											
	Time 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25		
		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035		
Annual Quantities (tonnes)																												
Total Material Generated		637,300	652,392	667,841	683,657	699,847	708,800	723,967	739,465	755,301	771,482	780,900	796,241	811,901	827,889	844,211	855,400	871,215	887,346	903,801	920,584	924,500	939,031	953,805	968,828	984,103		
At Source Diversion Rate		60.0%	60.6%	61.2%	61.8%	62.3%	62.9%	63.5%	64.1%	64.7%	65.3%	65.8%	66.4%	67.0%	67.6%	68.2%	68.8%	69.3%	69.9%	70.5%	71.1%	71.7%	72.3%	72.8%	73.4%	74.0%		
Portion to Disposal		40.0%	39.4%	38.8%	38.3%	37.7%	37.1%	36.5%	35.9%	35.3%	34.8%	34.2%	33.6%	33.0%	32.4%	31.8%	31.3%	30.7%	30.1%	29.5%	28.8%	28.3%	27.6%	27.2%	26.6%	26.0%		
Total Material for Disposal		254,920	257,151	259,345	261,499	263,609	262,847	264,248	265,591	266,873	268,090	266,808	267,404	267,927	268,374	268,741	267,313	267,173	266,943	266,821	266,202	261,942	260,581	259,117	257,547	255,867		
Total Material to Facility		250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000		
Surplus Material to Landfill		4,920	7,151	9,345	11,499	13,609	12,847	14,248	15,591	16,873	18,090	16,807	17,404	17,927	18,374	18,741	17,312	17,173	16,943	16,821	16,202	11,942	10,581	9,117	7,547	5,867		
Total Waste to Facility (tonnes)		250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000		
Recovered Materials		13,169	13,169	13,169	13,169	13,188	13,169	13,169	13,169	13,168	13,168	13,169	13,169	13,169	13,169	13,169	13,169	13,168	13,169	13,169	13,169	13,169	13,169	13,169	13,169	13,169		
Facility Residue to Landfill		111,563	111,563	111,563	111,563	111,563	111,563	111,563	111,563	111,563	111,563	111,563	111,563	111,563	111,563	111,563	111,563	111,563	111,563	111,563	111,563	111,563	111,563	111,563	111,563	111,563		
APC Residue to Disposal		3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500		
Total Residue to Landfill		116,483	118,714	120,908	123,062	125,172	124,410	125,811	127,154	128,436	128,653	128,371	128,967	129,490	129,937	130,304	128,878	128,736	128,506	128,184	127,765	123,505	122,144	120,680	119,110	117,430		
Electricity Output Mwh		114,500	114,500	114,500	114,500	114,500	114,500	114,500	114,500	114,500	114,500	114,500	114,500	114,500	114,500	114,500	114,500	114,500	114,500	114,500	114,500	114,500	114,500	114,500	114,500	114,500		
Life Cycle Costs (X 1,000)																												
Initial Capital	290,782																											
Net Electricity Sales Revenue		(6,870)	(6,870)	(6,870)	(6,870)	(6,870)	(6,870)	(6,870)	(6,870)	(6,870)	(8,870)	(8,870)	(6,870)	(6,870)	(6,870)	(8,870)	(8,870)	(6,870)	(6,870)	(6,870)	(6,870)	(8,870)	(6,870)	(6,870)	(8,870)	(6,870)		
Recovered Recyclables Sales Revenue		(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)	(2,874)		
Facility Operating Costs		17,550	17,550	17,550	17,550	17,550	17,550	17,550	17,550	17,550	17,550	17,550	17,550	17,550	17,550	17,550	17,550	17,550	17,550	17,550	17,550	17,550	17,550	17,550	17,550	17,550		
Residue Disposal Cost Including APC		12,698	12,921	13,141	13,356	13,567	13,491	13,631	13,765	13,894	14,015	13,887	13,947	13,999	14,044	14,080	13,938	13,924	13,901	13,868	13,827	13,400	13,264	13,118	12,961	12,793		
Total Annual Cost	290,782	20,505	20,728	20,947	21,163	21,374	21,297	21,437	21,572	21,700	21,822	21,693	21,753	21,805	21,850	21,887	21,744	21,730	21,707	21,675	21,633	21,207	21,071	20,924	20,767	20,599		
PV Costs	440,053																											
Levelized Quantity	2,063																											
Total Alt Costs	825,372																											
Total Quantity	6,250																											
Average Cost per Tonne	$ 132																											
	Time 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25		
Annual Quantity		250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000		
Annual Tip Fee Revenue	213	53,328	53,328	53,328	53,328	53,328	53,328	53,328	53,328	53,328	53,328	53,328	53,328	53,329	53,328	53,328	53,328	53,328	53,328	53,328	53,328	53,328	53,328	53,328	53,328	53,328		
Levelized Cost Calculation (X 1,000)																												
Open Balance		290,782	287,037	283,141	279,074	274,816	270,344	265,348	259,992	254,235	248,031	241,328	233,828	225,634	216,675	206,865	196,111	184,138	170,954	156,428	140,419	122,766	102,921	80,856	56,649	29,753		
Annual Net Costs	290,782	20,505	20,728	20,947	21,163	21,374	21,297	21,437	21,572	21,700	21,822	21,693	21,753	21,805	21,850	21,887	21,744	21,730	21,707	21,675	21,633	21,207	21,071	20,924	20,767	20,598		
Annual Tip Fee Revenue		(53,328)	(53,328)	(53,328)	(53,328)	(53,328)	(53,328)	(53,328)	(53,328)	(53,328)	(53,328)	(53,328)	(53,328)	(53,328)	(53,328)	(53,328)	(53,328)	(53,328)	(53,328)	(53,328)	(53,328)	(53,328)	(53,328)	(53,328)	(53,328)	(53,328)		
Annual Interest	-	29,078	28,704	28,314	27,907	27,482	27,034	26,535	25,999	25,424	24,803	24,133	23,383	22,583	21,668	20,687	18,611	18,414	17,095	15,643	14,042	12,277	10,292	8,096	5,665	2,975		
Closing Balance	290,782	287,037	283,141	279,074	274,816	270,344	265,348	259,992	254,235	248,031	241,328	233,828	225,634	216,675	206,865	196,111	184,138	170,954	156,429	140,419	122,766	102,921	80,956	56,649	29,753	(0)		