AEROBIC LANDFILL TECHNOLOGIES

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Landfill Closure Options

(BASED ON 1MT LANDFILL)

ANAEROBIC CLOSURE

The conventional landfill closure option. The organic waste in the landfill will take more than 150 years to fully stabilize, all the while producing landfill gas and leachate as by-products of the decomposition.

CAP AND MONITOR

The most basic of landfill closure options; install the final cap and monitor the landfill for the required time, addressing environmental and regulatory issues as they arise.

LFG FLARING

An augmentation to "cap and monitor", after the cap is installed wells are drilled into the waste mass and a gas extraction system is installed to convey the landfill gas (LFG) to a flare for methane combustion. Under Alberta regulations, the greenhouse gasses destroyed at the flare can generate carbon offset credits for 13 years.

LFG TO ENERGY

Creating a value addition from the "LFG flaring" option, using a generator in place of the flare. Typical LFG to energy systems operate for 15 years, at which point the gas production at the landfill has reduced by half and either a smaller system needs to be installed or the process is halted. In Alberta carbon offset credits can be generated for 13 years of operation.

AEROBIC LANDFILL BIOREACTOR

This new method of landfill stabilization involves air being injected into the landfill to create aerobic conditions in the waste. The landfill is stabilized within 5 years, while avoiding methane emissions in the landfill gas and avoiding leachate production.

AEROBIC WITH CLOSURE

After the landfill is stabilized a final cover is installed and monitored. This option does not reclaim the land, but the risks associated with future regulation changes and unexpected releases of leachate or gas are minimized

AEROBIC WITH EXPANSION

After the aerobic stabilization of the site, the site will have settled by approximately 35%. The landfill can be reopened, as a vertical expansion of the site, accepting 35% more waste. This option reintroduces landfill life and a new source of income.

AEROBIC WITH MINING

Once the landfill has been aerobically stabilized, the site can be safely mined to recover material as well as reclaiming the land for new uses. As the landfill is mined, the stabilized waste can be separated and 90% of the waste can be reused. This option creates a value addition in the form of materials that can be sold for recycling, materials that can be repurposed and the recovery of the land for any new uses or as a new landfill site.

	AEROBIC WITH MINING	AEROBIC WITH EXPANSION	AEROBIC WITH CLOSURE	LFG TO ENERGY	LFG FLARING	CAP AND MONITOR
Capital Costs	$7,363,000	$7,363,000	$12,230,000	$9,298,000	$8,798,000	$6,848,000
O&M Cost	$14,940,000	$11,480,000	$18,580,000	$16,780,000	$15,530,000	$12,230,000
Carbon Revenue	$37,524,000	$37,524,000	$37,524,000	$14,393,000	$14,393,000	
Electricity Value				$18,589,000		
System Recovery Benefit	$2,050,000	$2,050,000	$2,050,000			
Increased Landfill Space		$5,550,000				
Land Recovery	$15,000,000					
Total	$30,221,000	$24,231,000	$6,714,000	$6,904,000	$(9,935,000)	$(19,078,000)

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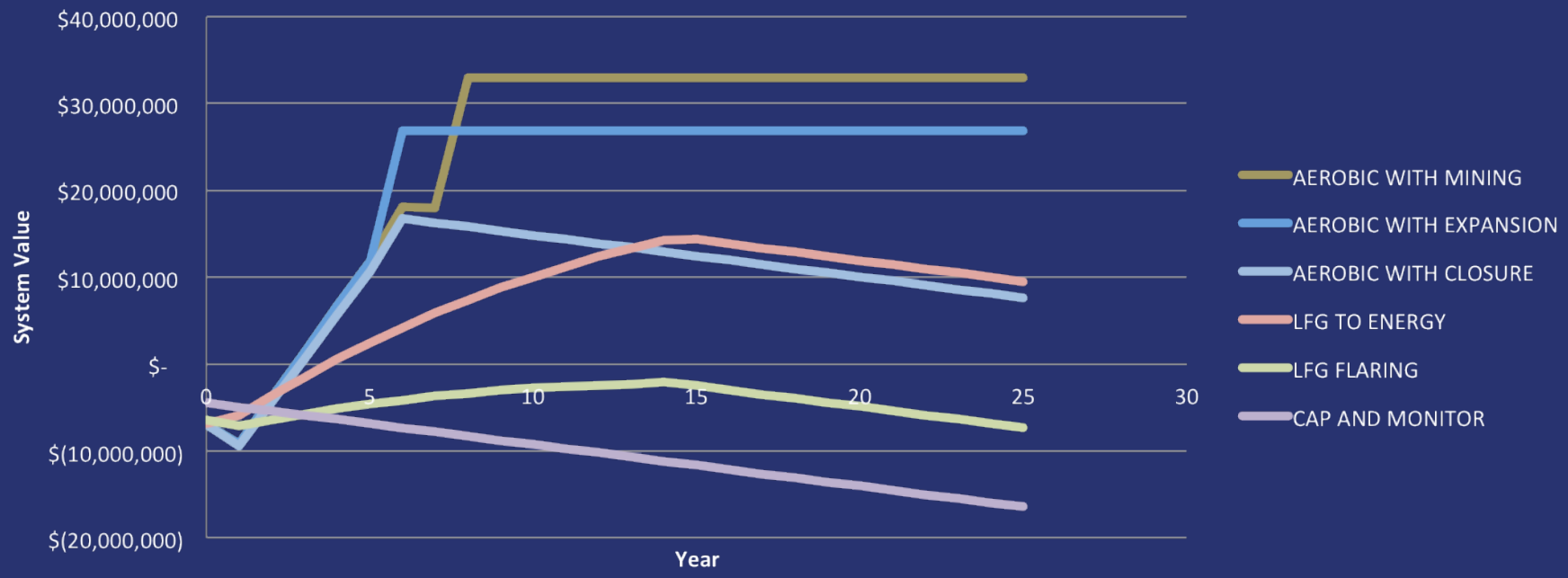

	AEROBIC WITH MINING	AEROBIC WITH EXPANSION	AEROBIC WITH CLOSURE	LFG TO ENERGY	LFG FLARING	CAP AND MONITOR
Cap	Base Layer	Base Layer	Base Layer Impermeable layer topsoil and vegetation	Base Layer Impermeable layer topsoil and vegetation	Base Layer Impermeable layer topsoil and vegetation	Base Layer Impermeable layer topsoil and vegetation
Minimum monitoring Life (years)	7	5*	25**	25	25	25
Ultimate GHG release (TCO_2e)	83,598	83,598	83,598	581,018	636,403	1,169,250
Recovery of value added products	Yes					
Risk of future leachate discharges				Yes	Yes	Yes
Risk of future regulations				Yes	Yes	Yes
Risk of monitoring past 25 years		Yes	Yes	Yes	Yes	Yes
Potential odours				Yes	Yes	Yes
New landfill life	Yes	Yes				

* 5 years of monitoring before the landfill is reopened

** 25 year monitoring starts after the final cover is installed, possibility to decrease monitoring life