Evaluation of Stock Island Landfill for Beneficial Use

PREPARED FOR:	John Paul Castro/ City of Key West
COPY TO:	Sean McCoy
PREPARED BY:	Bo Bruner/ Jacobs, Katie Chapman/ Jacobs
DATE:	January 4, 2019
PROJECT NUMBER:	706814
REVISION NO.:	Final
APPROVED BY:	Bo Bruner/ Jacobs

1.0 Purpose

CH2M (Now Jacobs) appreciates the opportunity to have worked with the City of Key West for your closed landfill since the 1988. Through this work, we have developed a thorough understanding of the landfill site and maintained strong positive relationships with the regulatory community. Recently at your direction, we have performed some preliminary cost opinion tasks and applied a Jacobs proprietary "LandRec "model that evaluates the preliminary feasibility or potential for "reclamation" of landfill sites to the closed City landfill. Jacob's permitting experts have also developed a summary of the potential permitting obligations and constraints that would be associated with mining and reclaiming the landfill property. The evaluation was limited to solid waste, air quality, wetland, and environmental regulations.

The purpose of this technical memorandum (TM) is to present the initial results of this modeling effort, a description of permitting requirements and restraints that would be required if the project were to move forward, and then to provide a discussion of the opportunity available for the City to undertake a "Reclamation" program at the closed Stock Island landfill.

2.0 Project Background

The City of Key West Stock Island Landfill is an unlined Class I Landfill that began operation in the early 1930s and accepted residential and commercial wastes, including construction and demolition debris and white goods from the City of Key West and the nearby Naval Station until 1987. There is no information available on the materials disposed of during the early years of the landfill. In 1987, the waste-to-energy (WTE) facility began operating and the landfill began taking the ash and residue from that operation, about 1,500 to 2,000 tons per month as well as materials that could not be accepted by the WTE facility. Prior to the WTE facility, there was no separation of waste types and all waste was disposed of co-mingled in the landfill. The site was closed in two phases, Phase I was closed in 1990 and Phase II was closed by 1992. The facility was in long-term care for 20 years, until April 24, 2016 when a stabilization report was filed and ended the long-term care.

3.0 Initial Landfill Reclamation LandRec Model Results

Jacobs estimated the volume of the Stock Island Landfill at two different levels: to the road level, as well as to sea level. These estimates were based on information provided by the City and available to the Engineer through previous work on this project.

Total Landfill Volume (yd^3) = from the road 718,000, from sea 1,101,000

The team ran several different scenarios in the LandRec model in order to present the City with multiple cost opinions based on different options for disposal. These are discussed in Section 3.2, below. In all the scenarios that were modeled, the greatest individual cost is always the transportation of the removed materials. All modelling scenarios were based on excavation to road level. Excavation to sea level would present significant logistical and environmental challenges, and was not consider practicable. Even if excavated to sea level, some solid waste would need to be left in place beneath the all-weather perimeter road.

3.1 Key Inputs

Model results are very sensitive to a number of input factors. Jacobs used conservative assumptions in estimating the costs to the City. Additional evaluation of the more sensitive factors could provide a more accurate estimate. Some of the more sensitive factors include:

- Composition of material landfilled: A higher recoverable soil to waste ratio results in less waste to be processed and disposed as part of reclamation and less import of closure material.
- Disposal tonnage: Assumptions were made based on the estimated landfill volume and waste density. The team believes the estimates are reasonable; however, it is important to note that the total tonnage transported and disposed of will have an impact on the cost, either increasing or decreasing.
- Excavation and processing of landfill material: Model uses general industry values to excavate and screen waste material. Since our initial analysis only included costs, the value of reclaimed materials was not considered. The final cost of excavation and processing will be impacted by the actual mix of waste materials. This estimate is purely a conceptual estimate at this stage.
- Transportation of waste to disposal facility and tip fees: Estimate modeled both the City's current contract price for hauling and disposal as well as general industry values for transportation and waste disposal. The estimate is based on transportation to and disposal at the Waste Management Landfill in Palm Beach County at their published disposal rates for MSW and C&D material.
- The team also looked into the logistics and cost estimates for barging the material rather than hauling by land. This may be a preferred alternative not only from a cost perspective, but also reduces the truck traffic on Highway 1 from Key West to Palm Beach, where the increase of 80-100 loads per day would be felt by the community. Even with a fleet of 80 trucks running, this operation could take approximately 3-4 years to complete. This would result in a high greenhouse gas emission level for the project and possible pushback from the community. Barge transport of waste to a Palm Beach County area port will reduce the community impact and truck traffic on Highway 1 as well as having the potential of an overall reduction in transportation cost (barge transport is combined with land transport at point of origination and destination).

Specific input parameters used for this preliminary modeling are shown in Appendix A at the end of this memorandum.

3.2 Opinion of Construction Costs

Jacobs has developed a construction cost opinion using the proprietary LandRec model, based on mining the Stock Island Landfill and properly disposing of the mined waste material. Note that these results are conceptual in nature and are intended for planning purposes. The descriptions of the scenarios and their cost opinions are as follows:

A) For scenario A, the team assumed a cost of $73 per ton contract rate for hauling and disposal, which is the City's current contract rate. The Net Present Value (NPV) under this scenario is negative $69,262,000 with a land value of $4,898,000/acre needed to offset reclamation costs.

B) For scenario B, the team assumed a cost of $40 per ton disposal and $0.54 per ton mile for hauling, which are book values, if the City cannot use their current contract for this waste. The Net Present Value (NPV) under this scenario is negative $186,614,000 with a land value of $13,198,000/acre needed to offset reclamation costs.

C) For scenario C, the team assumed a cost of $73 per ton contract rate for hauling and dispose with an assumption that 3% of the waste will need to be handled as hazardous material. The Net Present Value (NPV) under this scenario is negative $73,783,000 with a land value of $5,218,000/acre needed to offset reclamation costs.

D) For scenario D, the team assumed a cost of $40 per ton disposal and $0.54 per ton mile for hauling with an assumption that 3% of the waste will need to be handled as hazardous material. The Net Present Value (NPV) under this scenario is -$189,692,000 with a land value of $13,415,000/acre needed to offset reclamation costs.

4.0 Permitting Requirements and Constraints

Jacobs has investigated the permitting requirements and constraints associated with mining and reclaiming the landfill. The evaluation did not include local land use, zoning, or building permit requirements. The guidance below is sourced from a compilation of Jacobs internal permitting experts, staff interviews at the Florida State and local levels as well as a guidance document. References are listed at the end of this section. A Pre-Application Meeting will be required between the City of Key West and the South District DEP to discuss the full scope of permitting requirements and constraints for this project.

Solid Waste

The project will require an Excavation and Disposal Plan (EDP), which will be submitted to the South District Office for the Florida Department of Environmental Protection. The EDP will include at least the following three items:

1. Extent of Waste- a delineation of the disposal area where the waste will be excavated, site plan, description of materials in test pits/borings and if ground water is expected to be encountered
2. Gas Concerns- a survey of ambient air conditions prior to excavation and again within ninety days after removal and sampling with soil monitoring probes for combustible gases
3. Waste Removal- a description of the waste removal activities planned

The EDP will also include waste characterizations that will be performed after excavation and before the waste is disposed of off-site. If any hazardous waste is discovered, it will need to be managed in accordance with the requirements of Chapter 62-730, F.A.C. Non- hazardous waste will be considered municipal solid waste and may be disposed of in a permitted Class I Landfill. Some wastes may qualify for disposal in a permitted Class III Landfill.

Water

Excavation of the landfill to road level and would leave some waste in place, and monitoring of the water quality would be required for some period of time. The Florida Department of Environmental Protection (DEP) may allow monitoring wells to be installed, and then require them to be sampled. Alternatively, the DEP may require a Ground Water Monitoring Plan (GWMP), and have the wells and monitoring occur under this plan. The DEP will need to be consulted to determine which approach will be required for this project. The frequency and duration of the monitoring will depend on the results of the water quality testing.

If most the waste is excavated and removed from the site (mining to sea level), then limited water quality sampling (usually one to three times) will usually be required in the area where the wastes were

previously disposed to determine if there are any violations of the Department's water quality standards or criteria. Under this scenario, DEP recommends preparing a Preliminary Contamination Assessment Plan (PCAP) and getting it approved by the DEP. After completing the activities in the PCAP, then a Preliminary Contamination Assessment Report (PCAR) will be prepared for review by the DEP. If the report finds that no water quality violations are occurring, then no further testing will be required.

Air

No air permits or limitations should apply to this project.

Environmental, Wetland and Endangered Species

No direct impact to endangered species is expected since the project will not disturb any areas outside the perimeter road. Storm water controls can be set up along the roadway to minimize any effects to nearby habitat. Since no take, harm or mortality is expected to occur, a Section 10 Incidental Take Permit should not be required. A nesting bird survey may be needed. Prior to the project beginning, the City should discuss the scope with the Department of Fish and Wildlife Services to confirm that they will not require any permits. A request for technical guidance may also be submitted to receive formal documentation of this decision. Other environmental impacts haven't been investigated fully- there are potential issues because of sensitively of the surrounding waters of Florida bay.

Construction

If the landfill is partially excavated, then the South District DEP office must be consulted prior to any construction occurring over the site. They will ensure there is no adverse effects on the environment, and health and safety. A Pre-Application Meeting will be required between the City of Key West and the South District DEP. The department also has a list of recommended guidelines for building over old disposal sites that can be found in Section 6.1 of the Guidance for Disturbance and Use of Old Closed Landfills or Waste Disposal Areas in Florida (link in references, below), but has instructed the team that more extensive protection measures may apply for material removed from the site. Any additional requirements will be discussed during the preapplication meeting once the DEP team has reviewed the full scope of the project.

While there are no formal restraints for residential and commercial development, landfill gas must be monitored and mitigated, especially for any structures in which humans will sleep. Mitigation examples include active or passive vents, vapor barriers, hardscape, etc. The DEP can assist in selecting appropriate technologies that they are comfortable with for residential and mixed-use development.

References for Permitting Requirements and Constraints

GUIDANCE FOR DISTURBANCE AND USE OF OLD CLOSED LANDFILLS OR WASTE DISPOSAL AREAS IN FLORIDA, Version 2.2 August 19, 2015 https://floridadep.gov/waste/permitting-compliance-assistance/content/beneficial-uses-wastes-and-old-landfills

Cory Dilmore, Department of Environmental Protection Tallahassee Office (850) 245-8712

Renee Kwiat, Department of Environmental Protection South District Office (239) 344-5673

Nolin Moon, Department of Environmental Protection Ft. Meyers Office (239) 344-5672

Richard Reaves, Jacobs Senior Ecologist Atlanta Office (678) 530-4285

5.0 Reasons to Consider Reclamation of the Site

As discussed above, Jacobs has performed some preliminary cost opinion modeling which preliminarily indicates that a reclamation program result in significant expense and/or capital outlay in the near future to accomplish the project. Thus, if no other financial or non-financial benefits will be realized by the City as a result of this project, undertaking the effort would need to be driven by motivations beyond purely economic.

There are a variety of reasons for the City to consider reclamation of this landfill, which were not considered in the model, primarily consisting of the following:

- Avoiding perpetual maintenance, landfill-related costs
- Increasing the land value
- Making the site available for other uses
- Protecting and enhancing Natural Resources

Appendix A
LandRec User Input Sheets

Scenario A

Landfill Reclamation Evaluation Tool v. 2.0

User Input Sheet

This model calculates a concept-level estimate of the net land value of a reclaimed landfill site taking into consideration costs of reclamation, constraints on use of site after reclamation, and inherent land value to owner.

Instructions: Input data into shaded cells only. Sheet should be completed with assistance of CH2M HILL staff

	Input	Units	Instructions and Typical Values
			Disclaimer: Unit cost values provided are generic and are based on 2007 costs. User should adjust costs, as appropriate.
FACILITY INFORMATION:			
Site name	Stock Island		Name of landfill to be evaluated
Term to be modeled for post reclamation income	NA	Yrs	
Is the site planned, active, or closed?	Closed	Pulldown Menu	Select from pull down menu
Type of Reclamation. Includes partial clean closure (portion of site reclaimed) and full clean closure (entire site reclaimed). Also includes	Partial clean closure, no screening/separation	Pulldown Menu	Select from pull down menu
REGULATORY/PERMITTING REQUIREMENTS			
Is the site under cleanup order?	No	Yes/No	
Is an EIR/EIS or similar report required? This is typically required if the landfill is planned, there is a cleanup order, or there is an alternate land use proposed.	No	Yes/No	
Estimated NEPA/CEQA costs	$0	dollars	If no EIR/EIS required, enter zero cost. These are site specific, typ range of $50,000 to $500,000 (not full NEPA/CEQA); default $75,000
Other permitting costs for projected land use. Includes construction permits, stormwater permits, typical waste management permits and requirements (SWFP, WDRs), etc.	$100,000	dollars	If no permitting cost required, enter zero cost. These are site specific, typ range of $10,000 to $100,000; default $50,000.
DISPOSAL COSTS			OFFSITE DISPOSAL COST CALCULATION
Total Landfill Volume	717,000	yd^3	If unknown, leave blank, will calculate using other parameters
Landfill Footprint	14.14	acres	Total Acreage of landfill module where reclamation (full or partial) will occur.
Average Depth of Landfill	31.4	ft	Average thickness/depth of landfill module to be reclaimed
Start Fill Date	1930	Yr	
End Fill Date	1993	Yr	
Expected Reclamation Date	2020	Yr	
Estimated In-Place Waste Density	1,350	lb/yd^3	Estimate if unknown, typ. range of 950 to 1800 lb/yd^3; default 1200 lb/yd^3
Estimated In-Place C&D Density	130	lb/ft^3	Range depends on type of C&D. If primarily concrete, use average of 130 pcf.
Estimated Soil Density	100	lb/ft^3	Soil density varies based on material type. Use 100 pcf average.
Estimated Acres to be Reclaimed	14.14	Acres	Acreage of landfill module to be reclaimed
Estimated Acres Available for Use After Reclamation	14.14	Acres	Reclaimed acreage available for reuse

		Percent	Unit Disposal ($/ton)	
Initial Composition of Fill (sum of all categories must total 100%). Note, percentage of waste (C&D + MSW) to soil can range from 3:1 (waste:soil) to 12:1; typical is 6:1.	MSW	100%	$73	Disposal costs vary widely and should be researched for the project location. Disposal at MSW LF can range from $3/ton to $85/ton. Default $38/ton
	C&D	0%		Disposal costs vary widely and should be researched for the project location. Disposal at C&D LF can range from $5/ton to $83/ton. Default $36/ton
	Soil	0%		Most soil will be accepted free of charge at landfills. Costs are typically for trucking only. Default $2/ton.
	Other Waste	0%	$308	Disposal costs vary widely and should be researched for the project location. Special waste, hazardous waste, contaminated, full disposal. Default $100/ton

Expected Percent of MSW Decomposed to Soil. Typically depends on age of waste; the older, the greater percentage decomposed.	0%	Percent	Maximum of 50% is expected for well decomposed waste
Expected Percent of C&D Decomposed to Soil. Typically depends on age of waste; the older, the greater percentage decomposed.	0%	Percent	Maximum of 20% is expected for well decomposed C&D waste
Expected Percent of C&D Material to be Disposed	100%	Percent	
Expected Percent of Reclaimed Soil that will stay on site (will not require disposal)	3.2%	Percent	If not 100, remaining soil gets disposed using tip fee and haul distance specified by user.
Excavation Cost: Includes excavation and loading of waste, decon, and monitoring, confirmation sampling and analysis.	$15	$/$yd^3$	Excavation of waste can range from $6/$yd^3$ to $20/$yd^3$; default use $10/$yd^3$
Processing Cost: Includes removal, screening, waste characterization and segregation	$0	$/$yd^3$	Varies widely based on process used. Default $20/$yd^3$ (detailed processing).
Cost of Engineering Elements (Reclamation)	10%	Percent	typ range of 3% - 10% of construction costs; default of 5%
Services During Construction (Reclamation)	10%	Percent	typ range of 3% - 10% of construction costs; default of 5%
Transportation Unit Cost (trucking only, cost per ton per mile)	$0.00	$/ton-mi	Trucking can range from $0.10/ton-mi to $2/ton-mi. Default $0.20/ton-mi.

Transportation Distance (1 way, average for all disposal sites)	Disposal Site Type	Miles	one way haul distance
	MSW	200	
	C&D	200	
	Soil	200	
	Other Waste	200	

SITE WORK

Percent of final landfill elevation to be recovered.	65%		% values from 1 to 100 (could be greater if site will be higher after reclamation), value indicates amount of elevation to be replaced by filling after waste excavation
Earthwork to be filled in after excavation	68,438	yd^3	Calculated as %age of landfill to be reclaimed x total landfill volume x %age of land available after reclamation x the percent of landfill elevation to be recovered.
Estimated reclaimed usable soils	45,625.1 bcy	yd^3	
Other soil fill material available on site	0 cy	yd^3	
Import Soil Needed to Complete Fill	12,500	byd^3	
Soil Surplus to be Removed from Site	0	yd^3	
Estimated Volume of Water to be Controlled	0	MG	Cost for any dewatering activities expected during the project.

		Percent	Unit Cost ($/yd^3)	
Composition of Fill Material: includes material, hauling, placement, and compaction.	Reclaimed Material	50%	$15	Cost for fill placement, typ $4 to $12 per yd^3; default use $6/$yd^3$
	Engineering Fill	50%	$85	Cost for fill placement varies widely, depending on whether import is required, cost of import, etc., typ $5 to $40 per cy; default of $25/$yd^3$

Cost per Acre of Additional Site Work. Includes mobilization, clearing and grubbing, subgrade preparation, etc.	$50,000	$/Acre	typ range of $10,000 to $100,000 per acre; default $50,000 per acre
Cost of Stormwater controls. Includes drainage ditches, basins, energy dissipaters, etc.	$100,000	Dollars	Range varies widely depending on size of site, local drainage requirements, etc; default use $50,000
Cost per million gallons for Dewatering. Includes collection, treatment, and disposal.	$100,000	$/MG	Range varies widely depending on size of site, local drainage requirements, etc; default use $1000/acre
Cost of Site Access Improvements and Controls	$300,000	Dollars	
Cost of Onsite Roads and Paths	$150,000	Dollars	
Cost of Site Re-vegetation, irrigation and other landscaping	$350,000	$/Acre	This value will vary significantly, depending on what type of revegetation is planned for the site. For basic erosion prevention (hydroseed), typical ranges $2000/acre-$3500/acre. More aggressive revegation could be part of the site redevelopment and will not be incorporated here. Default $2500/acre
Cost of Slope Reinforcements and Retaining Walls	$0	Dollars	
Cost of Engineering Elements	10.0%	Percent	typ range of 3% - 10% of construction costs; default of 5%
Services During Construction	8.0%	Percent	typ range of 3% - 10% of construction costs; default of 5%

User Input Sheet

FACILITY INFORMATION:

Site name	Stock Island		Name of landfill to be evaluated
Term to be modeled for post reclamation income	NA	Yrs	
Is the site planned, active, or closed?	Closed	Pulldown Menu	Select from pull down menu
Type of Reclamation. Includes partial clean closure (portion of site reclaimed) and full clean closure (entire site reclaimed). Also includes	Partial clean closure, no screening/separation	Pulldown Menu	Select from pull down menu

REGULATORY/PERMITTING REQUIREMENTS

Is the site under cleanup order?	No	Yes/No	
Is an EIR/EIS or similar report required? This is typically required if the landfill is planned, there is a cleanup order, or there is an alternate land use proposed.	No	Yes/No	
Estimated NEPA/CEQA costs	$0	dollars	If no EIR/EIS required, enter zero cost. These are site specific, typ range of $50,000 to $500,000 (not full NEPA/CEQA); default $75,000
Other permitting costs for projected land use. Includes construction permits, stormwater permits, typical waste management permits and requirements (SWFP, WDRs), etc.	$100,000	dollars	If no permitting cost required, enter zero cost. These are site specific, typ range of $10,000 to $100,000; default $50,000.
Health and Safety Supervision	2.15%	Percent	Typical range of _____of construction costs for incidental level H&S. If hazardous waste is present, typical range of_____ of construction costs; default
Overhead Costs (Construction Only)	12.5%	Percent	Typical Range: 8% to 15%; default use 10%

CURRENT AND PROJECTED CLOSURE/POSTCLOSURE COSTS

Discount Rate for NPV analysis			Discount Rate may be obtained from Office of Management and Budget, Circular No. A-94, Appendix C, or as determined by user policy.
Current Annual and/or Post Closure Costs	$0	Dollars	$0 to $1,000,000
Remaining Term of Annual and/or Post Closure Costs	0	Years	0 to 50 years, 30 year postclosure period per Title 27
Future Estimated Annual/Post Closure Costs (post reclamation)	$0	Dollars	
Term of Estimated Annual/Post Closure Costs	0	Years	0 to 50 years
Anticipated Closure or other Capital Costs without Reclamation	$0	Dollars	$0 to $15,000,000
Projected Closure or Other Capital Costs Remaining (post reclamation)	$0	Dollars	$0 to $10,000,000
Will Structures Be Built On Site as Part of Reclamation?	No	Yes/No	
Cost of Protecting Structure	$0	Total Cost	If there are no structures, if structures are not onsite or if costs of structure protection will be borne by site development, enter zero

OTHER COSTS

		% Recovered	Density (ton/yd^3)	Cost per ton	
Recoverables	Ferrous	0%			There are no typical ranges. One site achieved 8% recover, while others were unknown. Material densities are averages from literature, but may not be appropriate. Costs per ton should reflect current industry values.
	Plastics	0%			There are no typical ranges. One site achieved 8% recover, while others were unknown. Material densities are averages from literature, but may not be appropriate. Costs per ton should reflect current industry values.

Current and Projected total income from site under current conditions	$0	Dollars	$0 to $1,000,000
Assigned value for non-economic benefits	$0	Dollars	This value will be typically be $0, but it can be used IF there is a definable non-economic "value" to having the site reclaimed. For example, are the neighbors willing to pay the landfill owner so that the landfill will "go away" and make their property have more perceived value.

This tool uses assumed values and simplified assumptions to generate generic planning level information. A more robust analysis in screening would be needed for an accurate estimate of net la development or policy decision analysis.

Scenario B

The only changes from Scenario A's User Inputs are shown in the Disposal Cost section, below.

DISPOSAL COSTS

OFFSITE DISPOSAL COST CALCULATION

Total Landfill Volume		717,000	yd^3	If unknown, leave blank, will calculate using other parameters
Landfill Footprint		14.14	acres	Total Acreage of landfill module where reclamation (full or partial) will occur.
Average Depth of Landfill		31.4	ft	Average thickness/depth of landfill module to be reclaimed
Start Fill Date		1930	Yr	
End Fill Date		1993	Yr	
Expected Reclamation Date		2020	Yr	
Estimated In-Place Waste Density		1,350	lb/yd^3	Estimate if unknown, typ. range of 950 to 1800 lb/yd^3; default 1200 lb/yd^3
Estimated In-Place C&D Density		130	lb/ft^3	Range depends on type of C&D. If primarily concrete, use average of 130 pcf.
Estimated Soil Density		100	lb/ft^3	Soil density varies based on material type. Use 100 pcf average.
Estimated Acres to be Reclaimed		14.14	Acres	Acreage of landfill module to be reclaimed
Estimated Acres Available for Use After Reclamation		14.14	Acres	Reclaimed acreage available for reuse
		Percent	Unit Disposal ($/ton)	
Initial Composition of Fill (sum of all categories must total 100%). Note, percentage of waste (C&D + MSW) to soil can range from 3:1 (waste:soil) to 12:1; typical is 6:1.	MSW	100%	$40	Disposal costs vary widely and should be researched for the project location. Disposal at MSW LF can range from $3/ton to $85/ton. Default $38/ton
	C&D	0%		Disposal costs vary widely and should be researched for the project location. Disposal at C&D LF can range from $5/ton to $83/ton. Default $36/ton
	Soil	0%		Most soil will be accepted free of charge at landfills. Costs are typically for trucking only. Default $2/ton.
	Other Waste	0%	$200	Disposal costs vary widely and should be researched for the project location. Special waste, hazardous waste, contaminated, full disposal. Default $100/ton
Expected Percent of MSW Decomposed to Soil. Typically depends on age of waste; the older, the greater percentage decomposed.		0%	Percent	Maximum of 50% is expected for well decomposed waste
Expected Percent of C&D Decomposed to Soil. Typically depends on age of waste; the older, the greater percentage decomposed.		0%	Percent	Maximum of 20% is expected for well decomposed C&D waste
Expected Percent of C&D Material to be Disposed		100%	Percent	
Expected Percent of Reclaimed Soil that will stay on site (will not require disposal)		3.2%	Percent	If not 100, remaining soil gets disposed using tip fee and haul distance specified by user.
Excavation Cost: Includes excavation and loading of waste, decon, and monitoring, confirmation sampling and analysis.		$15	$/$yd^3$	Excavation of waste can range from $6/$yd^3$ to $20/$yd^3$; default use $10/$yd^3$
Processing Cost: Includes removal, screening, waste characterization and segregation		$0	$/$yd^3$	Varies widely based on process used. Default $20/$yd^3$ (detailed processing).
Cost of Engineering Elements (Reclamation)		10%	Percent	typ range of 3% - 10% of construction costs; default of 5%
Services During Construction (Reclamation)		10%	Percent	typ range of 3% - 10% of construction costs; default of 5%
Transportation Unit Cost (trucking only, cost per ton per mile)		$0.54	$/ton-mi	Trucking can range from $0.10/ton-mi to $2/ton-mi. Default $0.20/ton-mi.
Transportation Distance (1 way, average for all disposal sites)		Disposal Site Type	Miles	one way haul distance
		MSW	200	
		C&D	200	
		Soil	200	
		Other Waste	200	

Scenario C

The only changes from Scenario A's User Inputs are shown in the Disposal Cost section, below.

DISPOSAL COSTS

OFFSITE DISPOSAL COST CALCULATION

Total Landfill Volume		717,000	yd^3	If unknown, leave blank, will calculate using other parameters
Landfill Footprint		14.14	acres	Total Acreage of landfill module where reclamation (full or partial) will occur.
Average Depth of Landfill		31.4	ft	Average thickness/depth of landfill module to be reclaimed
Start Fill Date		1930	Yr	
End Fill Date		1993	Yr	
Expected Reclamation Date		2020	Yr	
Estimated In-Place Waste Density		1,350	lb/yd^3	Estimate if unknown, typ. range of 950 to 1800 lb/yd^3; default 1200 lb/yd^3
Estimated In-Place C&D Density		130	lb/ft^3	Range depends on type of C&D. If primarily concrete, use average of 130 pcf.
Estimated Soil Density		100	lb/ft^3	Soil density varies based on material type. Use 100 pcf average.
Estimated Acres to be Reclaimed		14.14	Acres	Acreage of landfill module to be reclaimed
Estimated Acres Available for Use After Reclamation		14.14	Acres	Reclaimed acreage available for reuse
		Percent	Unit Disposal ($/ton)	
Initial Composition of Fill (sum of all categories must total 100%). Note, percentage of waste (C&D + MSW) to soil can range from 3:1 (waste:soil) to 12:1; typical is 6:1.	MSW	97%	$73	Disposal costs vary widely and should be researched for the project location. Disposal at MSW LF can range from $3/ton to $85/ton. Default $38/ton
	C&D	0%		Disposal costs vary widely and should be researched for the project location. Disposal at C&D LF can range from $5/ton to $83/ton. Default $36/ton
	Soil	0%		Most soil will be accepted free of charge at landfills. Costs are typically for trucking only. Default $2/ton.
	Other Waste	3%	$308	Disposal costs vary widely and should be researched for the project location. Special waste, hazardous waste, contaminated, full disposal. Default $100/ton
Expected Percent of MSW Decomposed to Soil. Typically depends on age of waste; the older, the greater percentage decomposed.		0%	Percent	Maximum of 50% is expected for well decomposed waste
Expected Percent of C&D Decomposed to Soil. Typically depends on age of waste; the older, the greater percentage decomposed.		0%	Percent	Maximum of 20% is expected for well decomposed C&D waste
Expected Percent of C&D Material to be Disposed		100%	Percent	
Expected Percent of Reclaimed Soil that will stay on site (will not require disposal)		3.2%	Percent	If not 100, remaining soil gets disposed using tip fee and haul distance specified by user.
Excavation Cost: Includes excavation and loading of waste, decon, and monitoring, confirmation sampling and analysis.		$15	$/$yd^3$	Excavation of waste can range from $6/$yd^3$ to $20/$yd^3$; default use $10/$yd^3$
Processing Cost: Includes removal, screening, waste characterization and segregation		$0	$/$yd^3$	Varies widely based on process used. Default $20/$yd^3$ (detailed processing).
Cost of Engineering Elements (Reclamation)		10%	Percent	typ range of 3% - 10% of construction costs; default of 5%
Services During Construction (Reclamation)		10%	Percent	typ range of 3% - 10% of construction costs; default of 5%
Transportation Unit Cost (trucking only, cost per ton per mile)		$0.00	$/ton-mi	Trucking can range from $0.10/ton-mi to $2/ton-mi. Default $0.20/ton-mi.
Transportation Distance (1 way, average for all disposal sites)		Disposal Site Type	Miles	one way haul distance
		MSW	200	
		C&D	200	
		Soil	200	
		Other Waste	200	

Scenario D

The only changes from Scenario A's User Inputs are shown in the Disposal Cost section, below.

DISPOSAL COSTS

OFFSITE DISPOSAL COST CALCULATION

Total Landfill Volume	717,000	yd^3	If unknown, leave blank, will calculate using other parameters
Landfill Footprint	14.14	acres	Total Acreage of landfill module where reclamation (full or partial) will occur.
Average Depth of Landfill	31.4	ft	Average thickness/depth of landfill module to be reclaimed
Start Fill Date	1930	Yr	
End Fill Date	1993	Yr	
Expected Reclamation Date	2020	Yr	
Estimated In-Place Waste Density	1,350	lb/yd^3	Estimate if unknown, typ. range of 950 to 1800 lb/yd^3; default 1200 lb/yd^3
Estimated In-Place C&D Density	130	lb/ft^3	Range depends on type of C&D. If primarily concrete, use average of 130 pcf.
Estimated Soil Density	100	lb/ft^3	Soil density varies based on material type. Use 100 pcf average.
Estimated Acres to be Reclaimed	14.14	Acres	Acreage of landfill module to be reclaimed
Estimated Acres Available for Use After Reclamation	14.14	Acres	Reclaimed acreage available for reuse

		Percent	Unit Disposal ($/ton)	
Initial Composition of Fill (sum of all categories must total 100%). Note, percentage of waste (C&D + MSW) to soil can range from 3:1 (waste:soil) to 12:1; typical is 6:1.	MSW	97%	$40	Disposal costs vary widely and should be researched for the project location. Disposal at MSW LF can range from $3/ton to $85/ton. Default $38/ton
	C&D	0%		Disposal costs vary widely and should be researched for the project location. Disposal at C&D LF can range from $5/ton to $83/ton. Default $36/ton
	Soil	0%		Most soil will be accepted free of charge at landfills. Costs are typically for trucking only. Default $2/ton.
	Other Waste	3%	$200	Disposal costs vary widely and should be researched for the project location. Special waste, hazardous waste, contaminated, full disposal. Default $100/ton

Expected Percent of MSW Decomposed to Soil. Typically depends on age of waste; the older, the greater percentage decomposed.	0%	Percent	Maximum of 50% is expected for well decomposed waste
Expected Percent of C&D Decomposed to Soil. Typically depends on age of waste; the older, the greater percentage decomposed.	0%	Percent	Maximum of 20% is expected for well decomposed C&D waste
Expected Percent of C&D Material to be Disposed	100%	Percent	
Expected Percent of Reclaimed Soil that will stay on site (will not require disposal)	3.2%	Percent	If not 100, remaining soil gets disposed using tip fee and haul distance specified by user.
Excavation Cost: Includes excavation and loading of waste, decon, and monitoring, confirmation sampling and analysis.	$15	$/$yd^3$	Excavation of waste can range from $6/$yd^3$ to $20/$yd^3$; default use $10/$yd^3$
Processing Cost: Includes removal, screening, waste characterization and segregation	$0	$/$yd^3$	Varies widely based on process used. Default $20/$yd^3$ (detailed processing).
Cost of Engineering Elements (Reclamation)	10%	Percent	typ range of 3% - 10% of construction costs; default of 5%
Services During Construction (Reclamation)	10%	Percent	typ range of 3% - 10% of construction costs; default of 5%
Transportation Unit Cost (trucking only, cost per ton per mile)	$0.54	$/ton-mi	Trucking can range from $0.10/ton-mi to $2/ton-mi. Default $0.20/ton-mi.

Transportation Distance (1 way, average for all disposal sites)	Disposal Site Type	Miles	one way haul distance
	MSW	200	
	C&D	200	
	Soil	200	
	Other Waste	200	