SOLID WASTE
FINANCIAL ASSURANCE PROGRAM REPORT

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY
WASTE MANAGEMENT DIVISION

December 22, 2000

Chapter 5

Chapter 5 - Procedure for Calculating Final Closure and Post-Closure Costs

The purpose of this chapter is to present the procedure for calculating final closure and post-closure cost estimates. The procedure will present brief and concise explanations for each identified task and service along with the associated unit cost. The tasks and services included in this procedure are based on the more complex closure and post-closure requirements for MSWLFs. C&D and NHISW landfills will find each task and service they require is included in this procedure. However, not every task and service included is required for C&D and NHISW landfills. Owners/Operators of C&D and NHISW landfills should determine which unit costs are applicable to calculate closure and post-closure cost for their facility. Users will be able to input site specific information to calculate the necessary financial assurance. This chapter contains sufficient information to stand alone as a guidance document available to owners and operators to calculate the necessary financial assurance.

5.1 Site Data

All site data necessary to calculate estimates of closure and post closure costs can be gathered by completing Table 5.1. Data from Table 5.1 should be inserted into Tables 5.2 and 5.3 to complete calculations.

Table 5.1 Site Data
FACILITY NAME:
PERMIT NUMBER:

DESCRIPTION	QUANTITY	UNITS
Total Permitted Area		acres
Active Portion		
Composite Lined		acres
Soil Lined		acres
Final Cover Area		
Composite Lined		acres
Soil Lined		acres
Perimeter Fencing		linear feet
Groundwater Monitoring Wells		linear feet
Methane Gas Probes		linear feet
Terraces		linear feet
Letdown Channels		
Perimeter Drainage Ditches		linear feet

5.2 Calculating Closure Costs

Table 5.2 can be used to calculate closure cost estimates for landfills for which site specific data are available. The table is designed to be executed as a computer spreadsheet, but will work equally as well using hand calculations.

The following procedures may be utilized to reach the estimated closure cost:

- Input site specific quantities from Table 5.1 into Table 5.2, making sure the requisite units are used. Some quantities are already given by the table.
- Multiply the value input for quantity by the multiplier and unit cost given by the table, and enter the resultant value in the subtotal column to compute values for Tasks/Services listed in Items 1 through 4.
- Add subtotals for Task/Service Items 1 through 4 to determine a Subtotal for Task/Services, and enter the sum as the value Item 5.
- Compute Administrative Services, Technical and Professional Services and Closure Contingency costs, Items 6, 7 and 8, by multiplying the Subtotal (Item 5) by the multiplier for each respective Item. Enter the resultant values.
- Compute the sum of Items 5,6,7,and 8 and enter the resultant as a value for Total Final Closure, Item 9. The value for Total Final Closure is the estimated Closure Cost for the facility for which data was entered.

Table 5.2 Closure Cost Estimate
FACILITY NAME:
FACILITY TYPE:
FACILITY LOCATION:

	Task/Service	Quantity	Units	Multiplier	Unit Cost	Subtotal
1	**PRELIMINARY SITE WORK**					
a	Conduct Site Evaluation		lump sum	1	$2,750.00	
b	Dispose Final Wastes					
	Average Daily Flow		tons/day			
	Disposal Cost		$/ton	5 days of waste		
c	Remove Temporary Building(s)	1	lump sum	1	$2,450.00	
d	Remove Equipment	1	lump sum	1	$2,000.00	$2,000.00
e	Repair/Replace Perimeter Fencing		linear feet	25% of fencing	$2.20	
f	Clean Leachate Line(s)	1	lump sum	1	$1,250.00	$1,250.00
2	**MONITORING EQUIPMENT**					
a	Rework/Replace Monitoring Well(s)		VLF	25% of wells	$41.40	
b	Plug Abandoned Monitoring Well(s)		VLF	25% of wells	$17.75	
c	Rework/Replace Methane Probe(s)		VLF	25% of probes	$35.75	

d	Plug Abandoned Methane Probe(s)		VLF	25% of probes	$14.00	
e	Rework/Replace Remediation and/or Gas Control Equipment	5% of equipment capital cost	lump sum	1		
3	**CONSTRUCTION**					
a	Complete Site Grading		acres	1	$1,122.00	
b	Construct Final Cap					
	Compacted On-site Clay Cap or		cubic yards	1	$3.20	
	Compacted Off-site Clay Cap or		cubic yards	1	$5.17	
	Install Geosynthetic Clay Liner Cap		square feet	1	$0.38	
c	Construct Landfill Gas Venting Layer					
	Place Sand or		acres	1	$30,000.00	
	Install Net and Geotextile		square feet	1	$0.27	
d	Install Passive Landfill Gas Vents		acres	1	$500.00	
e	Install Flexible Membrane Liner		square feet	1	$0.32	
f	Drainage Layer					
	Place Sand or		acres	1	$30,000.00	
	Install Net and Geonet		square feet	1	$0.27	
g	Place On-site Topsoil		cubic yards	1	$1.50	
	Place Off-site Topsoil		cubic yards	1	$12.00	
h	Establish Vegetative Cover		acres	1	$400.00	
4	**DRAINAGE/EROSION CONTROL**					
a	Construct Terraces		linear feet	1	$7.24	
b	Construct Letdown Channels		linear feet	1	$5.55	
c	Clean Perimeter Drainage Ditches		linear feet	50% of ditches	$4.70	
5	**SUBTOTAL**					
6	**ADMINISTRATIVE SERVICES**	1	lump sum	1	10%	
7	**TECHNICAL and PROFESSIONAL SERVICES**	1	lump sum	1	12%	
8	**CLOSURE CONTINGENCY**	1	lump sum	1	10%	
9	**TOTAL FINAL CLOSURE**					

5.3 Calculating Post-Closure Costs

Table 5.3 can be used to estimate Post-Closure Costs. Table 5.3 may be utilized in the same manner as Table 5.2.

The following procedures may be utilized to reach the estimated post-closure cost:

- Input site specific quantities from Table 5.1 into Table 5.3 making sure the requisite units are used. Some quantities are already given by the table.
- Multiply the value input for quantity by the multiplier and unit cost given by the table, and enter the resultant value in the subtotal column to compute values for Tasks/Services listed in Items 1 through 5.
- Add subtotals for Task/Service Items 1 through 5 to determine a Subtotal for Task/Services, and enter the sum as the value Item 6.
- Compute Administrative Services, Technical and Professional Services and Closure Contingency costs, Items 7,8, and 9, by multiplying the Subtotal (Item 6) by the multiplier for each respective Item. Enter the resultant values.
- Compute the sum of Items 6, 7, 8, and 9 and enter the resultant as a value for Total Post Closure, Item 10. The value for Total Post Closure is the estimated Post-Closure Cost for the facility for which data was entered.

Table 5.3 Post Closure Estimate
FACILITY NAME:
FACILITY TYPE:
FACILITY LOCATION:

	Task/Service	Quantity	Units	Multiplier*	Unit Cost	Subtotal
1	**SITE MAINTENANCE**					
a	Site Inspections	4	per year	30 yrs	$500.00	
b	General Maintenance	1	lump sum	30 years	$1,500.00	
c	Remediation and/or Gas Control Equipment	5% of equipment capital cost	lump sum	one per 5 yrs for 30 years		
2	**MONITORING EQUIPMENT**					
a	Rework/Replace Monitoring Well(s)		VLF	25% of wells	$41.40	
b	Plug Abandoned Well(s)		VLF	25% of wells	$17.75	
c	Final Plugging of Monitoring Wells		VLF	1	$17.75	
d	Rework/Replace Methane Probe(s)		VLF	25% of probes	$35.75	
e	Plug Abandoned Probe(s)		VLF	25% of probes	$14.00	
f	Final Plugging of Methane Probes		VLF	1	$14.00	
g	Final Plugging of Piezometer(s)		VLF	1	$14.00	

3	**SAMPLING and ANALYSIS**					
a	Groundwater Monitoring Wells		wells	2/yr for 30 years	$551.00	
b	Methane Gas Probes		probes	2/yr for 30 years	$35.00	
c	Surface Water Monitoring Points		points	2/yr for 30 years	$65.00	
d	Leachate		sample	2/yr for 30 years	$ 105.00	
4	**FINAL COVER MAINTENANCE**					
a	Mow and Fertilize Vegetative Cover		acres	30 years	$160.00	
b	Repair Erosion, Settlement, and Subsidence for On-site Soils		acres	2 CY/acre for 30 years	$2.00	
	Repair Erosion, Settlement, and Subsidence for Off-site Soils		acres	2 CY/acre for 30 years	$12.00	
c	Re-seed Vegetative Cover		acres	20% of area for 30 years	$400.00	
5	**LEACHATE MANAGEMENT**					
a	Clean Leachate Line(s)	1	lump sum	30 years	$1,250.00	
b	Maintain Leachate Collection System and Equipment	1	lump sum	30 years	$2,000.00	
c	Collect, Treat, Transport, and Dispose Leachate		gallons/year	30 years	$0.25	
6	**SUBTOTAL**					
7	**ADMINISTRATIVE SERVICES**		lump sum	1	6%	
8	**TECHNICAL and PROFESSIONAL SERVICES**		lump sum	1	7%	
9	**POST-CLOSURE CONTINGENCY**		lump sum	1	10%	
10	**TOTAL POST CLOSURE**					

5.4 Adjusting for Inflation

Since unit costs for tasks and services given in Tables 5.2 and 5.3 are given in current dollars they should be updated periodically to account for rises in inflation and other market influences. To provide accurate closure and post closure cost estimates it is recommended that quick and easy inflation adjustments be made annually. A more thorough but time consuming reassessment of unit costs should be conducted after every fifth year. Steps for accomplishing both annual adjustments and comprehensive reassessments are given below.

5.4.1 Annual Adjustment

Currently in accordance with OAC 252:510-21-2 (c) and 3(c), MSWLF owners and operators must annually adjust their final closure and post-closure costs for inflation. OAC 252:510-21-2(c) and 21-3(c), though not yet adopted as permanent regulation, describe how to perform inflation adjustment calculations using an inflation factor.

The inflation factor is derived from the most recent annual "Implicit Price Deflator for Gross National Product" or the "Implicit Price Deflator for Gross Domestic Product" published by the U.S. Department of Commerce in its *Survey of Current Business* in the year for which the adjustment is being made. The inflation factor is the result of dividing the latest published annual Deflator by the Deflator for the previous year.

The first annual adjustment should occur the first year after this document is published. The first adjustment should be made by multiplying the unit costs given in Tables 5.2 and 5.3 by the inflation factor. The adjusted values should then be used to calculate closure and post closure costs estimates. Subsequent adjustments should be made annually by multiplying the latest values for unit costs by the latest inflation factor. This process of adjustment should be utilized until the unit costs are more thoroughly reassessed after year five.

5.4.2 Comprehensive Reassessment

After five years, a more comprehensive adjustment of unit costs should be performed. This can be accomplished by re-tracing some of the steps taken in Chapter Four of this document. Those resources consulted in Chapter Four, members of the regulated community, vendors service providers, and standard references, could provide current unit costs for tasks and services. For instance, labs would be asked to submit current price lists, and ODOT bid tabs for the previous year could be reviewed to determine the costs of topsoil and salvaged topsoil. Attachments 8 through 11 contain all the necessary contact information for those agencies and companies submitting information used to determine the original unit costs used in this document.

Tables 5.2 and 5.3 should be revised when new values for unit costs have been determined. At this point, MSWLF owners and operators should recalculate closure and post closure costs using the revised tables. Annual adjustments, as described in 5.4.1, should now resume and continue until the next comprehensive five year adjustment occurs.

5.5 Utilization of Closure and Post-Closure Cost Estimates

After exhaustive research of numerous resources including other states, the EPA, cost estimate publications such as R.S. Means, and the owner/operators of the regulated landfills in Oklahoma, the comprehensive list of tasks and services and unit costs are presented in this chapter. It is recommended that the list of tasks and services and unit costs be utilized in the State of Oklahoma to calculate adequate costs estimates for closure and post-closure activities. It is recommended that these unit costs be updated periodically to account for inflation and other market influences as discussed in this chapter.