

INSTRUCTIONS FOR LANDFILL CLOSURE COST ESTIMATE WORKSHEET WITH KDHE/BWM PROVIDED UNIT COSTS

This guidance has been prepared to simplify the Permittees' task of preparing closure cost estimate documentation in an accurate and timely manner. Following this guidance will help to lessen KDHE's time to review and approve the estimate. The landfill Permittee or his/her design consultant is to use approved Design Drawings and Record Drawings from past construction quality assurance (CQA) events as a basis to prepare the facility's closure cost estimate. These instructions are applicable to Subtitle D MSW landfills, SALs, C&D landfills, and Industrial landfills.

- I. Make sure that you have an updated landfill Facility Site Map and an Area, Capacity, and History TABLE(s).
- II. Download the proper Closure Cost Estimate Forms from the KDHE-BWM website at http://www.kdheks.gov/waste/forms_swclosurecosts.html. Make sure you use the form for the correct fiscal year and facility type. The Kansas state fiscal year begins on July 1st, and ends on June 30th.
- III. Complete a Closure Cost Estimate Form for each type of Landfill for which you are permitted. For example, if you have a facility that has waste disposal areas permitted for municipal solid waste (MSW), construction and demolition waste (C&D), waste tires, and industrial waste (IDL), you would need to complete a separate Closure Cost Estimate Form for **each** of those landfill types.
- IV. The unit costs on the Closure Cost Estimate Forms have been updated for inflation.
- V. Obtain the following Permit Documents:
 - a. **Approved Design Drawings**
 - i. Plat or Certificate of Survey
 - ii. Make a **copy** of the Facility Site Map and illustrate all of the permitted waste disposal areas for the given type of landfill.
 1. Determine the areas of the landfill that are:
 - a. Closed. Areas that closed after 2001 must have an approved CQA report and official documentation from KDHE-BWM to be classified as being officially closed.
 - b. Open, and have intermediate cover over them.
 - c. Open, and are within the "Active Area" of the landfill.
 - d. Open, that have received final cover, but have not been certified closed by KDHE.
 2. A copy of the Area, Capacity, and History Table must be submitted for all facilities. A facility site map with the open, closed, and intermediate cover areas and acreages labeled is required to be submitted for all Subtitle D facilities. It is not required for SALs, C&Ds, industrial landfills, and waste tire monofills, but it is encouraged, as it will expedite the KDHE review process. These are living documents that must be continuously updated.
 - b. **Approved CQA Reports**
 - i. A copy of the As-Built or Record Drawings from CQA Reports can also be used to illustrate how much a waste disposal area or cell has been filled.
- VI. From your copy of the Facility Site Map, fill out all of the information at the top of the sheet.
 - a. **OWNER:** _____ State the name of the Permittee.
 - b. **OPERATOR:** _____ This is usually the same as the Permittee.
 - c. **FACILITY PERMITTED AREA:** _____ ACRES. This acreage is illustrated and stated on the sealed Plat or Certificate of Survey approved by KDHE-BWM.
 - d. **TOTAL PERMITTED WASTE DISPOSAL:** _____ ACRES. This is the total amount of permitted waste disposal area for this type of landfill. This area is should be stated on the most recently executed Permit for the facility. This acreage is **Not** the Facility Permitted Area (FPA) acreage.
 - e. **TOTAL PERMITTED WASTE AREA CERTIFIED CLOSED:** _____ This is the area that has received final cover, and if closed after 2001, was documented closed in a CQA report approved by KDHE to certify closure.
 - f. **LARGEST AREA REQUIRING FINAL COVER DURING THE RENEWAL PERIOD:** _____ ACRES. This includes all areas that have or will receive waste during the renewal period, but have not received final cover. It also includes active areas, and areas under daily or intermediate cover.
 - g. **WAS A FACILITY SITE MAP SUBMITTED WITH THIS CLOSURE COST ESTIMATE? (Y/N) _____:** State whether a facility site map was submitted or not.
 - h. **DATE:** _____

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- i. PERMIT NUMBER: _____
 - j. ACRES CURRENTLY OPEN: _____ This is the area that is open at the time that the estimate is prepared. It includes all active areas, areas under intermediate cover, as well as areas that have received final cover after 2001, but have not been certified closed by KDHE via the CQA process.
 - k. ESTIMATOR: _____ State your name, position, and the facility or company you represent.
 - l. IS THERE AN APPROVED ALTERNATIVE FINAL COVER (Y/N): _____ State yes or no.
 - m. LOW PERMEABILITY SOIL DEPTH: _____ This is the depth of low permeability soil required to construct final cover. This value is 1.5 ft. unless there is an approved alternative final cover.
 - n. PROTECTIVE SOIL DEPTH: _____ This is the depth of soil included with vegetative soil to provide frost protection. This value will depend on the geographical location of your facility. Frost protection is only required for MSW facilities. Frost protection is not necessary for C&D landfills. A frost depth map is included for reference.
 - o. VEGETATIVE SOIL DEPTH: _____ This is the depth of vegetative soil needed to construct final cover. This value will be 1 ft. unless there is an approved alternative final cover for your facility.
 - p. Contact your KDHE-BWM Permit Manager if you have any questions.
- VII. Complete all of the Line Items in the Closure Cost Estimate Worksheet. If some of the Line Items are not applicable to your facility, state NA (Not Applicable) in the far-right column. An explanation of each specific line item can be found in the "Closure Line Items" section. If KDHE's unit costs are used, write "KDHE unit cost" in the right-hand column. If you use a different unit cost, provide your source in the right-hand column.
- a. Provide a separate sheet attached to show your calculations and include the units. Perform all calculations in the units that are listed on the closure cost estimate.
 - i. For example, if the area open is 5 acres and you are wanting to compute the volume of low permeability soil in cubic yards,

$$5.0 \text{ acres} \times 43,560 \text{ ft}^2/\text{acre} \times 1.5 \text{ ft} \times 1 \text{ yd}^3/27\text{ft}^3 = \text{_____} \text{ cubic yards.}$$
 - ii. Another example is in computing the amount of vegetative cover in cubic yards:

$$5.0 \text{ acres} \times 43,560\text{ft}^2/\text{acre} \times 1.0 \text{ ft} \times 1\text{yd}^3/27\text{ft}^3 = \text{_____} \text{ cubic yards.}$$
 - b. Standard final cover consists of 18 inches of low permeability soil and 12 inches of protective soil and vegetative soil. If you have an approved alternate final cover, reference the approved design specifications and the date that it was approved in the right-hand column.
- VIII. Print, sign, and date at the bottom of the page.

NOTES:

The Bureau analyzed data from the July 1, 2013 – June 30, 2014 permit renewal period and developed unit cost factors for closure and post-closure care for landfills by landfill type.

CLOSURE LINE ITEMS:

1.0.0 Preparing Site for Final Cover

- 1.0.1 Backfill below grade areas with structural fill: Cost includes the purchase of backfill material, the hauling of backfill material, the spreading of backfill material, the addition of water and compaction of the backfill.
- 1.0.2 Construct and install pump(s) for perpetual pumping: Cost includes drainage medium, geomembrane, pump(s) and piping needed to dewater any saturated zone in contact with the composite liner.
- 1.0.3 Other: Provide design and itemize: Cost includes items in the provided design.
- 1.0.4 **Preparing Site for Final Cover Subtotal:** Total of

- 1.0.1, 1.0.2 and 1.0.3.
- 2.0.0 **FINAL COVER**
- 2.0.1 **Low Permeability Soil Layer**
- 2.0.2 Complete soil contouring and grading for final cover: Costs include grading the site to final elevations prior to placement of low permeability soil layer.
- 2.0.3 Clay--compacted, on-site: Cost includes hauling and spreading of the clay, addition of water and compaction. This layer must have a minimum thickness of 18" unless an alternative final cover has been approved.
- 2.0.4 Clay--compacted, off-site: Cost includes purchase of the clay, hauling and spreading of on-site materials, addition of water and compaction. This layer must have a minimum thickness of 18" unless an alternative final cover has been approved. *Do not include this item if clay is available on-site.*
- 2.0.5 **Low Permeability Soil Layer Subtotal:** Total of 2.0.2, 2.0.3 and 2.0.4.
- 3.0.0 **GEOMEMBRANE AND DRAINAGE LAYER**

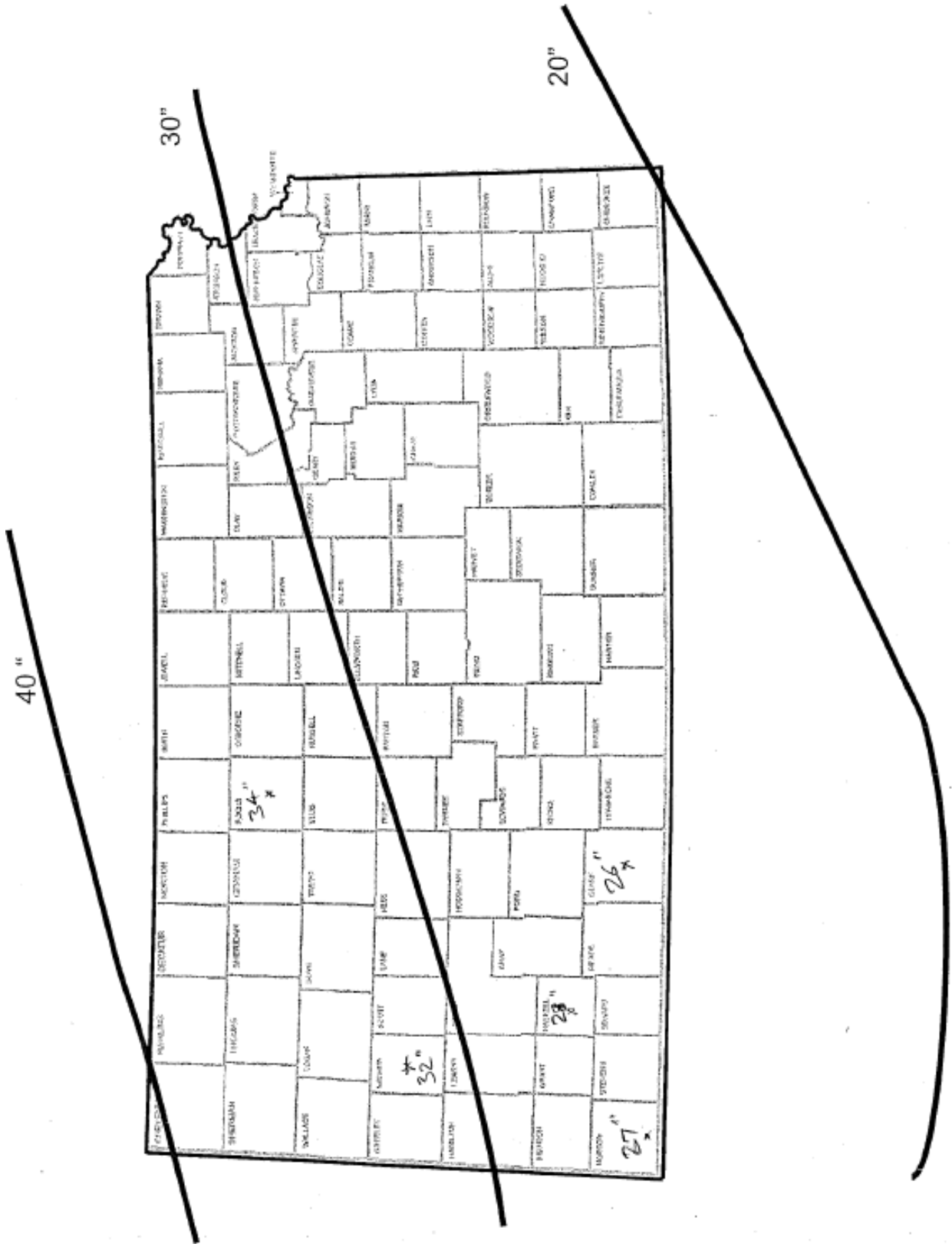
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- 3.0.1 Drainage material--sand: Cost includes purchase of material and installation of sand drainage layer above the geomembrane with a minimum thickness of 6". If a geogrid is used, no sand is required.
- 3.0.2 Drainage material--geogrid: Cost includes installation of a drainage geogrid above the geomembrane.
- 3.0.3 Geomembrane: Cost includes installation of the geomembrane liner.
- 3.0.4 Geomembrane and Drainage Layer Subtotal:** Total of 3.0.1, 3.0.2 and 3.0.3.
- 4.0.0 PROTECTIVE SOIL AND VEGETATIVE LAYER**
- 4.0.1 Protective Soil, On-site: Cost includes the excavating, transporting, placing and compacting of protective soil on top of the low permeability layer or drainage layer to a depth capable of protecting the low permeability layer from desiccation due to freeze thaw. Quantity must match earthwork balance.
- 4.0.2 Soil--off-site: Cost includes purchasing, hauling, placing and compacting of protective soil on top of the low permeability layer or drainage layer to a depth capable of protecting the low permeability from desiccation due to freeze-thaw. Quantity must match earthwork balance. *Do not include this item if soil is available on-site.*
- 4.0.3 Vegetative Soil (Topsoil), On-site: Cost includes the loading of on-site soil and spreading of soil on top of the low permeability layer or drainage layer to a depth capable of protecting the low permeability layer from desiccation due to freeze-thaw. This layer should be capable of supporting vegetation. Quantity must match earthwork balance.
- 4.0.4 Vegetative Soil (Topsoil), Off-site: Cost includes purchasing and hauling soil to the landfill and spreading of soil on top of the low permeability layer or drainage layer to a depth capable of protecting the low permeability from desiccation due to freeze-thaw. This layer should be capable of supporting vegetation. Quantity must match earthwork balance. *Do not include this item if soil is available on-site.*
- 4.0.5 Seeding and mulching: Cost includes the purchase and application of grass seed and of 1" of straw mulch.
- 4.0.6 Fertilizer: Cost includes the purchase and application of appropriate, grass fertilizer.
- 4.0.7 Protective Soil and Vegetative Layer Subtotal:** Total of 4.0.1, 4.0.2, 4.0.3, 4.0.4, 4.0.5 and 4.0.6.
- 5.0.0 EROSION CONTROL**
- 5.0.1 Terraces and letdowns: Cost includes the construction of soil terraces and letdowns to control erosion.
- 5.0.2 Checkdams and filters: Cost includes the construction of checkdams and filters to control erosion.
- 5.0.3 Grass ditching/channels: Cost includes the construction of grass-lined ditches to provide drainage from the top of the landfill.
- 5.0.4 Riprap ditching/channels: Cost includes the construction of riprap-lined ditches to provide drainage from the top of the landfill. Riprap should be used where flow velocities are in excess of 5 feet/sec.
- 5.0.5 Erosion Control Subtotal:** Total of 5.0.1, 5.0.2, 5.0.3, 5.0.4, and 5.0.5.
- 6.0.0 GAS SYSTEM**
- Not applicable for most C&D landfills.
- 6.0.1 Gas vents: Cost includes installation of a large diameter boring installation of piping, installation of gravel pack, and filling of the annular space with low permeability material.
- 6.0.2 Passive system
- 6.0.3 Passive well head flare: Cost includes installation of a passive well head flare with an auto-ignited solar-powered ignition unit.
- 6.0.4 Active System
- 6.0.5 Flare: Cost includes installation of a flare/blower unit.
- 6.0.6 Additional well installation: Costs include the installation of new gas wells..
- 6.0.7 Ancillary gas equipment: Cost includes all necessary materials and labor to connect individual wells into an active system including but not limited to piping, trench, cuts, valves and sampling ports. Cost for equipment already installed need not be included.
- 6.0.8 Gas System subtotal:** Total of 6.0.1, 6.0.2, 6.0.3, 6.0.4, 6.0.5, 6.0.6 and 6.0.7.
- 7.0.0 GROUNDWATER MONITORING SYSTEM**
- Not applicable for most C&D landfills.
- 7.0.1 Well installation: Cost includes mobilization and mileage to bring personnel, materials and equipment on-site; labor equipment and materials needed to install new groundwater monitoring wells; and completing and submitting the WWC5 well forms.
- 7.0.2 Abandon and plug wells: Cost includes removal and disposal of the concrete pad, the steel protective casing and a minimum of the top 10' of the well casing. It also includes plugging the well with bentonite and completing and submitting the WWC5 well forms.
- 7.0.3 Upgrade or repair existing wells: Cost includes repair or replacement of well pads, repair of protective casing and padlocks. Cost also includes labor and materials and should assume a minimum of 4 hours of labor per well, prorated over 30 years.
- 7.0.4 Dedicated pump/sampling system installation/upgrade: Cost includes installation and maintenance of dedicated pump/sampling system.
- 7.0.5 Groundwater sample collection: Cost includes the transportation of personnel and equipment to the site and the sampling of the groundwater wells according to the approved Sampling and Analysis Plan. Costs also include decontamination of the sampling and depth sounding equipment. Costs are based on 2 sampling events per year multiplied by the number of wells sampled.
- 7.0.6 Sampling analysis and reporting: Cost includes analysis of groundwater samples from all monitoring wells within the approved system twice a year for all constituents listed in Appendix I of K.A.R. 28-29-113 for landfills and submittal of the groundwater sampling

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- event report as defined in the Sampling and Analysis Plan.
- 7.0.7 Groundwater Monitoring System Subtotal:** Total of 7.0.1, 7.0.2, 7.0.3, 7.0.4, 7.0.5 and 7.0.6.
- 8.0.0 LEACHATE/CONTACT WATER COLLECTION SYSTEM**
Not applicable for most C&D landfills, and unlined SALs.
- 8.0.1 Additional/upgrades for collection piping: Cost includes purchasing and installation of leachate/contact water collection system piping.
- 8.0.2 Additional/upgrades to pumps: Cost includes the purchasing and installation of leachate/contact water collection system pumps.
- 8.0.3 Additional/upgrades to storage containers: Cost includes the purchase and installation of leachate/contact water collection system storage containers.
- 8.0.4 Baseline sample collection: Cost includes drawing leachate/contact water samples for analysis. The cost also includes mobilization and mileage to bring personnel on- site.
- 8.0.5 Baseline sample analysis and reporting: Cost includes annual leachate/contact water analysis for each unit for parameters listed in K.A.R. 28-29-107 (i)(6)(B).
- 8.0.6 Leachate/Contact Water Collection System Subtotal:** Total of 8.0.1, 8.0.2, 8.0.3, 8.0.4 and 8.0.5.
- 9.0.0 OPERATIONS AND INVENTORY REMOVAL**
- 9.0.1 Excess solid waste: Cost includes the removal, hauling and disposal of excess solid waste.
- 9.0.2 Mobile equipment/machinery (e.g. containers, tanks, etc...): Cost includes the removal, hauling and disposal of mobile equipment/machinery.
- 9.0.3 Stored leachate/contact water: Cost includes the removal, hauling and disposal of stored leachate/contact water.
- 9.0.4 Contaminated soils: Cost includes the removal, hauling and disposal of contaminated soils.
- 9.0.5 Operations and Inventory Removal Subtotal:** Total of 9.0.1, 9.0.2, 9.0.3 and 9.0.4.
- 10.0.0 DEMOLITION/REMOVAL SITE IMPROVEMENTS**
- 10.0.1 Office/shop/maintenance and other ancillary buildings: Cost includes the removal of buildings and structures.
- 10.0.2 Equipment to be decommissioned (e.g., weigh scales, bulking/solidification pits, collection pits/sumps, piping, etc...):
- 10.0.3 Site Utilities: Cost includes the disconnecting and demolition of the utilities coming onto the site.
- 10.0.4 Demolition/Removal Site Improvements Subtotal:** 10.0.1, 10.0.2 and 10.0.3
- 11.0.0 REPLACE/REBUILD SITE ACCESS CONTROLS**
- 11.0.1 Fencing: Cost includes the purchase and installation of fence.
- 11.0.2 Gates: Cost includes the purchase and installation of Gates.
- 11.0.3 Access Barriers: Cost includes the purchase and installation of access barriers.
- 11.0.4 Other security equipment: Cost includes the purchase and installation of other security equipment.
- 11.0.5 Replace/Rebuild Site Access Controls Subtotal:** Total of 11.0.1, 11.0.2, 11.0.3 and 11.0.4.
- 12.0.0 BORROW AREA RECLAMATION**
- 12.0.1 Grading and site preparation: Costs include grading the borrow area to final elevations prior to placement of backfill.
- 12.0.2 Soil, On-site (excavate, transport, place, compact): Cost includes the excavating, transporting, placing and compacting of the soil.
- 12.0.3 Soil, Off-site: Cost includes purchase, hauling, spreading, and compaction of the soil. *Do not include this item if soil is available on-site.*
- 12.0.4 Seeding and mulching: Cost includes the purchase and application of grass seed and of 1" of straw mulch.
- 12.0.5 Fertilizer: Cost includes the purchase and application of appropriate, grass fertilizer.
- 12.0.6 Borrow Area Reclamation Subtotal:** Total of 12.0.1, 12.0.2, 12.0.3, 12.0.4 and 12.0.5.
- 13.0.0 CLOSURE COST SUBTOTAL:** Total of 1.0.4, 2.0.5, 3.0.4, 4.0.7, 5.0.6, 6.0.8, 7.0.7, 8.0.6, 9.0.5, 10.0.4, 11.0.5 and 12.0.6
- 14.0.0 PROFESSIONAL SERVICES [Closure cost subtotal (13.0.0) X 10% or enter costs provided by third party with sources listed in line items below]: Cost = 10% of the Closure Cost Subtotal.**
- 14.0.1 Professional Services (10% of Closure Cost Subtotal): Cost = 10% of the Closure Cost Subtotal.
- 14.0.2 Topographic and Boundary Survey: Cost includes development final closure survey and establishment of the final waste boundaries.
- 14.0.3 Engineering (Design, Bid Documents, Procurement, Construction Contract Management): Cost includes development of the bid documents for project letting from existing closure plans.
- 14.0.4 Engineering Services, (Construction Oversight, Testing, Reporting, Certification): Cost includes all construction quality assurance inspections and testing required to properly close the landfill and preparation of the Certification of Closure report.
- 14.0.5 Professional Services Subtotal:** Total of 14.0.1, 14.0.2, 14.0.3 and 14.0.4.
- 15.0.0 ADMINISTRATION AND CONTINGENCY**
- 15.0.1 Administration Services: Cost includes third party administration fee of 10% of the Closure Cost Subtotal.
- 15.0.2 Contingency: Cost includes a contingency of 10% of the Closure Cost Subtotal.
- 15.0.3 Administration and Contingency Subtotal:** Total of 15.0.1 and 15.0.2.

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Extreme Frost Penetration (in Inches) Based Upon State Averages
Manual"
Adopted from NAVFAC DM*-7.1, May 1982
*Naval Facilities Engineering Command "Soil Mechanics Design